APPENDIX C: METRO MAYORS CAUCUS & COLORADO WATERWISE COUNCIL BEST MANAGEMENT PRACTICES FOR WATER CONSERVATION AND STEWARDSHIP

Thirty-two municipalities in the greater Denver area make up the Metro Mayors Caucus. Twenty-seven of these jurisdictions signed a Memorandum of Understanding on Water Conservation and Stewardship on January 22, 2005, pledging to "…use our best efforts to identify and adopt, or urge the water utilities that serve us to adopt, best management practices that achieve efficient water use through conservation, reuse, and/or new technologies." The following BMPs were compiled by municipal staff, water providers, landscape and irrigation contractors, environmental consultants and others working through the Metro Mayors Caucus and the Colorado WaterWise Council, and were adopted by the Metro Mayors Caucus on [date] 2005. These voluntary BMPs are intended to serve as a resource document or "menu" of options for water providers.

Metro Mayors Caucus & Colorado WaterWise Council
Best Management Practices for Water Conservation and Stewardship

Contents

I - General Information Relevant to Review of Best Management Practices

1. Background & Purpose

The following Best Management Practices (BMPs) were compiled by municipal staff, water providers, landscape and irrigation contractors, environmental consultants and others working through the Metro Mayors Caucus and Colorado WaterWise Council. These BMPs for commercial-industrial and municipal (residential) use are intended to serve as a resource document or "menu" of options for water providers that want to enhance water conservation by reducing water demand among their customers. The BMPs also fulfill, in part, a commitment made in ¶2 of our regional Memorandum of Understanding on Water Conservation and Stewardship by 27 jurisdictions on January 22, 2005 to continue to identify and adopt BMPs for conservation.[1]

2. Voluntary Nature

Implementation of any or all of these BMPs by water providers and/or non-provider municipalities is strictly voluntary and should be based on the (implementing body's) analysis of the costs and benefits of implementation for their service area. As new technologies become more affordable and/or infrastructure investments are made, we hope that providers will consider implementing additional conservation measures.

3. Reuse/Recycling of Water and Other Supply Side Measures

With the exception of BMP 11, these BMPs deal with demand side and distribution opportunities. An equally important part of conservation is supply side efficiency measures such as lining of irrigation ditches and ponds, conjunctive use, dry-year leasing and grey water reuse. Attention to these measures is a logical next step and will be the subject of a subsequent working group in 2005.

4. Implementation by Municipalities that are not Providers

Municipalities that are not providers are encouraged to review the Best Management Practices and implement them where possible (for example BMPs 1&4 have applicability for non-providers) and cost effective.

5. Use by the Colorado Water Conservation Board

Our BMPs will be forwarded to the Colorado Water Conservation Board (CWCB) for incorporation into the Model Water Conservation Plan Guidance Document that the CWCB has posted on its website. These BMPs **will not be** part of the statutorily required "Water Conservation Plan Guidelines" being drafted by the CWBC in response to HB 04-1365, the Water Conservation Act of 2004. The model conservation plan will be a reference document that can be used by a water entity to assist them in creating a new or revised water conservation plan. The provisions of the model conservation plan are strictly voluntary and serve to illustrate current planning methodology. A water entity that chooses to follow the model plan may be eligible for increased grant amounts, if that entity has sought financial assistance through the CWCB.

6. Information Sharing and Reporting on Best Practices (Internal and External)

Water conservation initiatives and BMP implementation benefit from multiple perspectives and the sharing of information. We hope that providers and non-provider municipalities will embrace information sharing on best practices internally and externally.

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[1] Signers on the MOU pledged to, "… use our best efforts to continue to identify and adopt, or urge the water utilities that serve us to adopt, best management practices that achieve efficient water use through conservation, reuse, and/or new technologies."

I - General Information Relevant to Review of Best Management Practices (continued)

Nationally, some providers are required to report on their conservation efforts as part of a larger monitoring effort. In Colorado a voluntary reporting system could be implemented if technical and monetary resources are identified. A statewide reporting mechanism and database would give providers and/or cities access to valuable information regarding implementation and effectiveness of BMPs. By creating a venue for information sharing and dialogue, opportunities to collaborate to overcome barriers may be identified (i.e., resource sharing such as audits of industrial users, expertise that may be available outside of jurisdiction or from another provider, opportunities to form partnerships around specific initiatives).

Ideally, cities in Colorado would voluntarily report on their implementation of BMPs and share information including, but not limited to, the following:

1. Water savings attributable to BMP implementation
2. Implementation mechanism(s) and how the BMP was tailored to community circumstances (provider vs. retail customer, growing vs. built out, large vs. small communities, etc.)
3. Costs incurred in implementation
4. Benefits of implementation that may not be suited to quantitative analysis

This effort is a logical next step for the Metro Mayors Caucus, Colorado WaterWise Council and others interested in information sharing on conservation. However, funding must be identified to support database creation and management.

Providers and non-provider/retail customer jurisdictions are also encouraged to disseminate information and get feedback about BMPs within their departmental structure (planning and development, parks and recreation, etc.). By sharing information about the BMPs and underscoring the administration's focus on conservation, staff at all levels can identify problems and possible solutions related to implementation of BMPs. Within a jurisdiction, the implementation of BMPs can have broad impacts. Expertise within departments and awareness of potential obstacles to BMP implementation can be used to develop solutions within each community or to adapt implementation to unique circumstances.

The members of the MMC Water Committee and the Best Management Practices working group believe that information sharing is one of the single most important steps we can take as a region to improve upon individual conservation efforts.

II. Best Management Practices for Water Conservation & Stewardship

BMP 1: Residential Indoor and Outdoor Water Use Conservation Programs

A. Description of Best Management Practice
Water providers should review residential water use patterns within their service area to determine the potential for reliable demand reductions. If reductions are cost effective and appropriate, implementation should be considered.

For the purpose of this BMP, the residential sector is generally defined as individually owned living units and landscaped areas under the control of the owner and/or occupant. Common area landscapes are not included in this BMP but are included BMP 3.

B. Benefits of Implementation
Replacing old fixtures, which do not meet current minimum standards, with new, code compliant fixtures, will produce on-going water savings and extend water supply. Alternatively, maintaining existing fixtures will produce short-term savings, which may diminish, as the need for maintenance increases.

Implementation of residential water use conservation programs targeted at improving irrigation efficiency or reducing irrigation requirements will produce a mix of both permanent and short-term water savings. Permanent savings may be achieved when non-reversible reductions of irrigation requirements are implemented through landscape regulations, water budgets, or other methods. While permanent savings may extend water supply, less permanent savings may both reduce the need for watering restrictions and limit landscape loss in times of an emergency through increased system efficiencies and improved system operation.

1. The following information can help water providers evaluate conservation potential:
    - Per capita water use for the customer class
    - Age of the housing stock
    - Percent of domestic indoor and irrigation use
    - Age of existing irrigation systems
    - Current municipal landscape requirements
    - The cost of new water supply

2. Implementation may consist of the following programs and methods:
    - Residential water survey or audit program
        - Professional auditor supplied
        - Homeowner performed
        - Indoor water uses
        - Outdoor water uses
    - Fixture replacement programs
        - Toilets
        - Washing Machines
        - Showerheads
        - Aerators
        - Irrigation controllers
        - Sprinkler system components
    - Maintenance programs
        - Toilet flapper replacement
        - Leak detection and repair

- Landscape/Sprinkler programs
  - Irrigation water budget
- Programs to encourage all seven principles of Xeriscape. The fundamentals are:
  - Planning and Design - for water conservation and beauty from the start
  - Create Practical Turf Areas - of manageable sizes, shapes and appropriate grasses.
  - Select Low Water Requiring Plants - group plants of similar water needs together and experiment to determine how much and how often to water the plants.
  - Use Soil Amendments - like compost or manure as needed by the site and the type of plants used.
  - Use Mulches - such as woodchips, to reduce evaporation and to keep the soil cool.
  - Irrigate Efficiently - with properly designed systems (including hose-end equipment) and by applying the right amount of water at the right time.
  - Maintain the Landscape Properly – by mowing, weeding, pruning and fertilizing properly.
  - Irrigation schedule design and education
- Implementation methods
  - Rebate incentives
  - Tap fee credits
  - Promotional advertising/publicity
  - Distribution of fixtures
  - Distribution of information
  - Contractor implementation
- Policy Options
  - Mandatory fixture replacement on resale of property ordinance
  - Building code mandates
  - Landscape/sprinkler system regulations
  - Increasing efficiency standards for new construction, for example:
    - Landscape design
    - Irrigation system design
    - Appliance/fixture requirements

C. Potential Barriers to Implementation

1. Budgetary
2. Staffing
3. Disposal of replaced fixtures
4. Level of need for additional water supplies
5. Level of need for additional water and wastewater treatment capacity
6. Permanence of savings
7. Irrigation water savings will not extend supply if an absolute ban on watering is in effect

D. Cost Considerations for Implementation

1. Reductions in water use will affect revenue. Significant projected reductions in revenue may require adjustments to rates or rate structures.
2. Reductions in water use and wastewater generated may be beneficial when planning for water and wastewater requirements. Additions or modifications to current capacity may be postponed or eliminated if demand is permanently reduced.
3. Education programs must be long term for consistent savings.

E. Criteria to Determine BMP Implementation Status

1. Water provider has reviewed water use patterns of the residential sector and determined cost effectiveness of conservation measures.

2. If water provider has determined measures are cost effective, provider has developed and implemented a strategy for targeting and marketing selected conservation programs.
3. If water provider has implemented selected programs, provider has tracked the type and number of customers contacted, retrofits completed, devices distributed, surveys completed, and program costs.
4. Water provider performs a periodic assessment of the water use patterns within the residential sector on a regular basis to address changes in the sector. The assessment period should be no less than once every 10 years.

F. For More Information:

1. Impact of National Plumbing Efficiency Standards on Water Infrastructure Investments, Author: Maddaus, Lisa, Mary Ann Dickinson, and William Maddaus., 01/01/2001. Available from California Urban Water Conservation Council at www.cuwcc.org
2. Freeriders in ULFT Programs, Author: Whitcomb, John.,12/01/2002. Freeriders in ULFT Programs' provides information on which cost-effective ultra-low-flush toilet (ULFT) retrofit programs minimize the potential for any 'free riders' to the program. This study examines several mature ULFT programs and considers the costs and loss of benefits associated with free ridership.
3. Evaluating Urban Water Conservation Programs: A Procedures Manual (287 pages, 10.8 MB) Author: Planning and Management Consultants, Ltd., 02/01/1992
4. ”Residential End Uses of Water." AWWA Research Foundation, 1999.
5. "Stretching Urban Water Supplies in Colorado: Strategies for Landscape Water Conservation," Rachel Barta for the Colorado Water Resources Research Institute. Special Report No. 13. February 2004.

BMP 2: Commodity Rate Metering For New Connections & Existing Connection Retrofit

A. Description of Best Management Practice

Water providers in Colorado are required to install meters for all new connections and bill by volume of use. All existing unmetered connections must be retrofitted with meters and billed by volume of use on or before January 1, 2009 in accordance with Colorado Statute 37-97-103.

B. Benefits of Implementation

Research has proven that customers use less water when it is metered and billed based on consumption.

- Accurate consumption measurement is influenced by the type and size of the meter as well as an appropriate testing and maintenance schedule.
- Individual metering of multiple dwelling unit buildings and businesses encourages accountability and allows customers to assess and modify their water usage.
- Water meters can also provide useful information for the management of irrigated landscapes, which constitute approximately 50% of municipal water use. When both landscape and domestic use are measured through the same meter, it is difficult to determine the consumption attributable to each category. Separate metering of landscape and domestic use provides new opportunities to identify and implement targeted practices to encourage more efficient water use.
- Utility bills should be mailed monthly to provide customers with timely consumption information. New, affordable meter technology uses remote displays so customers can calculate their consumption instantaneously; the ability to track consumption in real time can promote efficient water use.

Additional implementation considerations:

- Size meters appropriately, based on industry standards and water use patterns, to provide accurate and reliable data.
- Establish an ongoing meter testing and maintenance program to maintain meter functionality and accuracy.
- Evaluate the benefits of requiring individual meters or sub-meters on a per dwelling unit or individual commercial space basis, and separate irrigation meters based on a minimum threshold of irrigated area.
- When specifying and purchasing water meters, evaluate the cost effectiveness of technology that allows customers to instantly determine their water usage.

C. Potential Barriers to Implementation:

1. Cost
2. Staffing
3. Training

D. Cost Considerations for Implementation

Accounts which are metered and billed by volume generally reduce demand as customers relate the amount of water used with the amount of the water bill. Adjustments in rates or rate structures may be required to assure adequate revenue for the utility.

E. Criteria to Determine BMP Implementation Status

1. In accordance with statute, provider with existing unmetered connections has completed meter retrofitting by January 1, 2009.
2. Provider has adopted standard operating procedures and routing for periodic meter testing, maintenance, and replacement.

F. For more information:

1. AWWA Manual M22, "Sizing Water Service Lines and Meters." Produced by the Customer Metering Practices Committee of the AWWA.
2. AWWA "Water Distribution Operator Training Handbook" (2nd Ed.). See chapter 13 on the different types of water meters, their capacities, meter reading, and AMR.
3. See also the websites of meter manufacturers such as Badger Meter (www.badgermeter.com), Neptune Technology Group (www.neptunetg.com), Sensus Metering Systems (www.sensus.com), Hersey Meters (www.herseymeters.com), AMCO Water Metering Systems (www.amcowater.com/en); or the manufacturer of meters used in your water system.

BMP 3: Landscape Water Conservation Policies & Programs for Commercial, Industrial, Institutional Properties (CII) and Public & Private Common Area Landscapes

A. Description of Best Management Practice

Landscape water conservation policies and programs are tools to promote efficient outdoor water use. This BMP is intended for CII landscapes, as well as public and private common area landscapes such as municipal parks, golf courses, and owners association common areas (including single and multi-family common areas). See BMP 1 for single-family residential indoor and outdoor conservation programs.

Water Provider Program Tools

1. Outdoor Water Use Audits - Audits are performed to evaluate the efficiency of landscape water use by a certified audit inspector who assesses:
    - Landscape design including evidence of soil amendment, size and location of practical turf areas, appropriate plant material selection and use of mulches.
    - The irrigation system including a measure of the rate and efficiency of water delivery and hydrozone specifications.
    - Evidence of appropriate maintenance practices.

    Upon completion, the auditor provides the customer with recommendations on how to use water more efficiently and provides estimates of potential water savings with adherence to the recommendations.
2. Landscape Water Allocations - An account-specific water allocation volume is established for properties based on an evaluation of landscape irrigation needs that factors in vegetation types and irrigable area. Pricing and other monetary incentives are provided to the customer to maintain water use within this pre-determined water allocation.
3. Rebate Programs - Landscape rebate programs provide a monetary incentive to retrofit existing landscapes and/or irrigation systems to a more water-efficient standard. Water provider rebates should be offered for:
    - Replacing high water-demand plant material with lower water-demand plant material and/or pedestrian hardscape/patio areas.
    - Updating less efficient irrigation systems and controllers with more efficient, state-of-the-art components.
    - Professional redesigning of a high water-demand landscape to a lower water demand.
    - Incorporating amendments into soil beyond minimum requirements and/or on an annual basis.
4. Educational Programs (Refer to BMP 4).

Municipal and other Governmental Policy Tools

1. Water-Wise Landscape Ordinance - Landscape ordinances, which regulate how new, redevelopment and/or existing properties are designed, should incorporate Xeriscape™ landscape design principles including:
    - Use of low water-demand plant material.
    - Promoting practical turf areas by limiting the use of high water-demand plant material to areas of high visibility or functional needs, while avoiding turf on steep slopes or narrow medians.
    - Grouping plants with similar water and environmental requirements together on the same irrigation zone.
    - Use of efficient irrigation systems, including meeting a minimum measure of uniformity and efficiency of water delivery.
    - Use of soil amendments and mulches, generally organic and biodegradable.
2. Construction Standards and Specifications - Construction Standards and Specifications describe minimum requirements and criteria for specific landscape portions of public and/or private projects and should translate Xeriscape ™ landscape principles into measurable requirements that include:
    - Soil amendment minimum amounts and requirements

- Mulch requirements
- Irrigation system requirements including performance standards of water delivery uniformity and efficiency
- Plant material hydrozone specifications
- Comprehensive landscape management plan including mowing, fertilization and irrigation schedule guidelines
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B. Benefits of Implementation

1. Outdoor water use audits are a direct, hands-on water consumer educational tool.
2. Policy tools that require water-wise new development landscapes are cost-effective when considering water savings and the cost to retrofit existing landscapes.
3. Built, maturing water-efficient landscapes can evolve to a water-wise "community ethic."
4. Permanent water savings extend water supply. Reduced outdoor demand can limit the need for watering restrictions and landscape loss in times of an emergency and can reduce the impact of a water provider's peak water demand needs.
5. The direct, immediate monetary incentive of a rebate is often all that is needed to spur ample program participation.
6. Administering a water-wise landscape ordinance promotes educational awareness between provider departments.

C. Potential Barriers to Implementation

1. Cost and Staffing
2. Owners association covenants
3. Public acceptance of non-traditional landscapes
4. Additional government regulation and oversight required
5. Public acceptance of timeline for retrofitted landscapes to mature
6. Ultimately, retrofitted landscapes reduce water demand, however, they do require additional water for up to 3 years to become established

D. Cost Considerations for Implementation

1. Cost of certifying inspectors for water audits
2. Cost for ongoing review and inspection personnel to evaluate project's compliance with Landscape Ordinance and Standards & Specifications
3. Cost of follow up tracking of accounts' water use via account billing
4. Cost of rebates and subsequent staff monitoring of rebate accounts
5. Capital costs (borne by property owner) for retrofitted plant material
6. Difference in capital costs between traditional high water-demand landscapes and water-wise landscapes
7. Ongoing training and educational costs

E. Criteria to Determine BMP Implementation Status

1. Identify and rank accounts according to water use.
2. Accounts using more than 80% Reference Evapotranspiration (ETo) contacted and landscape water audit performed.
3. Performance review of managers of public landscapes tied to water audit assessment.
4. Rebate program designed and implemented with a three year monitoring record.
5. Updated landscape ordinance includes water-wise landscape design.
6. Updated Standards and Specifications include water-wise landscape installation and maintenance requirements.

F. For More Information

1. Colorado Department of Local Affairs – Office of Smart Growth *"Water Efficient Landscape Design Model Ordinance"*
2. Denver Water Large User Audit Program www.water.denver.co.gov
3. GreenCo Best Management Practices www.greenco.org
4. Irrigation Association web page www.irrigation.org
5. Northern Colorado Water Conservancy District web page www.ncwcd.org
6. Center for ReSource Conservation web page www.conservationcenter.org
7. Water-Efficient Landscaping: A Guide for Utilities and Community Planners. By Scott Whittier Chaplin for the Rocky Mountain Institute, 1994.
8. Local Landscape Ordinances. By Gary O. Robinette. 1992. by Agora Communications, P.O. Box 868048, Plano, TX 75086.
9. Landscape Code and Policy Manual. City of Colorado Springs, City Planning. Effective
10. Date: November 1, 1998.
11. "Landscape Management for Water Savings: How to Profit from a Water Efficient Future," by Tom Ash. Fall 1998. published by Municipal Water District of Orange County, CA. (a handbook for the Green Industry to use with their customers)
12. Growing Greener: Putting Conservation into Local Plans and Ordinances. By Randall Arendt for the Natural Lands Trust. Island Press. Washington DC. 1999.

BMP 4: School Education Program

A. Description of Best Management Practice

This BMP involves implementing an education program in schools to promote water conservation and conservation's related benefits. An effective schools program includes working with public and private schools in the water service area to provide instructional assistance, educational materials and classroom presentations. These may include everything from handouts, to in-class presentations, to assembly shows, to children's water festivals and contests. The most effective materials and presentations are those that correlate easily with the State of Colorado education standards for each grade level. Many water providers find that working with grades 5- 7 works best for the school districts' curricula, the students' learning capabilities, and the water providers' resources.

B. Benefits of Implementation

1. Students, particularly those in upper elementary school and middle or junior high school, are the most receptive to lessons about water and water conservation. These students often remember their lessons well into adulthood, and thus are better citizens, wiser water users and more educated water customers than people who did not learn these lessons as children.
2. School programs offer an opportunity to reach parents/guardians through the student population. Brochures and other adult conservation materials may be sent home with students to promote family discussion of water conservation.
3. Creating and maintaining relationships with school districts is also good management policy for a water provider. Accurate information and timely updates (especially in times of crisis) can be delivered to students, teachers, administrative staff and parents because of this relationship.
4. These programs pay off over the long term in better customer relationships, which are particularly beneficial in times of crisis when effective communication can be both costly and difficult.

C. Potential Barriers to Implementation

1. Cost: - Even if schools programs are delivered by current employees, there are real costs associated with the program.
    - Reallocating Resources: Providers may need to revisit priorities to find dollars and employee time for running a schools program.
2. Academic - Some school districts, wary of non-academic organizations trying to influence students and teachers and administrators, may not embrace efforts to integrate the program into their curriculum.
3. Curriculum - Consultants may argue that existing conservation curriculum is not pertinent to a provider's situation and urge the provider to pay for creation of a new curriculum. Providers should be aware that there are several excellent water conservation curricula available. Many new curriculum documents sit on shelves unused because they have not been tested against state standards, or teachers are not familiar with them, or for any number of other reasons.

D. Cost Considerations for Implementation

- Curriculum - Water providers can purchase existing curriculum and handouts for a school program from the resources listed below. Costs range from about $1.50 per student to $32 per student; impacts in terms of real savings and long-term customer loyalty are somewhat commensurate with costs.
- Events - For big events like children's water festivals and contests, there are costs associated with publicizing the event and awarding prizes to winners. These can range from almost nothing (assuming donated space for publicity and donated prizes) to thousands of dollars depending upon the level approved by the water provider's managing board of directors.

- Employee Costs - Water providers can assign an employee full-time or part-time to coordinate a program of contractors, or to actually make presentations and develop relationships with school districts. Costs will vary with salaries, contract costs and materials costs.

E. Criteria to Determine BMP Implementation Status

1. Provider has procured educational materials and/or personal appearances appropriate for school children.
2. Provider has made a concerted effort to distribute water conservation materials to schools in its water service area.
3. Provider has documentation, updated annually, of the number of students and teachers reached.

F. For More Information

1. Learning to Be WaterWise, a program of Resource Action Programs, www.resourceactionprograms.org/
2. "Making Waves: How to Put on a Water Festival" and "Making Ripples: How to Organize a School Water Festival" by the Groundwater Foundation www.groundwater.org
3. Water in the City, a program of The Franklin Institute, http://www.fi.edu/city/water/. Project WET, a non-profit organization focusing on water education for teachers, www.projectwet.org
4. WET in the City - An urban environmental education program of the Council for Environmental Education (CEE) focusing on water resources. www.wetcity.org
5. Colorado Alliance for Environmental Education, the umbrella organization for environmental education programs for ages 1-99 in Colorado, and the organization that correlates environmental education to the State of Colorado education standards, www.caee.org
6. Water Wizards, a project for the City of Colorado Springs and others by educator, Judith Daley of Gentle Earth Educational Resources, EarthEducators@aol.com
7. On-line resources at H2O University, sponsored by the Southern Nevada Water Authority, www.h2ouniversity.org
8. New Mexico Water Conservation Program - On-line water conservation material for Xeriscaping, tips, water harvesting and more, www.seo.state.nm.us/waterinfo/conservation/h2o-outreach.html
9. WaterWiser's online directory of water education resources, www.waterwiser.org/links/index

BMP 5: Conservation Program for Commercial-Industrial-Institutional & Multi-Family Residential Accounts (Indoor)

A. Description of Best Management Practice

Most water providers serve both residential and non-residential customers. Non-residential customers that are categorized as commercial, industrial or institutional (CII) accounts are typically a provider's largest users. Cost-benefit analysis may reveal that small changes toward conservation can result in significant savings in this category.

Water efficiency categories included in this BMP are sanitation, irrigation, kitchen, process water, cooling, laundry, wastewater cooling, and miscellaneous other uses. Depending upon conservation programs already implemented, typically the greatest water savings can be achieved in sites such as office buildings, hospitals, schools, hotels and motels, restaurants, commercial car washes, and commercial laundries.

1. Successful programs will include:
    - Identifying and ranking all CII accounts by water use.
    - Implementing a water-efficient (1.6 gal/flush or less) program for CII over 3 years.
    - Instituting a program to audit/survey 10% of CII customers within ten years.
    - Committing to all customers that any information received by water provider staff or contractors will be completely confidential.
    - Offering incentives/rebates for implementing conservation measures.
        - Writing into the incentive/rebate contract a statement that the CII customer will repay the incentive/rebate amount if the savings do not continue for at least five years.
    - Demonstrating how the water provider achieved reductions in the CII sector through other means such as rules, ordinances, rates, etc.
    - Designating a CII Customer Representative to work with customers on conservation and other issues.
    - Implement successful water efficient washing machine program.
2. Methods to achieve water efficiencies in the CII-Multi-Family Residential (MFR) Sector include:
    - Audits/Surveys/Check-ups
    - Rebates
    - Vouchers/coupons for devices, water efficient machines, etc.
    - Pay for Performance
    - Grants
    - Ordinances, for example:
        - Prohibit once-through cooling
        - Require efficient fixtures
        - Require sub-metering
        - Require upgrading of appliances, fixtures and machines on sale of property
        - See BMP 3 for suggested landscape ordinance
    - Education/publicity
3. Definitions: This BMP applies to three categories of customers, defined as follows:
    - Commercial Accounts: any water used to provide or distribute a product or service, such as hotels, restaurants, office buildings, commercial businesses or other places of commerce. Agricultural, multi-family residential and other industrial or institution customers are not included in this definition.
    - Industrial Accounts: any water users that are primarily manufacturers or processors of materials as defined by the Standard Industrial Classifications (SIC) Code numbers 2000 through 3999.
    - **Institutional Accounts:** any water-using establishment dedicated to public service regardless of ownership. This includes schools, courts, churches, hospitals, and government facilities.

B. Benefits of Implementation

1. Benefits to the water provider/utility include:
    - Stretching scarce and/or expensive water supplies.
    - Procuring new water supplies at a cheaper price by using efficiently the water that is already treated and delivered to the city.
    - Saving water in this class (which is typically sold at very low prices) frees up water that can be sold to higher rate classes.
    - A better perspective on seasonal water use, which helps prepare for, or smooth out, higher-cost peak usage.
    - Developing a working relationship with these customers.
    - Building customer support for other utility programs by showing how they can save money on their water bills.
    - Helping small businesses to be more competitive by cutting their costs, thus helping to keep jobs and revenue coming into the city.
2. Benefits to the customer include:
    - Cutting costs of production which often leads to higher profits.
    - Understanding the "real" cost of water.
        - Water price per 1000 gallons in winter and in summer, if different
        - Sewer price per 1000 gallons of water used
        - Sewer surcharge – Based on BOD, suspended solids and total K nitrogen of waste
        - Energy – cost of heating or pumping water
        - Chemical – cost of treating water
    - Being part of a sustainable community of water users.
    - Creating a public/private partnership to smooth out interactions between the water/wastewater utility and the customers.
    - Reducing other business costs such as energy and wastewater treatment.
    - Reducing community costs (higher water prices) for building extra capacity for water or wastewater treatment.
    - Complying with laws governing water or wastewater uses.
    - Reducing storm water runoff from landscaping reduces costs and complies with new storm water regulations.

C. Potential Barriers to Implementation

1. Costs - Initial costs for improving efficiencies in this category are often very high. If a water provider does not have funds available for helping businesses become more efficient, then many businesses, especially small ones, will delay making changes in their processes. Because water is so inexpensive compared to other business costs, few new businesses will start up their operations with the most efficient technologies if there is a cheaper but less efficient method. Water efficiencies do not get the attention that energy efficiency does.
2. Textbooks and Technical Information - Although there is a great deal of general information about efficiency in the CII category, water uses vary widely. There is no single textbook that deals with all the varieties of water uses in business. However, there is a large portion of an existing book dealing with this issue - see resources section for Amy Vickers' book. A water provider may not have the in-house expertise to run a program like this, and finding a qualified contractor/consultant takes some research.
3. Public health codes and Colorado water law issues may impact measures involving onsite water recycling.

D. Cost Considerations for Implementation

1. Provider Implementation Costs: Funding this BMP can impact utility water rates and revenues, either in the short or the long term. However, resources allocated to developing new supplies from mountain reservoirs or wells in the past might now be reallocated toward managing demand as a supply augmentation plan.
2. Means of inducing customers to make changes:
   - Low or no-interest loans to customers to make changes in existing processes.
   - Incentive programs in which providers pay only for savings achieved by changes to existing customer accounts.
   - Incentives for new businesses to be as efficient as possible in the design and construction of the new facility (often as part of economic development program or measure).
   - Special rates or prices for customers using less than a given level of water per billing period.
   - Ordinances and regulations mandating customer changes (note that there are associated enforcement costs).
3. CII Program Management Costs: Although there are management costs, among BMPs CII programs provide larger measurable returns on investment and effort. Some utilities have one employee designated as a program manager to contract with industrial engineering consultants to do the technical design work. Other utilities offer these programs in house. Still others can rely on their wholesale water provider for these services.

E. For more information

1. www.waterwiser.org, click on Resources, then search category "Industrial," for abstracts of articles, presentations, and books on this topic.
2. www.denverwater.org. click on Conservation, then on Commercial-Industrial Info, then on Incentive Program
3. American Water Works Association Research Foundation, "Commercial and Institutional End Uses of Water," 2000. Highlights can be found in **Handbook of Water Use and Conservation** by Amy Vickers. WaterPlow Press, Amherst MA, 2001.
4. California Urban Water Conservation Council, "BMP Costs & Savings Study: A Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices." 2000. www.cuwcc.org
5. **AquaCraft Water Engineering and Management, "**Commercial and Industrial Water Conservation Opportunities**" (PowerPoint presentation about the City of Westminster, CO) available for downloading on** www.aquacraft.com)
6. Pacific Institute. "Waste Not, Want Not: The Potential for Urban Water Conservation in California." November 2003. (download from www.waterwiser.org, click on References, then search category: Industrial)

BMP 6: Wholesale/Contract/Allottee Assistance Programs

A. Description of Best Management Practice

Wholesale providers supply bulk water and/or services to retail water providers. This relationship should include an agreement on cooperative efforts for promoting water conservation.

1. Financial Support
   - Wholesale water providers can provide financial incentives, or equivalent resources, as appropriate, beneficial, and mutually agreeable to their retail water customers to advance water conservation efforts and effectiveness.
   - All BMPs implemented by retail water customers that can be shown to be cost effective in terms of avoided cost of water from the wholesaler's perspective, using cost-effectiveness analysis procedures, should be supported.
2. Technical Support - Wholesale water providers can share conservation-related technical support and information with all retail customers for whom they serve as a wholesale supplier.
3. Program Management - When mutually agreeable and beneficial, the wholesaler may operate all or any part of the conservation-related activities that a given retail customer is interested in implementing.
4. Water Shortage Allocations - Wholesale providers should work in cooperation with their customers to identify and remove potential disincentives to long-term conservation created by water shortage allocation policies and to identify opportunities to encourage and reward cost effective investments in long-term conservation shown to advance regional water supply reliability and sufficiency.
5. Wastewater Recycling and Reuse - Some providers increase their efficiency by "recycling" or using water more than once. Wholesale agencies should consider reusing treated wastewater where feasible. Current technology provides the methodology for treating wastewater to either potable or non-potable standards. The main issues for providers are the cost of treatment and the available water rights. Other aspects to be addressed in a benefit cost analysis include: pumping, piping, maintenance, pricing and discussions with retail, contract and allottee customers to project usage volume, flows, sequencing and timing of adding new customers to the recycled water distribution system.

B. Benefits of Implementation

Cooperative efforts have the potential to use resources more effectively than independent efforts. By taking advantage of economies of scale and consistency of approach, financial and technical resources can be used more efficiently. Additionally, cooperative efforts offer a more consistent message to the public, usually resulting in more consistent interpretation and implementation of conservation measures.

C. Potential Barriers to Implementation

1. Staffing an assistance program can be a barrier if the wholesale agency has not planned for this in advance. The necessary technical expertise can be acquired through contracting, but most providers prefer to have an employee manage the program.
2. There are costs that need to be built into rate structures and contracts in order to finance the assistance program. These costs might be shared by the wholesale and retail water provider, or the wholesale provider might choose to pay the entire cost in exchange for proven water savings. Assistance programs are not free, and so the costs need to be factored into revenue streams and financing plans.
3. It is possible that there might be social and/or political barriers. Some retail water providers might resent the intrusion of the wholesale provider and thus decline to participate.

D. Cost Considerations for Implementation

The wholesale provider, together with retail water customers, will need to make cost-effective decisions based on the economic value of the recovered water, the outlay of funds, and the benefits delivered.

E. For more information:
See wholesale program information from California, Texas, Seattle and Phoenix.

1. California www.cuwcc.org
2. Texas - Report of the Water Conservation Implementation Task Force, November 2004. www.twdb.state.tx.us/assistance.conservervation/taskforcedocs/wcitfbmpguide.pdf
3. Seattle Public Utilities - www.seattle.gov/util
4. www.phoenix.gov/waterservices/

F. Monitoring and Reporting:
Documentation of all shared-services agreements, cooperative conservation program goals, measures, results, and budgets.

BMP 7: Conservation Pricing Via Water Rate & Fee Structures

A. Description of Best Management Practice

Water rate structures communicate the value of water to water customers and can be used to effectively promote long-term efficient use. Conservation pricing refers to the setting of rates and rate structures that provide clear and consistent price incentives for customers to use water more efficiently. With conservation pricing, water rate structures are designed to provide an incentive for efficient water use while rewarding conserving customers with lower, more affordable rates. Effective rate structures can also encourage the installation of water-efficient fixtures, processes, and landscapes.

To maximize their effect on water use efficiency, water rate structures should reflect the marginal costs of new water supply and treatment facilities rather than average costs of current supplies and facilities. The total cost of domestic water use may include:

1. The utility's existing operation, maintenance, and replacement costs.
2. Costs to procure and develop additional water supplies to meet demands.
3. Social and environmental "opportunity costs" of losing other benefits of the water and natural waterways.

When evaluating conservation rate structures, impacts on total, average, and peak use should be considered. Since water rate structures play an important role in maintaining stable revenue flows to the utility, customer use patterns and utility revenue needs must also be considered.

The following are examples of water rate structures that may promote conservation:

1. Steeply increasing block rates: Unit prices increase as consumption increases, promoting efficient use and assigning water development costs more proportionately to customers who most strain the system.
2. Water budget rate structure: An increasing block rate design where unit prices increase after a predetermined, account-specific monthly water budget is exceeded (with block prices increasing as water budget volume is exceeded by increasing percentages).
3. Seasonal rates: Unit prices change seasonally to promote conservation and correspond to the fluctuating value of water from winter to summer.
4. Hybrid rate structure: A combination of the above designs that sends a conservation message through various means (e.g., a seasonal rate structure, with increasing block rates during summer months).

Please note, applying the above-mentioned rate structure design options does not guarantee that the resulting rate structure will effectively promote efficient water use. For example, increasing block rates will only promote efficient use if the block prices increase in a relatively steep manner.

In addition, new water tap fees should be designed to recover both the cost to procure and develop additional water supplies and capital-related costs incurred to size and construct facilities and infrastructure. Tap fee schedules should be designed and implemented in a way that promotes efficient use by prospective customers. Assigning a tap fee schedule that is based on projected water volume use, instead of service line sizes, generates a price incentive for new development to incorporate efficiency measures into development design and subsequently reduce water use.

B. Benefits of Implementation

If designed appropriately, conservation pricing can yield the following benefits:

1. Provide water at low prices for basic and essential needs, so *all* customers can afford it.
2. Reward conserving customers with lower unit rates for water.
3. Encourage efficient use by sending a strong conservation price signal.

4. Fairly assign water supply and development costs proportionately to the customers placing the highest burden on the supply system and the natural supply sources.
5. Provide a revenue source for other conservation programs.
6. Stretch existing water supplies farther and avoid much of the cost, delay, and controversy resulting from large new water development projects.
7. Do all of the above, while still maintaining a stable flow of revenue to the utility.

C. Potential Barriers to Implementation

1. Public misconception that increasing block rates are simply "rate increases" for all customers.
2. The need for a comprehensive public education campaign, which is important in preparing customers for any notable changes in water rate structure.
3. Older computer billing systems may be incompatible with more complex rate structures.
4. Concerns with revenue stability for the utility, particularly during the months or year that follow the rate structure change.
5. Large lot owners that claim a pricing inequity since they "need" to use more water than the average customer, and therefore should not be charged higher unit prices for larger volumes of use.

D. Cost Considerations for Implementation

A provider does not incur direct costs by enacting and administering an efficiency-based water rate structure, unless the utility opts to concurrently upgrade its computer billing systems and/or its metering program. Conservation pricing can be effective without these upgrades. However, to maintain customer satisfaction a widespread public education effort should accompany any significant rate structure change. The effort should focus on how the change may affect customers, why it is needed, how they will benefit, and what is at stake if the change is not made.

Changes in water rate structures affect customer use patterns and utilities' revenue flows. The most volatility typically occurs within the first year of the change. Over time, water use patterns should re-stabilize into a "new" norm. Regardless, to assure revenue stability, the utility should try to forecast new water use trends (and subsequent revenue flows) prior to modifying the rate structure. In addition, the utility can build in a safety factor by establishing a "stabilization fund" to maintain budget stability during periods of irregular revenue flows (e.g., after a rate structure change, during a drought, etc.).

E. For more information:

1. AWWA industry standards for rate structure designs www.awwa.org
2. *"Water Rate Structures in Colorado: How Colorado Cities Compare in Using This Important Water Use Efficiency Tool"*, released by Western Resource Advocates, Sept. 2004. www.westernresourceadvocates.org

BMP 8: Water Waste Prohibitions and Enforcement Program

A. Description of Best Management Practice

Enforcement of water waste prohibitions is one of the most direct means a provider can use to change wasteful behavior. Consumers who over water lawns or do not recognize a leaking fixture as water waste usually require outreach and education. When a violation is reported, public outreach and education materials should be provided to the consumer. Explaining the importance of water conservation may be all that is necessary to change behavior. However, fines, reductions in service, or cessation of service may be necessary to deter repeat violators. One example of a reduction in service is to install a flow restrictor on the pipeline from the meter to the house or irrigation system.

In addition, by communicating to employees the purpose of the water waste prohibition, what is considered water waste and their responsibility to respond to incidents of water waste, a provider can engage all employees in the enforcement process. To support a Water Waste Enforcement Program, an organization may:

1. Coordinate the implementation of Water Waste Enforcement by developing a separate Task Force dedicated to enforcing the prohibition.
2. Approach the program as a team effort, with each discipline taking responsibility for meeting the appropriate BMP. Departmental staff is able to identify areas where their discipline is able to contribute to the water waste prevention effort and coordinate that effort internally. All staffs are able to meet to evaluate the effectiveness of the Water Conservation Program.

C. Potential Barriers to Implementation

1. Special Districts - which may have limited authority to enact and enforce water waste prohibitions.
2. Staff Impacts - although the Water Waste Enforcement Program does not require an organization to employ additional staff, it will add another dimension to existing staff responsibilities and may necessitate staff training regarding water waste.
3. Property Contact Information – the lack of which may result in an inability to contact the property owner or resident when a violation has been discovered. A property contact database should be developed by the provider to assure violations are remedied in a timely manner.

D. Cost Considerations for Implementation

1. The cost of staff training, additional staff, and/or resources may need to be considered.
2. Enforcement costs – court time, records management, etc.

E. For More Information

Municipalities and water providers have water waste prohibitions. Contact the appropriate provider or see their website for details.

BMP 9: Water Conservation Coordination

A. Description of Best Management Practice
Water Conservation Coordination manages the efforts of an organization to develop, implement and document an effective and efficient water conservation program. This approach aids organizations in ensuring applicable BMPs are being implemented to the maximum extent practicable and provides a point of contact for internal and external inquiries.

B. Benefits of Implementation
Water Conservation Coordination can be effectively implemented by staff with experience and/or training in the water conservation field. Organizations can implement Water Conservation Coordination in many ways, including the following:

1. Designate a staff member to act as a Water Conservation Coordinator to oversee the program and coordinate BMP implementation with appropriate departments.
2. Establish a water conservation contact to route concerns to the appropriate party or provider.
3. Take a team approach where each discipline takes responsibility for meeting the appropriate BMP. Departmental staff is able to identify areas where their discipline is able to contribute to the water conservation effort and coordinate that effort internally. Staffs from each department are able to meet to evaluate the effectiveness of the effort. Internal departments such as Finance, Public Information, Parks, Economic Development, Community Development, Enforcement and Public Safety should be brought into the water conservation discussion.
4. Develop internal water conservation incentives by allowing departments that save money through conservation to "use" those saved dollars elsewhere.

C. Potential Barriers to Implementation
Although Water Conservation Coordination does not require an organization to designate a single Coordinator, it will add another dimension to existing staff responsibilities.

D. Cost Considerations for Implementation
The cost of staff training, additional staff, and/or resources may need to be considered.

E. For More Information:
Municipalities and water providers have Water Conservation Plans. Contact the appropriate water provider or see their website for details.

BMP 10: Demand Reduction During A Water Crisis

A. Description of Best Management Practice
While BMPs 1-9 deal with demand reductions that generate water savings through everyday conservation, BMP 10 specifically deals with reducing demand in times of crisis. Plans should be in place for dealing with various crises, including major pipeline breakages, severe chemical shortages, drought, and electrical outages. Some providers have both a drought response plan and a crisis response plan; others have one plan covering different types of crises and responses.

In many situations, the short term answer to a crisis is severe water reductions. It is important that customers understand that short-term water reductions during crises *are not the same* as long-term water efficiencies that are part of a strategic water conservation or demand management program. Some providers also have a crisis communications plan to deal with communication internally and externally to their customers. These documents can be integrated into a total water crisis response to deal with known potential crises.

Annual plan reviews with adjustments for changing situations will limit the provider's vulnerability to uncertainties. Periodic simulation events can identify weaknesses in the plan or significant changes occurring since the last plan was published.

B. Benefits of Implementation
Having a crisis response plan in place will ease the strain on employees and customers alike. Customers want to know that the water utility is prepared for and knows how to deal with emergencies. Customers also want to know what they are/will be expected to do at their homes and businesses. Other governmental agencies need to have a clear outline of what their role will be in an emergency, since they are expected to be role models. A well-thought-out and well-implemented plan can be both a response to an emergency situation and also an opportunity to demonstrate excellence. This level of service can improve the image of the provider as an organization that is well-prepared to deal with crises and thus has the interests of customers at heart**.**

C. Potential Barriers to Implementation
Writing a Crisis Response Plan requires staff or paid consultant time. Simulations to evaluate preparedness take time otherwise allocated to "real" projects. Organizational culture often does not support the practice of a crisis plan, thus it may be difficult to get staff to set aside their regular duties for a simulation.

D. Cost considerations for Implementation
In addition to the cost of creating a plan and periodic simulations, it is possible that through this process a provider may discover a problem requiring the outlay of additional funds. A provider may also sell less water during a crisis, negatively impacting revenues.

E. For More Information:
The American Water Works Association offers seminars on Emergency Response Planning. To learn more, see their website at www.awwa.org/education/seminars/

BMP 11: Water Loss - System Audits & Leak Detection Programs

A. Description of Best Management Practice
Leakage and unaccounted for water result in additional costs to the provider and can have a significant impact on the quality of service for water customers. Providers should perform analysis to identify the amount of water lost, the likely cause(s) of leakage and the projected cost of repairs. Many cities have cost effectively reduced distribution system losses to 10% and below, some have reduced losses below 5%.

Water loss programs use a systematic methodology to account for all water uses within a provider's service area. The information gathered is used to develop cost-effective water loss management strategies.

1. System Audits
   - Relatively simple system audits are analyses that attempt to account for the water entering a system. The total amount of accounted for water is subtracted from the total water placed into the system and the result is unaccounted for, or lost, water. The records needed for the audit are often readily available to the provider.
   - More complex system audits involve a detailed investigation into actual policies and practices of the provider. There are several areas to be reviewed including:
     - Proper metering of all authorized uses.
     - Development of better estimates of water use by the fire department, for line flushing, street cleaning, and during water breaks.
     - Appropriate meter testing and main line maintenance, repair and replacement procedures.
2. Leak Detection Programs
   - Leak detection programs are proactive means of finding and repairing leaks in the distribution system.
   - A number of methods can be used ranging from using the customer's water meterto detect in-home leaks, such as toilet or sprinkler system leaks, to the use of leak detection equipment (typically mechanical or electronic sound intensifying instruments that "hear" water escaping from the water system).

B. Benefits of Implementation
System water losses require the additional outlay of funds to produce and deliver water to the source of the leak. Additional costs are distributed over the customer base. Because less water is being processed and delivered, reducing leaks lowers costs and lessens wear on pumps, water treatment plants and distribution systems. Other potential benefits include increased fire fighting capacity, fewer main breaks resulting in property damage and insurance claims, and reduced flows to wastewater plants.

C. Potential Barriers to Implementation
The cost of implementing system audits and leak detection programs can be significant and may involve the capital costs for items such as leak detection equipment and billing software upgrades.

D. Cost Considerations for Implementation
The provider will need to make cost-effective decisions based on the economic value of the recovered water and the outlay of funds. It may be several years before the initial costs of a water loss program are recovered.

E. For More Information:
1. American Water Works Association's, M36 Manual: Water Audits and Leak Detection is a useful guideline for establishing an effective water loss control program. The procedures in the manual can help assess and assist in finding the right approach to reducing water losses.
2. Thornton, Julian. Water Loss Control Manual., 01/01/2002. Available at www.cuwcc.org the website of the California Urban Water Conservation Council. This is a guide to utility system water auditing

and reducing water loss in water distribution systems. In addition to raising awareness of the extent of the water loss problem and current practices, it covers all of the basic tools required to perform a systematic and effective water audit both on paper and in the field. The book discusses how to calculate and evaluate losses and cost-to-benefit ratios and how to set up suitable and sustainable field intervention programs.

GLOSSARY OF COMMON WATER RELATED ABBREVEATIONS & DEFINITIONS
(ADAPTED FROM WATERWISER GLOSSARY)

UNITS OF MEASUREMENT

af	Acre-feet, = 43,560 cubic feet
afa	Acre-feet per annum (year)
ccf	Hundred cubic feet = 748 gal.
cf	Cubic feet = 7.48 gal.
gal	Gallons, 1 gallon = 0.134 cubic feet
gcd or gpcd	Gallons per capita per day
gpd	Gallons per day
gpf	Gallons per flush (of a toilet or urinal)
gpm	Gallons per minute
gpsf	Gallons per square foot
kcf	One thousand cubic feet = 7480 gal.
kgal	One thousand gallons = 134 cubic feet
lcd	Liters per capita per day
lpf	Liters per flush (of a toilet or urinal)
MG	Million gallons
mgd	Millions of gallons per day
MG/yr	Millions of gallons per year

ACRONYMS

AMR	Automatic meter reading equipment
ANSI	American National Standards Institute
ARM	Automated remote metering
ASME	American Society of Mechanical Engineers
AWC	Average winter consumption
AWR	Applied water requirement, the gross amount of water that must be applied to a plant or grass to accommodate ET including runoff and water required to overcome system efficiencies
AWWA	American Water Works Association
AwwaRF	American Water Works Association Research Foundation
BMP	Best management practice
CC&Rs	Conditions, covenants, and restrictions
CI	Commercial and Industrial
CII	Commercial, industrial, and institutional
CIS	Customer information system
CUWCC	California Urban Water Conservation Council
DCU	Data collection unit (in an AMR system)
DU	Distribution uniformity- a measure of irrigation efficiency
ER	Effective rainfall

ET	Evapotranspiration, water loss via evaporation from plant surfaces and soil at base of plant and transpiration from plant leaf or grass surfaces
ETo	Reference ET for a standard crop of grass 4 inches to 7 inches tall
HOA	Homeowners association
IE	Irrigation Efficiency
IRP	Integrated resources planning
LF	Low-flow
MIU	Meter interface unit. Also known as a Telemetry Interface Unit.
NIST	National Institute of Standards and Technology
SMART	Class of irrigation controllers using soil, weather, or ET-based measurements to control irrigation scheduling
SWRS	Subregional water reclamation system
ULF	Ultra-low flow
ULFT	Ultra-low flow toilet. Standard "low consumption toilets". Refers to toilets which consume 1.6 gallons (6 liters) or less of water when flushed. A bit of a misnomer as toilets do not "flow" unless they are broken and are wasting water.
WD	Water district
WW	Wastewater

DEFINITION OF WORDS AND PHRASES

Cost-effective	When the present value of benefits exceeds the present value of costs.
Categorical variables	Variables that are not scaled, but are “nominal,” that is, there is no direction or number associated with the levels.
External costs and benefits	An external cost is when one party adversely affects another party either by reducing its productivity or well being. An external benefit is where one party beneficially affects another party either by increasing its productivity or its well being, or lowering its costs.
Externalities	External costs and benefits
Fixed costs	Costs that do not change as output level changes over the time horizon being analyzed.
Fixed rates	Part of a master metered or resident utility bill that is not affected by consumption.
Incremental costs and benefits	Costs and benefits that occur due to a course of action (e.g. BMP implementation)
Irrigation only accounts	Customers who have separate meters dedicated to landscape irrigation purposes.
Individual metering	The installation of meters for each individual dwelling unit as well as separate common area metering with the local water utility providing customer read, bill and collect services.
Life-cycle analysis	Examines the costs and benefits of an action over its entire expected life span.

Marginal cost	The additional cost incurred by supplying one more acre-foot of water.
Master meter	A single meter measures utility usage for an entire property, or an entire building, which usually includes common areas.
Meter	Device that measures utility usage.
Net present value	The present value of benefits minus the present value of costs.
Opportunity costs	The true costs faced by a decision maker, measured as the highest valued alternative that is foregone when an action is taken.
Partial-capture submetering	Type of submetering where only a portion of the total water consumption in each unit is measured.
Submetering	The practice of using meters to measure master-metered utility consumption by individual users. Also, see partial-capture submetering and total-capture submetering.
Telemetry interface unit	A device that translates meter data prior to transmission to a receiver. Also known as a Meter Interface Unit (see MIU.)
Total-capture submetering	Type of submetering where all of the actual water consumption in each unit is measured
Utility	Used alternately to describe a provided a natural resource, such as water, gas, electric as well as for the provider of the resource
Utility allocation	Determining resident charges for utilities by means of a formula rather than measured usage.
Variable costs	The costs that change in response to changes in level of output.
Xeriscape	Landscaping practice based on seven principles – proper planning and design, soil analysis and improvement, practical turf areas, appropriate plant selection, efficient irrigation, mulching, and appropriate maintenance.
Zero footprint	The complete reduction and/or offset of the potable water demand of a proposed urban development project by conservation, use of recycled water or other measures.