Evaluation of
Potential Best Management Practices

Plan Review

Prepared for
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DISCLAIMER

This report is based on readily available information and cursory analysis of potential water savings within the State of California that might result from a specific action. It does NOT constitute acceptance nor endorsement of a product, program, or other action by a water utility, municipality, or the California Urban Water Conservation Council (CUWCC). It does NOT create nor endorse a specific Best Management Practice and should not be construed as such. The name or logo of the CUWCC shall not be used by anyone in making any product claims or representing any findings within this report without the written authorization of the CUWCC. Please contact the CUWCC if you have any questions regarding this report or any of the CUWCC's Potential Best Management Practice reports.

Summary

The purpose of this study was to detail examples of existing plan review processes with water agency involvement designed to implement water conservation. Additionally, it was a goal to review agencies with data that could be used to produce quantifiable and substantiated water savings and cost-effectiveness to determine whether the water conservation savings increases through implementation of such a plan review process.

Research found that a more common approach involved adoption of ordinances to implement water conservation in new development. Most water providers contacted for this study noted that passive conservation for indoor water use exists due to long-standing building and plumbing codes; therefore, the majority of information contained in this report is focused on landscape plan reviews and ordinances.

Finding quantifiable water savings data associated with plan reviews or ordinances proved to be a difficult task. Two water providers included in this report are studying the savings associated with their plan review program. Examples from Las Vegas and Arizona have provided information on percentage of water saved compared to typical landscapes that would have been installed prior to adoption of their landscape ordinance. Other examples report observed or perceived savings in the form of reduced runoff or lower peak demand.

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Introduction

This report seeks to determine the conservation value of the plan review, permitting and inspection process when water purveyors participate in the plan review process for new development of CII, residential, and outdoor/landscape areas. In other words, how effective are plan review processes with water conservation requirements at saving water?

East Bay Municipal Utility District's WaterSmart Guidebook, includes an excellent description of the benefits of adopting a plan-review process for water-use efficiency for new construction.[1] When done successfully, a plan review program has the potential to maximize water efficiency, providing benefits to all stakeholders, including the community and the environment. Additional opportunities for savings include:

- Reduced costs to the developer in the form of lower water connection fees if smaller meters can be installed due to the installation of efficient technology
- On going reduced costs to business or homeowner for water and wastewater costs.
- Designing for and installing efficient measures during construction rather than retrofitting after construction is a more cost-effective approach.

In the purest form of a plan review program, a water provider or planning agency will adopt water-use efficiency standards that require review and approval of a developer's plans as a condition for water service. Collaboration among agencies is key to successfully implementing such a program. Applicants for new development begin the plan review process with the local planning or building department therefore, communication and collaboration is critical for the water provider to participate in the review process.

Although on a much larger scale than the focus of this study, California's recently approved water supply laws encourage coordination among agencies. Setting the tone for better communication and planning, California passed Senate Bills 610 and 221. Effective January 1, 2002 state law was amended to improve the link between information on water supply availability and certain land use decisions made by cities and counties. The goal of these companion measures is to promote more collaborative planning between local water suppliers and cities and counties. Known as the "show me the water laws" both statues require a verified water supply prior to approval of large development projects.[2]

California Water Code Section 10620-10621 requires urban water suppliers with 3000+ customers to adopt water management and water conservation plans. Urban Water Management Plans are key resources for water planning and encourage coordination between water agencies and local government.[3]

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[1] www.ebmud.com/sites/default/files/pdfs/WaterSmart-Guidebook.pdf
[2] California Department of Water Resources, "*Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001*", www.water.ca.gov/pubs/use/sb_610_sb_221_guidebook/guidebook.pdf
[3] www.water.ca.gov

State law mandates cities and counties in California have a General Plan describing their long-range land use plans; many have included a Water Element. These plans should also be a conduit for local government and water suppliers to communicate.

These existing regulations promote opportunity for cities, counties, water agencies and developers to work together. Some water providers have decided to adopt ordinances for water conservation in new construction as opposed to a plan review program. Existing state laws can have an impact on this decision. For example, Water Code Section 375 allows public entities that supply water at retail or wholesale to adopt and enforce a water conservation ordinance or resolution that requires installation of water saving devices. Many water providers in California have adopted water conservation ordinances, but enforcement can be a challenge.[4]

Two recent pieces of legislation that address water conservation in new development may impact a water provider's decision to implement a plan review program.

- Water Conservation in Landscaping Act
  In 1990, AB 325 required California Department of Water Resources (CADWR) to develop a Model Water Efficient Landscape Ordinance. The ordinance sought to impart the idea that landscape design, installation, and maintenance can and should be water efficient.

  Expanding on this ordinance, AB 2717 (2004) created the California Urban Water Conservation Council Landscape Task Force to evaluate and recommend proposals for improving California's water use efficiency in new and existing urban irrigated landscapes.

  In 2006, AB 1881 required CADWR to update the Model Efficient Landscape Ordinance (MELO) and required local agencies to adopt by January 2010, the updated MELO or one that is "at least as effective as".[5]

- California Green Building Standards Code
  On January 1, 2011, California adopted the California Green Building Standards Code, which is Part 11 of the California Building Standards Code in Title 24 of the California Code of Regulations. The CALGreen Code contains both mandatory and voluntary green building measures for new residential and nonresidential buildings throughout California, including indoor and outdoor measures for water efficiency and conservation. As of July 1, 2012, some mandatory requirements were extended to certain nonresidential additions and alterations. On January 1, 2014, the Code will become more restrictive, requiring all new homes to install 1.28 gal/flush toilets, 2.0 gpm showerheads, 1.8 gpm kitchen faucets, 1.5 gpm bathroom faucets, and weather- or soil moisture-based automatic irrigation system controllers.

  Provisions within the code relating to water efficiency and conservation include indoor and outdoor submetering, 20 percent savings schedules, multiple showerheads, wastewater

[4] www.leginfo.ca.gov
[5] www.water.ca.gov/wateruseefficiency/docs/LandscapOrdinanceReport_to_Leg-4-22-2011.pdf

reduction, plumbing fixtures and fittings, landscape irrigation water budget, and irrigation design.

Building department personnel performing plan examinations and building inspections are primarily responsible for enforcing the code. New buildings subject to plan review, permits and inspections by the local building department are subject to the CALGreen Code requirements and enforcement. Although a statewide code, it is adopted at the local level and cities and counties can adopt more restrictive green building standards than those provided in the CALGreen code.[6]

With the adoption of the California Green Building Standards, California now has the most aggressive minimum building code mandate in the country.[7]

There are also a number of voluntary building programs that have potential for water conservation and efficiency in new development. Builders are beginning to recognize the benefit of "green" building from the perspective of improved air and water quality, conservation of natural resources, and reduced operating costs to occupants.

- The Leadership in Energy and Environmental Design (LEED) Green Building Rating System
  LEED is a voluntary, point-based rating system which encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. LEED is an internationally recognized certification system that measures water efficiency, among other metrics.[8]

- Environmental Protection Agency (EPA) WaterSense for New Homes
  WaterSense Labeled New Homes must be independently certified to meet EPA's efficiency and performance criteria. Builders must comply with the EPA WaterSense Builder Resource Manual and partner with a licensed certification provider to inspect and certify the home.[9]

- Build It Green (BIG)
  Established in 2005, BIG, a California nonproft organization offers an independent, third-party verification system that labels homes GreenPoint Rated. This labels verifies a home has been built or remodeled according to proven green standards across five categories, including water conservation.[10]

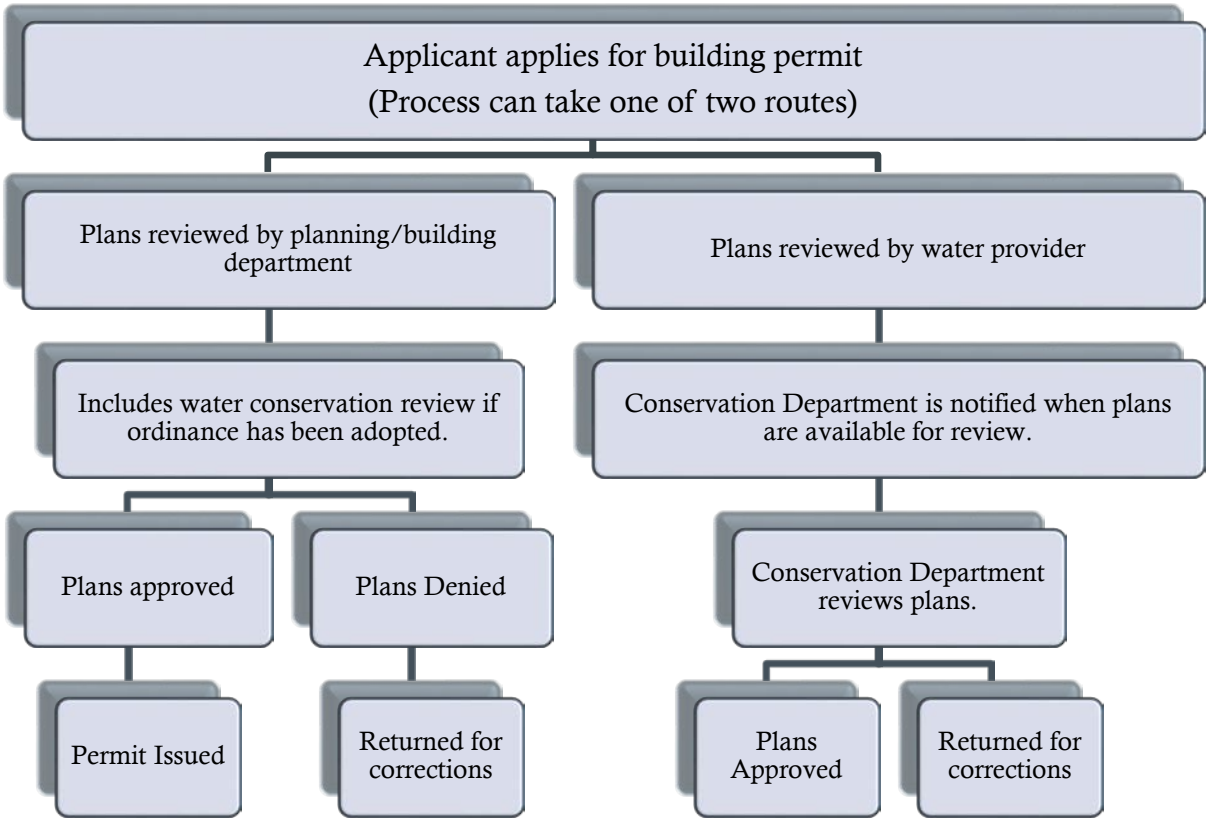
- The Ahwahnee Water Principles
  Developed by The Local Government Commission (LGC) and adopted in 2005, the Ahwahnee Water Principles encourage California's local governments to consult with water

[6] www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf
[7] Robert Raymer, Senior Engineer/Technical Director, California Building Industry Association, personal communication, November 20, 2013
[8] www.usgbc-ncc.org/learn/leed
[9] www.epa.gov/watersense/new_homes
[10] www.builditgreen.org

supply agencies early in the land use decision-making process. Among other things, these principles promote dual plumbing for graywater, incorporating urban water conservation technologies in all new construction, and retrofitting remodeled buildings.[11]

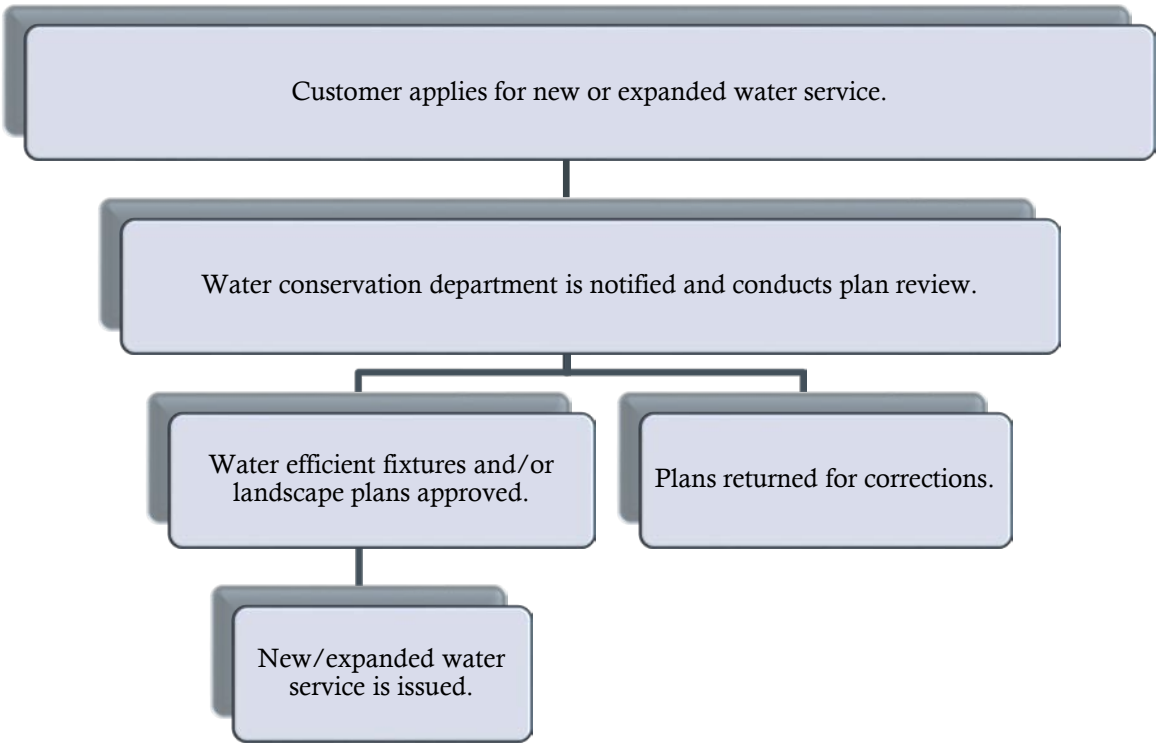
This study found either the planning/building department or the water department could conduct the plan review. In the case where a water conservation ordinance has been adopted, the planning or building department will review the plans including the water conservation requirements. Or the planning or building department will notify the water department that plans are available for review, and the water department conducts the plan review for water conservation. When the water provider does not rely on the planning/building department to forward plans for review, the applicant must submit plans directly to the water provider, usually as a requirement for new or expanded water service.

Plan Review Process Originating with the Building or Planning Department



[11] www/lgc.org/ahwahnee/principles/html or www.water.lgc.org/guidebook

Plan Review Process by Water Provider



Case Studies

This research found there are a variety of ways water purveyors encourage conservation in new construction: 1) performing plan reviews, 2) adopting ordinances, 3) utilizing checklist, 4) developing Guidebooks to educate developers and customers, and 5) encouraging voluntary or incentive based measures. Some water purveyors use more than one of these methods (refer to Table 1).

This report also includes examples of water purveyors who have expressed interest in implementing a plan review program for water conservation in new development, but have been unsuccessful for reasons such as the political atmosphere may be too sensitive for the process to be achieved; or lack of adequate funding and/or staffing might hinder the process. In some cases, the water purveyor provides the opportunity for water savings, but the measures are voluntary or self-reported.

Case studies for this report came from California, Texas, Arizona, Nevada and Colorado. Attempts were made to locate data from outside the southwestern United States, but were unsuccessful. Online research uncovered a seemingly good example to include in this study in which the City of Cary, North Carolina used a New Homes Points Program to encourage water conservation in new construction. The idea was for the city to approve development projects based on a point scale, giving extra points for subdivisions that use selected water efficient measures. A projected water savings was attached to this program, however, personal communication with the city found that this program never materialized.[12]
With a few exceptions, the majority of case studies included in this report focus on outdoor/landscape ordinances or plan reviews.

[12] Marie Cefalo, Conservation Programs Supervisor, City of Cary, personal communication, September 3, 2013

Table 1
Case Studies

			Water Efficiency Process in New Development				
Agency Name	**Type**	**Size**	**Plan Review**	**Ordinance**	**Checklist**	**Guidebook**	**Voluntary/ Incentives**
East Bay Municipal Utility District	Wholesale	1.3 million customers in service territory	X		X		
City of Goodyear, AZ	Retail	15,000 Connections	X				
City of Santa Monica, CA	Retail	17,000 Connections	X	X			
County of Riverside CA	N/A	N/A	X	X		X	
Coachella Valley Water District	Retail	107,700 Connections	X	X	X		
Western Municipal Water District	Retail/ Wholesale	23,000 Connections		X			
Eastern Municipal Water District	Retail	136,000 Connections		X		X	
Southern Nevada Water Authority	Wholesale	529,000 Connections		X			X
City of Westminster, CO	Retail	32,000 Connections		X			
City of Chandler, AZ	Retail	78,000 Connections		X			
Coastside County Water District	Retail	7,000 Connections		X	X		
City of San Diego, CA	Retail	274,000 Connections		X			
Sonoma County Water Agency	Wholesale	600,000 customers in service territory				X	
Austin Water Utility, TX	Retail	200,000 Connections		X			X
San Antonio Water Systems, TX	Retail	465,000 Connections		X			

East Bay Municipal Utility District, Oakland, CA

East Bay Municipal Utility District (EBMUD) has been very proactive in the plan review process for new construction. In an effort to educate and encourage water conservation in new construction, in 2008, the District published the *WaterSmart Guidebook: A Water Use Efficiency Plan Review Guide for New Businesses.*[13]

By providing information on water-saving technologies currently available to the commercial, industrial, and institutional sectors, and encouraging communication and cooperation between planning departments and water providers, the guidebook aims to make available the tools to incorporate water efficiency into the plan-review process.

Upon completion of the guidebook, the District conducted outreach to water providers and planning agencies in the 22 cities and unincorporated areas within their service territory. Although some of these cities have adopted aggressive water efficiency ordinances, EBMUD also conducts their own plan-review process for water conservation. As outlined in Section 31 of EBMUD'S Regulations Governing Water Service, all applications for standard service require approval from EBMUD's Water Conservation Division. New or expanded water service will only be furnished when all applicable water-efficiency measures have been installed.[14]

Unlike other examples in this report, EBMUD does not rely on city or county building or planning departments to forward plans for review. When customers apply for new or expanded water service, the New Business Office alerts the Water Conservation Department via email. The Water Conservation department reviews the file to determine if a review for water efficiency requirements is necessary. The District keeps a database of information on each project, recording all communications between departments and the customer in a "notes" section.

All applicants for residential indoor water are required to submit an electronic copy of plans. The plan review involves confirmation of the use of water-efficient fixtures such as: toilets, showerheads, kitchen and bathroom faucets, clothes washing machines and dishwashers.

All applicants for residential landscape water use must submit detailed landscaping plans when three or more residential units are proposed or for any new or retrofitted landscaping greater than 5,000 square feet of irrigated area. The plan-review involves looking at type of plant material, irrigation, grading and hydrozones.

Applicants for residential landscape water use with one or two residential units and with less than 5,000 square feet of irrigated landscaping are required to complete the District checklist. Applicants may opt to submit a detailed landscape plan for water-efficiency review by the District.

[13] http://www.ebmud.com/sites/default/files/pdfs/WaterSmart-Guidebook.pdf
[14] www.ebmud.com/sites/default/files/pdfs

All applicants for nonresidential service must submit an electronic copy of plans. The plan review involves confirmation of water-efficient fixtures such as: toilets, urinals, showerheads, bathroom and kitchen faucets, laundry washing machines, cooling towers, food steamers, ice machines, commercial refrigeration, pre-rinse spray valves and vehicle wash facilities.

Detailed landscape plans are required for all new commercial sites for water efficiency reviews.

Enforcement of Section 31 is crucial, but adaptability is also important. EBMUD reserves the right to conduct site inspections but staffing makes the actuality of this a challenge.

EMBUD has been reviewing plans since July 2007 and although no water savings have been tracked to date, they have noticed a trend toward better planning from landscape architects. The landscape industry has taken note of the enforcement of the plan review process for water efficiency and the plans submitted for review have become more creative.

Planning for and incorporating water efficient technology during the design and construction phase is expected to be more cost-effective than retrofitting after construction. With good planning, the business community can capture the benefits of reduced costs for water and energy as well as the potential to lower connection fees as a result of smaller meter sizes or reduced water use resulting from the use of water efficient technology.[15]

EBMUD is currently collecting three years of data as a result of their plan review process. A quantitative water savings study will be published in Spring 2014.

City of Goodyear, Arizona

In 1980 the Arizona Department of Water Resources identified the state's five most populous and fast-growing regions that rely heavily on groundwater. These regions were designated as Active Management Areas (AMAs) and each has an individual Water Management Plan that is updated per statutory schedule. Statutory management goals for each AMA guide the policies for managing water in these regions.[16]

Large providers (cities, towns, private water companies) are assigned an annual total gallons per capita per day allotment. This GPCD allotment is not a uniform standard; rather it is based on the water sources, housing stock, mix of industrial and residential demand, and levels of development within each AMA. Over the past twenty-five years, water providers regulated under the GPCD program have implemented a variety of conservation programs to help them meet their requirements.

[15] Charles Bohlig, Supervisor of Water Conservation, EBMUD, personal communication, August 28, 2013

[16] Ruth Greenhouse, Water Planning Division, State of Arizona, personal communication, August 12, 2013

Recognizing the importance of outdoor water use as a conservation measure, one requirement of municipalities is to identify and report to the state any properties considered "turf-related" facilities. These are landscapes that include ten or more acres of turf or other water intensive landscapes, such as a lake or orchard. The state defined a water conservation allowance per landscape type that determines the maximum amount of water each property should be using.

Phoenix is one of the five AMAs and most municipal water providers in the Phoenix area review landscape plans for compliance with state and local water conservation guidelines. Cities establish their own restrictions on landscape water use, reviewing plans and deciding on acceptable plant materials within the State guidelines. Within the Phoenix AMA is the City of Goodyear. With over 90 percent of the housing in Goodyear having been built since 2000, most homes' plumbing meets the 1993 federal efficiency standards. In 2011 the City of Goodyear water resource staff began regularly reviewing landscape plans for conservation potential. The City states they have reviewed over 500 plans since 2011.

The Water Resource Department receives notification of new landscape plans at each stage of the building process. If the new development is less than ten acres, it will receive a quick review and possibly some advisory comments, but there is no legal requirement to review full plans.

Landscape plans for large subdivisions and other large landscapes must be reviewed to determine if they meet state requirements. Construction plans are reviewed in detail including proposed plant lists. The City also has additional requirements on plant siting. Any plans not in compliance are returned for corrections. Park staff is responsible for reviewing irrigation systems and planting plans, however, current staffing shortages make it difficult to conduct irrigation reviews and inspections.

The water provider is required to identify to the State of Arizona Department of Water Resources properties that have over ten acres of high water using acreage within 90 days of the first watering of these tracts. These property owners are required to report annual water use to the state. The property owner/water bill payer is responsible for maintaining the water budget. If they are out of compliance, the state may issue a fine based on the excess volume of water.

Quantifiable water savings data is not available related to this plan review process. However, the State's conservation allotments are defined based on research from the 1990s that showed Arizona areas planted with grass require 4.9 acre-feet of water per acre, whereas native plants/desert landscaping (required to be planted at a minimum of 50% coverage) only require 1.5 acre-feet of water per acre.[17]

City of Santa Monica, CA

The City of Santa Monica, a retail water agency with a population of approximately 90,000 residents and 17,000 water connections, has a very progressive landscape and irrigation

[17] Sandra Rode, Water Conservation Specialist, City of Goodyear, AZ, personal communication, August 14, 2013

ordinance that applies to existing, renovated, and new single-family, multi-family and commercial landscapes. Originally adopted in 2008 and updated in February 2012, the *Water-Efficient Landscape and Irrigation Standards* are found in the City of Santa Monica Municipal Code 8.108.[18]

This ordinance was based on the Irrigation Association's *Turf and Landscape Irrigation Best Management Practices* and is more restrictive than the California Department of Water Resources' State Model Water Efficient Landscape Ordinance.

The City's ordinance requires landscape and irrigation plans for major remodel and new construction projects, including single-family, multi-family and commercial. The plans are submitted electronically and reviewed by a dedicated staff person in the City's Office of Sustainability and the Environment. Two inspections are required and performed by the same staff person: 1) an open-trench inspection to ensure the valves, backflow, and underground pipes are installed properly and 2) the final inspection to ensure the plants and irrigation are installed per the approved plans and that there is no irrigation runoff or overspray.

In 2004 the City of Santa Monica began offering monthly professional and homeowner classes that address every aspect related to their landscape and irrigation ordinance. To date, no open-trench inspections have passed on the first inspection. Common deficiencies include backflow devices that are installed at incorrect heights, installed parts that vary from approved plans, and lateral lines haphazardly installed or installed at incorrect depth under hardscapes, sidewalks, etc. This shows a continued lack of understanding of basic irrigation design and installation within the landscape and contractor industries despite the hundreds of hands-on landscape and irrigation workshops provided for free by the City. Once the project passes an inspection, the permit is approved and a certificate of occupancy can be issued by the City's Building and Safety Department.

This ordinance may impact infrastructure and costs on a limited case-by-case basis for single-family construction. For example, if a project calls for a 1" meter by law and the customer has incorporated low water use plants and irrigation systems in conjunction with indoor water efficiency measures, the customer can seek a variance to install a ¾" meter thus saving water and money.

Although no actual savings data is available associated with the implementation and enforcement of the landscape and irrigation ordinance, one interesting measure of potential water reduction is a noticeable decline in urban water runoff diverted to the Santa Monica Urban Runoff Recycling Facility (SMURRF). Although this cannot be definitively tied to these conservation measures, the City has seen a 35% reduction in runoff flows to the SMURRF since 2008.[19]

[18] www.smgov.net

[19] Kim O'Cain, Water Resources Specialist, City of Santa Monica, personal communication, September 11, 2013

County of Riverside, CA

An example of a regional approach to plan reviews for water conservation can be found in Riverside County. As the fourth largest and one of the fastest-growing counties in California, receiving an average of just ten inches of precipitation per year, it is a semi-arid region where outdoor water use is an important consideration.

When Riverside County adopted Ordinance 859 in December 2006, they were one of the first planning agencies in the region to have a Water Efficient Landscape Requirements Ordinance for new development. The County worked for two years to institutionalize the process, developing the *County of Riverside Guide to California Friendly Landscaping*[20] as well as educating staff.

The ordinance applies to all new and rehabilitated commercial and industrial landscapes, and to new and rehabilitated residential landscapes with a total landscape area equal to or greater than 2,500 square feet.

Developed in collaboration with the Riverside County Water Task Force, the critical elements of the ordinance include a 30% reduction in maximum annual water allowance, efficient irrigation methods, California Friendly plants and professional plan-check and inspections. County staff oversees the work of a consulting Landscape Architect who performs the plan checks.

The County of Riverside Planning Department collects inspection fees in the form of a Landscape Security Deposit to cover site visits for inspections related to the ordinance. Three inspections are required: 1) Installation Inspection, 2) Establishment Inspection, and 3) Post Inspection. A certificate of occupancy is not issued until the Establishment Inspection is complete and found in compliance with the ordinance. Upon successful completion of the Post Establishment Inspection, the security deposit is released.[21]

No savings data is available related to the adoption of Ordinance 859.

Most water purveyors under the jurisdiction of Riverside County rely on the county for plan review and inspection.[22] The following three water districts provide examples of the variety of approaches the plan review process can take under the county's ordinance and plan review program.

[20] www.rctlma.org/planning/content/devproc/landscpe/guidelines.pdf

[21] www.rctlma.org/trans/documents/landscaping_guidelines/Comprehensive_Landscape_Guidelines_and_Standards.pdf

[22] Kristi Lovelady, Planner, County of Riverside, personal communication, September 16, 2013

Coachella Valley Water District, Coachella, CA

Primarily serving Riverside County, and including portions of Imperial and San Diego Counties, Coachella Valley Water District (CVWD) provides an excellent example of how a special district can work together with their cities and as a region.

After close collaboration with the cities in their service territory, Ordinance 1302.1 Landscape and Irrigation System Design Criteria became effective October 1, 2007.[23] This ordinance expands on CVWD's original landscape ordinance passed in 2003 and far exceeds the minimal requirements set by the state of California. In 2009, the District collaborated with the Coachella Valley Association of Governments meeting with representatives from eight cities, five local water purveyors, Riverside County and the Building Industry Association. These representatives met in response to the state's Water Conservation in Landscaping Act requirement to adopt a water efficient landscape ordinance. As a region, these representatives opted to use the CVWD ordinance.[24]

This ordinance requires a plan review by the District prior to receiving a permit for construction. CVWD has two full-time staff members who spend approximately fifty percent of their time reviewing landscape plans. Over 750 plan reviews have been performed since 2009.

Under this ordinance, new construction and rehabilitated landscapes require a building or landscape permit, plan check or design review. New and rehabilitated landscapes for public agency projects, private development, developer-installed for single-family and multi-family and for homeowner-provided in single family and multi-family residential projects with a total landscape area equal to or greater than 5,000 square feet also fall under this ordinance.

Prior to construction, the project applicant is required to submit to the District two copies of a Landscape Documentation Package along with a Landscape Documentation Package review fee of $300. No water meter will be issued until the District reviews and approves the Landscape Documentation Package. Upon approval, the District submits a copy of the project's Water Efficient Landscape Worksheet to the local planning agency.

Included in the Landscape Documentation Package is a checklist that serves to verify that all elements of the Package have been completed. District staff initially reviews the Plan Checklist for compliance to the ordinance. If the checklist is complete, the District will move forward with reviewing all aspects of the plans for compliance. Personal communication revealed that it usually takes two plan checks before approval, and sometimes three. As the District charges an hourly plan review rate of $65 (in addition to the $300 Documentation Package review fee), it is in the best interest of the Landscape Architect to make every attempt to comply with the ordinance.

This ordinance may have implications for infrastructure design. Water district engineers consider reduced water use as a result of the conservation ordinance when designing infrastructure.

[23] www.cvwd.org/news/publicinfo/2009_12_04_Ordinance_1302_1_revised.pdf
[24] www.cvwd.org/news/news85.php

CVWD is currently studying 24 projects that have been designed and installed under Ordinance 1302.1 for water savings. Analysts will compare the water use for newly installed "desert landscape" to conventional landscapes planted in turf and shrubs with spray irrigation. The study will compare actual landscape water use to estimated landscape water use under the maximum applied water allowance.[25] The District plans to publish the study in March 2014.

Western Municipal Water District, Riverside, CA

Prior to the adoption of Riverside County's Water Efficient Landscape Requirements Ordinance in 2006, Western Municipal Water District (WMWD) conducted their own plan reviews. A Landscape Architect was hired on a contract basis to review all new landscape plans. The District enforced the plan check process by withholding the installation of a water meter until the plans were approved.

With the adoption of Ordinance 859, both the County and WMWD were reviewing plans, each charging the developer a fee for the review. This triggered a high volume of customer complaints. The County assured WMWD they would perform plan reviews based on the water conservation elements in the Ordinance and WMWD now defers to the County for these plan reviews. Applicants for new landscape designated for recycled water use are still required to consult with the District early in the development review process.

WMWD felt the process of plan reviews was very expensive and required extensive staff time. Even though a consultant was doing plan reviews, staff time was required to coordinate receipt and return of plans between the applicant and the consultant, and track required revisions. Overwhelmingly, the plans did not pass the first time and had to be revised and rechecked.[26]

WMWD does not have quantifiable water savings based on the plan review process.

Eastern Municipal Water District, Perris, CA

Eastern Municipal Water District (EMWD), within Riverside County, also relies on the county to perform plan checks under Ordinance 859. However, anticipating that most new construction in their service territory will be residential development, in July 2013, EMWD published a guidebook titled *Water Efficient Guidelines for New Development*.[27] This guidebook provides voluntary measures to reduce overall water use in new residential buildings beyond what is required by state and local codes and requirements (business customers are referred to East Bay

[25] Dave Koller, Conservation Coordinator, Coachella Valley Water District, personal communication, September 19, 2013
[26] Pam Pavela, Water Use Efficiency, Western Municipal Water District, personal communication, September 16, 2013
[27] www.emwd.org

Municipal Utility District's WaterSmart Guidebook). These voluntary guidelines are incentive-driven and cost-effective water efficiency measures.

To assist builders and developers who are involved in the design and construction of residential housing, EMWD's *Water Efficient Guidelines for New Development* indoor guidelines help with decisions about water efficient appliances and fixtures for installation. Outdoor guidelines are designed primarily for those making decisions about the creation of new or rehabilitated landscapes, (i.e. residents, landscape architects, and builders).

In addition to the county plan reviews EMWD uses water budgets and tiered water rates to encourage efficient use of water. The guidebook, intended for use by developers and new homeowners, is an educational tool. Recognizing it is cost-effective to educate developers and homeowners prior to designing or installing landscapes, the guidebook provides tools for determining the water requirements of any landscape.

Research for the guidebook found there is opportunity for greater water efficiency even after applying the applicable landscape ordinance requirements and the California Green Building Standards Code (CALGreen). It was determined that if all new housing in EMWD territory were to fully implement the guidebook recommendations, 14.5 billion gallons of water could be conserved by the year 2035.

Applying voluntary measures for indoor water use described in the guidebook could reduce water use by an estimated 11% per household over current CALGreen requirements. Homes built to current CALGreen specifications are expected to use 35 gallons per capita per day (GPCD), for a household of three people. Incorporating the efficiency recommendations in the guidebook lowers this projected GPCD to 31.

Southern Nevada Water Authority, Las Vegas, NV

Formed in 1991 to address Southern Nevada's unique water needs on a regional basis, the Southern Nevada Water Authority (SNWA) is governed by a seven-member agency comprised of representatives from each of its member organizations.[28]

Southern Nevada is most focused upon outdoor water efficiency for a number of reasons:

- Approximately 70 percent of the housing stock in Las Vegas has been constructed post-1992 water efficiency regulations and is already equipped with reasonably efficient fixtures;
- Southern Nevada's appropriation from the Colorado River is based upon consumptive use. The principal consumptive use in the region is landscape irrigation.
- All treated wastewater is already indirectly reused by return and recovery from the Colorado River watershed. As such, indoor conservation measures do not extend available water resources.

[28] www.snwa.com

In 2003 a Turf Limitation Ordinance was adopted by all jurisdictions served by the Southern Nevada Water Authority (SNWA). The ordinance contains numerous components relating to outdoor water use, including a provision that aggressively regulates the use of lawn grass ("turf") for ornamental purposes. Since 2003, turf installation has been prohibited in new residential front yards and limited to a maximum of 50 percent in new residential side and back yards. For institutional facilities, turf is prohibited except for schools, parks and cemeteries. Commercial properties are not allowed to use turf except through special exemption, such as daycare facilities. The ordinance also defines restrictions relating to mist cooling, water bodies, swimming pools and other outdoor water uses. All jurisdictions prohibit homeowners' associations ("HOAs") from mandating installation and/or maintenance of turf landscapes.

Prior to 2003 the political momentum did not exist to address the potential for aggressive development standards for outdoor water conservation. In 2002, extreme drought conditions on the Colorado River were the impetus for the formation of the Drought Code Implementation Committee (DCIT). This inter-jurisdictional and interdisciplinary committee, made up of planners, utility staff, and water agency staff from all jurisdictions met frequently for about a year. The collaborative process resulted in a model code to be adopted by all jurisdictions within SNWA boundaries. To be successful, the code was written as a basic policy with compliance enforced through penalties. If developers or homeowners are out of compliance with the code, fines are issued until compliance is achieved.

Recognizing that too much detail written into the code could derail enforcement, the code incorporated a reasonable amount of administrative flexibility. A model code was drafted and provided to each jurisdiction. The code states that the administrative policy will be developed by the building/planning department within each jurisdiction. All jurisdictions have adopted the code and the policies are the same throughout the jurisdictions.

Local planning and building departments enforce the code as it relates to new development. To be credible, enforcement is essential to the success of the code. The plan reviewer is responsible for determining if the development is in compliance with the code. Water agency staff feel the simplicity of the ordinance is key to enforcement as well as reduction in administrative costs. For example, by stating no turf is allowed in front yards, rather than using a complex "turf budget," the code is simple to manage and easy to enforce.[29]

Recognizing that in the southwestern United States, a majority of water consumption goes to outdoor irrigation, SNWA conducted a Xeriscape Conversion Study. Completed in 2005, this study found a one-third reduction in water consumption for the average single-family residence that converted from turf to xeriscape. SNWA has used this study to determine that homes built since adoption of the Turf Limitation Ordinance use 40% less water than homes built prior to the code.[30]

In addition to developing the ordinance, SNWA has partnered with the Southern Nevada Home Builders Association to develop a certification program that labels new homes and

[29] Doug Bennett, personal communication, July 15, 2013
[30] Sovocool, K., 2005. Xeriscape Conversion Study. Southern Nevada Water Authority

neighborhoods as "Water Smart". Reacting to public scrutiny regarding new development, homebuilders were willing partners in the certification program. These Water Smart Homes include water-smart landscaping and water-efficient appliances and can save as much as 75,000 gallons of water each year compared to homes built a decade ago. A recent SNWA analysis showed that Water Smart Homes use approximately half as much water as homes built prior to 2003.[31] To date, more than 9,000 Water Smart Homes have been built, constituting about ten percent of all new homes in the region.

It is important to note however, that even with the code in place a project may be approved that does not meet the code. This can occur either with an approved variance, as an oversight, or through misinterpretation of code.[32]

City of Westminster, CO

Westminster, Colorado is a suburb of Denver with a population of 109,000. In September 2004, the City of Westminster Water Department and Community Development department composed a Landscape Regulations document with specific requirements for all projects. The Westminster City Council adopted these Landscape Regulations and enforcement is provided in the Westminster Municipal Code.[33] The success of these regulations and enforcement comes from a very collaborative approach. The Water Department and the Community Development Department work closely and have a shared vision of water conservation.

The Landscape Regulations apply to all new landscape areas and are intended to provide minimum design, installation and maintenance criteria for landscape elements. The City states that its regulation provides flexibility, as they are less focused on prescriptive measures and more on performance measures.

In response to these Regulations, the City created two new positions. Under the Community Development Department, a Landscape Architect reviews all landscape plans and a Landscape Inspector inspects all new landscape and irrigation installations. No construction or landscape improvements can occur until the City approves the landscape and irrigation construction plans. After completion, the developer is required to hire an Irrigation Association (IA) Certified Irrigation Auditor to certify that the project meets IA Distribution Uniformity (DU) standards. The City will not issue a Certificate of Occupancy if the inspections fail or the irrigation audit does not meet the IA DU minimums.

[31] www.snwa.com/biz/programs_home.html

[32] Doug Bennett, Conservation Manager, Southern Nevada Water Authority, personal communication, July 15, 2013

[33] www.ci.westminster.co.us/Portals/0/Repository/Documents/CityGovernment/landscaperegs.pdf

Landscape and irrigation plans are not required of individuals constructing single-family or duplex residential units that they intend to own and occupy. However, the landscape and irrigation regulations must be followed.

The City of Westminster has not studied water savings since implementation of these Landscape Regulations, but has observed a trend of declining water use. Peak demand, which is based on irrigation use, has dropped significantly. The City believes the regulations and enforcement are playing a considerable role in reducing outdoor water use, reporting that before adoption of the Landscape Regulations, most irrigation taps used 200-300% more water than the City anticipated for each tap. After these regulations were put in place, irrigation taps use about 125% of anticipated required use.

This plan review process does have implications for infrastructure design decisions for new development. The City requires that irrigation taps be sized appropriately for the project. The formula to calculate tap size allows the property to be watered sufficiently by running the irrigation system every other day for a maximum of 8 hours per day during the peak irrigation week, which also allows for flexibility when restrictions are required. Basing the tap size on this formula gives the City a good estimate of the demand each tap will put on the City's infrastructure. An undersized tap will place a higher demand than anticipated on infrastructure. Important to the planning process is calculating and requiring the right tap size. This gives the City a reasonable estimate of the long-term impact of the tap to the City's infrastructure.

Additionally, for redevelopment projects, the Water Department reviews the project plans and if the tap size is no longer adequate, whenever possible, they will work with the developer to change the type of water fixtures planned or installed to keep the building within the current tap size. This prevents placing additional demands on infrastructure and saves the developer, as well as the tenant or owner, money.[34]

City of Chandler, Arizona

The City of Chandler Water Conservation Department works closely with the Transportation and Development Department, which is responsible for reviewing and approving plans for new construction.

In January 2000, the City of Chandler approved Ordinance No. 3081 requiring all new non-residential water users who use more than 9,000 gallons per day (gpd) to submit a Water Use Plan sealed by an Arizona registered architect or engineer that complies with the city ordinance as a condition of issuance of a building permit.[35]

The Water Use Plan must describe the following:

1. Any available water conservation training programs offered to employees;

[34] Stu Feinglas, Water Resources Analyst, City of Westminster, Colorado, personal communication, August 21, 2013

[35] www.library.municode.com/index.aspx?clientId=10158

2. Any alternative water sources that will be used;
3. Operating levels of Total Dissolved Solids or conductivity for cooling towers and total cooling capacity;
4. Whether the user will use the best available conservation technologies in accordance with existing process uses;
5. Any plans for the reuse of wastewater or process water at the facility;
6. Type of landscaping and irrigation system.

When the non-residential customer applies for a building permit, the City Planning Department issues an informational packet that includes current codes that affect water use and the new Non-Residential Interior/Exterior Water Use Plan.

The Water Use Plan is distributed to all facilities, but only those that utilize over 9,000 gpd are required to submit a completed plan. The Water Use Plan must be completed as a condition of issuance of a building permit. The applicant submits the completed Water Use Plan to the Planning Department, who send the applicant a Facility Managers Guide to Water Conservation. This guide is a resource to assist in identifying areas where commercial, industrial, and institutional facilities can improve their water use efficiency within reasonable economic parameters. The goal is to promote water conservation measures prior to actual building.

The City has not tracked water savings associated with adoption of the ordinance.[36]

Coastside County Water District, Half Moon Bay, CA

Coastside County Water District serves nearly 20,000 people in the City of Half Moon Bay and part of the unincorporated area of San Mateo County.

In May 2010, Coastside County Water District adopted the Indoor Water Use Efficiency Ordinance and Checklist.[37] This ordinance became effective on January 1, 2011 and requires all projects with new or expanded water service to install water efficient fixtures and appliances. The District relies on planning and building officials from the county and city to refer projects to the District for review.

When an applicant applies for new or expanded water service, they are given a copy of the ordinance and the checklist. The applicant is required to meet the minimum water use efficiency standards for indoor plumbing fixtures. The applicant returns the completed checklist to the District who reviews it for compliance with the ordinance, along with the plan review documents. New or expanded water service will only be approved if the checklist meets the

[36] Cathy Rymer, Water Conservation Coordinator, City of Chandler, personal communication, August 5, 2013

[37] www.coastsidewater.org/waterconservation/Water_Use_Efficiency_Ordinance_and_Checklist.pdf

standards of the ordinance. The District will, at its discretion, verify and inspect that the minimum standards have been met.

Although it is the District's intention to implement the measures in the ordinance, enforcement has proven to be a challenge. No additional staff was hired to implement the ordinance or conduct inspections, and currently the District must rely on the applicant to complete the checklist and call for a final inspection. Due to limited authority, the only enforcement the District has is turning off the water, which would occur only in the event that gross water waste was found. The ordinance has resulted in positive dialogue with local builders and customers on water use efficiency, and has provided the District an opportunity to promote EPA WaterSense labeled products with local builders and customers.

Coordinating with planning and building officials at the county and city has been and continues to be a challenge for the District. Green building code has been a positive step toward including high efficiency plumbing fixtures and appliances into the plan review process but the expertise of building officials has been focused on building safe structures not water use efficiency. The District continues to work with city and county building officials to include water use efficiency into the plan review process.

No water savings have been quantified with the passage of this ordinance.[38]

City of San Diego, CA

The City of San Diego Water Department is not involved in the plan review process for new construction, however, in 2009, the City adopted its own Landscape Ordinance. This, along with other city ordinances, is implemented in new construction through San Diego's Development Services Department.

For indoor water conservation, the City implemented San Diego Municipal Code 93.0208 in January 1992. This became known as the "Retrofit Upon Re-Sale Ordinance" and was initially administered by the City's Building Inspection Department. The code was revised in February 1995, and administration of the code was transferred to the Water Utilities Department in an effort to improve code compliance. Effective January 2000, the Retrofit Ordinance was re-sequenced and renumbered to 147.04 in SDMC. This ordinance requires all residential, commercial and industrial buildings prior to a change in ownership be certified as having water-conserving plumbing fixtures in place.

The seller/transferor is responsible for ensuring that the property is in compliance with the ordinance. Upon the sell of the property, the buyer and seller must sign a Water Conservation Certificate, certifying that any bathroom alteration has replaced existing plumbing fixtures with water-conserving plumbing fixtures. Pursuant to City Council direction, this ordinance does not include verification by the water department; rather this is a self-verification process in which the

[38] Cathleen Brennan, Water Resources Analyst, Coastside County Water District, personal communication, August 5, 2013

transferor and the transferee both sign the certificate. This certificate must be filed with the City prior to the close of escrow.[39]

In 2005 the City began capturing savings from this ordinance and has determined 3.6 million gallons of water is saved each day.[40]

Sonoma County Water Agency, Santa Rosa, CA

Sonoma County Water Agency (SCWA) is a wholesale agency that delivers water to nine cities and special districts serving more than 600,000 residents in portions of Sonoma and Marin counties.

In 2011 Sonoma County Water Agency developed a draft *Water Smart Development Guidebook* in an effort to identify and integrate water smart planning on a countywide scale.[41] The guidebook is intended to provide developers, city and county planning officials, and environmental regulatory agencies with a reference guide to avoid and minimize potential water resource impacts while planning residential and commercial development.

As a wholesale agency, SCWA has no enforcement authority but offers the guidebook as a tool for water conservation in new development. The guidebook recognizes and encourages communication between developers, planners, and regulators who review and approve projects as a critical step.

In an effort to support the local (city/county) review and approval process for new development in Sonoma County, the guidebook includes a checklist for water conservation. The checklist is intended to provide guidance on implementation and tracking of the recommended water conservation actions presented in the guidebook.

The retail agencies have yet to adopt the practices in the Guidebook partially due to a lack of new development in the region. However, several of the retailers have already adopted many of the water conservation practices identified in the guidebook. SCWA is hopeful that upon finalization of the guidebook, the region will adopt a more holistic approach to development and consider Low Impact Development as a standard.[42]

[39] Luis Generoso, Water Resources Manager, City of San Diego, personal communication, August 6, 2013
[40] Chris Robbins, Water Conservation Supervisor, City of San Diego, personal communication, August 8, 2013
[41] www.scwa.ca.gov/watersmartdevelopment
[42] Carrie Pollard, Principal Programs Specialist, Sonoma County Water Agency, personal communication, July 29, 2013

Austin Water Utility, Austin, TX

The Texas Commission on Environmental Quality regulates irrigation systems in the State of Texas. Beginning January 1, 2010 the State of Texas requires that a licensed irrigation contractor be on site providing supervision during construction of irrigation systems. These systems must be in compliance with state codes, which specify that all irrigation systems shall be designed, installed, maintained, altered, repaired, serviced, and operated in a manner that will promote water conservation[43]. Additional local ordinances require that irrigation systems be maintained and operated in a manner that promotes water conservation. Plans must be on site at all times during the installation of the irrigation system, and provided to the property owner at project completion.

To ensure the code is implemented in the field, each spring and fall Austin Water Utility conducts education and outreach programs for the irrigation industry. Irrigation installations are inspected as part of the City's plumbing permit process and those found with deficiencies require correction.

Austin has considered an irrigation design review process for new development, but concern by city officials over added costs and delays to developers outweighed the potential marginal benefit of a pre-installation plan review. However, Austin has developed strong incentives for green building. Similar to the LEED point system, The Green Building Rating program is a recognition opportunity for new construction and achievement of a particular rating may be a potential condition of development. New construction that includes innovative technologies beyond Austin's code requirements can apply for incentives through the Water Conservation Program up to $100,000 per project based on cost and demonstrated water savings.[44]

San Antonio Water Systems, San Antonio, TX

As mentioned in the above case study, the Texas Commission on Environmental Quality regulates irrigation systems in the state of Texas. San Antonio Water Systems (SAWS) does not have the necessary staff to review all new development plans so adoption of ordinances has been a primary strategy to implement water conservation in new development. The City of San Antonio adopted an Irrigation Standards ordinance to promote urban water conservation through efficient design, installation and consumer education. The Department of Development Services enforces the ordinance and will only issue a certificate of occupancy after receiving a letter certifying the irrigation system is installed according to code.

To enforce the ordinance, as well as state laws regarding irrigation installation, SAWS has part-time personnel that visit job sites to ensure the permits, plans, and licensed irrigation contractor

[43] Texas Commission on Environmental Quality, *Landscape Irrigation Program: Implementation,* www.tceq.state.tx.us

[44] Drema Gross, Water Conservation Division Manager, Austin Water Utility, personal communication, September 6, 2013

are on-site. In an effort to keep the inspection process quick and inexpensive, the final inspection by the planning department does not incorporate water conservation.[45]

[45] Karen Guz, Conservation Director, San Antonio Water Systems, personal communication, August 30, 2013

Estimating Conservation Potential and Cost Effectiveness

Determining the conservation potential and cost effectiveness of a plan review program is challenging. Water providers interviewed for this report stated it is difficult to obtain this type of savings data, particularly where outdoor/landscape is concerned. Many stated it is less about how much water is being conserved and more about improved efficiency. Without a pre and post ordinance landscape design, it is unknown what the landscape plans would look like. Budget constraints were also mentioned as a reason for lack of data.

Intuitively, one could assume that if a water provider has control over the installation of efficient plumbing devices and the type of landscape and irrigation in new construction, one would expect water savings to be realized. However, at this time, very little data exists on quantifiable water savings relating to plan reviews or ordinance adoption. East Bay Municipal Utility District and Coachella Valley Water District both have studies underway to quantify water savings based on plan reviews and ordinances.

Some water providers included in this report have other methods to identify water savings. For example, the City of Westminster reported a noticeable trend in declining use related to peak demand and the City of Santa Monica reported a reduction in sprinkler runoff. The City of Goodyear and Southern Nevada Water Authority have savings data based on turf landscapes versus the use of desert landscapes. A study undertaken by Eastern Municipal Water District produced projected savings based on indoor water efficiency beyond existing codes.

The City of San Diego was the only case study to report actual water savings on a gallons per day basis as a result of their Retrofit On Resale Ordinance. This was the only case study included in this report that highlighted this type of ordinance, although there are other cities that do have similar ordinances. Recently the City of Santa Monica repealed their Retrofit on Resale Ordinance, which was adopted in 1993, when they determined the goals of the ordinance had been met.

This study found there is perceived benefits to the water provider when working with the developer as early as possible in the planning process. “If conservation and efficiency can be “built in” to all new buildings, then water savings will accrue for years to come and additional interventions to modify demands in these buildings will not be necessary.”[46]

Savings can also be realized for the developer/builder. The application for water service is the first step in determining the fees the developer will pay for service. Fee amounts depend upon the projected water demand, the size of the water meter and the demand the new project will place on existing facilities. If the water agency can require water efficient devices, a low water use landscape and efficient irrigation, it may reduce a developer’s costs.

[46] Eastern Municipal Water District. *Water Efficient Guidelines for New Development.* 2013

Conclusions and Recommendations

In addition to examining potential water savings and cost effectiveness, this report sought to establish the practicality of implementing a plan review, permitting and inspection program. While conducting research for this report, very little data was found to support a recommendation for adopting this pBMP from a quantifiable water savings data perspective. When data becomes available from East Bay Municipal Utility District and/or Coachella Valley Water District, it may provide evidence and justification for the reclassification of this pBMP.

The difficulty in implementing a plan review program is an important consideration. When a water provider decides to put into action a plan review process, enforcement is critical. Some agencies may lack the financial and human resources necessary to enforce a plan review program. Municipal water departments generally seem to have more success with plan review programs for water conservation due to their closer relationship with other city departments. Special districts, which lack direct enforcement of conservation codes, may encounter a lack of cooperation from the cities and counties within their service territory; much of the time this is simply due to the added burden to existing staff.

Southern Nevada Water Authority and Coachella Valley Water District are examples of successful collaboration with the cities in their boundaries to write and adopt landscape ordinances, and in the case of Coachella Valley Water District, even perform plan reviews. The key is to invite all the stakeholders into the process and develop a document that is broad enough for adoption into all city codes. Although Southern Nevada Water Authority relies on the planning agency to enforce the ordinance, whereas Coachella Valley Water District performs in-house plan reviews, they both are successful at implementation.

When deciding to implement a plan review process, the water provider must determine if they will internally review plans or pass an ordinance leaving the plan review in the hands of the planning/building department. If these departments do not have a shared vision of water conservation, this may not be the most effective approach.

In California, the adoption of CALGreen Code and the Model Water Efficient Landscape Ordinance provide an opportunity for all water providers to implement water conservation in new construction, but this is only effective if enforcement follows ordinance adoption. Water providers who have implemented a plan review program have done so as a way to ensure efficiency measures are included in new development.

Uniform plumbing codes generally play a role in passive indoor water conservation as they govern installation of water-efficient products. Outdoor conservation through landscape and irrigation design, installation and maintenance, however, can be much more difficult. Water providers who seek to have input through a plan review process must employ consultants or staff that are knowledgeable about low-water use plants, as well as the best technologies in irrigation design and installation to review plans and perform field inspections.

Any agency considering adoption of an ordinance or plan review program must enter into the process with the understanding that it will require political will, persistence, and a great deal of

patience. After adoption of the Landscape Regulations, the City of Westminster spent three years outreaching to landscape contractors in their city. Each spring they offered seminars utilizing industry experts to educate contractors on the regulations required by the ordinance. The City reports their efforts have paid off as they have seen landscape plans submitted by contractors and landscape architects change as they develop an understanding of what is expected by the city.

Although implementation of a plan review program or adoption of water conservation ordinances can be a long and tedious process, when done successfully, the outcome can produce important benefits. The goal of any water conservation program is to improve water use efficiency and water supply reliability. A plan review program may be useful in achieving these goals as well as reducing costs both in the short and long term for developers and owners. To ensure effectiveness of the plan review process, the water provider may decide the best way to implement the program is to have their conservation department, or a qualified consultant, review plans. For outdoor landscape, plan review should be followed by installation inspections to ensure compliance. This can be accomplished by having staff members do inspections or as in the case of Westminster, Colorado; the developer is required to hire a Licensed Irrigation Auditor to certify the project. Either way, as evidenced by the case study for the City of Santa Monica, installations are often done incorrectly and persistent oversight and enforcement is critical to successfully achieve water conservation in a landscape plan review program.

It is common for new homebuilders to install front yard landscaping, however, the side and back yards are generally left for the homebuyer to complete. This could pose a challenge for a landscape plan review process for residential new development, as the front yard may be in compliance with MELO, or the local ordinance, based on the design by the homebuilder, whereas the side and back yards may not. In this case, local jurisdictions will need to educate homebuyers on plant materials and efficient design and installation of automatic irrigation systems. Providing information to the new homeowner that is simple to understand and clearly represents potential water savings is essential.[47]

[47] Robert Raymer, Senior Engineer/Technical Director, California Building Industry Association, personal communication, November 20, 2013.