20x2020
Water Conservation Plan

DRAFT

April 30, 2009

How to comment on the Draft 20x2020 Plan:

Submit written comments via e-mail by May 22, 2009 to:
2020comments@waterboards.ca.gov

Provide oral comments at a public workshop:
Friday, May 29, 2009
10:00 a.m. to no later than 1:00 p.m.
Sacramento

A live video broadcast of the workshop will be available via the Internet and can be accessed at:
http://cawater.rmxpres.com/webcast/data/dwr05292009/msh.htm

For more information on providing comments or attending the workshop, visit the 20x2020 Agency Team website hosted by the State Water Resources Control Board:
http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml

Preface

In California, water is precious, competition for water is fierce, and conservation is critical. The value that Californians place on water is reflected in a constitutional provision ensuring its reasonable and beneficial use. Article X, section 2 of the California Constitution prohibits the waste and unreasonable use of this precious resource. All water within the state is the property of the state, but the right to use water may be acquired under California law. To manage competition for scarce water supplies, California has an appropriative water right system that provides for the orderly development of the state's water resources while safeguarding against waste and unreasonable use.

Despite constitutional provisions prohibiting waste and a system of water rights to manage allocations, water conservation has always been important. California has a long history of laws, policies and practices that promote water conservation. Conservation and efficiency of water usage are recognized least-cost strategies to help ensure a vital economy, a healthy environment, and a high standard of living.

As our understanding, knowledge and technology improve, we have learned that our use of water for given purposes can also improve. Statutes and policies have been instituted that continually define our evolving abilities to do more with less water and begin to restore the health of the natural water systems on which we so greatly depend. Yet, with a burgeoning population and the movement of that population to drier climates, our overall demand for water has exceeded our reliable developed supply. Without additional action, demand will continue to exceed supply. The Delta is in crisis, drought has depleted our reservoirs and groundwater resources are overdrafted. Our need to pursue conservation and eliminate unnecessary uses of water is more important than ever to ensure the future health of our state.

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Executive Summary

In February 2008, Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. As part of this effort, the Governor directed state agencies to develop a plan to reduce statewide per capita urban water use by 20 percent by the year 2020. This marked the initiation of the *20x2020 Water Conservation Plan (20x2020 Plan)* process.

California's water resources are finite and now require managing for sustainability. Multiple benefits can be realized as a result of more aggressive water conservation including:

- reduced stress on the environment of the beleaguered Sacramento-San Joaquin Delta
- delayed capital cost of new infrastructure to treat and deliver water
- reduced demand for wastewater treatment, including capital costs and ongoing treatment costs
- reduced water-related energy demands and associated greenhouse gas emissions
- improved ability to meet environmental needs
- improvements in the quality of receiving waters related to reduced discharge
- reduced use of fertilizers, pesticides, and herbicides, reduced escape of these chemicals into surface waters, reduced production of green waste, and improved habitat value of urban landscapes
- enhanced flexibility in water management and delivery systems, especially during dry periods
- better capacity to meet the challenge of California's growing population.

California can reduce its per capita use 20 percent, from the current 192 gallons per capita daily (GPCD) to 154 GPCD. This amounts to an annual savings of about 1.74 million acre-feet.

20x2020 Plan Scope and Process

The *20x2020 Plan* sets forth a statewide road map to maximize the state's urban water efficiency and conservation opportunities between 2009 and 2020, and beyond. It aims to set in motion a range of activities designed to achieve the 20 percent per capita reduction in urban water demand by 2020. These activities include improving an understanding of the variation in water use across California, promoting legislative initiatives that incentivize water agencies to promote water conservation, and creating evaluation and enforcement mechanisms to assure regional and statewide goals are met. The *20x2020 Plan* discusses these many activities in detail.

This *20x2020 Plan* was developed through the collaborative effort of an Agency Team, which consisted of state and federal agencies including the Department of Water Resources (DWR), State Water Resources Control Board (SWRCB), California Energy Commission (CEC), Department of Public Health (DPH), California Public Utilities Commission (CPUC), Air Resources Board (ARB), and the US Bureau of Reclamation (USBR). The Agency Team also developed research papers (Technical Memoranda) and solicited input from water suppliers and organizations through public workshops and conference calls during the planning phase of the *20x2020 Plan*. In addition, the California Urban Water Conservation Council contributed toward the analysis and development of this *20x2020 Plan*.

Comments received through the public review process were used to modify and shape the recommendations of this *20x2020 Plan*.

Establishing a Baseline and Targets

The 2005 statewide baseline urban water use value, expressed in gallons per capita per day (GPCD), is **192 GPCD**. The corresponding statewide targets are:

- Interim 2015 Statewide Target = 192 GPCD (Statewide Baseline) minus 10 percent = **173 GPCD**
- Final 2020 Statewide Target = 192 GPCD (Statewide Baseline) minus 20 percent = **154 GPCD.**

This represents a statewide savings of 1.74 million acre-feet (MAF) from 8.7 MAF to 7 MAF. California can achieve at least a 20 percent reduction in per capita water use by 2020.

Using ten hydrologic regions as defined by DWR for water resources planning purposes, regional baseline and target values were derived for daily per capita water use.

Table ES-1. Regional Urban Water Use Pattern

	DWR Hydrologic Region									
Sector Water Use (GPCD)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8***	**9**	**10**
Residential (Single- and Multi-Family)	115	103	109	126	174	159	180		176	255
Commercial and Institutional	18	19	17	23	25	27	23		19	38
Industrial	8	17	8	9	21	32	43		11	3
Un-Reported Water	24	18	20	22	33	30	39		31	50
Total Baseline	165	157	154	180	253	248	285	243	237	**346**

* Region 8 does not have enough usable data in the PWSS database to compute for baseline values. The LWUP database was used instead. Note that the LWUP database only contains data for 1998, 200, 2001. The baseline values for this region may not be as reliable as values computed for the other regions.

Table ES-2. Regional Urban Water Use Targets

DWR HR Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Baseline (1995-2005)	165	157	154	180	253	248	285	243	237	346
Interim Targets (2015)	151	144	139	165	215	211	237	208	204	278
Targets (2020)	**137**	**131**	**123**	**149**	**176**	**174**	**188**	**173**	**170**	**211**

Recommendations

Recommended actions to contribute toward a statewide strategic approach (as described in more detail in Chapter 3) fall into the following categories:

1. Establish a foundation for a statewide Conservation Strategy.
    a. Establish targets and goals in statute.
    b. Establish a state agency leadership and coordination framework.
    c. Mandate uniform data collection and establish a statewide database.
    d. Maintain existing programs and institutions.
2. Reduce landscape irrigation demand.
    a. Support the implementation and enforcement of landscape design and irrigation programs and the development of new landscape programs.
    b. Mandate the landscape irrigation BMP.
    c. Require water-efficient landscapes at state-owned properties.
3. Reduce water waste.
    a. Accelerate installation of water meters.
    b. Establish a state standard for water meter accuracy.
    c. Revise the water loss BMP to incorporate improved methodologies and accelerate coverage goals.
4. Reinforce efficiency codes and related BMPs.
    a. Obtain authorization for state standards for high efficiency clothes washers.
    b. Support landscape irrigation equipment standards.
    c. Accelerate replacement of non-efficient showerheads, toilets and urinals.
    d. Accelerate adoption of proven water saving technologies in new businesses.
5. Provide financial incentives.
    a. Encourage or mandate conservation water pricing.
    b. Provide grants, loans, and rebates to wholesale and retail water suppliers.
    c. Establish a public goods charge for water.
    d. Fund the installation of water meters.
6. Implement a statewide conservation public information and outreach campaign.
7. Provide new or exercise existing enforcement mechanisms to facilitate water conservation.
    a. Require implementation of water conservation as a condition to receive state financial assistance.
    b. Take enforcement actions to prevent waste and unreasonable use of water.
    c. Provide additional enforcement tools for water suppliers.
8. Investigate potential flexible implementation measures.
    a. Investigate requiring conservation offsets for water demand generated by new development.
    b. Investigate establishment of a cap-and-trade regime.
9. Increase the use of recycled water and non-traditional sources of water.

Implementation

The *20x2020 Plan* will be implemented through three phases, as outlined in Table ES-3.

Table ES-3. *20x2020 Plan* Implementation Outline

Plan Phase	Year	Activities
I. *20x2020 Plan* completion and Start-up Actions	2009 – 2010	• Finalize *20x2020 Plan* • Establish a lead agency and coordination framework • Develop detailed implementation task descriptions for recommended actions • Provide technical assistance in conservation legislation discussions • Evaluate an interim data collection and management mechanism • Collect, manage and validate data • Implement conservation actions • Conduct legislative, regulatory and administrative actions • Provide oversight
II. *20x2020 Plan* Implementation, Monitoring, Evaluation, Adjustments	2011 – 2020	• Establish interim and long-term data collection and management Implement conservation actions • Monitor implementation progress • Assess and design additional measures such as a conservation offset and a conservation credits trading program as needed • Conduct an Interim Target Assessment and Performance Evaluation in 2015
III. Conclusion	2020	• Conduct a Final Target Assessment and Performance Evaluation • Publish Results and Lessons Learned

Year 2020 and Beyond

Water resources will continue to be scarce beyond 2020. An important factor to the success of this *20x2020 Plan*, from now through 2020 and beyond, relies on the fundamental revolution of the way Californians view water. One of the many goals of this *20x2020 Plan* is to bring Californians to recognize that the water our lives depend on is indeed a very limited resource, and that it must be used wisely, innovatively, responsibly, and efficiently. The success of the *20x2020 Plan* also demands political will to continue to invest and push to capture the full extent of water conservation potential.

In succeeding, this *20x2020 Plan* will bring benefits not only to California but will allow us to share this leadership and experience in the national and international efforts to mitigate the global crisis of water deficiencies.

1. Introduction

In February 2008, Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. The first element of the Governor's Delta plan is water conservation. In the Governor's words, California must have:

> **"A plan to achieve a 20 percent reduction in per capita water use statewide by 2020.** Conservation is one of the key ways to provide water for Californians and protect and improve the Delta ecosystem. A number of efforts are already underway to expand conservation programs, but I plan to direct state agencies to develop this more aggressive plan and implement it to the extent permitted by current law. I would welcome legislation to incorporate this goal into statute."

The Governor's call for greater conservation is reflected in the work of the Delta Vision Blue Ribbon Task Force. The Vision and Strategic Plan of the Task Force call for significantly greater implementation of water use efficiency measures to reduce water export demands on the Delta and its struggling ecosystem.

Delta protection and restoration are not the only reasons to increase conservation efforts. Global climate change will affect water management in California and water conservation will help the state not only mitigate climate change by reducing greenhouse gas emissions but also adapt to climate change by reducing water use. Approximately one-fifth of the electricity and one-third of the non-power plant natural gas consumed in the state are associated with water delivery, treatment and use so efficient use also can reduce water-related energy demands and associated greenhouse gas emissions. Without this program, water-related greenhouse gas emissions in 2020 would be higher than is currently forecast. The Water Energy Subgroup of the Climate Action Team estimates that this plan will reduce emissions by 1.4 million metric tons per year.

Water conservation is also an attractive water management strategy because it can yield multiple benefits. Reduced demand can reduce or delay the capital cost of new infrastructure to treat and deliver water. Reduced use also reduces the demand for wastewater treatment, including capital costs and ongoing treatment costs. There may also be improvements in the quality of receiving waters related to reduced discharge. Landscape water conservation can yield multiple benefits including reduced use of fertilizers, pesticides, and herbicides, reduced escape of these chemicals into surface waters, reduced production of green waste, and improved habitat value of urban landscapes.

The California Water Plan acknowledges the importance of water conservation as an element of statewide water management. The *California Water Plan Update 2005* as well as the draft *California Water Plan Update 2009* identifies urban water conservation as the water management strategy that will be most effective at matching supply and demand. California needs a comprehensive plan to increase water use efficiency and achieve the multiple benefits that accompany more efficient use.

This *20x2020 Plan* outlines recommendations to the Governor on content and implementation of the requested "more aggressive plan". These recommendations were developed through a collaborative effort involving several agencies that are involved in water planning and management. The Agency Team consists of seven state agencies and a federal agency: Department of Water Resources (DWR), State Water Resources Control Board (SWRCB), California Energy Commission (CEC), Department of Public Health

(DPH), California Public Utilities Commission (CPUC), Air Resources Board (ARB), California Bay Delta Authority (CBDA) and the US Bureau of Reclamation (USBR). In addition, the California Urban Water Conservation Council contributed toward the analysis and development of this *20x2020 Plan*.

Achieving a 20 percent reduction in statewide per capita urban water use is a challenging task. Achieving it will require quick and concerted effort throughout the state. However, the urgent threat of water deficiency and overdraft, water needs of the environment, a growing population, and the unknown impact of climate change on water supplies, requires that California move boldly to foster water conservation.

Conservation versus Efficiency

The terms water conservation and water use efficiency are often used interchangeably. *Water conservation* is often defined as a reduction in water loss, waste, or use. The general term water conservation may include *water use efficiency*, in which more water-related tasks are accomplished with the same or lesser amounts of water.

When widespread conservation programs are implemented, water managers may become concerned about demand hardening. This is the phenomenon in which customers lose the ability to easily institute emergency conservation during drought or other crises because they have already captured all their conservation savings. Although this is a legitimate concern, California will still have ample conservation opportunity even after statewide per capita use is reduced by 20 percent, through additional fixture and appliance replacement, reductions in landscape irrigation, and habit change.

Plan Scale and Scope

To meet the Governor's charge, the Agency Team has worked to develop the *20x2020 Plan* that answers these questions:

- What is per capita urban use now, or in some recent base period?
- What would the reduction in per capita use be when the Governor's goal is met?
- How does per capita use vary across the state?
- How does the potential for additional conservation vary across the state?
- Is it feasible to expect that the Governor's goal can be met?
- Will existing measures enable us to achieve the Governor's goal? How does this vary by region?
- Can we expect to achieve the goal with new measures? What would it take to implement them?
- How might implementation (and needed implementation assistance) vary by region?

This *20x2020 Plan* addresses only urban water use and conservation. To achieve a reduction in overall water use while protecting the Delta's ecosystem, it is recognized that both urban and agricultural water use must be more efficient. The Governor's charge was to achieve a 20 percent reduction in *per capita* use, which implies an urban focus. There are many differences between California's urban and agricultural supplies and demands. These differences in water qualities and quantities, delivery systems, and other use characteristics, coupled with different institutional and conservation mechanisms require that separate mechanisms be developed to address the urban and agricultural sectors.

The focus on urban use here does not diminish the relevance of agricultural use to the state's total water use or the potential for significant reductions in overall state water use from the agricultural sector. In fact, the Legislature's first attempt to incorporate the Governor's goal into statute, AB 2175 in 2008, proposed a vitally important institutional improvement in California's approach to agricultural water management: planning and implementation requirements for irrigation districts that are parallel to the standards that have been in place for urban suppliers since 1983. This balanced and comprehensive approach is a sound water management strategy.

This *20x2020 Plan* addresses only potable water use. "Water use efficiency" in some state programs includes both water conservation and water recycling, but this meaning is not used for this plan. Urban potable water use includes all residential, commercial, institutional and industrial users as well as non-revenue water. Non-potable recycled water was excluded while estimating baseline per capita urban water use to give credit to agencies that have promoted recycled water in the past. Additional use of recycled water will be a significant method by which regions can continue to offset baseline potable urban water demand to meet 2020 goals.

This *20x2020 Plan* does not consider processes that convert a non-potable source into a potable source as methods to reduce per capita use, since they are new supply options. Desalination and use of recycled water to recharge aquifers or augment surface supplies are included among these new supply options. Municipal stormwater capture is also not included.

This *20x2020 Plan* does not address water supplied by customers for their own use or consider processes that create new supply on the customer side of the meter. The plan focuses on potable water supplied in municipal distribution systems and does not include quantities of self-supplied water in per capita use calculations. Some water users have access to groundwater or surface water to provide a part or all of their water needs. In addition, alternative sources of water, such as graywater (untreated household waste water from clothes washers, tubs and showers), rainwater recapture, and on-site diverted stormwater are examples of non-potable sources that may reduce per capita use, but were not included in the analysis at this time.

This *20x2020 Plan* does not address water losses in transmission of water between sources of supply and potable water treatment and distribution systems. An attempt has been made to account for water losses within potable water distribution systems, captured within the categories of "non-revenue water" or "unreported water." In the DWR database that was the primary source of data for this project, "un-reported water" includes "large landscapes" (parks, golf courses, schools)) for which water deliveries may not be measured; "other" (system flushing, fire hydrant testing, etc.): and "non-revenue water" (previously referred to as "un-accounted for water" (i.e. system water losses from leaks, slow meter registers, theft, etc.) Further discussion of data development can be found in Chapter 2.

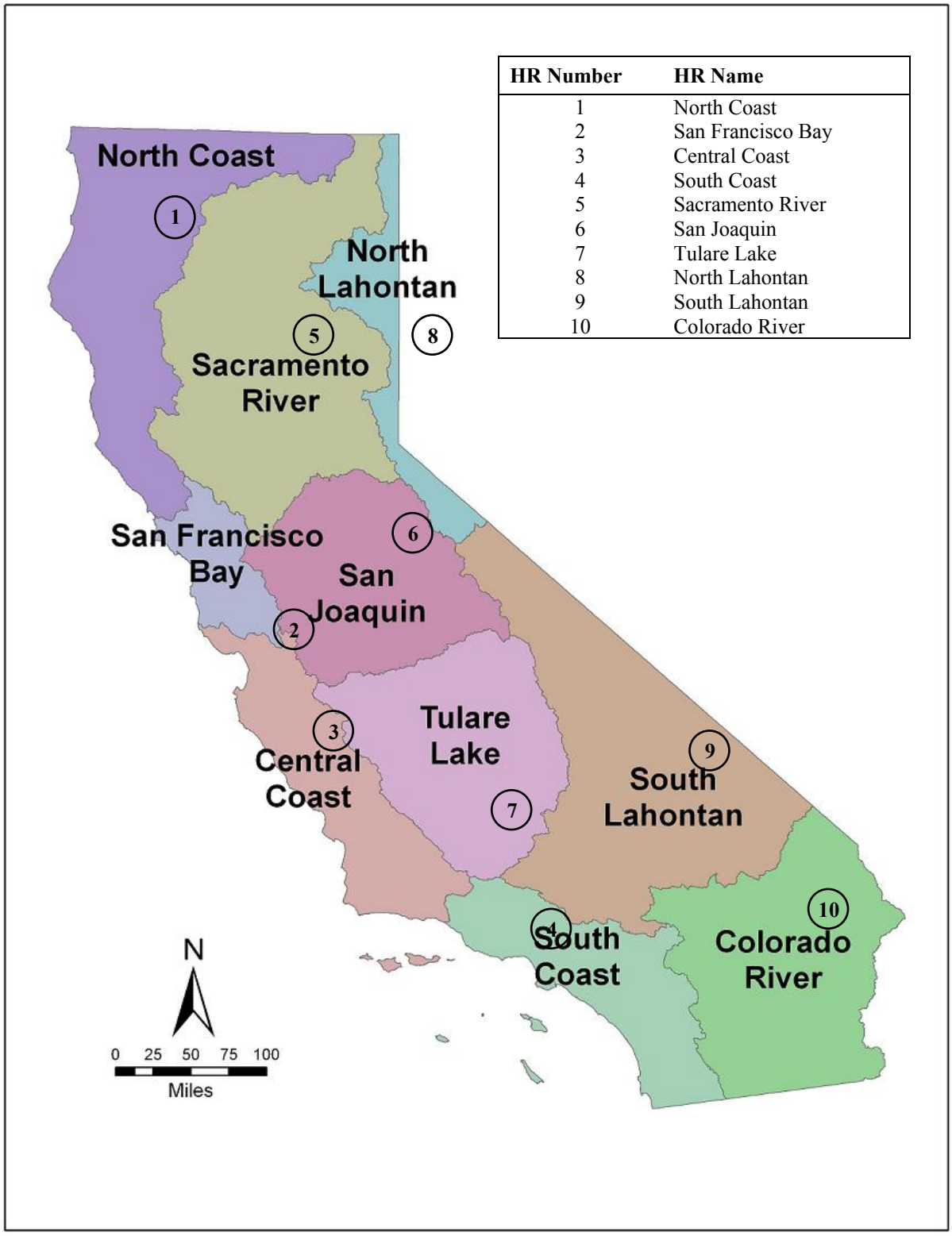
This *20x2020 Plan* recommends actions that will reduce per capita use, not total urban use, by 20 percent. While this *20x2020 Plan* is being implemented, California's population will continue to grow. Depending on the rate of population growth, total urban water use may never go down and could eventually rise, even if all the recommendations in this *20x2020 Plan* are successfully implemented. Clearly, this *20x2020 Plan* alone will not lead to long-term sustainable water use. Other efforts to balance supply and demand will be needed, including continued reductions in per capita demand.

This *20x2020 Plan* is based on analyses conducted on a regional and statewide basis. The analyses were designed to account for regional differences, including varying

levels of past conservation in different regions and varying climate that affects outdoor water use. Two regional approaches to planning were considered – use of hydrologic regions (HR) and reference evapotranspiration (ETo) zones. Hydrologic Regions refer to the 10 regions delineated by DWR based on topographic and hydrologic characteristics (Figure 1). ETo zones refer to the 18 zones delineated by DWR and the University of California based on climate characteristics (Figure 2) related to the consumption of water by well-watered cool season turfgrass species. Analysis at the water supplier level was not carried out because the supplier-level data were inconsistent and incomplete, and such a fine level of detail was not considered necessary to develop the *20x2020 Plan*.

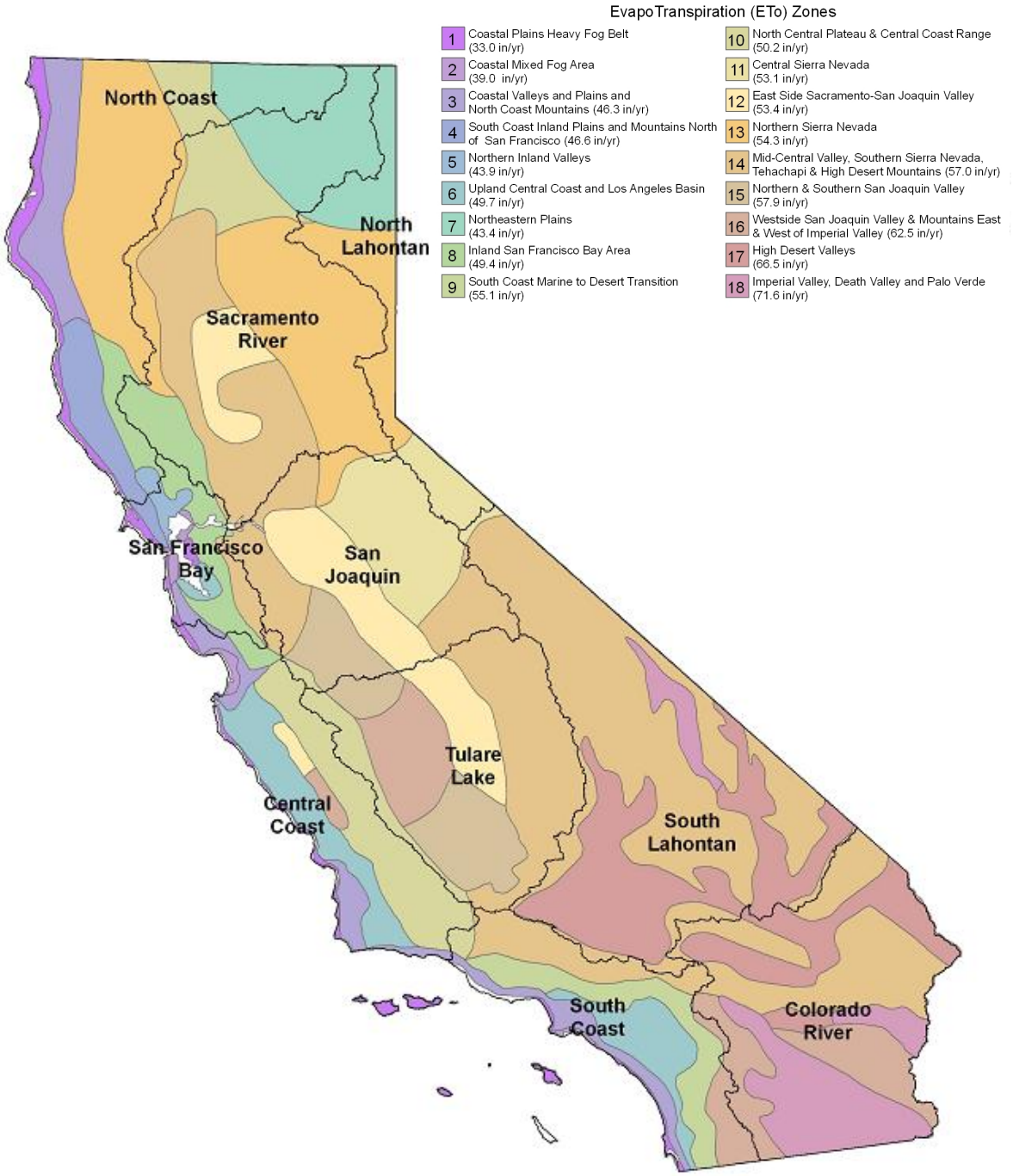
Data analysis and development of conservation targets for planning purposes was conducted by hydrologic region rather than ETo zone for two reasons. First, a large portion of data available for undertaking the analyses presented here were either already collated by hydrologic region, or were easier to collate by hydrologic region than by ETo zones. Second, major funding for integrated regional water management – including water conservation – is structured according to hydrologic region. Regional entities, such as Integrated Regional Water Management consortia, have an important role to play in the success of this *20x2020 Plan* and implementing its recommendations. Nevertheless, climate is a powerful factor affecting water use. Ideal regional targets would reflect the climate variability represented by the ETo zones, would result in irrigation water use substantially lower than ETo amounts, and would be flexible enough to accommodate implementation at the geographic scale of hydrologic region or water supplier service area.

Figure 1. California Hydrologic Regions



HR Number	HR Name
1	North Coast
2	San Francisco Bay
3	Central Coast
4	South Coast
5	Sacramento River
6	San Joaquin
7	Tulare Lake
8	North Lahontan
9	South Lahontan
10	Colorado River

Figure 2. California Reference Evapotranspiration Zones Overlapping Hydrologic Regions

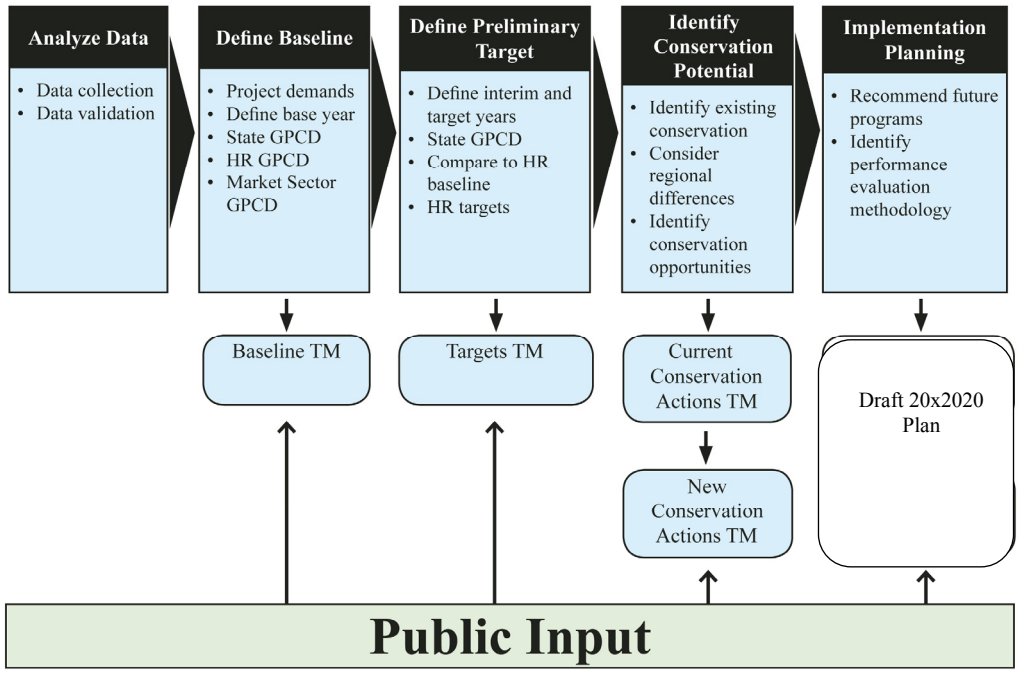


20x2020 Planning Process

The process of developing the *20x2020 Plan* is illustrated in Figure 3 (completed steps are highlighted). There are five steps:

1. Data Analysis
2. Baseline Definition
3. Preliminary Targets Development
4. Conservation Potential Identification
5. Implementation Planning

Figure 3. *20x2020 Plan* Development Process



In this *20x2020 Plan,* findings of previous works are summarized, and many tools and activities that the State and local water suppliers could implement to achieve a statewide 20 percent reduction in per capita use are described.

Summary of the Statewide Planning Effort

A significant amount of data collection and technical analysis was conducted to prepare this *20x2020 Plan*. Results of this work are contained in the following technical memoranda (TMs). All of these documents are available at the following website hosted by SWRCB: http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml

These TMs were draft working documents and were not updated to include changes made in response to public comment or further analysis by the agency team. They provided a starting point, with comments and discussion from stakeholders and the team modifying the approach and conclusions of the initial TM findings to produce this document. As such, they provide a historic reference to this *20x2020 Plan*.

TM 1. Establishing Baselines

This TM evaluated the available potable water use data and established baseline per capita water use values for each of the ten hydrologic regions, expressed as gallons per capita daily or GPCD. These baselines were used to determine the target GPCD values.

TM 2. Determining Conservation Targets

Urban water use varies widely among regions, due to the effect of past conservation efforts, community attributes, and climate differences. A uniform statewide 20 percent reduction in water use would fail to properly account for these regional differences. To provide one idea of how regional targets might vary, this TM used the baseline GPCD values determined in TM 1 to set the target GPCD values for each of the ten hydrologic regions. These targets were derived before savings estimates from "current" and "future" conservation programs and actions were fully developed. Considerable public input on target-setting received at public workshops prompted further revision of both the methodology and the targets. The revised targets and methodology discussed in this document supersede what was earlier presented in TM 2. See Chapter 2 of this *20x2020 Plan* for additional discussion.

TM 3 (Performance Metrics) and TM 6 (Implementation Plan) were not developed as Technical Memoranda as originally anticipated. They are not posted as Technical Memoranda on the website, but are addressed only in this *20x2020 Plan*, as described in Chapter 4. Because of timing and funding constraints, these sections will be included for discussion during the final public workshop.

TM 4. Potential Conservation Savings from Current Actions

TM 4 evaluated GPCD savings that each region could likely achieve using existing conservation tools and programs. Measures quantified include the impact of existing plumbing codes, the potential impact of existing regulatory initiatives requiring complete urban metering by 2025; the implementation of Best Management Practices (BMPs) at existing rates (except for high efficiency clothes washers which were considered as a new action); and improving these implementation rates in the future because of recent legislation (AB 1420, Laird 2007) which ties receipt of water-related state grant funding to BMP implementation.

After adopting the California Urban Water Conservation Council's Memorandum of Understanding Regarding Urban Water Conservation (MOU) in 1991, many urban water suppliers initiated water conservation programs identified as BMPs in the MOU. These BMPs are listed in Table 1.

A key source for the savings estimates was the CALFED Bay-Delta Program's *Water Use Efficiency Comprehensive Evaluation*.[1] This evaluation was conducted by the CALFED Bay-Delta Program to assess water use efficiency progress made during the implementation of the CALFED Program from 2000 to 2004, and to assess the potential for additional efficiency improvements under several different funding and implementation scenarios. To develop the *20x2020 Plan*, these estimates were updated to account for new codes, such as AB 715 (Laird, 2007), that requires only high-efficiency toilets and urinals (HETs and HEUs) to be sold or installed after January 1, 2014. The *Comprehensive Evaluation's* savings estimates were also re-based to 2005, the last year of the 11 year water production

[1] CALFED Bay-Delta Program Water Use Efficiency Element, "*Water Use Efficiency Comprehensive Evaluation*," August 2006.

data history from which baseline GPCD estimates were derived. The *Comprehensive Evaluation* examines different levels of implementation of the Best Management Practices for Urban Water Conservation (BMPs) as described in the Memorandum of Understanding administered by CUWCC. Although the MOU was revised in December, 2008, the list of BMPs presented here is as they existed prior to this revision since that is how the *Comprehensive Evaluation's* analyses were conducted.

Table 1. List of Best Management Practices (BMPs)

BMP	Description
BMP 1	Water survey programs for residential customers
BMP 2	Residential plumbing retrofit
BMP 3	System water audits, leak detection and repair
BMP 4	Metering with commodity rates for all new connections and retrofit of existing unmetered connections
BMP 5	Large landscape conservation programs and incentives
BMP 6	High efficiency clothes-washing machine financial incentive program
BMP 7	Public information programs
BMP 8	School education programs
BMP 9	Conservation programs for commercial, industrial, institutional (CII) accounts
BMP 10	Wholesale agency assistance programs
BMP 11	Retail conservation pricing
BMP 12	Conservation coordinator
BMP 13	Water waste prohibition
BMP 14	Residential ultra-low-flush toilet (ULFT) replacement programs

TM 5. Potential Conservation Savings from New Actions

TM 5 evaluated GPCD savings that each region could likely achieve through new conservation tools and programs. Measures quantified include savings from the retrofit of non-efficient clothes washers with more efficient washers, retrofit of large-landscape residences with weather-based irrigation controllers, and several new technologies evaluated by CUWCC as part of its Potential Best Management Practice review. TM 5 also estimated additional savings likely if coverage goals for a select set of BMPs are expanded relative to what is stated in the MOU, if aggressive programs are pursued to reduce unaccounted for water beyond what is required by the MOU, if residential irrigation is restricted to only two or one day per week, and if recycling projects come on line as projected.

Finally, TM 5 presented some placeholder estimates of likely additional savings at an assumed level of investment of grant funds for water conservation. These savings estimates are also drawn from the *Comprehensive Evaluation*. The scenario assumes that $30 million per year would be available between 2005 and 2014, and $7.5 million per year thereafter until 2020. It is important to note that the *Comprehensive Evaluation* followed an elaborate cost-effectiveness criterion to allocate funds across different hydrologic regions, taking into account an estimate of the marginal cost of water to a region. Under Proposition 84, which

allocated $1 billion in grant funds for water management, each region is assured a proportionate share of the total grant funding. This does not assure that regional funds will be used to implement efficiency improvements, and conservation efforts have been more modest in areas such as the Central Valley where the cost of water has been comparatively lower. Therefore, estimates of grant-funded savings should be treated as highly uncertain. Additional incentives or disincentives may be needed to improve water use efficiency in regions where the price of water is furthest from fully reflecting the true costs of the water supply and does not include the costs of extensive conservation programs.

Public Outreach

Information on development of the *20x2020 Plan* is posted on the SWRCB website at: http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml

This website also includes links to all the TMs in addition to a website with e-mail comment capability.

The *20x2020 Plan* effort hosted two public workshops and a toll-free conference call to receive additional input on the conservation planning effort, and is currently planning a third public workshop in Sacramento.

- Public Workshop #1 was held in Sacramento on September 15th, 2008 and included over 100 participants. This first workshop focused on establishing baseline GPCD and targets for the year 2020. The discussion provided an overview of the 20 percent by 2020 process and allowed stakeholders to share ideas and questions directly with the Agency Team. The workshop allowed the Agency Team to get an initial read on the public's concerns and sentiments which were incorporated into the draft *20x2020 Plan*.
- Public Workshop #2 was held in Sacramento on November 20th, 2008 and included over 40 stakeholders. The second workshop focused on potential conservation savings from current and new actions. Public comments were addressed and folded into the draft *20x2020 Plan* including an extensive dialogue regarding the treatment of commercial, industrial and institutional target setting.
- Stakeholders present at the second workshop requested a conference call be held to provide additional clarification on the method used to establish conservation targets. This conference call was hosted on December 8th, 2008 and included over 40 participants.
- Public Workshop #3 will be held in Sacramento on May 29th, 2009 *(tentative date)* and will focus on the public review draft of the *20x2020 Plan*.
- Throughout the *20x2020 Plan* process a public comment e-mail address was active as a mechanism for providing input and a means for posing questions regarding the process. Before each workshop roughly one dozen comments were submitted via email and were addressed by the Agency Team.

2. Establishing a Baseline and Targets

Water use depends on various factors such as population, climate, land use patterns, (lot sizes, square footage of irrigated landscape), the age and condition of the water distribution infrastructure (water losses), and industrial and socioeconomic characteristics (the cost of water and income level of residents) of a region. There are significant variations in per capita use across the state reflecting these factors. The analyses in this *20x2020 Plan* are presented by hydrologic region in part to recognize and account for some of this variation.

In order to achieve a savings target, it is essential to first define a baseline. Data from a number of different sources were assessed, as described in following Section 2.1. However, the data available for this analysis were not complete and accuracy levels vary significantly among water suppliers. Furthermore, through the existing water use data collection systems, there is a considerable lag time between when data are collected and when they are reported to the various entities. With this in mind, the analyses provided in this *20x2020 Plan* should be treated as initial estimates, based on the best available information. An important step in implementing this *20x2020 Plan* will be to standardize and improve the data collection process. This recommendation is discussed in more detail in Chapter Three.

Establishing a Baseline

The baseline values for each region represent the starting point of the *20x2020 Plan*, and help to determine the progress achieved toward the Governor's goal. Establishing the baseline is a dynamic process. The methodology used to develop the baseline in the planning effort of this *20x2020 Plan* was based on the data and resources available at this time and is a good first step towards accomplishing the *20x2020 Plan*'s goals. There is ample room, however, for improvement and refinement of the baseline as new information becomes available.

Over the years, many agencies and organizations – including DWR, DPH, CPUC and CUWCC – have collected urban water use data depending upon their goals and needs. Each dataset has strengths and limitations summarized in Table 2.

Table 2. Dataset Strengths and Limitations

Data Source	Strength	Limitation
DWR – Public Water Systems Survey (PWSS)	• Detailed water production, water delivery, population, and connections data. • Categorized by market sectors (e.g., residential, commercial, industrial, etc.). • Compiled into a central database.	• Collected voluntarily, which impacts data completeness and accuracy. • Recent data (2005-present) have not yet been compiled and validated, and are not available for use for this Plan.
DWR – Land and Water Use Program (LWUP)	• An extension from PWSS database, with data validated and modified at a sub-county level and validated using professional judgment. • Every area has a water use value.	• Only three (3) years of data are available (1998, 2000, and 2001).
California Urban Water Conservation Council (CUWCC)	• Detailed water use data by demand sector/customer type • Includes estimates of water saved through conservation Best Management Practices	• Only entered by Signatories of Memorandum of Understanding (approximately 225 of largest urban water suppliers in 2008) • Values expressed in 2006 dollars.
CPUC	• Recent urban water use data readily available. • Mandatory so data set should be complete.	• Limited data points • Only residential data available. • Data for connections and water use only. • Data was reported on annual basis, which limits the analysis for residential indoor/outdoor water use.
DPH	• More complete database since the Safe Drinking Water Act requires water suppliers to report water use data annually.	• Not available electronically. • Has not been compiled into a central database. Stored as hard copies in each DPH office across the state.
Urban Water Management Plans (UWMPs) prepared by Water Suppliers	• Could provide more detail on water use because plans are prepared by individual water suppliers. • Water suppliers serving more than 3,000 connections or more than 3,000 AFY are required by law to develop and submit UWMPs. • Mandatory but compliance is not 100 percent.	• Developed only once every five years. • Not compiled into a central database and therefore not available electronically. • No data from small water suppliers that serve fewer than 3,000 connections or 3,000 AFY.

Supply and Demand Data

Because water production data for any given year includes missing and inconsistent elements, several years of production and delivery data (1995 through 2005) were pooled to derive more stable average estimates of baseline consumption. Based on these data, no discernable trend was observed in the overall statewide and regional per capita water use over this period. Therefore, the most recent year for this period, 2005, has been selected as the baseline year.

Review of the strengths and limitations associated with the available databases revealed that data provided by DWR (both the PWSS and LWUP databases) contain the most relevant information that could be used for this *20x2020 Plan*. There are a number of uncertainties and possible inaccuracies in these data, but they were the best available at this time.

Because data submittal to DWR is voluntary, the completeness and accuracy of these data vary substantially between water suppliers. Some suppliers did not provide data for certain market sectors and/or certain years. Suppliers also used different methods in measuring water production and delivery. It is also evident that water suppliers had different understandings of specific data fields.

Most suppliers did not provide data on recycled water. If recycled water data were provided, they were removed from the demand data used to calculate per capita use. Water production of private water suppliers (e.g. residents with private water wells) is not captured in the PWSS database and was therefore also excluded from this analysis.

Data Development

Table 3 and Figure 4 below show the variations in average GPCD across the state's 10 hydrologic regions from the data analyzed in the PWSS database. This includes the base sectors of total residential, commercial, industrial and other/non-revenue where data were available.

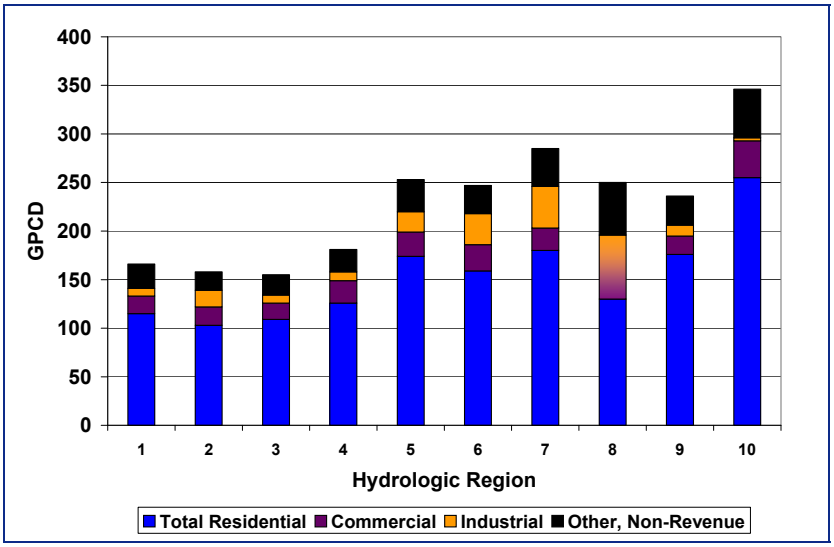
Review of the compiled data by hydrologic region showed significant variations across the state. As expected, the GPCD values were higher in the more arid areas such as the Colorado Basin (Region 10). The coastal regions (1 through 4) have the lowest GPCD, partly because they have a cooler climate, limited water supplies, and higher cost of water, and because these areas have implemented more water conservation programs than many of the inland areas.

Table 3. Regional Urban Water Use Pattern

	Hydrologic Region									
Sector Water Use (GPCD)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8***	**9**	**10**
Residential (Single- and Multi-Family)	115	103	109	126	174	159	180		176	255
Commercial and Institutional	18	19	17	23	25	27	23		19	38
Industrial	8	17	8	9	21	32	43		11	3
Un-Reported Water	24	18	20	22	33	30	39		31	50
Total Baseline	165	157	154	180	253	248	285	243	237	**346**

* Region 8 does not have enough usable data in the PWSS database to compute for baseline values. The LWUP database was used instead. Note that the LWUP database only contains data for 1998, 200, 2001. The baseline values for this region may not be as reliable as values computed for the other regions.

Figure 4. Regional Urban Water Use Patterns



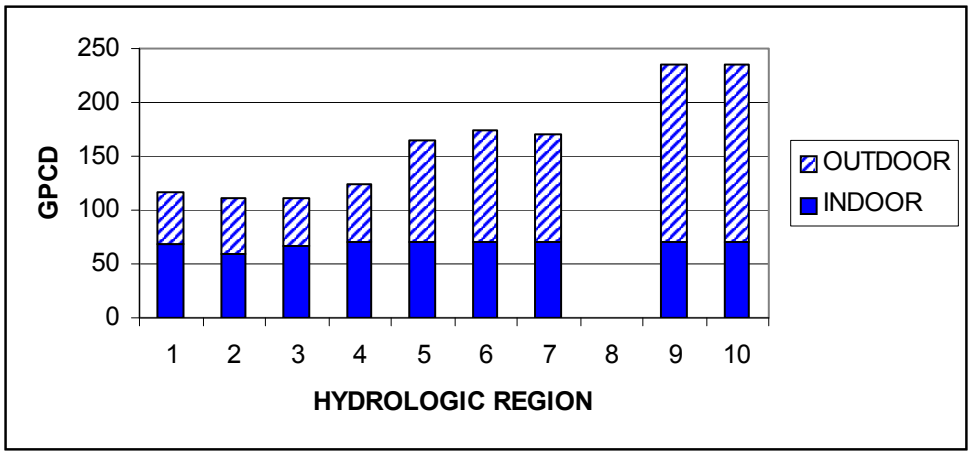
As demonstrated in Table 4, even within hydrologic regions there is significant variation in use, due to climatic, demographic, or economic factors as well as differing levels of conservation implementation.

Table 4. Per Capita Urban Water Use in California, 1995-2005

Region	Weighted Average 1995-2005, GPCD	Range, GPCD
Region 1: North Coast	165	141-170
Region 2: San Francisco Bay	157	149-173
Region 3: Central Coast	154	141-177
Region 4: South Coast	180	171-198
Region 5: Sacramento River	253	237-272
Region 6: San Joaquin River	248	236-250
Region 7: Tulare Lake	285	242-341
Region 8: North Lahontan	243	242-385
Region 9: South Lahontan	237	221-286
Region 10: Colorado River	346	272-387

As demonstrated in Figure 5 analysis of the baseline data indicated that outdoor water use is a significant part of the demand profile for single family households, and reflects a large part of the differences among regional data. Comparison of the lowest monthly consumption data (which usually represents mostly indoor use) with the rest of the year showed large potential for water savings due to landscape modifications or irrigation restrictions. In all Regions outdoor water consumption exceeds 40 percent of urban consumption. In Regions 5 through 10, it represents more than 50 percent of total demand, and almost 70 percent of demand in Regions 9 and 10. (There was insufficient data to represent HR 8 in Figure 5).

Figure 5. Single Family Residential Indoor/Outdoor Baseline Distribution



Potential Conservation Savings from Current Actions (Basic Measures)

Retail water suppliers in California have reported per capita water use remaining steady or dropping since the early 1990s in many parts of California, for several reasons. First, after adopting the California Urban Water Conservation Council's Memorandum of Understanding Regarding Urban Water Conservation (MOU) in 1991, many urban water suppliers have undertaken water conservation programs identified as Best Management Practices (BMPs) in the MOU.

The state has also undertaken several regulatory initiatives to improve water use efficiency, such as mandating that unmetered connections be metered by 2025; that new construction with significant landscaped areas be subject to plan review to ensure that efficient irrigation systems and low water-using plants are being used (Model Water Efficient Landscape Ordinance); and that there be better coordination between land use and water use planning (SB 221 and SB 610). Not all of these BMPs, regulatory initiatives, new technologies, or education and outreach activities have easily quantifiable effects, but they are generally acknowledged to affect water use.

However, overall statewide and regional per capita water use trends remained flat in California between 1995 and 2005, as indicated in the available datasets employed by this *20x2020 Plan*. This suggests that other factors have been at play counteracting the effect of BMPs, codes, and the above-mentioned regulatory initiatives or perhaps that progress in reducing GPCDs that have been made in some communities have been offset by increasing GPCDs in other communities.

The effect of the following codes, active programs, and regulatory activities have been considered in quantifying conservation savings from current actions.

1. Regulatory activities
    a. The conversion of unmetered connections served by the Federal Central Valley Project (CVP) to metered connections by 2013, and non-CVP unmetered connections converted by January 1, 2025, as required by state law.
2. Codes related to plumbing and appliance efficiency
    a. The 1992 Federal Energy Policy Act requiring the sale of efficient showerheads and California Code regarding high efficiency toilets, AB 715

(Health and Safety Code section 17921.4), that requires only high-efficiency toilets and urinals (HETs and HEUs) to be sold or installed after January 1, 2014. The Federal preemption on regulations pertaining to these devices expired several years ago, which manufacturers of these devices acknowledge.

3. Best Management Practices
    a. The active conservation programs aimed at retrofit of inefficient fixtures (BMPs 1, 2, 9 and 14), those aimed at improving outdoor water use efficiency in residential (BMP 1) and large landscape settings (BMP 5), those aimed at improving water use efficiency in Commercial, Industrial and Institutional (CII) settings (BMP 9), and those aimed at reducing system leaks (BMP 3). The impact of high-efficiency clothes washer retrofits (BMP 6) is included among future actions because this BMP was not being aggressively implemented during the baseline period, and uncertainty remains about when a waiver of federal pre-emption might be obtained for the state's efficient clothes washer standard. The remaining BMPs have non-quantifiable benefits.
4. New technologies already having an impact
    a. Two new conservation measures that are already being implemented under the auspices of CII programs: (1) pre-rinse spray valves; (2) steam sterilizers.

Table 5 shows potential savings from code and regulation driven retrofits, and from conversion of unmetered accounts to metered accounts. Codes bring about increased efficiency in two ways. They ensure that fixtures and appliances in new construction are of the more efficient kind. Also, they ensure that when old fixtures and appliances in existing construction turn over, they are replaced by the more efficient kind.

Table 6 shows potential savings that result from BMP implementation (except for BMP 6) up to a point that is regionally cost effective. A measure is regionally cost-effective if the cost per unit of savings ($/AF) is less than the cost of the most expensive supply measure currently available regionally. The impact of regionally cost-effective retrofits of pre-rinse spray valves; commercial dishwashers; steam sterilizers; CII process water; and efficient residential dishwashers are also included in these estimates. The regionally cost-effective estimates of savings potential come from CALFED's *Water Use Efficiency Comprehensive Evaluation*, which provides a complete description of the underlying data, methodology, and models used to develop these estimates.

Four important caveats apply to these estimates.

First, savings estimated to result from the cost-effective implementation of BMPs (Table 6) assume both signatories and non-signatories of the CUWCC Memorandum of Understanding implement all BMPs and other measures deemed regionally cost-effective (the row entitled "total savings GPCD @ 100% compliance) This level of implementation exceeds what water suppliers have achieved historically through the MOU process. On the other hand, BMP implementation data filed by MOU signatories is also of uneven quality, and does not capture conservation by non-signatories. Relying solely on these implementation reports will likely understate achieved conservation. Keeping in mind these data problems, and that only approximately 60 percent of California's population was being served by retail water supplier MOU signatories as of 2006, perhaps only half of the 100 percent compliance savings is likely to be realized if current trends continue. On the other hand, passage of AB 1420 in 2007 is widely expected to spur water suppliers to increase their efforts to implement BMPs. It is assumed that enforcement of AB 1420 will result in 80 percent compliance with cost-effective conservation measures. Table 5 shows that efficiency codes can be expected to lower statewide water use by 4 percent and

regionally cost-effective programs at 80 percent compliance achieve and additional 6 percent (Table 6) for a total statewide reduction of 10 percent.

Second, estimation of baseline consumption itself involves several uncertainties, which if properly accounted for, could further lower the above reported percent savings estimates. Because water production data for any given year includes missing and inconsistent elements, several years of production data (1995 through 2005) were pooled to derive more stable average estimates of baseline consumption. Production data from 2005 (the most recent year for which statewide water production data are available) was used as the base year for estimating remaining savings potential through 2015 and 2020.

Third, code driven savings associated with toilets and showerheads are computed using unverified saturation estimates. Small errors in baseline saturation estimates can have significant impacts.

Finally, the regional marginal water supply cost estimates upon which the cost-effectiveness analyses are based are somewhat dated and may not capture changes in the State's water supply situation, particularly as it pertains to the Delta, that have driven up water supply costs in recent years. Economic incentives to invest locally in water use efficiency measures may now be greater than assumed for these analyses.

The analyses of current actions yield several important conclusions. Efficiency codes still have considerable potential to further reduce water consumption in California on a per capita basis, even in hydrologic regions with already less than average use. Also, implementation of BMPs to a level that is regionally cost effective can almost double the impact of efficiency codes in certain hydrologic regions, such as San Francisco Bay and South Coast that account for a large share of the state's population, thus also water use. On the other hand, simply following a BMP strategy, which relies on voluntary implementation of locally cost-effective conservation measures, would fail to ensure implementation of some very reasonable basic conservation measures in many other hydrologic regions, such as Sacramento River, San Joaquin River, North and South Lahontan, and Tulare Lake that are also home to a significant share of California's population, but where urban water supply costs remain low relative to other parts of the state. Different mechanisms will need to be devised to incentivize water suppliers in these regions to aggressively pursue conservation. The AB 1420 requirement for water suppliers to implement conservation measures in order to receive state grant or loan funds already attempts to do this, and it will help, but will not provide sufficient spur for every region to reach its 2020 target.

Table 5. 2020 Efficiency Code Water Savings – GPCD

HR Number ->	1	2	3	4	5	6	7	8	9	10	
HR Name ->	North Coast	SF Bay	Cent. Coast	South Coast	Sac. River	SJ	Tulare Lake	North Lahontan	South Lahontan	CO River*	State-wide
Residential - Indoor	5	5	5	4	8	7	6	5	5	5	**5**
Residential - Outdoor	0	0	0	0	10	9	5	0	0	1	**2**
CII	1	2	1	1	1	1	1	2	1	1	**1**
Total savings GPCD	7	7	7	6	19	17	12	7	6	6	**8**
Baseline GPCD	165	157	154	180	253	248	285	243	237	346	**192**
% of Baseline GPCD	4%	5%	4%	3%	7%	7%	4%	3%	3%	2%	**4%**
2020 Population (Million)	0.8	7.0	1.7	22.5	3.6	2.8	3.0	0.1	1.4	1.2	**44.1**

* Savings estimates for CII and landscape measures in HR 10 may have low reliability due to faulty estimates of landscape applied water

Table 6. 2020 Water Savings from Cost-Effective Measures – GPCD

HR Number ->	1	2	3	4	5	6	7	8	9	10	
HR Name ->	North Coast	SF Bay	Cent. Coast	South Coast	Sac. River	SJ	Tulare Lake	North Lahontan	South Lahontan	CO River*	State-wide
Residential - Indoor	1	1	0	2	0	0	0	0	0	0	**1**
Large landscape (BMP 5)	1	4	2	4	0	3	1	4	7	40	**4**
CII	2	7	5	7	0	1	1	3	2	4	**5**
Non-Revenue Water	0	3	2	4	0	0	0	0	0	0	**2**
Total savings GPCD @ 100% compliance	4	15	9	17	0	3	2	7	9	44	**13**
Total savings GPCD @ 80% compliance	3	12	8	13	0	3	2	6	8	36	**11**
Baseline GPCD	165	157	154	180	253	248	285	243	237	346	**192**
% of Baseline GPCD @ 80% compliance	2%	8%	5%	7%	0%	1%	1%	2%	3%	10%	**6%**
2020 Population (Million)	0.8	7.0	1.7	22.5	3.6	2.8	3.0	0.1	1.4	1.2	**44.1**

* Savings estimates for CII and landscape measures in HR 10 may have low reliability due to faulty estimates of landscape applied water.

Potential Conservation Savings from New Actions (Additional Measures)

Current actions alone will not achieve the state's 20 percent reduction goal by 2020. However, the goal can be achieved through a combination of current and new actions. For this *20x2020 Plan*, many potential measures were considered. The following categories of measures are recommended for the initial focus of state action and support based on potential water savings and feasibility of implementation:

- Efficient clothes washers
- Residential weather-based irrigation controllers
- Grant funding
- Accelerated coverage goals for some BMPs
- Aggressive reduction in non-revenue water beyond BMP 3
- Landscape practices
- New technologies
- Recycled water

Table 7 combines all the savings estimates developed for the *20x2020 Plan*. Efficient clothes washers, residential weather-based irrigation controllers and grant funding are considered as "Basic Measures" in Table 7, along with efficiency code changes and cost effective water conservation measures, since many water suppliers are already implementing such programs and are expected to continue to support those activities. Accelerated coverage goals, reduction in non-revenue water, landscape practices, new technologies and recycled water are considered "Additional Measures" in Table 7.

Efficient clothes washers

The California Energy Commission (CEC) adopted water efficiency standards for clothes washers in 2004. It is a tiered standard based on the "water factor" of the clothes washer, which is the number of gallons per cubic foot of drum capacity. Conventional washers have a water factor of about 13.3. In 2007, the maximum water factor to be allowed was 8.5. By 2010 the standard would have been further reduced to 6.0. Federal approval is still required, as the Federal Energy Policy Act of 1992 allows only the federal government to regulate residential clothes washers, pre-empting state standards, unless a state waiver is approved. California has requested such a waiver and continues to press for federal approval.

Several MOU signatories since 2005 have begun to promote efficient clothes washers through rebate programs (BMP 6), and market forces are also transforming the appliances retailers are offering to consumers. The impact of all these factors remains uncertain and difficult to model. Savings were estimated in the following way: First, savings were estimated assuming that the above mentioned efficiency code had gone into effect as intended; but then halved this estimate under the assumption that active rebate programs and natural turnover will produce half the savings efficiency codes would have realized by 2020. This "half" estimate roughly works out to two to three GPCD.

Residential weather-based irrigation controllers

Studies have shown that landscape irrigation is frequently inefficient and in some cases a high percentage of residential landscape irrigation is wasted as a result of over-watering, poor design and poor maintenance. The analysis assumed that the top quarter of single-family homes in terms of landscape area can be cost-effectively fitted with weather-based

irrigation controllers that take much of the "guess-work" out of scheduling and determining the needed quantities of water. Many suppliers are experimenting with this measure even though it is not specifically included in any BMP. Savings from this measure are conservatively estimated to be 3 to 4 GPCD by 2020.

Grant funding

Estimates of likely additional savings from grant funding to promote water conservation were included in the analysis, with input from the *Comprehensive Evaluation*. The scenario assumes that $30 million per year would be available between 2005 and 2014, and $7.5 million per year thereafter until 2020.

Accelerated coverage goals for some BMPs

Instead of implementing BMPs within the existing voluntary framework, all water suppliers or others could be required to implement certain basic conservation measures, regardless of cost-effectiveness, to meet a maximum coverage goal. For example, all residential or commercial buildings could be required to have efficient toilets, urinals, and showerheads by 2020. This would force fixture replacement even in regions where the avoided cost of water is still perceived to be low. This would generate additional savings since active programs and natural turnover are not expected to raise the saturation of these devices to 100 percent by 2020.

For the purpose of quantification, the following measures and corresponding 2020 coverage goals have been included in the list of affected BMPs:

- Saturation of non-efficient toilets and urinals in residential and commercial buildings to drop below 5 percent in each hydrologic region
- Saturation of non-efficient showerheads to drop below 5 percent in each region (this is expected to happen due to natural turnover anyway, so including this requirement does not contribute incremental savings, but was included to ensure that such a basic item automatically becomes subject to a field verification program)
- Efficient clothes washer saturation to reach a level it would have in the presence of the State's efficiency code (roughly 85 percent)
- All unmetered urban connections to be converted to metered connections before 2020
- Non-revenue water is to be brought down to no more than 10 percent of total production where at present it is greater than 10 percent - BMP 3 would be mandatory

Aggressive reduction in non-revenue water beyond BMP 3

There is significant opportunity for water use reductions related to leak detection and repair in water delivery systems. The new water audit structure promoted by the American Water Works Association and being discussed by the CUWCC includes a more rigorous standard than BMP 3. Most utilities currently use a percentage of production to evaluate losses, but expression of losses as gallons per connection provides a measure that is easier to relate to usage.

BMP 3, which aims to reduce non-revenue water to 10 percent of production, has already been analyzed in previous sections. However, these goals can be exceeded, as other countries have demonstrated. For example, in the United Kingdom the target for

unaccounted water is 30 gallons per connection per day. Many communities in the United Kingdom and Europe are at or below 40 gallons per connection per day. If a similar goal were to be pursued in California, water savings from a low of 2 GPCD for Central Coast to a high of 21 GPCD for the Colorado River regions could be achieved.

Landscape practices

There are many actions that may be taken to improve landscape water use efficiency. Professional landscape and irrigation design, proper installation, careful maintenance and management of the site, and the selection of high quality irrigation equipment are some of the factors that can influence the efficient use of water in the landscape. Dedicated landscape meters, establishment of landscape water budgets and associated budget-based rate structures, the performance of irrigation audits, public information programs, technical training for landscape professionals, the use of alternative sources of water in the landscape, and a multitude of rebate programs to support conversion from lawns to water smart plants and irrigation equipment are examples of actions that can be taken along with or in place of irrigation restrictions.

It is essential for state government to lead a comprehensive suite of programs to improve landscape water use efficiency in California in order to achieve the Governor's water use efficiency goal. Such an effort would yield many other benefits such as improved water quality, reduced energy use and corresponding greenhouse gas emissions, more stormwater capture, and less production of green waste.

For the purposes of this *20x2020 Plan*, landscape water savings are based upon estimates related to irrigation restrictions. However, the combination of a variety of other landscape actions could result in similar savings. Irrigation restrictions can be a very useful tool for reducing water use especially in the high demand summer months and in the warmer regions of the state. In many areas water use doubles when customers start to irrigate their landscapes. Many utilities use irrigation restrictions during a prolonged drought or when water reservoirs run low. This can be practiced all year every year to some extent to improve water conservation and reduce GPCD. In some locations, irrigation restrictions have been combined with subsidies for turf removal. This results in some customers reducing irrigation by changing landscape choices from turfgrass to native or other plant species adapted to the California climate of winter rains and a summer dry season.

In practice, restricting irrigation to one day per week would probably require some major changes. In most parts of the state, lawns can do well with twice weekly irrigation, but not as well with once weekly irrigation. If the more stringent restriction would be put in place, it could be combined with subsidies that incentivize users to convert their turf into drought-tolerant landscapes, or to install drip irrigation. Such "cash for grass" programs have been implemented successfully in California and other states.

With twice weekly watering, savings are estimated to be between 11 and 40 GPCD depending on the region. If irrigation were restricted to once per week, then the range would be 20 to 73 GPCD.

New technologies

CUWCC screened several new conservation technologies between 2004 and 2007. Savings were estimated for the following:

- On-premise laundries (e.g., hotels, hospitals, universities, prisons, etc.)
- Building cooling systems

- Efficient residential dishwashers for new construction
- Vehicle wash systems
- Residential hot water distribution systems for new construction
- Commercial ice machines
- Waterless urinals

Finally, there are additional technologies, each with small individual impacts that can generate some additional savings. For example, there are savings from replacing non-efficient urinals with high-efficiency urinals (HEUs using 0.5 gallons per flush). But, if waterless urinals are used as replacements instead of HEUs, savings would roughly increase by an additional 0.2 GPCD by 2020. Savings from other devices, such as pressurized water brooms and dry vacuum pumps, could contribute roughly 0.1 GPCD. Total impact from all these myriad conservation measures can thus be expected to roughly equal 2 GPCD, which is what was used in the final accounting, presented in Table 7.

Recycled water

Data from the DWR and the SWRCB were used to quantify the amount of recycled water likely to be available in each region for offsetting urban use by 2020. The recently-adopted SWRCB water recycling policy is anticipated to increase the use of recycled water throughout the state. Since only potable water is considered in the GPCD calculations in this *20x2020 Plan*, increasing the use of recycled water will result in lower per capita use when that replaces an otherwise potable demand.

Putting it all together

Table 7 combines all the savings estimates developed for this *20x2020 Plan*, including savings from current actions (Basic Measures) as well as savings from future actions (Additional Measures). Basic Measures are those that are already being implemented by water suppliers and could be adopted by those that have not aggressively pursued conservation until now. Basic Measures include the minimum activities expected within each region. Additional Measures are those that can be pursued to meet the regional targets when the Basic Measures alone do meet the regional targets. The savings estimates from the first group, Basic Measures, were used in the derivation of regional targets described in the next section.

In the development of Table 7 considerable care was taken to prevent double-counting of savings. For example, savings estimates from code and from cost-effective implementation of BMPs reflect separate increments of savings. Grant funded savings, while obtained from implementation of existing BMPs, count only the savings that would not already be obtained through codes and implementation of cost-effective measures. Savings attributed to irrigation restrictions only reflect the savings from the single-family residential sector; large-landscape programs are included separately. Savings from conservation rate structures and the Model Landscape Ordinance are not included in Table 7 to avoid any possibility of double-counting. The only exception is savings attributable to smart irrigation controllers which is included.

Table 7. Summary of 2020 Savings from All Evaluated Measures – GPCD

HR Number ->	1	2	3	4	5	6	7	8	9	10	
HR Name ->	North Coast	SF Bay	Cent. Coast	South Coast	Sac. River	SJ	Tulare Lake	North Lahontan	South Lahontan	CO River*	State-wide
Savings From Basic Measures											
Code	7	7	7	6	19	17	12	7	6	6	8
80% of local CE	3	12	8	13	0	3	2	6	8	36	11
Grant funded	11	1	12	1	3	8	13	15	24	8	4
Efficient clothes washers	3	2	3	2	3	3	3	3	3	3	3
Residential ET controllers	4	3	3	3	3	3	3	4	3	3	3
TOTAL (basic measures)	**28**	**26**	**32**	**24**	**28**	**33**	**32**	**36**	**43**	**56**	**28**
Savings From Additional Measures											
Accelerated coverage goals	11	8	10	7	17	13	14	14	17	17	9
Recycling	4	7	1	4	3		1			6	3
Water loss control (40 g/conn./day)	3	2	2	4	11	11	15	11	10	21	6
Irrigation restrictions (2 day/week)	11	11	11	13	23	22	25	11	29	40	16
Miscellaneous PBMPs	2	2	2	2	2	2	2	2	2	2	2
TOTAL (additional measures)	**31**	**30**	**26**	**29**	**56**	**48**	**57**	**38**	**58**	**86**	**37**

* Savings estimates for CII and landscape measures in HR 10 may have low reliability due to faulty estimates of landscape applied water.

Statewide Targets

The development of per capita use targets was the most difficult task in this *20x2020 Plan*. This effort yielded insights that may help the Legislature as it works to incorporate the 20 percent reduction goal into statute. These insights are discussed more fully in Chapter 3.

The variations within the data provided, the lack of data from many water suppliers, and the limited scope of this planning effort meant that an analysis of GPCD on an agency-by-agency basis was not possible. However, there was enough data on a regional (hydrologic region) basis to evaluate trends and provide initial target methodologies. The aim is to use these regional targets as an example of how targets might vary by region according to base year water use, past conservation practices, and current per capita use.

The conservation targets for the interim year (2015) are not a linear interpolation between the baseline and the final goal. An interim conservation target, equivalent to 50 percent of the expected savings, would allow time for water suppliers to incorporate the *20x2020 Plan* goals into their conservation program activities. A conservation target of a statewide 20 percent reduction from the baseline was defined for year 2020, by which time all suppliers should be able to implement the conservation programs necessary to achieve the statewide 20 percent reduction goal.

The statewide baseline water use value, expressed in gallons per capita per day (GPCD), is **192 GPCD**. The corresponding statewide targets are:

- Interim Statewide Target = 192 GPCD (Statewide Baseline) minus 10 percent = **173 GPCD**
- Final Statewide Target = 192 GPCD (Statewide Baseline) minus 20 percent = **154 GPCD.**

This represents a statewide savings of 1.74 million acre-feet (MAF) from 8.7 MAF in 2005 to 7 MAF.

Figure 6 below summarizes the regional targets. Detailed step-by-step explanation and equation of the methodology used to determine these targets are included in Appendix B.

Table 8. Regional Urban Water Use Targets

HR Number	1	2	3	4	5	6	7	8	9	10
Baseline (1995-2005)	165	157	154	180	253	248	285	243	237	346
Interim Targets (2015)	151	144	139	165	215	211	237	208	204	278
Targets (2020)	137	131	123	149	176	174	188	173	170	211

Figure 6. Regional Urban Water Use Targets

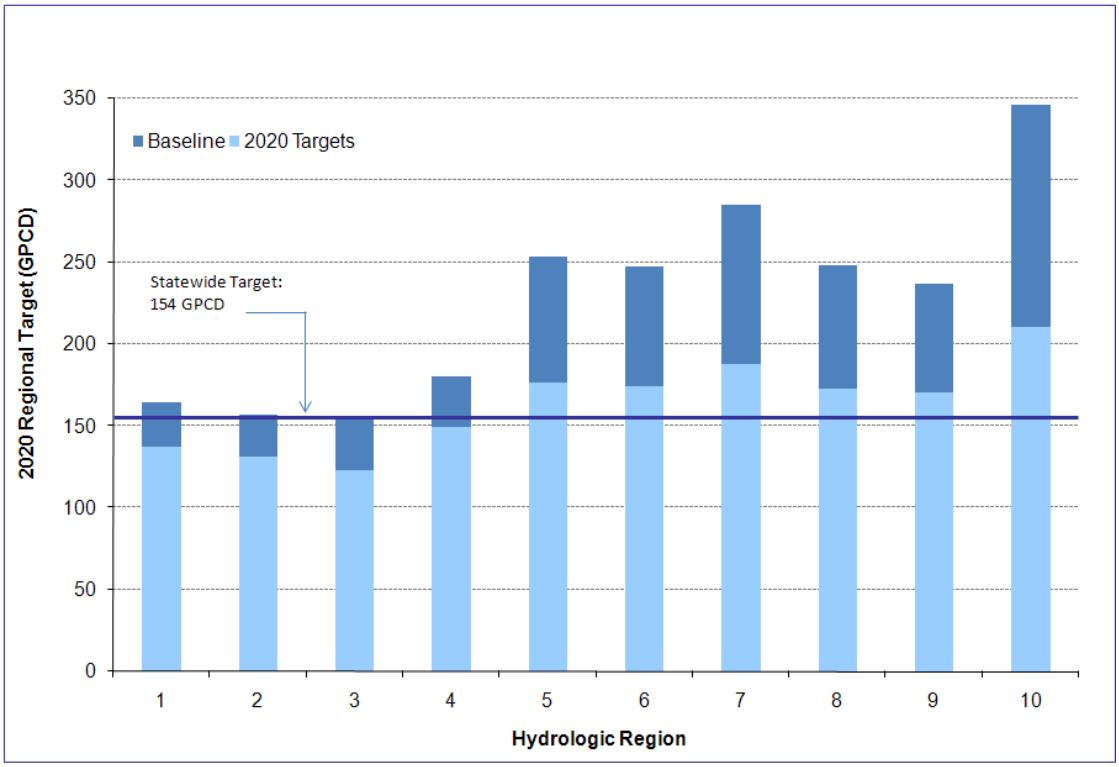


Table 9 shows each region's progress in meeting targets with the implementation of basic measures and, if necessary, implementation of additional measures. The statewide column in this table shows the result in 2020. By this time, population growth will have occurred in each region, with a larger share of population growth occurring in regions with higher per capita use. Thus, the no-action baseline would rise from 192 GPCD currently to 199 GPCD in 2020.

By 2020, through prompt aggressive action and sustained effort, California can reduce its per capita use more than 20 percent. Only one region would be unable to meet its target after implementing the measures described in this plan, the Tulare Lake region.

Table 9. Achievement of Targets by Region, 2020

HR Number	1	2	3	4	5	6	7	8	9	10	Statewide 2020 Result
Baseline (1995-2005)	165	157	154	180	253	248	285	243	237	346	**199**
Targets (2020)	137	131	123	149	176	174	188	173	170	211	**154**
Desired savings	28	26	31	31	77	74	97	70	67	135	**45**
Total savings (basic measures)	28	26	32	24	28	33	32	36	43	56	**28**
2020 Savings shortfall after implementing basic measures	-	-	-	7	49	41	65	34	24	79	**17**
Total savings available (additional measures)	31	30	26	29	56	48	57	38	58	86	**37**
2020 Shortfall still remaining after implementing additional measures	-	-	-	-	-	-	8	-	-	-	-

3. Recommendations

California can achieve at least a 20 percent reduction in per capita water use by 2020. The analyses described in Chapter 2, as summarized in Table 7, show that basic conservation measures including implementation of BMPs, codes, and ordinances that will produce significant savings, and in some regions of the state, most of the water savings sought by the 20 percent statewide target. Nevertheless, these actions will be insufficient to achieve the target for most regions. To achieve the Governor's goal, some new actions will be needed. Legislation or additional secure funding will be needed to ensure that these measures are implemented. A long-term statewide strategic approach with conservation targets mandated by statute and an array of new measures available to water suppliers and regions is needed to achieve the goal.

California can achieve this ambitious goal only if state agencies, regions, and local water suppliers take prompt and aggressive action. Recommended actions to contribute toward a statewide strategic approach (as described in more detail in this chapter) fall into the following categories:

1. Establish a foundation for a statewide Conservation Strategy.
    a. Establish targets and goals in statute.
    b. Establish a state agency leadership and coordination framework.
    c. Mandate uniform data collection and establish a statewide database.
    d. Maintain existing programs and institutions.
2. Reduce landscape irrigation demand.
    a. Support the implementation and enforcement of landscape design and irrigation programs and the development of new landscape programs.
    b. Mandate the landscape irrigation BMP.
    c. Require water-efficient landscapes at state-owned properties.
3. Reduce waste.
    a. Accelerate installation of water meters.
    b. Establish a state standard for water meter accuracy.
    c. Revise the water loss BMP to incorporate improved methodologies and accelerate coverage goals.
4. Reinforce efficiency codes and related BMPs.
    a. Obtain authorization for state standards for high efficiency clothes washers.
    b. Support landscape irrigation equipment standards.
    c. Accelerate replacement of non-efficient showerheads, toilets and urinals.
    d. Accelerate adoption of proven water saving technologies in new businesses.
5. Provide financial incentives.
    a. Encourage or mandate conservation water pricing.
    b. Provide grants, loans, and rebates to wholesale and retail water suppliers.
    c. Establish a public goods charge for water.
    d. Fund the installation of water meters.
6. Implement a statewide conservation public information and outreach campaign.

7. Provide new or exercise existing enforcement mechanisms to facilitate water conservation.
    a. Require implementation of water conservation as a condition to receive state financial assistance.
    b. Take enforcement actions to prevent waste and unreasonable use of water.
    c. Provide additional enforcement tools for water suppliers.
8. Investigate potential flexible implementation measures.
    a. Investigate requiring conservation offsets for water demand generated by new development.
    b. Investigate establishment of a cap-and-trade regime.
9. Increase the use of recycled water and non-traditional sources of water.

Establish a foundation for a statewide conservation strategy

Establish targets and goals in statute

The 20 percent goal for reducing water consumption by 2020 is achievable. However, without a firm requirement to achieve the savings, track progress, and define consequences for suppliers or regions that fail to meet targets, California is not likely to achieve the goal set by the Governor.

The Agency Team's efforts to develop a planning approach to target-setting, the public feedback received on this draft approach, and the public discussions regarding AB 2175 (Laird, 2008), which would have established conservation targets, all provide valuable insights into target-setting legislation. The following criteria should guide the structure of legislation to place the Governor's goal into statute:

- All water suppliers should be treated consistently, and targets should be equitable.
- The approach to target-setting should be kept as simple as possible.
- The target-setting approach should take into account past conservation efforts by suppliers or regions.
- Differences in climate should be taken into account.
- The law should allow flexibility in implementation, to the greatest extent possible.
- The law should accommodate, encourage and support emerging regional water management entities and allow regional compliance.
- Separate approaches are necessary for residential water use as opposed to commercial, industrial and institutional water use.
- The legislation should allow and encourage implementation of the most cost-effective measures through mechanisms such as regional compliance that would permit an incremental step toward a cap-and-trade approach.
- Some regions and water suppliers will need to achieve more conservation than others, due to varying levels of past conservation implementation.
- The legislation should establish regional targets, deadlines for compliance as well as consequences for failure to comply.

Establish a state agency leadership and coordination framework

Several state agencies have responsibility or authority over different aspects of water management. Better communication and coordination among these agencies, and designation of a lead agency will be important aspects of implementing the *20x2020 Plan* and assuring

its success. The lead agency should coordinate and organize a framework for agency implementation efforts; use combined agency data sources to measure progress toward meeting the Governor's goal; communicate implementation success to the public and to stakeholders; alert water suppliers and regions that are not meeting targets; and recommend additional actions that may be needed to meet the goal.

The Agency Team evaluated each agency's ability to lead a specific task under this *20x2020 Plan*, and also identified the expected outcome of such tasks. Some of the tasks are already being performed by certain agencies. It is not anticipated that the existing authorities of different involved agencies will be consolidated into one agency for the purpose of implementing this *20x2020 Plan*. However, it probably will be necessary to appoint one agency with an overall lead and coordination role.

In conjunction with this lead agency, each involved state agency will be responsible for implementing and tracking components of the *20x2020 Plan* that fall within the purview of its authority. For example, the CPUC has regulatory oversight of investor owned utilities; the SWRCB enforces water rights and constitutional prohibitions on waste and unreasonable use; the CEC has regulatory authority over water use efficiency standards for appliance and equipment; the DPH has authority for enforcement of the Safe Drinking Water Act, which regulates potable water treatment and delivery by all public water systems; and DWR has planning and conservation monitoring authority, as well as influence over the disbursement of grants and loans. Closer state interagency coordination will be needed to facilitate data management, program implementation, and statute enforcement.

The lead agency, with the cooperation of participating agencies should:

- Coordinate and organize agency implementation efforts
- Use combined agency data sources to measure progress toward meeting the Governor's goal
- Communicate implementation success to the public and to stakeholders
- Encourage water suppliers to expand and strengthen implementation of water conservation programs and recycled water programs
- Expand state technical assistance programs to help suppliers and regions implement voluntary or elective local programs
- Alert water suppliers and regions that are not meeting targets
- Finalize a measurement and evaluation plan (performance metrics) to assess whether 2015 and 2020 regional targets have been met
- Recommend additional actions that may be needed to meet the goal.

DWR should serve as the lead agency. DWR is currently responsible for updating the California Water Plan, disbursing grants for integrated regional water management, promoting water conservation, and reviewing urban water management plans.

In addition, there is a need for closer coordination with federal agencies, the CUWCC, IRWM Planning Groups and water suppliers, all of whom will play a role in the successful implementation of the *20x2020 Plan*. Table 10 shows potential agency roles for the implementation.

Table 10. Agency Roles for Key Implementation Activities

Program Task	Key Agencies	Activities
20x2020 Administration	DWR	Management, coordination, analysis, reporting
Data Management	DWR, SWRCB, DPH, CPUC, CEC, CUWCC	Coordinate with other agencies to ascertain overall data requirements. Design and maintain an electronic data submission system
Design regional strategies for achieving regional targets	DWR, SWRCB, Regional water management entities	Assess baseline GPCD by supplier, conservation programs undertaken to date, and what tools will take the region to its target GPCD
Identify new legislation and regulations required	DWR, SWRCB, CUWCC	Develop proposed text for each legislation and regulation
Appropriate grant funding	DWR, SWRCB	Interact with legislature to generate a reliable revenue stream for promoting water conservation
Landscape water conservation	DWR, SWRCB, CEC, CUWCC	Establish a range of new programs to promote landscape water conservation
Outreach	DWR, SWRCB, CUWCC	Inform water suppliers about the Program's requirements. Obtain feedback from stakeholders
Public education	DWR, CUWCC	Design and implement a general public education campaign emphasizing water conservation
Metering	DWR, SWRCB, DPH, CPUC	Develop and implement programs to expedite metering
Appliance efficiency standards	CEC, DWR	Promote higher appliance efficiency standards.
Other potable water offsets	DWR, SWRCB, DPH	Promote the use of recycled water, storm-water capture, and gray-water
Coordinate with AB 32 Scoping Plan implementation	ARB, DWR, SWRCB, CEC, CPUC	Ensure that conservation implementation is mindful of GHG reductions to comply with AB 32
Improve coordination between water and land use agencies	DWR, SWRCB, ARB	Work with water suppliers and local governments to coordinate actions; recommend improvements.

Mandate uniform data collection and establish a statewide database

California currently lacks a consistent method of collecting water data from local water suppliers. Water data is collected by different State agencies based on their individual project needs, which leads to overlaps and gaps between the databases. This has been an obstacle in the data analysis and per capita water use calculations during the development of the baseline and target numbers. It is recommended that California mandate submittal of water use and conservation data. Submittal of the data should be coordinated among state agencies to reduce reporting burdens on local water suppliers.

A uniform streamlined data collection process would have multiple advantages: the reporting burden on local agencies would be reduced; data reviews related to state action such as grant disbursement would be expedited; state agencies would have more timely access to water use data; the quality and accuracy of the data would improve; better and

more complete data would facilitate better water management; and data management costs would be reduced over time.

At a minimum, suppliers should disaggregate and report usage according to the following sectors:

- Single family residential
- Multi-family residential
- Commercial
- Institutional
- Industrial
- Dedicated irrigation
- System water losses
- Recycled water

As shown in Table 10, data on water supply and demand are managed by five state agencies as well as CUWCC. Much of the data collected are unique to the needs of each agency or CUWCC, and the reporters of data (mainly water suppliers and water right holders) do not submit data to all agencies or CUWCC. Data submittal to some state agencies such as DWR is voluntary, while submittal to other state agencies such as DPH is mandated by law. Where there is overlap in data needs, common definitions and formats for submittal of data should be established. There is a need to incorporate the data that is collected into electronic databases to make the data available for sharing, analysis, and the administration of the respective programs of the agencies and CUWCC. A centralized database or data entry web portal for the state agencies with data entry forms customized to meet the needs of individual agencies and programs could facilitate data sharing and allow data common to more than one agency to be entered only once by a data reporter. While CUWCC is not a state agency, coordination with CUWCC would assist in common efforts to collect data. The following is recommended:

- Initiate coordination and standardization of data collection
- Evaluate the feasibility of creating a centralized database or portal for water supply and demand data.
- Where there are gaps in the data currently being collected, exercise existing regulatory authority or seek legislation to require the submittal of the needed data.
- Establish cost sharing and funding sources to facilitate development and maintenance of data management systems.

Pursuant to Assembly Bill No. 1404 enacted in 2007, the SWRCB in collaboration with DWR, CDPH, and CALFED is preparing a report to be submitted to the Legislature in 2009 to evaluate the feasibility, estimated costs, and potential means of financing coordinated water measurement. This report, when it becomes available, may be valuable in fulfilling the recommendations above.

However, this type of costly endeavor is not essential to begin the process of improving data collection and management. Implementation of an improved data collection and management process can occur incrementally. For example, DWR should automate the submittal of summary information from mandated Urban Water Management Plans and structure data submittal to be consistent with its voluntary Public Water System Survey. This would provide more timely information from water management plans, encourage submittal of annual water use information, and expedite DWR grant application review under AB 1420.

Other simple data management tools are available. An example of such tool is the GPCD Calculator that was recently developed for the New Mexico Office of the State

Engineer. This calculator introduces a consistent methodology that could standardize data collection and GPCD calculations. Water suppliers can use the Calculator to develop or refine service area population estimates, calculate per capita use for various water use sectors, and calculate total system per capita use.

Maintain existing programs and institutions

As new programs, policies, and laws are established to support the achievement of a 20 percent reduction in per capita water use, existing effective programs should continue. Examples of current programs include CEC appliance efficiency standard setting, DWR California Irrigation Management Information System, and the Model Water Efficient Landscape Ordinance. Effective institutions such as the CUWCC will also need to continue and expand their role in water use efficiency.

Reduce landscape irrigation demand

Support the implementation and enforcement of landscape design and irrigation programs and the development of new landscape efficiency programs

An estimated 50 percent of total urban potable water is applied to urban landscapes. This sector of water use has the greatest potential for reduction. The recently updated Model Water Efficient Landscape Ordinance, if complied with as written, will reduce irrigation by roughly 12 percent relative to the earlier Ordinance. A recent survey of compliance with the original state law requiring local ordinances showed that many local agencies failed to comply with state law or are only partially in compliance. A much more vigorous information and outreach effort will be needed to ensure that the new ordinance achieves its potential efficiency improvements.

The revised Model Ordinance will help to ensure that new landscapes are designed to be efficient. However, by itself, the model ordinance will do little to transform existing high-water-using landscapes, or persuade Californians to choose the most efficient new landscape designs. Because landscape water conservation offers so much potential for increased efficiency, a vigorous comprehensive program to improve landscape water use efficiency will be essential to ensure that the governor's efficiency goal is met. Elements of the comprehensive program should include:

- Limiting the irrigation of most landscapes to two days per week or less, in order to encourage climate-appropriate landscapes, reduce the use of water for irrigation of landscapes, and reduce the potential for overirrigation of landscapes. This could be accomplished through local ordinances, or as new state legislation.
- working with landscape architecture curriculum programs to ensure that future landscape architects have the knowledge to design landscapes and irrigation systems that are efficient as well as more suited to California's climate and conditions
- Widespread training programs for professional landscape maintenance contractors on water use efficiency, system maintenance and improvements
- Educational websites for consumers on landscape design, plant selection, irrigation system installation and repair
- Widespread adoption of tiered rates structures or other conservation pricing
- Widespread installation of separate landscape meters for better information and water management

- More irrigation auditor training programs, and more irrigation audit programs provided by local water suppliers
- Better communication and coordination between water suppliers and local governments to ensure consistent policies and programs related to water use efficiency
- Expansion of programs to promote the use of graywater and rainwater
- Support for rebate programs that fund improved landscape plantings, reduction of turf areas, upgrades to irrigation systems and controllers
- Use of public building landscapes as local examples of good design, installation, and maintenance

Mandate the landscape irrigation BMP

The CUWCC provides a cooperative forum for the development and implementation of BMPs. The BMPs are generally considered to be the minimum level of effort for a credible water conservation program, but these practices are voluntary. AB 1420 (Laird, 2007) requires implementation of conservation measures listed in the Water Code as a prerequisite for access to grant funds, but water suppliers that are not applying for state financial assistance are under no requirement to implement such measures.

In the case of landscape water conservation, implementation of appropriate conservation practices yields so many benefits that it is worthwhile to consider making implementation of such measures mandatory. The flexibility of BMP implementation would not easily translate into mandates in the Water Code. A requirement might take the form of mandated measures that are "at least as effective as" the landscape BMPs. This is the approach the Legislature has taken in requiring landscape ordinances for new construction.

Require water efficient landscapes at all state-owned properties

Establish a strict policy of low water using landscaping and efficient landscape equipment at all state-owned or occupied buildings except for historic landscapes or plantings that provide erosion control. Use state landscapes as examples and teaching tools for locally-appropriate water-efficient design.

Reduce water waste

Water waste can be reduced by improving water measurement through expedited installation of water meters, establishment of a standard for water meter accuracy, and the improvement of detecting and repairing water delivery systems.

Accelerate installation of water meters

At present, state law requires that unmetered connections served by the Federal Central Valley Project (CVP) be converted to metered connections by 2013, and non-CVP unmetered connections be converted by January 1, 2025. This law applies to community water systems serving 3,000 connections or more.

All progress comes from careful measurement. Metering of water deliveries is essential to obtain valid data about consumption and water waste, and to promote water conservation programs. Communities that do not meter water deliveries will likely find it impossible to meet reasonable consumption targets. Accordingly, it is recommended that the state accelerate meter installation and facilitate more widespread metering of small water systems.

It is recommended that California enact legislation to move the state metering deadline from 2025 to 2020.

In addition, the following incentives and disincentive should be considered to accelerate metering:

- Provide incentives such as access to additional grant funds for unmetered suppliers that complete metering before the deadline,
- Require regions with unmetered connections to dedicate a defined percentage of regional water management funds to metering.
- Pursue economic stimulus funds to accelerate metering.
- Support legislation for additional conservation requirements for suppliers that are not fully metered.

Metering is the foundation for measuring consumption as well as detecting waste. The state must continue to push for near universal metering in its urban water systems which account for the majority of potable water use, and also begin to improve the incidence of metering in smaller systems and rural areas.

Establish a state standard for water meter accuracy

Water meters generally meet a high standard of accuracy when they are manufactured and initially calibrated. However, meters tend to become less accurate over time as they are used and parts begin to wear. Most often, worn meters under-register the volume of water delivered. This reduces revenue for the water supplier and provides faulty information to the consumer.

Some other western states such as Colorado, Idaho, and Texas require minimum standards of accuracy for meters in use. California should consider meter accuracy standards written into code at no less than +/- 2.5 percent.

Revise the water loss BMP to incorporate improved methodologies

In every hydrologic region, well above 10 percent of urban potable water produced is unaccounted for (non-revenue water). This may include system leaks, meter errors, emergency use (e.g. fire fighting), and/or unauthorized use. The high proportion of non-revenue water represents a major potential for reduction in urban water demand.

Leak detection methodologies have improved considerably and water suppliers can reduce non-revenue water beyond levels stated in BMP 3. It is recommended that this BMP be revised such that maximum allowable levels of non-revenue water are expressed in terms of gallons per connection per day, instead of the present format where it is expressed in terms of percentage of produced water. A standard of a maximum of 40 gallons per connection per day is achievable by 2020.

Reinforce Efficiency Codes and related BMPs

As technology advances, water and energy use efficiency codes for appliances and equipment should be established or strengthened.

Obtain authorization for state standards for high efficiency clothes washer

Continue the California appeal of the U.S. Department of Energy's denial for a waiver of federal preemption for the State's water efficiency standards for residential clothes washers. Once the waiver is approved, pursue a waiver to regulate commercial coin-operated clothes washers.

Support landscape Irrigation equipment standards

Support CEC approval of landscape irrigation equipment standards and labeling requirements, and follow with a variety of rebate and outreach programs to accelerate upgrades of irrigation equipment installed in the state. AB 1881 (Laird, 2006) requires that the CEC develop efficiency standards for irrigation equipment including controllers, irrigation heads, valves, and sensors. This effort is underway in 2009.

Accelerate replacement of non-efficient toilets, showerheads, and urinals

Support legislation to require replacement of non-efficient toilets, showerheads, and urinals in both the residential and commercial/industrial sectors. Potential approaches include:

- Replacement of inefficient fixtures upon resale (responsibility on property seller)
- Replacement of inefficient fixtures upon change of water service (responsibility on new water customer)
- Replacement of all inefficient fixtures by 2020 (implemented in early years by rebate programs and information campaigns)

Accelerate adoption of proven water saving technologies in new businesses

Research and evaluation has been completed by the CUWCC and others on a host of water conservation technologies, including:

- On-premise laundries (e.g., hotels, hospitals, universities, prisons, etc.)
- Building cooling systems
- Efficient residential dishwashers for new construction
- Vehicle wash systems
- Residential hot water distribution systems for new construction
- Commercial ice machines

Continue to support CUWCC research initiatives to develop reliable data on water savings from emerging technologies, promote use of these technologies in the marketplace, and support efficiency standards in law as needed.

Provide financial incentives

Financial incentives can be in the form of financial assistance to implement water conservation measures or pricing signals through appropriate water pricing structures.

Encourage or mandate conservation pricing structures

Water rates that encourage conservation can be powerful tools to reduce per capita use. Three effective conservation rate structures include volumetric pricing with uniform or increasing block rates, seasonal pricing, and allocation-based rates. Increasing block rates charge a higher amount per gallon as usage increases, which provide an incentive to keep use low. Seasonal rates charge a higher amount per gallon during the irrigation season when the water supplier's demands are highest, because the peak demands are generally most expensive for the supplier to meet. Allocation-based rates include higher per-gallon costs for usage exceeding base usage established for each customer according to customer characteristics, such as number of occupants or size of irrigated landscape. Flat rates (generally used by suppliers that do not yet meter water use) and rate structures that reduce the per-gallon price for increased usage (declining block rates) are not considered to be conservation pricing structures.

For any of these rate structures, retail water bills typically include two parts: fixed charges and variable charges that are based on the amount of water used by the customer. Water billing that includes a relatively small fixed portion and a significant volumetric component that increases with volume of water use provides a financial incentive to the consumer to reduce water use. The installation of water meters and billing by volume of use can reduce water use by ten percent. While increasing block rates are generally the most effective, there may be little additional cost incentive to the customer compared to uniform rates if the increase in per-gallon cost is small.

Conservation rates structures should be mandated while allowing flexibility for water suppliers in defining their rates. Within this context, increasing block rates should be encouraged. Most water suppliers currently use either a uniform or increasing block rate structure, with a trend toward increasing block structures with steeper increases in billings for increased usage to encourage conservation.

Good communication can complement a conservation rate structure and help ensure that customers respond to an effective pricing signal. Billings need to communicate to the customer the amount of water used in commonly understood units such as gallons rather than units that are more commonly used by water suppliers such as hundreds of cubic feet (HCF). Water suppliers should further reinforce the conservation message by providing customers with comparisons of current and past usage, comparisons to usage by similar customers, and information on how billings are affected by increased use. More frequent billing, that is, monthly, also can be more effective.

A provision added by Proposition 218 in November 1996 to the California Constitution, Articles XIII.C and XIII.D, requires that fees related to property ownership must not exceed the proportional cost of the service attributable to a parcel of property. In subsequent court decisions this provision has been applied to water rates. While many water suppliers have successfully implemented tiered water rates and used revenues from water billings to finance water conservation programs, there is still some legal uncertainty whether these rates or uses of revenue could be challenged under the constitutional provisions. The Legislature addressed this issue in Assembly Bill No. 2882 (2008 Statutes) for one form of tiered water pricing called allocation-based pricing. Pricing tiers can include costs for water conservation, securing dry-year water supplies, and procuring water supplies to satisfy increments of water use in excess of basic use allocations for customers (Water Code section 370-373). It is recommended that similar provisions be added to the Water Code to apply to all forms of tiered water pricing.

Provide grants, loans, and rebates to wholesale and retail water agencies

The relative differences in the cost of water delivery continue to be an impediment to rapid water conservation implementation across the state. DWR and the SWRCB should continue to support accelerated conservation BMP implementation and higher levels of water use efficiency through bond funding, especially Proposition 84, state revolving fund loans, and contractual obligations when funds are made available to water agencies for the implementation of water conservation programs. State funding for water management should be devoted to water use efficiency commensurate with the potential of efficiency measures to make water available.

Regional or wholesale water suppliers should continue existing or implement new rebate or financial assistance programs for retail agencies and customers. A public goods

charge, as described below, could be another source of funds to support water conservation programs.

Establish a public goods charge to provide stable funding for water management

California does not have adequate funding mechanisms in place to ensure the needed investment in water management improvements over the long term. In recent years, local communities have relied primarily upon state bond funding to augment local investment in water management and efficiency improvements. Bond funds alone do not provide a steady, reliable source of funding and are subject to "boom and bust" cycles that make it difficult to plan long-term or multi-phase projects. Furthermore, bond funding at current levels is insufficient to meet California's long-term water infrastructure needs.

Local municipal water agencies face challenges raising the capital to invest in efficiency improvements, and substantial investment in efficiency measures may reduce water use, water sales, and revenue for the water supplier. This can provide a substantial disincentive for suppliers to implement aggressive conservation programs.

Energy utilities have overcome these challenges, reflecting the costs for conservation, efficiency and research programs in their rates. Investor Owned energy utilities have accomplished this in two ways. First, in the 1980's, the CPUC de-coupled the utilities' revenues from their volumetric energy sales thereby facilitating utility support for efficiency programs. These efforts have reduced peak capacity needs by more than 12,000 MW and continue to save about 40,000 GWh per year of electricity. Second, in 2000, a state law was passed approving a public goods charge for energy, to be regulated by the CPUC, with the Investor Owned energy utilities allowing a charge per unit of energy sold to finance additional energy efficiency measures by the participating utilities.

Similarly, the CPUC has introduced decoupling mechanisms as part of its water conservation program with Investor Owned water utilities. As part of implementing a water conservation program with regulated water utilities, the CPUC has piloted conservation rate designs that decouple revenue from the volume of water sold. Under this program, six participating Class A utilities have rate structures in place which remove the risk of declining revenues due to reduced volumetric sales which might accompany successful water conservation by permitting the utilities to employ revenue adjustment mechanisms and balancing accounts to track the difference between actual and expected quantity charge revenues. If the revenues decline due to conservation, the utility is credited for the loss and if the revenues increase as part of the conservation rate design, the customers will be credited.

Finally, in California's Climate Action Plan, the California Global Warming Solutions Act of 2006 (AB 32 Scoping Plan), the Air Resources Board recommends a public goods charge for funding investments in water management actions that improve water and energy efficiency and reduce greenhouse gas emissions. The Climate Action Plan proposes a public goods charge on water that can be collected on water bills and then used to fund end-use water efficiency improvements, system-wide efficiency projects, water recycling, and other actions that improve water and energy efficiency and reduce GHG emissions. Depending on the fee schedule, a public goods charge could generate $100 million to $500 million annually. These actions would also have the co-benefit of improving water quality and water supply reliability for customers.

California should enact a public goods charge to support water management and water use efficiency to help ensure stable and adequate funding to achieve the Governor's efficiency goal.

Fund the installation of water meters

Several reasons were provided for accelerating the installation of meters. The ability to induce conservation through price signaling is yet another reason why the state should accelerate the pace of metering efforts. State financial assistance would encourage accelerated installation of meters.

Implement a statewide water conservation public information and outreach campaign

A statewide water conservation campaign can communicate the need for water conservation and its importance within the context of the state's overall water supply and demand situation.

In 2009 California is in the midst of a water crisis. Water supplies for many cities, farms and businesses are being significantly reduced due to drought. Climate change is further compounding the problem.

The Governor has proclaimed a state of emergency due to drought and requested that all Californians reduce their individual water use by 20 percent during the drought. Even when normal rainfall returns, the state will continue to see water supply challenges. To maintain a 20 percent reduction in per capita use over time, Californians need to fundamentally change they way they think about and use water.

The drought and the Governor's proclamation have highlighted the need for an immediate, statewide public education campaign to encourage greater water conservation, similar to the successful "Flex Your Power" public education campaign. On April 21, 2009 California announced the "Save Our Water" campaign. This water conservation campaign will reach out to different demographic and business segments to achieve significant reductions in water use. The first step is to educate members of the public about the drought and what they can do to immediately reduce their water use. Then, California can use the Save Our Water campaign to achieve long-term changes in the way Californians think about and use water as part of a comprehensive solution to the state's water problems.

The Save Our Water campaign will educate Californians about drought, the effects of climate change on the state's water supply, and the many reasons all Californians need to conserve water over the long term. The program will offer consumer-oriented information and tips to increase awareness and understanding of the complexity of the long-term issues facing the state's water delivery and supply system. This outreach campaign will complement other programs and actions by water suppliers and regions.

Provide Enforcement Mechanisms for Water Conservation

Mechanisms are needed to enforce water conservation when agencies fail to fulfill legal requirements or there is evidence of a lack of diligent effort to eliminate excessive water use.

Require implementation of water conservation as a condition to receive state financial assistance

The existing and proposed water conservation framework is a combination of voluntary and mandatory water conservation measures at both the water supplier and consumer levels. At the consumer level, mandatory measures allow only the products in the marketplace that meet certain water efficiency standards and local restrictions imposed by retail water suppliers, such as irrigation restrictions. There are also mandatory design

standards for large landscapes in the Water Conservation in Landscaping Act (the Model Water Efficient Landscape Ordinance). Cities and counties are responsible for enforcing the design standards.

Mandates at the water supplier level are primarily for water supply planning in the Urban Water Management Planning Act. Urban Water Management Plans must be submitted every five years and must contain an evaluation of 14 conservation measures. The 14 measures correspond to the BMPs in the CUWCC MOU but there are no established criteria for performance. There is a form of indirect enforcement of these measures as a condition of receiving state financial assistance for water resource projects. Funding applicants must demonstrate implementation of the 14 measures, provide a schedule for implementation, or explanation of why the measures are not planning to be implemented. Water suppliers cannot be required to sign the CUWCC MOU, but DWR has determined that implementation levels defined in the BMPs will be the initial required standard for implementation, even for non-signatories.

BMPs were designed to be the minimum standard of conservation implementation for virtually all water suppliers, and it is reasonable to expect a higher standard of efficiency from entities that seek state grant funds. In the future, DWR will consider establishing higher levels of efficiency or additional conservation actions as a prerequisite for receipt of bond funds.

Take enforcement actions to prevent waste and unreasonable use of water

There is broad authority under Water Code section 275 for the State Water Board or DWR to take appropriate proceedings or actions to prevent water waste or violation of the reasonable use standard. There are limited resources for aggressive enforcement activities at the state level. However, this is the strongest enforcement tool available to state government. It is recommended that enforcement action be initiated on water suppliers that have high per capita water use compared to communities of similar climatic and demographic conditions, high water loss rates, or fail to comply with statutory or regulatory conservation mandates.

Provide additional enforcement tools for water suppliers

Communities where the local government is not the water supplier face many unique challenges. One is that water suppliers generally monitor water use for waste, but unlike local governments they do not have the authority to issue citations. It would help water suppliers mount effective waste prevention programs if state law provided clear authority for local governments to transfer citation authority to water suppliers to discourage water waste.

Investigate Potential Flexible Implementation Measures

Some proposals appear to have promise to encourage water conservation or allow flexibility in implementation of conservation. Conservation offsets and cap-and-trade regimes are two promising ideas. Protection of the environment and consistency with environmental quality standards are necessary components of conservation offsets, cap-and-trade regimes, or other new programs developed to improve water use efficiency.

Investigate requiring total or partial conservation offsets

A conservation offset is a requirement for a developer to partially or fully offset the increased water demand created by a new development. The offset is generally accomplished by the implementation of conservation measures elsewhere in the community, or payment by

the developer into a water conservation fund administered by the local water supplier or local government. Conservation offsets can be a useful mechanism for promoting new development with a low-water use foot print.

Conservation offsets can also be controversial. The California Legislature considered but did not pass a bill requiring conservation offsets in 2008, (AB 2153, Krekorian). Total offsets may raise the price of new housing significantly in a state where affordable housing is already an issue. Requiring offsets for projected indoor water use that exceeds what might be considered "efficient" indoor use, and for all of projected outdoor use could be a possible compromise. On the other hand, plumbing codes are already at work improving indoor water use efficiency, while outdoor water use is subject to the constraints of the Model Landscape Ordinance. Including offsets over and above these existing requirements could prompt alteration of the design of new construction significantly, making new housing even more water efficient. Certainly, requiring offsets could generate a stream of revenues to fund conservation programs in existing construction.

Conservation offsets should be considered as a method of bolstering efficiency programs if water suppliers or regions cannot meet interim targets in 2015.

Investigate a cap-and-trade regime for water conservation

Cap-and-trade regimes have been successfully implemented for the control of industrial air pollutant emissions. They provide a flexible framework where participants can choose between undertaking emission reductions themselves, or paying others to reduce their emissions, depending upon which of the two is cheaper. The net result is that participants in a cap-and-trade regime retain flexibility, while overall goals are achieved at least cost.

California's AB 32 Scoping Plan identifies a cap-and-trade program as one of the main strategies California will employ to reduce the greenhouse gas emissions that cause climate change.

A similar framework could facilitate implementation of the most cost-effective water conservation measures in California. Formal cap-and-trade programs are complex and challenging to establish and administer. However, a modest variation of a cap-and-trade program could easily be created within the context of integrated regional water management. Within a region, water suppliers could work together to meet mandated per capita use targets by funding the most cost-effective efficiency measures within a region. This flexibility should be included in any legislation that places the Governor's efficiency goal into statute.

Increase the use of recycled water and non-traditional sources of water

By increasing the use of recycled water, graywater, rain water and storm water, per capita use of potable water will decrease and agencies as well as individuals will be better able to cope with times of water shortage.

4. Implementation

The *20x2020 Plan* will be implemented through three phases, as discussed below and summarized in Table 11. Several key implementation barriers have been identified, for which actions are recommended.

Table 11. *20x2020 Plan* Implementation Outline

Plan Phase	Year	Activities
I. *20x2020 Plan* completion and Start-up Actions	2009 – 2010	• Finalize *20x2020 Plan* • Establish a lead agency and coordination framework • Develop detailed implementation task descriptions for recommended actions • Provide technical assistance in conservation legislation discussions • Evaluate an interim data collection and management mechanism • Collect, manage and validate data • Implement conservation actions • Conduct legislative, regulatory and administrative actions • Provide oversight
II. *20x2020 Plan* Implementation, Monitoring, Evaluation, Adjustments	2011 – 2020	• Establish interim and long-term data collection and management Implement conservation actions • Monitor implementation progress • Assess and design additional measures such as a conservation offset and a conservation credits trading program as needed • Conduct an Interim Target Assessment and Performance Evaluation in 2015
III. Conclusion	2020	• Conduct a Final Target Assessment and Performance Evaluation • Publish Results and Lessons Learned

Phase I. *20x2020 Plan* Completion and Startup Actions

During Phase I the goals are to finalize the *20x2020 Plan* followed by more detailed implementation task descriptions for each action, including designated responsibilities, schedules, and budget and staff resources. Also, a lead agency to coordinate the plan implementation and coordination framework must be designated. While the *20x2020 Plan* has sought input from multiple state agencies, it does not have an implementation governance structure in place to oversee the remaining phases of the Plan. Chapter Three proposes a clearer program role for each state agency building upon their existing responsibilities. The goal of this proposed governance framework is to implement the *20x2020 Plan* in a coordinated, consistent, and efficient fashion that acknowledges the different but complementary statutory authorities among state agencies. The coordination framework will include ongoing communication and cooperation by the state agencies and CUWCC, which is expected to be an important partner to interface with water suppliers and other stakeholders. State agencies will provide technical assistance in the development of legislation to incorporate conservation goals or target into law. An interim data collection

and management mechanism will be evaluated for implementation until a more long-term comprehensive database can be established.

Phase II. Plan Implementation, Monitoring, Evaluation and Adjustment

Monitoring and Evaluation

Monitoring of the plan will occur at two levels: implementation of the actions specified in the *20x2020 Plan* and measurement of progress in reduction in urban per capita water use. The lead agency will coordinate and monitor the actions of all of the state agencies and CUWCC. Systematic data collection from water suppliers will begin. Regulatory powers may be used or legislation may be sought to require data submittal by suppliers to a state entity.

Challenges to Monitoring Progress

A number of factors besides long term reductions in demand will influence variations in per capita consumption from year to year. Annual fluctuations can be related to differences between unusually wet and dry years, as well as what short-term actions water agencies may take in response to such events (such as drought rationing). Drought restrictions, either voluntary or mandatory, preserve human health and safety during years of limited water supply, and typically result in lower per capita consumption rates. When restrictions are lifted, water consumption can return to pre-drought levels. Finally, commercial and industrial uses can also differ widely in the amount of water they use. Unusually strong or weak rates of economic growth can cause GPCD to fluctuate from year to year. Thus, to better account for these factors, GPCD reductions should be monitored on a multiple-year basis instead of single end-point years.

Annual Progress Reports

The lead coordinating state agency should prepare annual reports to chart the progress of the 20x2020 Program. These reports would compile in one place what each state agency has accomplished with respect to this Program. At a minimum the progress reports should address the following items:

- Evaluate implementation status of conservation programs by region in coordination with water suppliers, the CUWCC and the regional IRWMPs
- Provide estimates of GPCD by region based upon the latest water usage data submitted by water suppliers
- Report on the status of statewide outreach efforts, and document key feedback received
- Report on the progress of legislative/regulatory/enforcement actions undertaken
- Report on grant funds disbursed
- Report on the progress of studies/analyses commissioned under the auspices of the Program
- Report on the adequacy of funds and staff for implementing the Program

Adjustments

If the interim targets are not achieved by the water year ending in 2015, the State could consider introducing additional initiatives to promote water conservation. In this phase, the State could:

- Continue to encourage water suppliers to implement conservation programs
- Rollout additional programs such as a conservation offsets program or an expanded conservation credits trading program if it appears the program is lagging the 2015 GPCD targets
- Consider additional legislative or administrative actions if necessary

Implementation Barriers and Recommendations

Implementation of this *20x2020 Plan* faces several barriers that must be surmounted. At the local and regional levels, barriers include:

- Drought-induced revenue reductions and increased costs at the water supplier level, leading to deferment of long term efficiency programs
- Competition for IRWM funds by proponents of water management strategies other than efficiency improvements
- Lack of understanding of the state's water challenges and their effect on the California economy and environment
- Inadequate communication and coordination between water suppliers, local governments, and land planning agencies

At the state level, barriers include:

- Lack of staff within state agencies to devote to this Program
- Lack of funds and staff that would monitor the implementation of this program in the lead coordinating agency, uncertainty about the availability of state grant funding
- Lack of enforcement authority to promote compliance with many elements of this Program
- Lack of comparable water use data across state water management and regulatory agencies.

Table 12 outlines the key barriers and the general approach that could be taken to overcome these barriers.

Phase III. Conclusion

It is envisioned that upon completion of Phases I and II, the State would be able to achieve the conservation goal of 20 percent reduction of statewide per capita water use by year 2020. In 2020, the State would conduct a final assessment of the program and recommend new or strengthened policies to maintain efficient use.

Table 12. Implementation Barriers and Recommendations

Item	Needed Resources	Recommended Actions
Overall Plan Governance	• Need Staff to oversee the Programs	• Appropriate funding, recruit staff to devote to this Program.
Voluntary nature of existing conservation	• Need legislation to drive some elements of this Program.	• Make some elements of this Program mandatory instead of voluntary. Bolster state agencies' enforcement authority where at present it is insufficient.
Data Reporting and Analysis	• Need technical staff to set up the central database system. • Software to run the analysis. • Experienced staff or analysts. • Data validation and correction.	• Provide for online data submission. • Develop spreadsheets or other software tools for automatic data analysis or at least GPCD calculation. • Work with MOU signatories and CUWCC on coordinated data submittal methods • Make reporting of water usage data mandatory
Funding	• Need a significant and predictable source of revenue to incentivize water suppliers to undertake/accelerate water conservation programs.	• Ensure that sufficient IRWM funds are invested to meet conservation targets. • Institute a public goods charge.
Appliance efficiency codes	• Given the state's water supply challenges, appliance efficiency codes must remain ahead of the rest of the nation	• Continue to pursue waiver of Federal preemption on appliance efficiency codes
Water pricing	• Need near universal metering and conservation oriented rate structures	• Promote/require conservation oriented rate structures that promote efficient use by customers and support agency conservation programs

Appendix A. References

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Appendix B. Determination of Regional Targets

The regional targets developed for this *20x2020 Plan* provide an example of how regional targets might be set, and provide the basis for analysis to determine what conservation measures could be implemented to achieve the Governor's goal. The targets were developed based on the principle that Regions 1 through 4, which are currently below or meeting the statewide target (154 GPCD) are expected to maintain or further reduce their GPCD values. Regions 5 through 10, limited by the high ETo rates, large numbers of unmetered connections, and historically lower levels of conservation programs, may find it more challenging to meet the statewide target. To ensure that the regional targets can be reasonably achieved by all regions such that the state as a whole can meet the 20 percent reduction goal, a "balancing" process was performed to assign each region with an appropriate regional target. The methodology ensures that the state as a whole can meet the 20 percent reduction target, while acknowledging that average consumption in Regions 1 through 4 will end up below the statewide goal and the goals for Regions 5 through 10 can be realistically achieved. A detailed step-by-step process is shown in Table B-1.

Methodology

To describe the procedures we will follow the table structure of Table B-1.

- **Row 1**
  GPCD Baseline 2005
  Taken from Table 2-6 Row 1
- **Row 2**
  GPCD Reduction with Basic Tools Only
  Taken from Table 2-5 "Total (Basic Measures)" Row 6
  This is the main change from the initial development of Targets (TM 2) which were calculated prior to the analysis of how much savings were currently available from the basic tools such as code improvements and BMP implementation.
- **Row 3**
  GPCD Target if Use Basic Tools Only
  Row 3= Row 1 – Row 2
  This Row is used to determine the Target GPCD level with consideration of Basic Tools GPCD reduction.
- **Row 4**
  GPCD Target if 20% Reduction
  Row 1 x 0.8
- **Row 5**
  GPCD Statewide Average Target
  The numbers were from Technical Memo 2. This is the overall statewide Target.
- **Row 6**
  GPCD Exceedance from State Average
  Row 6 = Row 1 – Row 5
  This Row determines how much each Hydrologic region is currently above the 2020 statewide target.

- **Row 7**
  2020 Population
  Taken for Department of Finance Information
  This data for Row 7 is taken directly from Department of Finance statistics. They are partitioned for 2020 on a Hydrologic Region basis.

- **Row 8**
  Baseline – Basic Tools (row 3) or 20% reduction (row 4), whichever is lower
  After review of the initially prepared targets (TM 2), and review of water supplier comments at both the public meeting and teleconference it was determined that a different methodology for calculating Targets was needed. If a region could reach below the statewide target of 154 GPCD by implementing all the code improvements and basic tools associated with the current BMPs, then that GPCD value would be used as its target. These regions turn out to be Regions 1, 2, and 3. Other regions would need to implement further actions. See row 9 through 16.

- **Row 9**
  Hydrologic Regions 1 – 3 Above or Below State Average
  *Row 9 = (Row 5 – Row 8) * (Row 7*365/1000000)*
  This is a calculation just for Hydrologic Regions 1 – 3. It is used to determine how much water (in million gallons per year) that these regions are above or below the statewide Target.

The previous Rows calculated the GPCD Targets for Regions 1 through 3. The following Rows determine the GPCD Targets for Hydrologic Regions 4 through 10.

- **Row 10**
  GPCD Target if 20% Reduction
  Row 1 x 0.8

- **Row 11**
  With 20% Reduction, GPCD amount above, or below (-) Statewide Target
  Row 11 = Row 5 - Row 10
  Note that Region 4 would be below the statewide average after a 20 percent straight reduction, while other regions would still be above the statewide average.

- **Row 12**
  20% reduction Exceedance from Statewide Reduction Target, MG
  Row 12 = Row 11 x Row 7 x 365/1,000,000
  This Row is developed to analyze the amount of water (in million gallons) that Regions of 4 – 10 could save. This is used as an interim step to develop the GPCD reductions for following Rows.

- **Row 13**
  Extra savings from high performing Regions to allow statewide 20% reduction MG
  Row 13 = (Total of Row 9/Total of Row 12 x Row 12)
  In this Row the amount of water saved from Regions 1-3 which is below the statewide average is then apportioned to the Regions 5 through 10 using a weighted average basis dependent upon their initial exceedance of the maximum Targets. This is to make sure that no Region has to improve their GPCD more than

other Regions compared to their initial starting point. For example, Region 10 is recommended to reduce GPCD significantly more than Region 9, but the Target for Region 10 is not lower than Region 9 (see Rows 15and 16).

- **Row 14**
  Net Reduction to Reach State Average Target
  Row 14 = Row 12 – Row 13
  This Row is a volume calculation to allow easier weighted average analysis of the GPCD reduction and along with Row 13, is a step calculation to determine the actual reduction.
  Note that Region 4 is added extra volume of water since it has reduced the target below statewide target after a straight 20 percent reduction.

- **Row 15**
  Net Reduction Hydrologic regions 4 – 10 to Reach State Average
  *Row 15 =Row 14/Row 7/ 365*1000000*
  This Row shows the net reduction in GPCD necessary for Regions 4 through 10 so that the overall 20% reduction will be achieved after addition of the water saved from Regions 1 through 3. This is apportioned as mentioned before, to make sure that each of the Regions 4 through 10 reduces their GPCD in proportion to each other.

- **Row 16**
  GPCD Target Hydrologic Regions 4 – 10
  Row 16 =Row 10 – Row 15
  This Row calculates the Target GPCD for Regions 4 through 10.

- **Row 17**
  Calculated Hydrologic Region Targets for 2020
  This is the result of the analysis and presents the calculated GPCD Targets for all the Hydrologic Regions within California using this approach. This represents one way to set regional targets.

Table B-1. Regional Targets

		Hydrologic Region										
Row	Process Description	1	2	3	4	5	6	7	8	9	10	Total
1	GPCD Baseline 2005 (Table 2-6)	165	157	154	180	253	248	285	243	237	346	
2	GPCD Reduction With Basic Tools Only (Table 2-5)	28	26	32	24	28	33	32	36	43	56	
3	GPCD Target If Use Basic Tools Only (Row 1-Row 2)	137	131	122	156	225	215	253	207	194	290	
4	GPCD Target if 20% Reduction	132	126	123	144	202	198	228	194	190	277	
5	GPCD State Avg Target	154	154	154	154	154	154	154	154	154	154	
6	GPCD Exceedance from State Avg (Row 1-Row 5)	11	3	0	26	99	94	131	89	83	192	
7	2020 Population	763,296	7,037,805	1,719,563	22,537,558	3,631,063	2,795,598	2,961,357	119,832	1,376,567	1,193,284	
8	Baseline - Basic Tools (Row 3) or 20% reduction (Row 4), whichever is lower	137	131	123	156	225	215	253	207	194	290	
9	Water Use Below State	4,736	59,082	19,331								83,150
10	If Code + Basic Tools is still > Statewide average, calculate 20% reduction				144	202	198	228	194	190	277	
11	With 20% Reduction, GPCD amount above, or below (-) Statewide Target				-10	48	44	74	40	36	123	
12	20% reduction Exceedance from Statewide Reduction Target, MG				-82,262	64,146	45,305	79,986	1,767	17,887	53,485	180,316
13	Extra savings from high performing Regions to allow statewide 20% reduction				-37,934	29,580	20,892	36,885	815	8,248	24,664	83,150
14	Net Reduction to reach State Avg Target, MG				-44,328	34,566	24,413	43,102	952	9,639	28,821	141,494
15	Net GPCD reduction to reach State Avg				-5	26	24	40	22	19	66	
16	2020 GPCD Target HR 4-10				149	176	174	188	173	170	211	
17	Recommended HR Targets for 2020:	137	131	123	149	176	174	188	173	170	211	