Water Conservation
Demand Management and Water Use Efficiency

I. INTRODUCTION

The purpose of this memo is to describe how water use efficiency connects with the development of sustainable management of Delta services. The construct of this memo assumes that the reader is aware of the other major components of a water management strategy including: groundwater and conjunctive use options, increased surface storage, recycling and desalination.

Although water use efficiency is acknowledged in the Water Supply and Quality context memo, additional information is deemed necessary because of its role in the relationship between water supply and demand management.

II DELTA POLICY CONNECTION

Water use efficiency is an option that is available to local agencies in their management of water supplies and end user demands. In relative terms the in-Delta connection for water use efficiency is not significant due to the hydraulic configuration of the Delta and the relatively small demand (see Water Supply and Water Quality Context Memo) compared to the state as a whole.

Outside of the Delta there is significant potential for gains from implementing cost-effective water use efficiency actions. The potential benefits of known water use efficiency actions are well characterized however there are some significant implementation issues. One of the challenges a local water supplier must address is the ability to incorporate the costs of water use efficiency actions into its rate structure. This is an issue particularly for agencies that are "built out" and not actively expanding. An aspect of water use efficiency that is difficult to quantify is end-user behavior modification that is often required for an action to be successful. For example, several studies have shown that adjusting run-time for lawn sprinklers can save a significant amount of water without sacrificing the aesthetic qualities of a lawn. However, the savings are dependent on active management of a controller. These nuances indicate why there is an advantage in expanding supplies over the implementation of water use efficiency actions. Another reason why it is easier to implement new water supply actions over water use efficiency is that new infrastructure can be operated, by a limited number of individuals, very efficiently for defined purposes. In addition, the financing of new infrastructure is much easier to structure.

Policy questions that the Delta Vision Task Force should be aware of include:

- Should the State have a role in the implementation of water use efficiency actions at the local level?

- What is the proper balance of water use efficiency in the supply-demand continuum (Integrated Water Management)?
- Should the use of Bay-Delta water supplies be linked to the implementation of water use efficiency actions?

II. SETTING THE CONTEXT

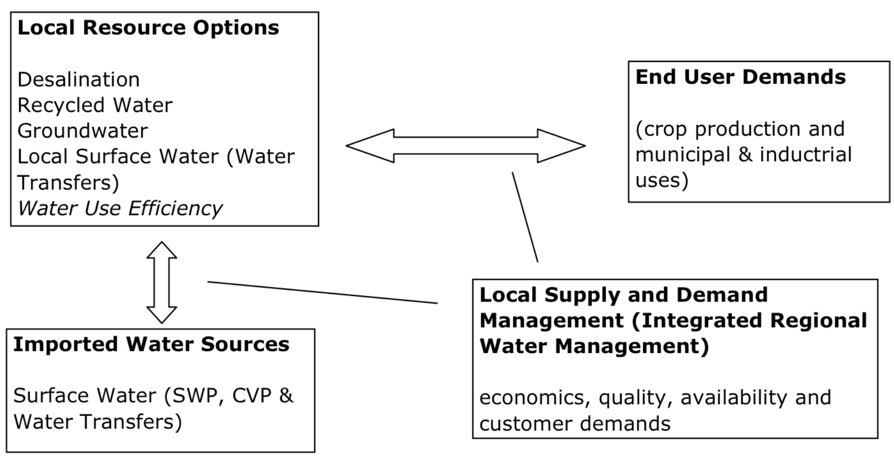
Demand Management

The figure below illustrates the relationship between water use efficiency, demand management and water supply. This conceptual model links with the ones presented in the Water Supply and Water Quality context memo and in the drinking water quality memo.

Water Conservation or Water Use Efficiency?

Historically the use of the phrase *water conservation* referred to the construction of dams and impoundments to store water for later use. The source of the stored water may be the reduction in a beneficial use of water – such as landscape irrigation or it could be captured runoff.

Water Use Efficiency refers to the amount of water required to meet an objective. The less water that is required to meet the objective the higher would have a higher efficiency in the conveyance of water than a canal with a sandy soil. A water use efficiency action can conserve water.



The figure shows that the implementation of water use efficiency actions is based on the nature of end user demands, the availability of different water resources, the economics of using a water source and the quality of the water. To support statewide demand management activities DWR maintains two approaches – The Office of Water Use Efficiency and Transfers and the Division of Planning and Local Assistance. Under the Division of Local Assistance, Prop 50 bond funding is administered to encourage integrated regional strategies for management of water resources and to provide funding for projects that protect communities from drought, protect and improve water quality, and improve local water security by reducing dependence on imported water.

It should be noted that nearly all, major water suppliers in the state, or their end users, rely on multiple water sources such as, groundwater, local surface water supplies, recycled water and imported surface water. The only major water supplier and end users with a sole source of water is the Imperial Irrigation District that gets its water from the Colorado River.

Delta Connections

The Delta impacts water use efficiency in several ways. If water is directly available from the Delta then the cost and quality of that source may be more economical than other options. For example, if Delta water costs $300 per acre-foot to deliver to the end user and recycled water costs $800 per acre-foot then based on cost alone the local agency would choose Delta water. However if implementing a water use efficiency option costs $125 per acre-foot then this would be the more economical option. On paper it seems obvious that water use efficiency is the best deal however, by selecting the water use efficiency option, the local agency has reduced a degree of freedom in its supply-demand continuum. This loss of flexibility can have major impacts to water suppliers during periods of drought. If the local agency has used the conserved water for other consumptive uses, the impact can be quite severe.

> **Who are water users?**
> *Agricultural* water users are growers – they can divert or pump their own groundwater, and order water from an organized district.
>
> *Urban* water users are households and businesses that almost exclusively receive water from an organized district.
>
> **Who are water suppliers?**
> Local agencies with authority over water – typically they deliver water to the end user although some, such as the Metropolitan Water District of Southern California serve as wholesalers to other districts. The State Water Project and the Central Valley Project are suppliers to their contractors.
>
> **Who are contractors?**
> Contractors are local agencies that sign long-term agreements from the State Water Project or the Central Valley Project. Contractors have the authority to use the water within their service area.

Another way that the Delta impacts water use efficiency is through water quality. Similar to the amount of water used, water quality becomes a factor in deciding what sources of water to use - especially for urban water suppliers. Local agencies typically configure treatment facilities to accommodate a tight range of water quality therefore they must balance their sources with their treatment infrastructure.

Timing of water availability from the Delta is a far more critical issue for Delta diverters and for the agricultural water users that are highly dependent on the Delta for their supply. Urban

> When water is used, some of it is removed from the system through evaporation or outflow to the ocean or other saline sink, this portion is **consumptive use** and is considered an **irrecoverable flow**. The portion of water that returns to the system is the **recoverable flow**, this portion is available for other uses.

agencies, particularly over the last ten years, have invested in local surface and groundwater storage. The impact of these actions is that they can smooth out the year-to-year hydrologic variation in Delta water supplies that are manifested at the export facilities. For the in-Delta users there is much less storage and fewer supply options – therefore these users are more dependent on the Delta as a source of supply.

IV. IMPLEMENTATION OF WATER USE EFFICIENCY

Service Characteristics of Agricultural and Urban Water Suppliers

There is a significant difference in the type of delivery service that is needed by agricultural and urban water users and this affects how a water supplier operates, including the implementation of water use efficiency. The objective of agricultural water users is to produce food and fiber subject to market forces and environmental variables. Municipal water users are two basic groups – industrial and residential both of which have fairly define demand patterns that are fairly constant from year to year.

Since the characteristics and the objectives differ between urban and agricultural water suppliers it is reasonable to expect that the implementation of water use efficiency differ. The following table highlights how the service needs differ between agricultural and urban water users.

Comparison of agricultural and urban delivery systems.

Characteristics	Agricultural	Urban Residential
Demand Patterns	Serve peak crop ET and typical losses; deliver to 5% to 15% of customers at a time	Ability to serve peak demand and meet fire hydrant flow/pressure standards; could serve virtually all customers at once
System Hardware	Mostly open channel, gravity flow; unexpected changes in deliveries can result in canal spills	Piped and pressureized systems; pipes flow full
Delivery Frequency	Deliveries arranged in advance or on fixed schedule (rotation) - two to six weeks between deliveries	Deliveries available on demand
Delivery Rate	0.5 to 20 cfs (225 to 9,000 gpm)	0.5 gpm to 20 gpm
Delivery Duration	2 to 72 hours	5 minutes to 2 hours
Water Quality	Untreated, contains debris	Treated to potable standards
On-Site Storage	Root zone stores crop demand for 2 to 6 weeks	None

The approach to urban water use efficiency is to implement best management practices. Best management practices are a specific list of actions that have been shown to improve water use efficiency. The installation of low-flow-shower heads is an example of an urban best management practice. Through a review of urban water management plans, the State of California monitors the implementation of best management practices. A memorandum of understanding between urban water suppliers and the California Urban Water Management Council identifies what actions a local supplier are obligated to implement. A fundamental criterion for the implementation of a best management practice is its cost-effectiveness.

Cost-effectiveness
From a recent report prepared for the California Urban Water Conservation Council.

At the heart of the new understanding of water efficiency is an economic standard: a good water use efficiency program produces a level of benefits that exceed the costs required to undertake the program. Water use efficiency programs for which this is not the case are questionable undertakings for water utilities. One of the key challenges lies in the determination of utility benefits from WUE programs…. By analyzing the direct costs that utilities can avoid via demand reduction, water utilities define the benefits produced by conservation programs.

As described above agricultural water suppliers typically have a much greater variation in both the infrastructure and operations compared with urban water suppliers. This variation makes it difficult to implement a standard list of water use efficiency practices. The current approach for agricultural water use efficiency is to use cost-effectiveness criteria to identify potential projects. For example, eliminating canal spill may cost $45 per acre-foot of saved water whereas the cost of importing water may be $75 per acre-foot therefore just based on economics this project would be justified. The CALFED program takes the agricultural water use efficiency one step further by pursuing statewide benefits from the implementation of local water use efficiency actions. For example if a river reach needs additional in-stream flow needs, the CALFED program is willing to pay for the portion of the costs that are not locally cost-effective.

V. STATUS AND POTENTIAL OF WATER USE EFFICIENCY

The information presented in this section is largely taken from the CALFED Program's evaluation of the first four years of its implementation of the water use efficiency element, a component CALFED's water supply reliability objective. The Comprehensive Evaluation looked at the progress to date in implementing agricultural and urban water use efficiency as well as recycling and desalination. In addition, the evaluation modeled the potential for additional agricultural and urban water use efficiency and discussed the possible range of recycling and desalination.

The Water Use Efficiency of CALFED has three main goals that support the overall CALFED effort: (1) reduce water demand through "real water" conservation, (2) improve water quality by altering volume, concentration, timing and location of return flows, and (3) improve ecosystem health by increasing in-stream flows where necessary to achieve targeted benefits. Although the first goal applies to both agricultural and urban water use efficiency efforts, the second and third goal applies primarily to agricultural water use efficiency. The program is based on the recognition that, although efficiency measures are implemented locally and regionally, the benefits accrue at local, regional and statewide levels.

Excerpt of the CALFED Bay-Delta Program's Comprehensive Evaluation of the Water Use Efficiency Element.

BACKGROUND

In the summer of 2000, federal, state and stakeholder representatives negotiating the CALFED Bay-Delta Program Record of Decision struggled to resolve differences over the Water Use Efficiency (WUE) Program Element. Some saw WUE as the cornerstone of CALFED's water management strategy. Others saw WUE as important, but not an initiative to be funded with more than $1 billion in state and federal funds.

Finally, negotiators reached a compromise: Provide unprecedented funding for WUE, but require an extensive evaluation to assess the program's effectiveness. This report - known as the Comprehensive Evaluation - represents the evaluation called for in the August 2000 Record of Decision (ROD).

Approach

The Comprehensive Evaluation is structured to assess the potential of each of WUE's four main components - agricultural water conservation, urban water conservation, recycling and desalination - to contribute to CALFED goals and objectives. The analysis has two main parts: a "look forward" that seeks to determine the potential of water use efficiency actions statewide given different levels of investment and policies, and a "look back" that assesses progress to-date.

The analysis, conducted by California Bay-Delta staff and consultants with input from CALFED Agencies and stakeholders, is intended primarily to help policymakers target future investments in the WUE Element and develop appropriate assurances. Additionally, the projections generated by the Comprehensive Evaluation are expected to - and already do - feed into other studies, such as the California Water Plan Update and the Common Assumptions efforts of the Surface Storage Investigations.

"Look-back" Findings
The ROD viewed WUE investments as a cost-effective way to accelerate the implementation of conservation and recycling actions statewide. (Desalination was incorporated into the program at a later date.) More specifically, the ROD suggested that, with extensive federal, state and local investment, WUE might be able to generate between 1.0- and 1.3-million acre-feet in the first seven years of the program.

In reviewing this report, readers need to be aware that the Comprehensive Evaluation was constrained by significant data limitations. For example, there is no comprehensive data related to locally funded actions within the agricultural, desalination and recycling components; only on the urban side is there an extensive database that collects voluntarily reported savings associated with local water use efficiency actions. Similarly, expected benefits associated with grant-funded projects reflect local agency proposed (grant application based) savings; the figures do not represent observed savings. This data gap represents a serious challenge to agencies and stakeholder communities committed to developing a well-informed water management strategy.

Still, there are important findings to be considered. The Comprehensive Evaluation suggests the following crosscutting findings:

- Projections strongly support the position that aggressive investment in water use efficiency actions can results in significant reductions in applied water use over the next 25 years. Depending on the level of investment and other policies, the analysis projects savings of 1.4 to 3.2 million-acre feet by 2030: 180,000 to 1.1 million acre-feet for the agricultural sector; and 1.2 million to 2.1 million acre-feet from urban. Additionally, there is very large potential from both desalination and recycling.

- There is solid demand at the local level for state and federal water use efficiency grants. Over the past four years, 235 grants totaling $305 million have been awarded across all four components. The demand for grant funding has repeatedly outstripped the available funds. In the urban sector alone, funding requests from urban water suppliers have exceeded available state/federal funds by a roughly eight-to-one ratio; agricultural requests were double the available funding.

- An analysis of WUE savings over the first seven years (Stage 1) offers a mixed picture. (See table below.) Agricultural and urban WUE show the potential to generate substantial water savings at average costs ranging from $25 to $340 per acre foot, but the overall savings are likely to fall far short of both ROD and Comprehensive Evaluation projections due to three main factors: (1) agricultural and urban grant funding for WUE actions is 80 percent lower than projected in the ROD; (2) key agricultural and urban assurances actions anticipated in the ROD are not yet implemented; and,

(3) local WUE actions are either below projected levels or there is insufficient data to measure progress. Recycling is anticipated to exceed ROD projections, but the cost – $800 per acre-foot on average – is significantly higher than savings generated through agricultural or urban water use efficiency actions. Savings generated through desalination are, also expensive relative to other WUE options averaged $957 per acre-foot.

CALFED Program Stage 1 Water Savings: Projected and Expected

		ROD Projections	Comp Evaluation Modeling	Expected Savings	Projected Yearly Average Cost Per Acre-Foot of Savings (based on recent grant-funded projects)
Ag[1]	Lower Bound	260,000 AF	180,000 AF	50,000 AF	$28/AF for in-stream savings; $350/AF for supply reliability savings[2]
	Upper Bound	350,000 AF	250,000 AF	50,000 AF	
Urban	Lower Bound	520,000 AF	267,000 AF	101,000 AF	$160 to $340/AF
	Upper Bound	680,000 AF	356,000 AF	142,000 AF	
Recycling	Lower Bound	225,000 AF	Not Modeled	387,000 AF	$800/AF
	Upper Bound	310,000 AF	Not Modeled	510,000 AF	
Desal	Lower Bound	Not Modeled	Not Modeled	20,000 AF (no range)	$957 per acre foot, on average; range from $430 to $1,387
	Upper Bound		Not Modeled		

- Although grant-funded water savings account for only a small percentage of total savings potential, they leverage significant additional local investment, act as an investment catalyst, help to promote regional partnerships and joint ventures, and increase the geographic base of implementation.

- Implementing agencies have not collected sufficient project-level baseline data or observed project cost and performance data. Therefore, an

[1] The Ag WUE figures include the savings and costs associated with both recoverable and irrecoverable savings.

[2] The range of per-acre foot average costs associated with ag savings was between $5/AF and $112 for in-stream, savings, and $28 to $515 for water supply reliability savings.

understanding of progress toward meeting ecosystem restoration, water quality and water supply reliability objectives is not possible. In addition, the lack of project- program-level data severely limits the use of adaptive management for program improvement.

Recommendations

The analysis and associated findings and considerations suggest that agencies responsible for the Water Use Efficiency Program may want to consider changes in the way the program is implemented. Below are specific recommendations that the consultant Team believes merit serious consideration. Any final approach is best considered as part of a dialogue that brings the affected stakeholder community to the table in a transparent series of discussions.

The recommendations – described in greater detail at the end of the Overarching Section – fall into four main categories:

- ***Program Structure/Assurances.*** The Comprehensive Evaluation suggests program implementers should consider three specific recommendations related to program structure and assurances. They are: (1) assess the viability of the grant-driven WUE approach given expected state and federal fiscal constraints; (2) determine whether to implement a process to certify compliance with the Urban Memorandum of Understanding; and, (3) revisit the effectiveness of the Quantifiable Objectives approach and associated assurances.

- ***Monitoring Performance.*** Data gaps and limited program assessments greatly handicap effective program implementation. To remove this important barrier, WUE Program implementers are encouraged to consider the following: (1) develop and track specific performance measures for the WUE Program; (2) where fiscally feasible, move forward with the broadly supported package of administrative and legislative water use measurement actions; (3) improve collection of data on locally funded actions; and, (4) revise the grant process to more closely monitor, verify and track results.

- ***Financial Assistance Program.*** A review of WUE financial assistance programs suggests that there is insufficient information to determine the extent to which current grant and loan programs are supporting WUE Program objectives. Based on the Comprehensive Evaluation findings, implementation agencies are encouraged to (1) revisit grant program structure and protocols, and (2) determine the need, efficacy and structure of urban and agricultural loan programs.

- ***Technical Assistance and Research.*** The Comprehensive Evaluation suggests that both technical assistance and research efforts to-date have consisted of a patchwork of initiatives. Agency implementers are encouraged to consider the following recommendations related to these important tasks:

(1) evaluate WUE research funded activities to-date, identify research priorities for the next program stage, and establish protocols to disseminate research findings and (2) conduct a market assessment to determine the appropriate structure and scope of technical assistance programs and develop a strategic plan for implementation.

Look-forward" Projections

The aim of the Authority's "look-forward" effort is to answer the question: What is the potential of water use efficiency actions statewide given different levels of investment and policies? In other words, the Water Use Efficiency Element is striving to develop a range of projections that reasonably bracket potential water use efficiency savings over the next 25 years or so. To generate a "reasonable bracket" of water use efficiency projections, the evaluation undertakes a series of analyses that assume differing levels of investments and different policy actions.

Agricultural Projections

The Comprehensive Evaluation's six projections of agricultural WUE potential strongly support the position that aggressive investment in agricultural water use efficiency can result in significant reductions in irrecoverable flows (flows to saline sinks and non-beneficial ET) and recoverable flows (in-stream flow and timing changes primarily achieved through changes to diversions, return flows and seepage) through 2030. These projections evaluated agricultural water use efficiency potential from:

1. Local implementation of known water management practices as well as other locally cost-effective WUE actions; and

2. Additional agricultural water use efficiency actions co-funded through CALFED agency grant programs.

The first five projections adopted different assumptions regarding public (state and federal) and local investment rates. The sixth projection is a technical potential that assumes 100% adoption of all WUE actions. This last projection serves as a reference point or bookend to evaluate the other five. In addition, there is an analysis of the potential to use regulated deficit irrigation to achieve reductions in non-productive evapotranspiration (ET).

Water use efficiency potential for the projections are given in the table below The results of the projections analysis indicate the following:

- Agricultural WUE actions for projection levels 1, 3 and 5 can generate between 184,000 and 1,137,000 acre-feet of recoverable and irrecoverable flows by 2030. This translates to 3 to 20% of the technical potential.

- Application of regulated deficit irrigation techniques on amenable crops is projected to yield approximately 142,000 acre-feet of reductions in non-productive ET. This water is then available for other beneficial uses such as transfers or consumptive use.

- All projection levels show potential to meet a portion or all of the in-stream flow needs identified in the Targeted Benefits (these are specific state needs that can be met through agricultural water use efficiency).

Estimates of 2030 on-farm and district agricultural WUE potential.

Projection Level	Local Agency Investment Assumption	Grant Funding Assumption	Recoverable Flows	Irrecoverable Flows	Regulated Deficit Irrigation
			1,000 Acre-Feet Per Year		
1	Historic Rate	Prop. 50 only	150	34	142
2	Locally cost-effective	Prop. 50 only	no change in locally cost-effective rate results same as PL 1		
3	Historic Rate	Prop. 50 + $15 mil./yr.	565	103	142
4	Locally cost-effective	Prop. 50 + $15 mil./yr.	no change in locally cost-effective rate results same as PL 3		
5	Locally cost-effective	Prop. 50 + $40 mil./yr. (2005-2014); $10 mil./yr. (2015-2030)	947	190	142
6*	$1,592 billion annually		4,338	1,819	142
*Projection 6 estimated the technical potential of agricultural WUE. It assumed 100% adoption statewide. Funding assumptions are based on implementation costs and are not divided between local and public funding.					

The Delta connection in the agricultural water use efficiency projection is both direct and indirect. The direct connection is in the reduction of irrecoverable flows - which translates to a reduced demand on Delta inflows and exports either now or in the future. Due to the cropping patterns in the Delta, it is unlikely that there is any significant change to the in-Delta portion of reduced irrecoverable flows. The indirect connection to the Delta from agricultural water use efficiency is through up-stream actions that either increase the quantity of in-stream flows (recoverable flows), improve the quality of water or both. The improved in-stream flow and quality are thought to improve the aquatic habitat and therefore improve the overall ecosystem.

Urban Projections

The Comprehensive Evaluation's six projections of urban savings potential strongly support the position that aggressive investment in urban water use efficiency can result in significant reductions in urban applied water use over the next 25 years. These projections evaluated urban water savings potential from three sources:

- Efficiency codes that require certain water using appliances and fixtures to meet specified levels of efficiency;
- Local implementation of BMPs as well as other locally cost-effective conservation measures; and
- Additional urban conservation measures co-funded through CALFED Agency grant programs.

The first five projections adopted different assumptions regarding state and federal and local investment rates. The sixth projection measured the water savings potential assuming 100% adoption of the measures under evaluation. This last projection served as a reference point from which to evaluate the other five.

Urban BMPs

BMP 1: Residential Survey Programs

BMP 2: Residential Plumbing Retrofit

BMP 3: System Water Audits

BMP 4: Metering w/Commodity Rates

BMP 5 Large Landscape Conservation

BMP 6: High Efficiency Clothes Washers

BMP 7: Public Information Programs

BMP 8: School Education Programs

BMP 9: Commercial Industrial Institutional

BMP 10: Wholesaler Agency Assistance Programs

BMP 11: Conservation Pricing

BMP 12: Conservation Coordinator

BMP 13: Water Waste Prohibitions

BMP 14: Residential Ultra Low Flush Toilet Replacement Programs

Water savings potential for the six projections are shown in the following table. The results of the projections analysis indicate the following:

- Water savings for projections 1 through 5 range between 1.2 million and 2.1 million acre-feet per year by 2030, and capture 39% to 68% of technical potential. The projected range of savings would meet the domestic water demands of 6.3 million to 10.9 million residents at current rates of household water use.
- While California's population is projected to increase 35% by 2030, urban water use would increase by only 12% if California were to realize the upper-end of the range of projected urban water savings (i.e. Projection 5).
- Water savings from local agency implementation are sharply affected by the local investment assumption. Realizing the upper-end of the range of savings

potential requires full implementation of locally cost-effective BMPs (Projections 2, 4, and 5). The analysis indicates that historic rates of investment in BMPs would not be adequate to realize the upper-end of the savings range (Projections 1 and 3). Savings potential assuming implementation of all locally cost-effective measures is approximately five times greater than from assuming the historic rate of BMP implementation.

- Efficiency codes are a significant source of water savings for the urban sector. Codes related to toilet, showerhead, and washer efficiency, as well as codes that require metering customer water connections are essential to realizing the projected water savings potential. Efficiency codes account for 46% to 84% of total savings for projections 1 through 5.
- Although grant funded water savings account for only a small percentage of total savings potential, they leverage significant additional local investment, can act as an investment catalyst, help to promote regional partnerships and joint ventures, and increase the geographic base of implementation.

Estimates of 2030 Urban Conservation Savings Potential

			1,000 Acre-Feet Per Year			
Proj. Level	**Local Agency Investment Assumption**	**CALFED Grant Funding Assumption**	**Efficiency Code**	**Local Agency**	**Grant Funded**	**Total Potential**
1	Historic Rate	Prop. 50 only	970	172	11	1,153
2	Locally cost-effective	Prop. 50 only	970	881	11	1,862
3	Historic Rate	Prop. 50 + $15 mil./yr.	970	172	257	1,399
4	Locally cost-effective	Prop. 50 + $15 mil./yr.	970	881	257	2,108
5	Locally cost-effective	Prop. 50 + $40 mil./yr. (2005-2014); $10 mil./yr. (2015-2030)	970	881	224	2,075
6*	N/A	N/A	N/A	N/A	N/A	3,096
*Projection 6 estimated the technical potential of the urban conservation measures evaluated by CBDA. It assumed 100% adoption statewide of these measures and provided a reference point for the other five projection levels.						

The figure below shows the reduction in applied water use due to efficiency codes and regionally cost-effective conservation investments by type of end use. Residential uses account for 57% of total savings potential while CII and nonresidential landscape uses account for the other 43%. Within residential uses, approximately three-fourths of the savings potential comes from indoor water uses and one-fourth from outdoor landscape water uses. Most of the indoor residential water savings are efficiency code-driven savings.

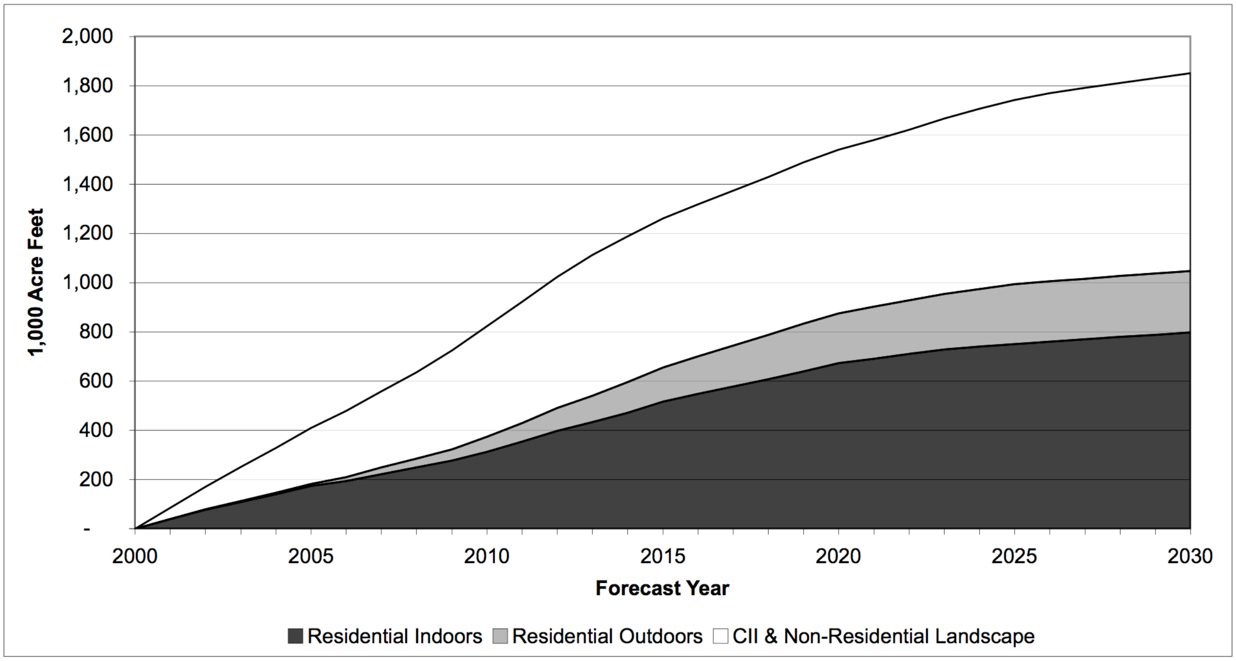


Figure X. Statewide reduction in urban water use resulting from the implementation of efficiency codes and regionally cost-effective investments.

The Delta connection in the urban water use efficiency projection is both direct and indirect. The direct connection is in the reduction of irrecoverable flows - which translates to a reduced demand on Delta inflows and exports either now or in the future. Due to the land use patterns in the Delta, it is unlikely that there is any significant change to the in-Delta portion of reduced irrecoverable flows.

III. Science and Information

The unknowns in water use efficiency are primarily related to a lack of comprehensive, consistent and timely data and as the scale increases, from local agency to statewide, the lack of consistent and comprehensive data becomes a greater issue. The preparation of the agricultural component of CALFED's Comprehensive Evaluation was severely hampered by a lack of data about the benefits of locally led water use efficiency actions. The urban analysis was more robust because there is relatively good data and information available through the California Urban Water Conservation Council. Analysis of state funded water use efficiency efforts was primarily limited to an analysis of the grant applications. This was necessary because there is no analysis of the benefits generated from the implementation of the CALFED Water Use Efficiency grant program. Data collection and analysis of individual grant funded projects and entire water use efficiency programs would allow for a more informed decision making effort. Ideally, the data and information would be utilized to develop a water management strategy that considers all options on the supply-demand continuum.