City of Palo Alto Utilities

2005 Urban Water Management Plan

December 2005

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List of Acronyms

AF	Acre Feet
ABAG	Association of Bay Area Governments
AF/Y	Acre Feet per Year
BAWAC	Bay Area Water Agencies Coalition
BAWSCA	Bay Area Water Supply and Conservation Agency
BCA	Baseline Consumption Allowance
BMP	Best Management Practices
CAFR	City Audited Financial Report
CALTRANS	California Department of Transportation
CCF	Centi Cubic Feet (hundred cubic feet)
CCSF	City and County of San Francisco
CEE	Consortium for Energy Efficiency
CEQA	California Environmental Quality Act
CIMIS	California Irrigation Management Information System
COM	Commercial
CPAU	City of Palo Alto Utilities
CUWCC	California Urban Water Conservation Council
DHS	Department of Health Services
DSM	Demand Side Management
DMM	Demand Management Measures
DSS	Demand Side Management Least Cost Planning Decision Support System
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ET	Evapotranspiration
ETO	Evapotranspiration
FEMA	Federal Emergency Management Agency

FY	Fiscal Year
gpm	Gallons per minute
HET	High Efficiency Toilets
ICI	Industrial Commercial and Institutional
IRP	Integrated Resource Plan
IRWMP	Integrated Regional Water Management Plan
IT	Information Technology
IWSAP	Interim Water Shortage Allocation Plan
MF	Multi-family
mg/L	Milligrams per liter
MGD	Million Gallons per Day
MOU	Memorandum of Understanding
O&M	Operations and Maintenance
OES	Office of Emergency Services
PARWQCP	Palo Alto Regional Water Quality Control Plant
PEIR	Program Environmental Impact Report
RWS	Regional Water System
SCVWD	Santa Clara Valley Water District
SF	Single-family
SFPUC	San Francisco Public Utilities Commission
SFWD	San Francisco Water Department
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TRC	Total Resource Cost
UAC	Utilities Advisory Commission
UER	Utilities Emergency Response
ULF	Ultra Low Flow
ULFT	Ultra Low Flow Toilet
URS	United Research Services, Consultant Firm
UWMP	Urban Water Management Plan
WIRP	Water Integrated Resource Plan
WPL	West Pipeline
WSIP	Water System Improvement Program
WSMP	Water Supply Master Plan

City of Palo Alto Utilities
2005 Urban Water Management Plan
Contact Sheet

Date plan submitted to the Department of Water Resources:

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Utility services provided by the City of Palo Alto: **Electricity, Water, Natural Gas, Wastewater Collection, Treatment and Disposal, Commercial Fiber, Refuse, Recycled Water, Sewer, and Storm Drain.**

Is This Agency a Bureau of Reclamation Contractor? **No**

Is This Agency a State Water Project Contractor? **No**

Section 1 – Plan Development and Adoption

Plan Adoption

The City of Palo Alto (City) began preparing this update of its Urban Water Management Plan during Spring 2005. The updated plan will be considered by City Council before December 31, 2005 and submitted to the California Department of Water Resources within 30 days of Council adoption. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning).

Public Participation

The City has actively encouraged community participation in its urban water management planning efforts. Notices were placed in the local daily and weekly newspapers informing the public of the City's update of the Urban Water Management Plan for 2005. The draft plan was placed on the City's website for public to review and comment.

The City's Utilities Advisory Commission (UAC) provides advice to utility staff and the City Council. The UAC meets once per month and reviews the activities of the various utility services (e.g. electric, gas, water, wastewater). One of the primary tasks of the UAC is to assist with the review and development of long-term plans for the City's utilities. The UAC meetings are open to the public and the agendas are posted for the public to review.

On November 2, 2005 the UAC reviewed the draft 2005 Urban Water Management Plan (UWMP) and provided comments that were incorporated into the draft of the 2005 UWMP provided to the Council on November 21, 2005.

In addition to the review of the UWMP, the UAC has been very active in the review of several other water supply and water management documents. This review during public meetings has included discussion and presentations of the following:

- Water Wells, Regional Storage and Distribution System Study (December 1999)
- San Francisco Public Utilities Commission's Water Supply Master Plan (2000)
- Preliminary Assessment of Water Resource Alternatives (2000)
- Long-Term Water Supply Study (2000)
- Alternative Emergency Water Supply Options Study (July 2001)
- FY 2001-03 Demand-Side Management and Public Benefits Plan (October 2001)
- Long Term Water Supply Issues (December 2001)

- Alternative Emergency Water Supply Study (January 2002)
- Water Seismic Study (February 2002)
- Information Update on Water Integrated Resource Plan (September 2002)
- Groundwater Supply Feasibility Study (May 2003)
- Update on Water Integrated Resource Plan (June 2003)
- Santa Clara Valley Water District's West Pipeline Extension Study (July 2003)
- Water Integrated Resource Plan Guidelines (August 2003)
- Water Customer Survey Proposal (December 2003)
- Investment in Recycled Water Pipeline to Mountain View (February 2004)
- Water Preferences Survey Results (March 2004)
- Long-term Water Demand Projections (April 2004)
- Regional Desalination Project Information (April 2004)
- Preliminary Water Purchase Projections (October 2004)
- Annual Public Benefits Plan Update (January 2005)
- Recycled Water Market Survey Proposal (August 2005)

The City encourages public participation in the review of this document. For this purpose, notices were placed in the local papers inviting the public to review the draft UWMP. During preparation of the 2005 UWMP, the 2000 UWMP was placed on the City's website for comments to be incorporated in the 2005 update. The draft 2005 UWMP was placed on the City's website.

The City's public review process began with the public meeting of the UAC on November 2, 2005. Comments were incorporated into the draft for consideration by the City Council on November 21, 2005 at a Public Hearing. At the November 21, 2005 Public Hearing, the Council requested some changes to the plan. Those changes were incorporated into the final draft presented to the Council for adoption on December 12, 2005. This schedule for public review opportunities was placed in local newspapers and on the City's website.

The City of Palo Alto Utilities (CPAU) has filed copies of the notices referred to above.

Agency Coordination

Law

> 10620 (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).
>
> (d) (1) An urban water supplier may satisfy the requirement of this part by participation in area wide regional, watershed, or basis wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.
>
> (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers

that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

Coordination Within the City

Many members of City staff met and coordinated the development of this plan including representatives from the Planning Department, City Manager's Office, Administrative Services Department, City Attorney's Office, the Regional Water Quality Control Plant, and Resource Management, Utility Marketing Services, Rates, Communications, and Engineering and Operations in the Utilities Department.

During the past several years, the City has completed several important water planning projects, including, but not limited to the following:

- **Water Wells, Regional Storage and Distribution System Study (December 1999)** – This study examined the ability of the City to supply water for a short (8-hour) curtailment of the primary San Francisco Public Utilities Commission (SFPUC) water supplies. The report recommended that the City's five emergency standby wells be rehabilitated, three new wells be drilled and a new water storage reservoir be constructed to ensure the City was prepared for an 8-hour curtailment of supplies and for fire protection.

- **Preliminary Assessment of Water Resource Alternatives (2000)** – This report provided a complete summary of the water supply alternatives available to the City.

- **Long-Term Water Supply Study (2000)** – This study examined the costs and operational issues relating to treatment of well water if used for potable supply.

- **Alternative Emergency Water Supply Options Study (2001)** – This study examined the capital improvements recommended in the 1999 Water Wells, Regional Storage and Distribution System Study to see how they would respond to emergencies other than an 8-hour outage of SFPUC water (e.g. 1 day, 3-days, 30 days). The conclusions were that the improvements recommended in the 1999 study, particularly the rehabilitation of the wells and the construction of new wells, would be valuable for emergencies of durations longer than 8 hours and for droughts as well.

- **Groundwater Supply Feasibility Study (2003)** – This study evaluated whether operating one or two of the City's emergency groundwater wells as active supplies would cause significant decrease in groundwater levels or deterioration in groundwater quality. The study determined the sustainable level of groundwater pumping on either a continuous basis or periodically, as for supplemental supplies in droughts. The

sustainable level was determined so that there would be no land surface subsidence, saltwater intrusion, or migration of contaminated plumes to the drinking water aquifer.

- **Santa Clara Valley Water District's (SCVWD) West Pipeline Extension Study (2003)** – The City participated in a study completed by SCVWD, which examined the costs and issues surrounding the possible extension of its West Pipeline to serve additional loads in northern Santa Clara County. The study determined that the costs were substantial for the extension, especially if retailers such as Palo Alto only want the connection for drought times.

- **Water Integrated Resource Plan (WIRP) Guidelines (2003)** – The City Council adopted a set of guidelines to direct the development of the WIRP. (See guidelines in Section 3 – Water Supply Sources under Historical Background.)

- **Recycled Water Market Survey (started in June 2005, to be completed by July 2006)** – This study was undertaken to update the Recycled Water Master Plan completed in 1992. The market survey will refresh the list of potential customers of recycled water and update the cost estimate for the project. Partners for the project will also be sought because the use of recycled water has a regional benefit.

The completion of the studies listed above required the cooperation of all divisions within the City's Utilities department and of several other departments within the City. Data and information from these reports was used in this document.

Interagency Coordination

The City is an active member of the California water community including the following:

- The City is a very active member of the Bay Area Water Supply and Conservation Agency (BAWSCA). The BAWSCA members, including the City, receive water from the City and County of San Francisco through a contract that is administered by the San Francisco Public Utilities Commission (SFPUC).
- The City is represented on the Santa Clara Valley Water District (SCVWD) Commission and the SCVWD Water Retailers Group.
- The City has actively participated through BAWSCA in the preparation of SFPUC's Program Environmental Impact Report for its Water System Improvement Program (WSIP).
- The City is a member of the Water Reuse Association.
- Through BAWSCA, the City is represented in the Bay Area Water Agencies Coalition (BAWAC), a group of the seven largest water agencies in the Bay Area. BAWAC was established to develop regional water planning objectives; coordinate projects and programs that would meet the regional objectives to improve water supply reliability and water quality; and document, coordinate and communicate existing and planned programs and activities being implemented in the Bay Area region in the areas of water use efficiency and water treatment.

- On September 12, 2005, Palo Alto's City Council authorized the mayor to sign the Letter or Mutual Understandings for coordination and development of an Integrated Regional Water Management Plan for the San Francisco Bay Area.
- Palo Alto's City Council adopted the Ahwahnee Principles for Resource Efficient Land Use on October 17, 2005. These principles were developed by the Local Government Commission, a nonprofit, nonpartisan organization working to create healthy, walkable, and resource-efficient communities.

The City is continually coordinating with neighboring communities and water agencies regarding water-planning activities.

The Water Supply Master Plan - One early example of interagency coordination and planning was the development of the Water Supply Master Plan (WSMP). From 1996 through 1999, the BAWSCA agencies and the SFPUC worked cooperatively to develop a WSMP. The WSMP is intended to address the future water supply needs of the 30 agencies and 2.3 million people who are served via the SFPUC water system. On April 25, 2000 the SFPUC formally adopted the WSMP including the implementation schedule for identified, selected projects.

Water Integrated Resource Plan (WIRP) - The City has evaluated all its water supply alternatives in an effort to determine what long-term direction the City should take for water resource planning. In 2000, an early document describing in detail all the alternatives was distributed to the members of the BAWSCA Water Resources Committee. Besides BAWSCA, the agencies that have received this document include: the City of Mountain View, Alameda County Water District, Stanford University, the City of San Jose, California Water Company, the City of Redwood City, the City of Daly City, the Purissima Hills Water District, the City of Santa Clara, the City of Milpitas and the City of Sunnyvale. In addition, the City continuously interacts with the 27 other BAWSCA agencies in the development of water efficiency programs to be implemented regionally, as well as the regional evaluation of water supply alternatives.

Integrated Regional Water Management Plan – A member of the Palo Alto's City Council sits on the Association of Bay Area Governments (ABAG) CalFed Task Force. ABAG is also the convener of a broader-based group of stakeholders that have been drawn into the planning process, the Bay Area Water Forum. This group has embarked on a major effort to develop an Integrated Regional Water Management Plan (IRWMP) for the Bay Area. The Bay Area IRWMP is intended to facilitate regional cooperation on issues of water supply, quality and reliability, water recycling and conservation, stormwater and flood water management, wetlands and habitat restoration and creation, and recreation and access.

The City is involved in the development of the Bay Area IRWMP on the water supply and reliability areas through BAWSCA's representation in BAWAC. In addition, on September 12, 2005 Palo Alto's City Council signed the Letter of Mutual Understandings for Coordination and Development of an Integrated Regional Water Management Plan for the San Francisco Bay Area.

The City coordinated the 2005 update of the Urban Water Management Plan actively with the following agencies:

Table 1: Coordination with Appropriate Agencies								
AGENCIES	Participated in Plan development	Sent notice of Plan preparation	Commented on the draft	Attended public meetings	Contacted for assistance	Received copy of draft	Sent notice of public hearing	Not involved / No information
SFPUC	X	X			X		X	
BAWSCA	X	X			X		X	
SCVWD		X			X		X	
City of East Palo Alto		X					X	
City of Mountain View		X					X	
City of Menlo Park		X					X	
Purissima Hills		X					X	
City of Redwood City		X					X	
Stanford University							X	
All other BAWSCA agencies							X	
County of Santa Clara							X	

Section 2 – Service Area

Law

> 10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:
>
> 10631. (a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

Demographics

Palo Alto is located in northern Santa Clara County approximately 35 miles south of the city of San Francisco. The City's population in 2004 was approximately 60,000[1]. The City is roughly 26 square miles in area and is a part of the San Francisco Bay metropolitan area. The City is one of the area's most desirable residential communities with approximately 27,000[2] housing units. The City's desirability is partly due to the excellent public schools, comprehensive municipal services, shopping, restaurants and the community's aesthetics.

The City is considered the birthplace of the high technology industry and the Silicon Valley. Located directly adjacent to the City is Stanford University which attracts major corporations from around the world. The City's 630-acre Stanford Research Park includes among its tenants such prestigious and innovative high-tech leaders as Hewlett-Packard, Lockheed, Varian, Roche, Tibco and Genencor. The City has 27.3 million square feet of commercial and industrial floor-space, 34 parks (comprising 170 acres and 3,731 acres of open space), tennis courts (52), community centers (4), theaters (3), swimming pools (1), nature centers (2), athletic center, golf course, cultural center, junior museum and zoo (Jun. 2004)[3].

Table 2 shows the population and employment projections for the City from 2005 to 2030 based on Association of Bay Area Governments (ABAG) December 2001 projections. This set of projections was used as input to the SFPUC's Water System Improvement Program (WSIP) Program Environmental Impact Report (PEIR)[4] and therefore, for consistency purposes, they are also used in this plan. According to these projections, total expected growth in population from 2005 to 2030 is about 10.7%. The City experienced a significant job loss due to the regional

[1] City of Palo Alto 2003-2004 Certified Annual Financial Report (CAFR).
[2] City of Palo Alto 2003-2004 Certified Annual Financial Report (CAFR).
[3] City of Palo Alto website "Palo Alto at a Glance".
[4] SFPUC Wholesale Customer Water Demand Projections (URS 2004).

economic slowdown in 2001. The job situation is expected to improve albeit at a modest rate. Total growth in employment from 2005 to 2030 is expected to be 7.1%.

Table 2: Population - Current and Projected[5]						
	2005	**2010**	**2015**	**2020**	**2025**	**2030**
Service Area Population	62,518	64,168	65,817	67,384	68,292	69,199
Five year - Percent increase		2.6%	2.6%	2.4%	1.3%	1.3%
Total Employment	106,668	108,450	110,308	111,475	112,849	114,224
Five year - Percent increase		1.7%	1.7%	1.1%	1.2%	1.2%

Climate Characteristics

The City enjoys a mild climate surrounded by the San Francisco Bay on the East, and Coastal mountains on the west. The monthly average temperature, rainfall and ETO (Evapotranspiration) for the area are presented in Table 3 below:

Table 3: Climate						
	Jan	Feb	Mar	Apr	May	June
Standard Monthly Average ETO[6]	1.35	1.87	3.45	5.03	5.93	6.71
Average Rainfall (inches)[7]	3.23	2.88	2.22	0.99	0.37	0.08
Average Temperature (Fahrenheit)[8]	48.0	51.3	53.6	56.6	60.7	65.0

Table 3: Climate (continued)						
	July	Aug	Sept	Oct	Nov	Dec
Standard Monthly Average ETO[6]	7.11	6.29	4.84	3.61	1.80	1.36
Average Rainfall (inches)[7]	0.02	0.05	0.18	0.71	1.83	2.72
Average Temperature (Fahrenheit)[8]	66.5	66.6	65.5	60.6	53.5	48.0

[5] ABAG's 2001 population and employment projections shown in this table were used in this plan and in the preparation of water consumption forecasts for the WSIP PEIR. The employment projections are from ABAG's 2001 projection of Palo Alto's sphere of influence modified for the service territory of the City of Palo Alto Utilities since ABAG's boundaries did not match that of the service area. However, the City's Planning Department has updated its population and employment forecasts according to ABAG's December 2004 projections. The difference between ABAG's 2001 and ABAG's 2004 projections is that growth is assumed to occur earlier in the 2001 projections (i.e., ABAG 2004 population projections for 2005 are 59,900, instead of 62,518) and the 2004 projections assume higher overall growth by 2030 (i.e., ABAG 2004 population projection for 2030 is 75,500 instead of 69,199.). In the mid-term, the two projections are very close (i.e., ABAG 2004 population projection for 2010 is 63,500 instead of 64,168). Note that the UWMP will be updated again in 2010, when new projections will be used. The impact on water supply needs by using one of these projections over the other is minor.

[6] Average ETO data for closest active station (San Jose) reported by CIMIS website http://wwwcimis.water.ca.gov/cimis/welcome.jsp

[7] Average rainfall data for Palo Alto reported by NOAA website http://www.wrcc.dri.edu/CLIMATEDATA.html

[8] Average temperature data for Palo Alto reported by NOAA website http://www.wrcc.dri.edu/CLIMATEDATA.html

Section 3 – Water Supply Sources

Law

> 10631. (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five year increments described in subdivision (a)…..

Historical Background

The water utility was established on May 9, 1896, two years after the City was incorporated. Local water companies were bought out at that time with a $40,000 bond approved by the voters of the 750-person community. These private water companies operated one or more shallow wells to serve the nearby residents. The city grew and the well system expanded until 9 wells were in operation in 1932.

In December 1937, the City signed a 20-year contract with the City and County of San Francisco (CCSF) administered by the San Francisco Water Department (SFWD) for water deliveries from the newly constructed pipeline bringing Hetch Hetchy water from Yosemite to the Bay Area. Water deliveries from the CCSF commenced in 1938 and well production declined to less than half of the total citywide water demand.

A 1950 engineering report noted, "the capricious alternation of well waters and the SFWD water...has made satisfactory service to the average consumer practically impossible." However, groundwater production increased in the 1950s leading to lower groundwater tables and water quality concerns. In 1962, a survey of water softening costs to City customers determined that the City should purchase 100% of its water supply needs from the SFWD. A 20-year contract was signed with San Francisco and the City's wells were placed in a standby condition. The SFWD later became known as the San Francisco Public Utilities Commission (SFPUC). Since 1962 (except for some very short periods) all the City's potable water has come from the SFPUC.

A group that coordinates many of the collective activities of the suburban customers of the CCSF is the Bay Area Water Supply and Conservation Agency (BAWSCA). BAWSCA comprises SFPUC's twenty-eight suburban customers. The City works through BAWSCA to manage the SFPUC contract and to interact with the SFPUC.

In 1993 the City completed a Water Integrated Resources Plan (IRP). This IRP was completed because the City was facing a decision regarding participation in a recycled water project. In the 1993 IRP, the City calculated the value of recycled water for water supply. At that time, the City decided not to participate in the recycled water project because the costs exceeded the benefits of the project.

In 1999, the City began to prepare a new Water Integrated Resources Plan (WIRP). As a first step, staff completed the Preliminary Assessment of Water Resource Alternatives, which provided a high level overview of each of the City's water resource options and helped identify the most promising alternatives to be further analyzed in subsequent phases. The second phase in the WIRP process was the development and evaluation of water supply portfolios so policy makers can determine the proper balance between cost, quality, reliability, and environmental factors. At the conclusion of the second phase of the WIRP in 2003, several pieces of missing information were identified that needed to be further developed in order to complete the WIRP.

The WIRP work has been coordinated with infrastructure work by the City to increase the distribution system reliability. Under a contract with the City, Carollo Engineers completed several studies of the water distribution system. These studies are discussed in Section 3 – Water Supply Sources under Groundwater.

The City, together with other Santa Clara County water retailers, coordinated with the Santa Clara Valley Water District (SCVWD) to examine extending the SCVWD's West Pipeline (WPL) that currently ends at Miramonte Road and Foothills Expressway to a point in Palo Alto to serve the City and other neighboring water agencies. In addition, the study examined creating an intertie between the WPL and the SFPUC's Bay Division Pipelines at Page Mill Road. The SCVWD's West Pipeline Conceptual Evaluation, completed in March 2003, concluded that the conceptual projects were constructible, but that no decisions could be made until additional studies the SCVWD is conducting are concluded. These ongoing studies include the SCVWD's project to evaluate its system reliability, its asset management program, and its Water Treatment Plant Master Plan Project. These studies, completed in the fall of 2004, concluded that extending the WPL to serve the City could not be justified from a county-wide reliability aspect when evaluated against more cost-effective alternatives.

The information obtained from the studies completed on the groundwater and SCVWD's conceptual study on the WPL Extension was used to characterize the supply options examined for the current WIRP.

In mid-2003, WIRP conclusions were prepared that addressed all that was known at the time. The conclusions were that supplies from the SFPUC are adequate in normal years, but additional supplies are needed in drought years to avoid shortages. Additionally, it was not recommended to seek supplies for use on a continuous basis unless there is another benefit that can be identified. Thus it was recommended not to connect to the SCVWD's treated water line for ongoing water needs or use the wells on a continuous basis. It was noted that expanded use of water efficiency programs and recycled water might be worthwhile for the environmental benefits and to reduce the drought-time deficit.

Based on the WIRP analysis, the City Council adopted a set of guidelines for the WIRP in December 2003. The WIRP guidelines include:

1. Preserve and enhance SFPUC supplies: With respect to the City's primary water supply source, the San Francisco Public Utilities Commission (SFPUC), continue to actively participate in the Bay Area Water Supply and Conservation Agency (BAWSCA) to assist

in achieving BAWSCA's stated goal: "A reliable supply of water, with high quality, and at a fair price."

2. Advocate for an interconnection between SFPUC and the SCVWD: Work with the Santa Clara Valley Water District and the SFPUC to pursue the extension of the SCVWD's West Pipeline to an interconnection with the SFPUC Bay Division Pipelines 3&4. Continue to re-evaluate the attractiveness of a connection to an extension of the SCVWD's West Pipeline.
3. Actively participate in development of cost-effective regional recycled water plans: Re-initiate discussions with the owners of the Palo Alto Regional Water Quality Control Plant (PARWQCP) on recycled water development. In concert with the PARWQCP owners, conduct a new feasibility study for recycled water development. Since the feasibility of a recycled water system depends upon sufficient end-user interest, determine how much water Stanford University and the Stanford Research Park would take.
4. Focus on water DSM programs to comply with BMPs: Continue implementation of water efficiency programs with the primary focus to achieve compliance with the Best Management Practices (BMPs) promoted by the California Urban Water Conservation Coalition.
5. Maintain emergency water conservation measures to be activated in case of droughts: Review, retain, and prioritize CPAU's emergency water conservation measures that would be put into place in a drought time emergency.
6. Retain groundwater supply options in case of changed future conditions: Using groundwater on a continuous basis does not appear to be attractive at this time due to the availability of adequate, high quality supplies from the SFPUC in normal years. However, SFPUC supplies are not adequate in drought years and circumstances could change in the future such that groundwater supplies could become an attractive, cost-effective option. Examples of changing circumstances could be that the amount of water available to CPAU from the SFPUC for the long-term is reduced. This could occur if regulations or legislation require additional water to be made available to the Tuolumne River fisheries. In addition, in the future, actual allocations or entitlements to SFPUC water may be developed. If those allocations are based on the dry-year yield of the system, allocations to all the users of the system, including CPAU, could be well below their current and projected future needs. CPAU should retain the option of using groundwater in amounts that would not result in land surface subsidence, saltwater intrusion, or migration of contaminated plumes.
7. Survey community to determine its preferences regarding the best water resource portfolio: Seek feedback from all classes of water customers on the question of whether to use groundwater during drought to improve drought year supply reliability. At the same time, seek feedback on the appropriate level of water treatment for groundwater if it were to be used in droughts. Survey all classes of water customers to determine their preferences as to the appropriate balance between cost, quality, reliability, and environmental impact.

Since the major conclusion reached in the WIRP was that SFPUC supplies are adequate except in drought years, the focus turned to the options to reduce the supply deficit during droughts. These options include using groundwater, connecting to the SCVWD's treated water pipeline,

developing recycled water; and expanding water efficiency programs. The idea of a WIRP is to find the proper balance between the key factors of cost, availability in a drought, water quality, and environmental impacts in determining the best portfolio for the community.

Following Council's adoption of the WIRP Guidelines and to gain insight into the question of whether to use groundwater as supplemental supply in droughts, the City surveyed its residential customers. Respondents were asked to rank three options for water supply in a drought:

A. Blend Groundwater – blend the groundwater with water from SFPUC in droughts. Water customers would still need to cut back water usage by 10% in droughts.
B. No Groundwater – use no groundwater during droughts. Instead, community is subjected to larger water usage cutbacks in droughts (20% cutback).
C. Treat Groundwater – highly treat the groundwater (reverse osmosis treatment) before introducing it into distribution system. Water customers would still need to cut back water usage by 10% in droughts.

Survey respondents generally preferred Options B (no groundwater) and C (treat groundwater), but Option A (blend groundwater) was not soundly rejected.

Based on the WIRP analysis completed and the results of the community survey, staff made the following conclusions and recommendations in June 2004:

1. Do not install advanced treatment systems for the groundwater at this time. This option is simply too expensive, both in capital and in operating costs.
2. Blending at an SFPUC turnout is the best way to use groundwater as a supplemental drought time supply while maintaining good water quality.
3. Staff should await the conclusion of the environmental review process for selecting any new emergency well sites before developing a recommendation on whether to use groundwater in droughts. In the selection process for new well sites, the costs for blending with SFPUC water in droughts should be considered. The least expensive location is a well at El Camino Park due to its proximity to an SFPUC turnout.
4. Actively participate in the development of long-term drought supply plans with SFPUC and BAWSCA.
5. Continue in the efforts identified in the Council-approved WIRP Guidelines:
    a. Evaluate a range of demand-side management (DSM) options for their ability to reduce long-term water demands;
    b. Evaluate feasibility of expanding the use of recycled water; and
    c. Maintain emergency water conservation measures to be activated in case of droughts.

At this time, no decision has been made regarding whether or not to use groundwater as a supplemental supply in droughts. A final analysis awaits the conclusion of the Environmental Impact Report (EIR) being completed for the projects to improve the distribution system reliability recommended in the 1999 Study (rehabilitation of the existing wells, siting new wells and reservoir facilities). When the EIR is complete, the cost to treat groundwater for use in drought-time can be evaluated. The EIR is expected to be completed in late 2006.

Table 4 below shows the current and planned water supply sources for the City.

Table 4: Current and Planned Water Supplies - AF/Y						
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
SFPUC[9]	14,826	14,644	14,557	14,587	14,572	14,606
Local Groundwater	0	0	0	0	0	0
Local Surface Water	0	0	0	0	0	0
Recycled Water	850	850	850	850	850	850
Transfers in or out	0	0	0	0	0	0
Exchanges in or out	0	0	0	0	0	0
Desalination	0	0	0	0	0	0
Other Sources	0	0	0	0	0	0
Total	15,676	15,494	15,407	15,437	15,422	15,456

Water Supply - SFPUC

The City receives most of its water supply from the City and County of San Francisco's regional system, operated by the San Francisco Public Utilities Commission (SFPUC). This supply is predominantly from the Sierra Nevada, delivered through the Hetch Hetchy aqueducts, but also includes treated water produced by the SFPUC from its local watersheds and facilities in Alameda and San Mateo Counties.

The amount of imported water available to the SFPUC's retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, the SFPUC is very dependent on reservoir storage to firm up its water supplies.

The SFPUC serves its retail and wholesale water demands with an integrated operation of local Bay Area water production and imported water from Hetch Hetchy. In practice, the local watershed facilities are operated to capture local runoff.

Water System Improvement Program (WSIP)

In order to enhance the ability of the SFPUC water supply system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply, the SFPUC is undertaking a Water System Improvement Program (WSIP). The WSIP will deliver capital improvements aimed at enhancing the SFPUC's ability to meet its water service mission of providing high quality water to its customers in a reliable, affordable and environmentally sustainable manner.

[9] Based on the End Use Model forecast.

The origins of the WSIP are rooted in the "Water Supply Master Plan" (April 2000). Planning efforts for the WSIP gained momentum in 2002 with the passage of San Francisco ballot measures Propositions A and E, which approved the financing for the water system improvements. Also in 2002, Governor Davis approved Assembly Bill No. 1823, the Wholesale Regional Water System Security and Reliability Act. Among other things, this act requires SFPUC to complete certain WSIP projects in a timely manner to reduce the risk to public health and safety. The WSIP is expected to be completed in 2016.

Program Environmental Impact Report (PEIR)

A Program Environmental Impact Report (PEIR) is being prepared under the California Environmental Quality Act (CEQA) for the Water System Improvement Program. A PEIR is a special kind of Environmental Impact Report under CEQA that is prepared for an agency program or series of actions that can be characterized as one large project. PEIRs generally analyze broad environmental effects of a program with the acknowledgment that site-specific environmental review may be required at a later date.

Projects included in the WSIP will undergo individual project specific environmental review as required. Under CEQA, project specific environmental review would result in preparation of a Categorical Exemption, Negative Declaration or Environmental Impact Report. Each project will also be reviewed for compliance with the National Environmental Policy Act and local, state and federal permitting requirements as necessary.

Water Master Contract & Implications For Long Term Supply

The business relationship between San Francisco and its wholesale customers is largely defined by the "Settlement Agreement and Master Water Sales Contract (Master Contract)" executed in 1984. The Master Contract primarily addresses the rate-making methodology used by the City in setting wholesale water rates for its wholesale customers in addition to addressing water supply and water shortages for the regional water system. The contract expires on June 30, 2009.

In terms of water supply, the Master Contract provides for a 184 million gallon per day (MGD, expressed on an annual average basis) "Supply Assurance" to the SFPUC's wholesale customers subject to reduction in the event of drought, water shortage, earthquake, other acts of nature, or rehabilitation and maintenance of the system. The Master Contract does not guarantee that San Francisco will meet peak daily or hourly wholesale customer demand when its annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to the allocation of the 184 MGD Supply Assurance among themselves, with each entity's share of the Supply Assurance set forth on a schedule adopted in 1993. This Supply Assurance survives the termination of the Master Contract in 2009.

The SFPUC can meet the water demands of its retail and wholesale customers in wet and normal years. The Master Contract allows the SFPUC to reduce water deliveries during droughts, emergencies, and for scheduled maintenance activities. The Interim Water Shortage Allocation

Plan (IWSAP) between the SFPUC and its wholesale customers adopted in 2000 provides that the SFPUC determines the available water supply in drought years for shortages of up to 20% on an average, system-wide basis. This plan is discussed in more detail in Section 8 –Water Shortage Contingency Plan.

BAWSCA And Its Role

The Bay Area Water Supply and Conservation Agency (BAWSCA) was created on May 27, 2003 to represent the interests of 26 cities and water districts, and two private utilities, in Alameda, Santa Clara and San Mateo counties that purchase water on a wholesale basis from the San Francisco Regional Water System.

BAWSCA is the only entity having the authority to directly represent the needs of the cities, water districts and private utilities (wholesale customers) that depend on the regional water system. BAWSCA provides the ability for the customers of the regional system to work with San Francisco on an equal basis to ensure the water system gets fixed, and to collectively and efficiently meet local responsibilities.

BAWSCA has the authority to coordinate water conservation, supply and recycling activities for its agencies; acquire water and make it available to other agencies on a wholesale basis; finance projects, including improvements to the regional water system; and build facilities jointly with other local public agencies or on its own to carry out the agency's purposes.

Compliance with the Urban Water Management Planning Act lies with each agency that delivers water to its customers. In this instance the responsibility for completing an UWMP lies with the individual BAWSCA member agencies. BAWSCA's role in the development of the 2005 UWMP updates is to work closely with its member agencies and the SFPUC to maintain consistency between the multiple documents being developed and to ensure overall consistency with the WSIP and the associated environmental documents.

Groundwater

The City's existing water well system consists of five wells (Hale, Rinconada, Peers Park, Fernando, and Matadero) with a combined total rated capacity of 4,300 gpm. Of these five wells, Fernando and Matadero are non-operational, reducing the current rated capacity to 3,575 gpm.[10] These wells were constructed in the mid-1950s and were operated continuously until 1962. In 1988, the wells were operated to provide supplemental supplies as SFPUC implemented mandatory rationing. Two of the wells were operated for about a month and a half in 1991 when it appeared that the City was facing a severe (45%) cutback requirement. At present, the wells are not in good repair. Major repair and upgrades have been identified if the wells are to be counted on either for emergency use or for supplemental drought supply.

[10] Water Wells, Regional Storage, and Distribution System Study, 1999, page 6-1.

Recent Analysis

During the past six years, the City has completed significant analysis of the city-owned wells and local distribution system. This analysis included several studies conducted by Carollo Engineers. The first study was completed in December 1999 and produced a report "Water Wells, Regional Storage, and Distribution Systems Study" (1999 Study). The 1999 Study recommended a list of capital projects to improve the system's ability to meet water demands during a temporary shutoff of water from the regional water system operated by the SFPUC. The recommended improvements related to addressing the City's emergency water supply deficiency included rehabilitating the five existing wells, constructing a new storage reservoir, and drilling up to three new wells.

To examine the issues and costs of using the newly rehabilitated or drilled wells as active sources of supply, the City again engaged Carollo Engineers to complete another study. The study report, finalized in May 2000, was entitled "Long-term Water Supply Study" (2000 Study). The 2000 Study examined in greater detail the realities associated with using the wells as active sources of supply. Specifically, the 2000 Study analyzed potential water treatment technologies to address the water quality issues of the City's groundwater and also evaluated each existing and potential new well site to determine whether treatment facilities could be sited there. The study concluded that certain of the wells are better than others for siting treatment facilities due to available space, well water quality, and well production capability.

The 2000 Study also evaluated optional supplies as to their ability to meet future supply needs as well as whether any of these supplies could obviate any of the capital projects recommended in the 1999 Study. The alternatives examined in the 2000 Study included: 1) using the wells for active supply either on a long-term basis or during droughts; 2) using groundwater for irrigation; and 3) connecting to the Santa Clara Valley Water District (SCVWD) treated water pipeline. The study concluded that the improvements recommended in the 1999 Study were superior to the alternatives studied on the basis of cost or the ability to meet the established emergency criteria.

Carollo Engineers completed the "Alternative Emergency Water supply Options Study" (2001 Study) to provide a high-level analysis of the various water supply options under different emergency supply options under different emergency scenarios. The conclusions of the 2001 Study were that the capital projects recommended in the 1999 Study were the best solution and that the wells could assist in shortages such as a multi-year drought and 30-60 day outages as well as the 8-hour outage they were designed to handle.

In 2002, the City again engaged Carollo Engineers to conduct a Groundwater Supply Feasibility Study to "evaluate whether operating one or two of the City's water wells as active supplies would cause significant decrease in groundwater levels or deterioration in groundwater quality." The study, completed in April 2003, concluded that producing 500 acre-feet/year (AF/Y) of water from the wells on a continuous basis or 1,500 AF/Y on an intermittent basis, such as during a drought year, would not result in subsidence, saltwater intrusion, or migration of contaminated plumes. One well producing 1,000 gallons per minute (gpm) would provide 1,500 AF/Y. Thus, only one or two wells would need to be operated to provide the water quantities

identified, if the City Council decided to operate the wells during droughts or on a continuous basis.

The results of these four studies provide a significant amount of information regarding the costs and operational issues of wells for emergency use, drought-only supply and full-time operation.

As recommended in the 1999 Study, it is assumed that the City's existing wells will be upgraded to improve their reliability and capacity. The water from these wells, however, exceeds secondary (aesthetic) drinking water standards for iron and manganese. In addition, the water from Hale and Rinconada wells exceeds the secondary standard for total dissolved solids (TDS). The water quality from the City's wells is adequate for emergency service and the wells are currently listed with the Department of Health Services (DHS) as 'standby' supply sources. As such, the wells may only be used for a maximum of five consecutive days, and no more than 15 days in a year (California Code of Regulations, Title 22, Section 64414).[11] If the wells were to be used for long-term supply, then treatment is required to reduce the levels of iron, manganese and TDS.[12]

Well Water Treatment Options

A variety of blending and treatment alternatives were evaluated in the 2000 Study. These alternatives differ from the standpoints of finished water quality, production capacity, capital cost, operations cost, and piping and equipment installed. The four well water treatment alternatives identified in the 2000 Study are[13]:

Option 1: Blend well water with SFPUC water to meet the regulatory limits for iron, manganese and TDS. The blended water will meet DHS standards but will have TDS levels two to three times the current level in the distribution system.

Option 2: Provide iron and manganese treatment at each well site. The water will meet the DHS standard, except the TDS at some of the wells will exceed the 500 mg/L standard. The TDS levels in the distribution system near the wells will be five to seven times the current levels in the overall distribution system.

Option 3: Provide iron and manganese treatment at each well site and blend with SFPUC water to reduce the well water TDS level. The blended water will meet DHS standards with a TDS level comparable to the current maximum level in the distribution system (120 mg/L) assuming that the

[11] Long Term Water Supply Study, 2000, page 2. This 'standby' listing would remain even if the existing wells are rehabilitated.
[12] Secondary water quality standards can be exceeded for longer periods of time if customers are notified. The notification option would avoid the need for treatment. Staff is not considering the notification option.
[13] The indented text is extracted from the Long Term Water Supply Study, 2000, page 7.

water received from the SFPUC is at the average level reported for 1999 (69 mg/L).

Option 4: Provide iron, manganese and TDS treatment at each well site. The treated well water quality will be comparable to the current SFPUC water quality.

These four treatment options result in different capital costs, volumes of treated water, cost for delivered water, and water quality. Table 5 provides a summary of the features for the five existing wells.

Table 5: Treatment Options for Existing Wells[14]

Existing Wells	Treatment Option			
	1	2	3	4
Capital Cost (Total for five wells)	$6.0 million	$6.0 million	$6.6 million	$26.0 million
Average Water Cost (Continuous Operation)	$434/AF	$395/AF	$647/AF	$713/AF
Well Production (AF/Y)	6,300	12,800	2,500	12,800
Average Water Cost (Drought-Only Operation)	$1,100/AF	$840/AF	$3,000/AF	$2,400/AF
Water Quality Parameters (1)				
TDS	130 - 300	440 - 700	120	120
Iron	0.08 – 0.3	< 0.30	0.05 – 0.06	< 0.30
Manganese	0.04 – 0.05	< 0.05	< 0.01	< 0.05

Transfer or Exchange Opportunities

Law

> 10631 (d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

Because the existing San Francisco regional water system does not have sufficient supplies in dry years, dry-year water transfers are an important part of future water supplies. The City has undertaken three activities to support transfers:

1) From 1996 to 2000, the City participated in the SFPUC-BAWSCA Water Supply Master Plan (WSMP) which identified dry-year purchases as an important part of the future water supply. The discussion in the WSMP includes purchasing additional Tuolumne River water and water from willing sellers located geographically south of the Delta who possess water rights or contractual entitlements to water diverted from the Delta. In addition, the WSMP

[14] Preliminary Assessment of Water Resource Alternatives, July 2000, Table 1

identifies potential opportunities of water purchases from willing sellers upstream of the Delta along the Sacramento, Feather, Yuba, American, San Joaquin Rivers and their tributaries.[15] The WSMP was formally adopted by the SFPUC and implementation of the WSMP (including investigating dry-year transfers) is ongoing.

2) The City adopted the Interim Water Shortage Allocation Plan (IWSAP). This plan includes the ability to transfer water allocated to the BAWSCA agencies between BAWSCA members during drought periods.

3) The City is monitoring the development of a water transfer market in California. The City supports SFPUC's efforts to pursue cost-effective dry-year water transfers as part of the overall water supply for the SFPUC system. BAWSCA has the ability to pursue water transfers on its own as long as a wheeling arrangement can be negotiated with SFPUC.

Water Recycling

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> 10633 (a) A description of the wastewater collection and treatment systems in the supplier's service area…

The source of the recycled water within the City is the Palo Alto Regional Water Quality Control Plant (PARWQCP) of which the City is the operator and a part owner.

In 1992, the City and the other PARWQCP owners completed a Water Reclamation Master Plan (Master Plan). This Master Plan identified a five-year, three-stage implementation for recycled water development in the service area of the PARWQCP. However, in 1995 the PARWQCP owners decided not to pursue any of the expansion stages of a water recycling system as the costs of such a project were not justified by the apparent benefits at the time.

Participation in Regional Recycled Water Planning

The City has participated in various regional recycled water planning initiatives:

- The City completed the Water Reclamation Master Plan (1992) for the service territory of the Palo Alto Regional Water Quality Control Plant, which includes the communities of East Palo Alto, Los Altos, Los Altos Hills, Mountain View, Palo Alto, and Stanford University.

[15] Draft SFPUC 2005 UWMP 100507, Section 5, Page 34

- The City is a stakeholder in the ABAG-led effort to secure grant funding for a Bay Area Integrated Regional Water Management Plan (IRWMP) and for projects identified in that IRWMP. In September, the mayor signed the Letter of Mutual Understandings for Coordination and Development of an IRWMP for the San Francisco Bay Area.

- The City of Palo Alto Utilities and the partners of the PARWQCP have committed to assist in the funding of a project to build a new recycled water pipeline from the plant to Mountain View. This project will not have new connections to end uses in the City, but the pipeline is sized to accommodate future expansion of recycled water use in the City. The project is currently in the design phase.

- The City is a member of the California WateReuse Association, which helps promote and implement water recycling in California.

Wastewater Collection and Treatment in Palo Alto

The City's wastewater flows to the PARWQCP, which is classified as an advanced treatment facility that provides tertiary treatment of wastewater in addition to primary and secondary treatment. Through these treatments, 99% of ammonia, organic and solid pollutants are removed. While the plant was not designed to remove metals, the treatment process through optimization has reduced the quantity of mercury, silver, and lead by 90%. The removal rates for other heavy metals range from 20 to 85%.

The plant's discharge meets very high standards that are among the most stringent discharge standards in the nation. The quality of water leaving the plant is approaching the standards for drinking water. In fact, the heavy metal content in the plant's discharge is significantly lower than Safe Drinking Water Act standards, hence appropriate for reuse with one additional disinfection step. The recycled water produced from the plant effluent is in full compliance with Title 22 of the California Administrative Code requirements for "Non-Potable Unrestricted Use."

Wastewater Treatment Processes

The PARWQCP is an EPA award winning Class V tertiary treatment facility featuring primary sedimentation, fixed film reactors, conventional activated sludge, dual media filters, disinfection, water reclamation, incineration, and bio-solids reuse. Table 6 provides some data on the PARWQCP. A full description of the treatment facility is included in the 1992 Water Reclamation Master Plan and is not reproduced here.

Table 6: Wastewater Treatment					
Treatment Plant Name	**Location (City)**	**Average Daily (2005)**	**Maximum Daily (2000)**	**Year of Planned Build-out**	**Planned Maximum Daily Volume**
PARWQCP	City of Palo Alto	24 MGD	47.3 MGD	Plant built out	80 MGD = Maximum Design Daily Flow 39 MGD = Average Design Daily Flow (Dry weather capacity)

Wastewater Generation, Collection & Treatment

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> 10633 (a) A […] quantification of the amount of wastewater collected and treated…

Palo Alto Regional Water Quality Control Plant (PARWQCP)

The PARWQCP has a treatment capacity of up to 39 million gallons per day (MGD). Current flows are approximately 25 MGD. The plant capacity is sufficient for current loads and for future load projections. There are no plans for expansion or to "build-out" the plant.

All of the wastewater treated at the PARWQCP can be recycled. The plant already has some capability to produce recycled water that meets the Title 22 unrestricted use standard (approximately 4 MGD of capacity of which 2 MGD, or 2240 AF/Y, is presently operating). The remaining treated wastewater meets the restricted use standard and can also be recycled.

Table 7: Wastewater Collected and Treated - MGD							
	2000	2005	2010	2015	2020	2025	2030
Wastewater Collected and Treated	27	24	28	29	30	30	30
Quantity that meets recycled water "restricted use" standard	25	22	24	24	24	23	22
Quantity that meets recycled water "unrestricted use" (Title 22) standard	2	2	4	5	6	7	8

Wastewater Disposal and Recycled Water Uses

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> 10633 (a) A description of the […] methods of wastewater disposal.
>
> 10633 (b) A description of the recycled water currently being used in the supplier's service area, including but not limited to, the type, place and quantity of use.
>
> 10633 (c) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.
>
> 10633 (d) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years.

Disposal of Wastewater

Table 8: Disposal of Wastewater (non-recycled) - MGD

Method of Disposal	Treatment Level	2005	2010	2015	2020	2025	2030
Discharge to San Francisco Bay	Tertiary (restricted use standard)	23.8	20.8	24.8	26.8	26.8	26.8
Discharge to Bay after going through Emily Renzel Marsh	Tertiary (restricted use standard)	1.2	1.2	1.2	1.2	1.2	1.2
Total		25	22	26	28	28	28

Recycled Water Currently Being Used

The existing water recycling capacity at the PARWQCP is being used for the following:

- Irrigation water for Greer Park in Palo Alto (76 AF/Y[16])
- Irrigation water for the Palo Alto Municipal Golf Course (187 AF/Y [17])
- Various uses at the Palo Alto Municipal Service Center, including use in street sweepers, dust control at construction sites, vehicle washing, and for irrigating road median strips

[16] Greer park usage from metered data for calendar year 2004.
[17] Golf Course usage from metered data for calendar year 2004.

- Irrigation water to Shoreline Park in Mountain View. Shoreline has not used recycled water for several years due to the deteriorated condition of the distribution pipeline, but used to use as much as 1/4 million gallons per day, or 280 AF/Y. A new pipeline to serve this and other Mountain View end uses is planned to be built within the next two years.
- Water for enhancements at the Emily Renzel Marsh in Palo Alto. The PARWQCP pumps from 1.0 to 1.5 MGD of water into the 14-acre freshwater marsh. This water does not get the full, recycled water treatment, just the standard tertiary treatment from the plant (restricted use standard). The recycled water used in the marsh enhancement project does not replace potable water (average of 1.2 MGD, or 1,344 AF/Y).
- Water for the Duck Pond in Palo Alto (24 AF/Y[18])
- Water for irrigation in and around the PARWQCP and in processes at the plant itself. The amount of recycled water that replaces potable water for this use is about 0.5 MGD, or 560 AF/Y. That usage can be broken down as about 0.2 MGD for landscape irrigation and about 0.3 MGD for mechanical seals and cooling water for the oil cooler on the blowers. An additional 1 MGD (1,120 AF/Y) of recycled water is used at the PARWQCP as stack scrubber water, however this use does not replace potable water.
- Water that can be collected by trucks at the plant to be used for dust control at construction projects, for irrigation, and in street sweepers. The quantities of this use vary, but can be up to 5,000 gallons per day.
- Irrigation water for CALTRANS, which may use up to 50,000 gallons per day in the summer for irrigating (by truck) the median strips on local highways

Table 9: Actual Recycled Water Uses in Palo Alto in 2004

Type of Use	Treatment Level	2004 Use (AF)
Agriculture	Tertiary treatment plus additional disinfection (Title 22 unrestricted use standard)	0
Landscape		487
Industrial		336
Groundwater Recharge		0
Palo Alto Duck Pond		24
Trucked uses for dust control and/or landscape irrigation		3
Total		850
Wildlife Habitat/Wetlands Enhancement (Emily Renzel Marsh)	Tertiary treatment (restricted use standard)	1,344
Industrial		1,120
Total		2,464
Grand Total		3,314

Projected Recycled Water Uses

The City is conducting a Recycled Water Market Survey to determine the potential for recycled water use in the City and the cost to implement an expanded recycled water delivery system.

[18] Duck Pond usage from metered data for calendar year 2004.

The study is expected to be completed by June 2006. Upon completion of that study, a recommendation to expand the use of recycled water in the future will be developed. Therefore the projected recycled water uses are equal to the current actual uses shown in Table 9 above.

Potential Uses of Recycled Water

A large number of potential recycled water uses were identified in the 1992 Water Reclamation Master Plan. This Master Plan recommended a five-year, three-stage implementation (see Table 10 below) for recycled water development in the service area of the PARWQCP. The primary use of the recycled water identified in the Master Plan is for landscape irrigation. In 1995 the PARWQCP owners decided not to pursue any of the recommended expansion stages of a water recycling system at that time. The biggest factor to overcome at that time was the cost to expand the use of recycled water within the PARWQCP service territory, including in the City.

Table 10: 1992 Water Reclamation Master Plan - Proposed Stages

Project Stage[19]	AF/Y in PARWQCP service area	Cumulative Capital Cost	O&M cost	Cumulative Annual Cost (Capital & O&M)	Average Cost $/AF
A	634	$8.0 million	$50/AF	$ 847,000	$1,336
B	1,779	$22.6 million	$50/AF	$ 2,389,000	$1,343
C	2,977	$30.0 million	$50/AF	$ 3,209,000	$1,078

The three stages of the 1993 Master Plan identified 63 "target" reuse sites representing about 4,000 AF/Y for the entire region of the PARWQCP. Of these sites, 3,400 AF/Y was found to be economical enough to make the final cut and be included into the staged implementation plan. This estimate included both existing and planned recycling projects within the City. Of the 3,400 AF identified, 1,724 AF/Y were located in the City and represented approximately 1,300 AF/Y when the completed and previously planned projects were excluded (e.g. Greer Park, the Palo Alto Municipal Golf Course and the Municipal Service Center).

Table 10 above shows the recycled water use for the entire PARWQCP service area. For end uses in Palo Alto, the totals for the 1992 Master Plan project stages are as follows:

- Project A – 134 AF/Y
- Project B – 1,279 AF/Y
- Project C – 1,279 AF/Y

[19] The numbers in Table 10 are all in 1992 dollars and assume that Stanford uses 500 AF/yr and excludes Greer Park, the Palo Alto Municipal Golf Course and the Municipal Service Center (since these three facilities were already using recycled water or under construction to use recycled water)

Based on the 1992 Master Plan, the potential uses in Palo Alto of recycled water are shown in Table 11 below. However, as explained below (see discussion of Recycled Water Market Survey), the City is currently updating the feasibility and cost of expanding recycled water use in the City. Since new information is not yet available from that study, the potential for future use of recycled water shown in Table 11 includes the existing uses (as of 2004) and the potential for future uses as estimated in the 1992 Master Plan. The table shows current use continuing for 2010 and the potential for expansion is shown in the totals for 2015 and beyond.

Table 11: Potential Future Use of Recycled Water - Potential AF/Y

Type of Use	Treatment Level	2010	2015	2020	2025	2030
Agriculture	Tertiary treatment plus additional disinfection (Title 22 unrestricted use standard)	0	0	0	0	0
Landscape		487	1766	1766	1766	1766
Industrial		336	336	336	336	336
Groundwater Recharge		0	0	0	0	0
Palo Alto Duck Pond		24	24	24	24	24
Trucked uses for dust control and/or landscape irrigation		3	3	3	3	3
Total		850	2,129	2,129	2,129	2,129
Wildlife Habitat/Wetlands Enhancement (Emily Renzel Marsh)	Tertiary treatment (restricted use standard)	1,344	1,344	1,344	1,344	1,344
Industrial		1,120	1,120	1,120	1,120	1,120
Total		2,464	2,464	2,464	2,464	2,464
Grand Total		3,314	4,593	4,593	4,593	4,593

Recycled Water Policy

In 1995 Palo Alto's City Council certified the final Program Environmental Impact Report (Program EIR) for the Master Plan projects. At the same time, the City decided not to pursue any of the recommended expansion stages of a water recycling system as the cost of the projects could not be justified. In addition, Council adopted a Water Recycling Policy, which includes continuation of the existing recycled water program and monitoring of the conditions that would trigger the future evaluation of the projects studied in the Program EIR. The policy described five conditions that would trigger future evaluation to implement the Master Plan projects:

1. Changes in the PARWQCP discharge requirements;
2. Increased mass loading to the PARWQCP;
3. Requests from partner agencies or other local agencies;
4. Availability of federal or other funds; and
5. Water supply issues – issues which may lead to an increase in the value of recycled water from a water supply perspective include:
    a. Water supply availability shortages;
    b. Regulatory or legislative initiative; or
    c. Advanced treatment for potable reuse.

Recycled Water Market Survey

Since the Council adopted the Water Recycling Policy, several things have occurred that prompt a review of the feasibility of recycled water use in the City:

1. The SFPUC has adopted the Water System Improvement Program (WSIP) that is intended to repair and improve the regional water system's infrastructure. This program is expected to cost over $4 billion requiring the wholesale water rates to triple from the current (FY 2005-06) rates of $444/AF to over $1300/AF in FY 2014-15. At these prices, recycled water appears to be much more competitive on a cost basis alone.
2. The PARWQCP completed a facilities plan and pre-design for a project to replace an existing deteriorating pipeline to Shoreline Golf Course in Mountain View and to extend the pipeline to the Mountain View-Moffett area. The pipeline replacement, when completed, will restore the golf course connection and will provide recycled water services to the Shoreline community. Construction of this pipeline is anticipated to occur in 2006. CPAU has committed to pay $1 million of the cost for this pipeline to ensure the pipeline will be sized to meet possible future needs in the City. In addition, CPAU has committed to pay another $1 million if and when it taps into the new pipeline.
3. There are potential partners for expanding the use of recycled water in the City. Since there is a regional benefit to maximizing local sources, neighboring communities and the Bay Area at large may wish to participate financially in an expansion of recycled water use in the City, especially if there are no feasible sites in their own communities.

Since enough has changed and because it has been over 13 years since the 1992 Water Reclamation Master Plan was complete, the City engaged a consultant to complete a Recycled Water Market Survey (Market Survey). The project objectives are to update the Master Plan's market survey and project cost estimates for expanding the recycled water infrastructure in the City. The Market Survey will review the list of potential recycled water users identified in the Master Plan and identify any new users and review and update the potential for recycled water use by the potential users. Assuming that the Mountain View-Moffett pipeline extension will be constructed, the Market Survey will also update the cost estimates contained in the Master Plan for delivery of recycled water to the City customers.

The Recycled Water Market Survey began in July 2005 and is expected to be completed by June 2006. After its completion, a recommendation will be developed on how to proceed with the expansion of recycled water use in the City.

Encouraging Recycled Water Use

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> 10633 (e) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

The City is encouraging Recycled Water usage in the following ways:

- Participating in the Integrated Regional Water Management Plan process
- Encouraging businesses and City departments to utilize the existing recycled water capability within the City
- Participating as an active member of the WateReuse Association, including hosting meetings of the Northern California Chapter of the Association
- Embarking on a Recycled Water Market Survey to update the feasibility of expanding recycled water use in the City
- Offering recycled water for free to users willing to pick it up at the PARWQCP by truck

Proposed Actions to Encourage Use of Recycled Water

There are a number of options available to the City to encourage customers to convert to recycled water. Several of these options are more fully described in the 1992 Water Reclamation Master Plan. In addition, the City Council adopted the Ahwahnee Water Principles for Resource Efficient Land Use on October 17, 2005. One of those principles is that new construction should be plumbed with purple pipe to facilitate the use of non-potable water for outdoor irrigation, toilet flushing, and commercial and industrial processes in anticipation of the future availability of recycled water. Staff plans to recommend the City Council adopt ordinances to implement that principle so that large, new developments will be prepared to use recycled water if and when the recycled water distribution is extended to serve it.

Depending upon the updated evaluation of expanding recycled water use (projected to be completed by June 2006), the City may implement financial incentives and other mechanisms to encourage use of recycled water such as requiring its use for certain applications if recycled water is available.

Recycled Water Optimization Plan

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban

> water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> 10633 (f) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems and to promote recirculating uses.

The City continues to examine methods to expand the use of recycled water. The Recycled Water Market Survey is a step in that direction as it updates the 1992 Master Plan. The City expects that the costs of implementing expanded recycled water use can be reduced through a combination of regional coordination and state and federal matching funds.

After the conclusion of the Recycled Water Market Survey, the City will further analyze recycled water as part of its ongoing Water Integrated Resource Plan (WIRP).

Desalinated Water

The City has no plans for development of desalinated water. If found to be feasible on a regional basis, the City may participate in the development of a desalination plant.

Section 4 – Water Demand

Law

> 10631 (e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:
>
> (A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; and (I) Agricultural.
>
> (2) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.

Historical Water Usage

The two drought periods since 1975 have had a profound effect on City and customer attitudes as well as how water is used. Substantial capital investments were made in 1977 toward more water-efficient equipment in the commercial and industrial sectors. New construction in every sector is subject to increasingly stringent regulations regarding water-consuming appliances and fixtures.

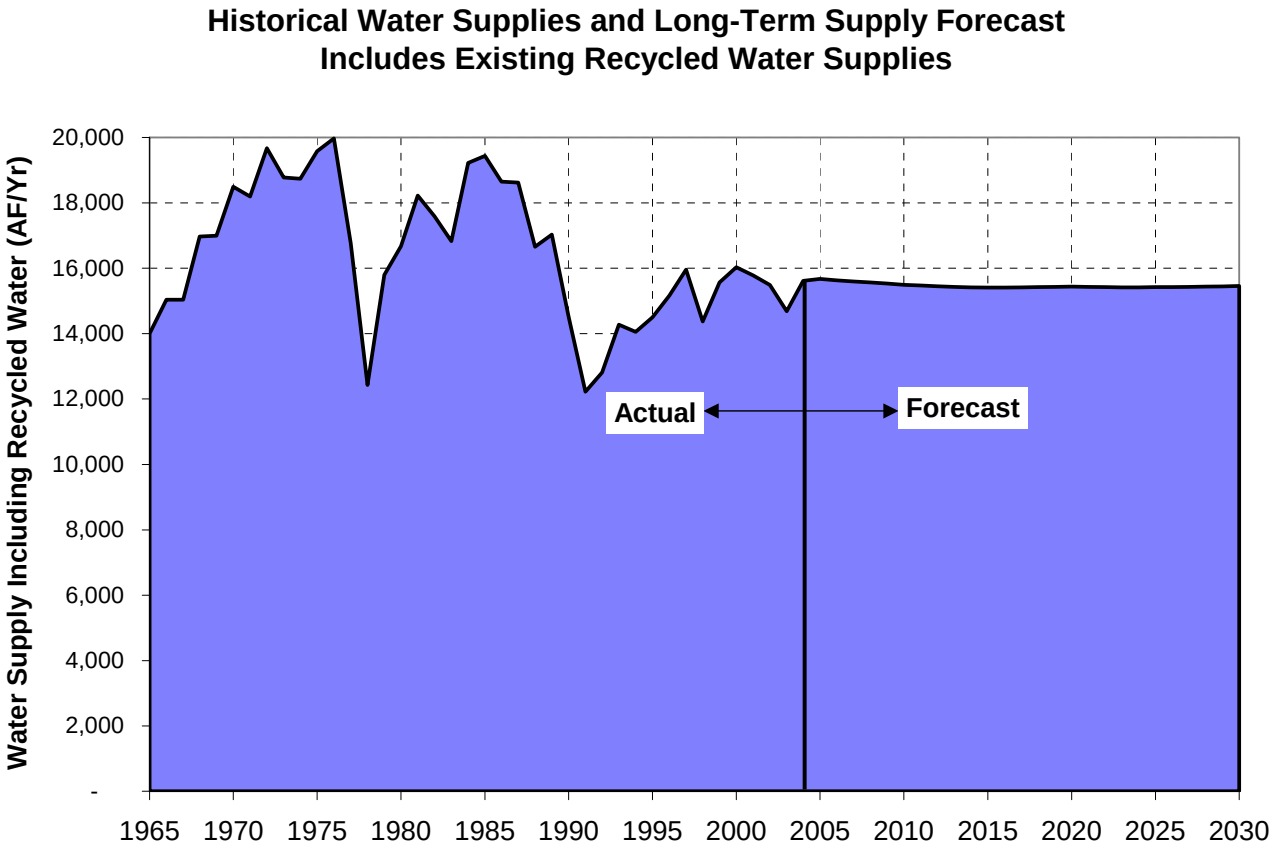
Overall, water use per account decreased by 18% during the last sixteen years (from 378 hundred cubic fee (CCF) in FY 1987-88 to 310 CCF in FY 2003-04). In fact, all customer classes, with the exception of the residential class, showed a significant drop in use per account. During this period, industrial use per account dropped by 61%, commercial use per account dropped by 14%, public facilities use per account dropped by 56% and City facilities dropped by 37%. Use by the residential sector, however, increased slightly by 4% (including single-family and multi-family buildings). Use per account in single-family buildings remained unchanged suggesting that this increase was mainly driven by the higher use in multi-family buildings.

The relative share of customer classes showed a marked change in favor of the residential class since the late 1980s. The residential single-family customer class increased its share from 41% to 48%. Including multi-family residential and multi-family commercial accounts, water consumption in the homes in total increased its share from 50% to 64% of total consumption. The share of commercial sector remained at 20%, the share of industrial sector dropped significantly from 20% to 9%. Public facilities and the City facilities also saw a decline. Since 1987, public facilities share of the total use dropped from 4% to 2%, and City facilities share dropped from 6% to 5%.

Current Water Usage

Figure 1 below shows the City's actual water supplies since 1965 and a projection of water supplies until the year 2030. Present water consumption is significantly higher than FY 1992-93 (a drought year), but lower that the 1987 (pre-drought) usage. This reduction in present water consumption, compared to pre-drought levels, appears to be the result of 'permanent' water conservation measures implemented during the past 12 years. The City's water consumption has been relatively stable since 2000. Future projections are uncertain, but large increases in consumption are unlikely. The following discussion explains water use trends.

Figure 1 - Historical Water Supplies – Actual and Forecast



Water Use by Customer Type

Total water consumption decreased by 5.9%, from 14,100 AF/Y to 13,300 AF/Y between 2000 and 2004 (last year of actual historical data) as shown in Table 12. For the forecast period, Table 12 shows demand projections by customer type before incorporating the impact of planned demand management measures discussed in Section 5 – Demand Management Measures.

Demand projections after netting out the impact of demand management measures are shown for the total at the bottom of Table 12.

Table 12: Past, Current and Projected Water Sales Before Demand Management Measures[20]

Segment	Actual Sales Data			Forecast					
	2000	2004	'00-'04 Change	2005	2010	2015	2020	2025	2030
Single-family									
Meters	14,771	14,941	1.1%	15,136	15,535	15,935	16,314	16,534	16,753
Units (AFY)	6,494	6,539	0.7%	6,561	6,618	6,661	6,716	6,724	6,742
Multiple-family									
Meters	1,929	1,939	0.4%	1,967	2,019	2,071	2,120	2,148	2,177
Units (AFY)	2,262	2,086	-7.8%	2,235	2,236	2,229	2,230	2,218	2,212
Commercial									
Meters	1,646	1,746	6.1%	1,648	1,675	1,704	1,722	1,743	1,765
Units (AFY)	2,933	2,524	-14%	2,654	2,625	2,610	2,590	2,583	2,582
Industrial									
Meters	248	255	3.1%	250	254	259	261	265	268
Units (AFY)	1,518	1,119	-26.3%	1,388	1,408	1,430	1,443	1,459	1,475
City Facilities									
Meters	141	295	109.4%	298	306	313	321	325	330
Units (AFY)	607	691	13.7%	631	648	665	681	690	699
Public Facilities									
Meters	63	80	27.8%	66	68	70	71	72	73
Units (AFY)	314	336	7.3%	393	403	414	423	429	435
Total Retail Sales									
Meters	18,797	19,254	2.4%	19,365	19,858	20,351	20,810	21,088	21,366
Units (AFY)	14,128	13,294	-5.9%	13,862	13,938	14,009	14,083	14,102	14,144
Future Planned Demand-Side Management (DSM)Program Impact									
Units (AFY)	Included			148	410	572	622	655	667
Net Water Sales: Projected Water Sales After Subtracting Planned DSM Impacts									
Units (AFY)	14,128	13,294	-5.9%	13,714	13,528	13,437	13,461	13,447	13,477

Demand Projection Development

The water demand projections for this 2005 Urban Water Management Plan were developed as part of a series of technical studies performed in support of the Water System Improvement Program for the SFPUC Regional Water System.[21] Water demand projections for the wholesale

[20] Demand Management Programs are discussed in the Section 5 of this report.
[21] SFPUC Wholesale Customer Water Demand Projections (URS 2004); SFPUC Wholesale Customer Water

customers were developed using an "End Use" model. Two main steps are involved in developing an End Use model: (1) Establishing base-year water demand at the end-use level (such as toilets, showers) and calibrating the model to initial conditions; and (2) Forecasting future water demand based on future demands of existing water service accounts and future growth in the number of water service accounts.

Establishing the base-year water demand at the end-use level is accomplished by breaking down total historical water use for each type of water service account (single-family, multi-family, commercial, irrigation, etc.) to specific end uses (such as toilets, faucets, showers, and irrigation).
Forecasting future water demand is accomplished by determining the growth in the number of water service accounts in a wholesale customer service area. Once these rates of change were determined, they were input into the model and applied to those accounts and their end water uses.

The end use model (also known as the Demand Side Management Least Cost Planning Decision Support System, or DSS model) also incorporates the effects of the plumbing and appliance codes on fixtures and appliances including toilets (1.6 gal/flush), showerheads (2.5 gal/minute), and washing machines (lower water use) on existing and future accounts. The projections presented in Table 12 show past, current and projected water sales without the impact of planned demand management programs. These programs are discussed in detail in Section 5 – Demand Management Measures – of this report. At the bottom of Table 12, the projected water sales after netting out the impact of demand management programs is shown.

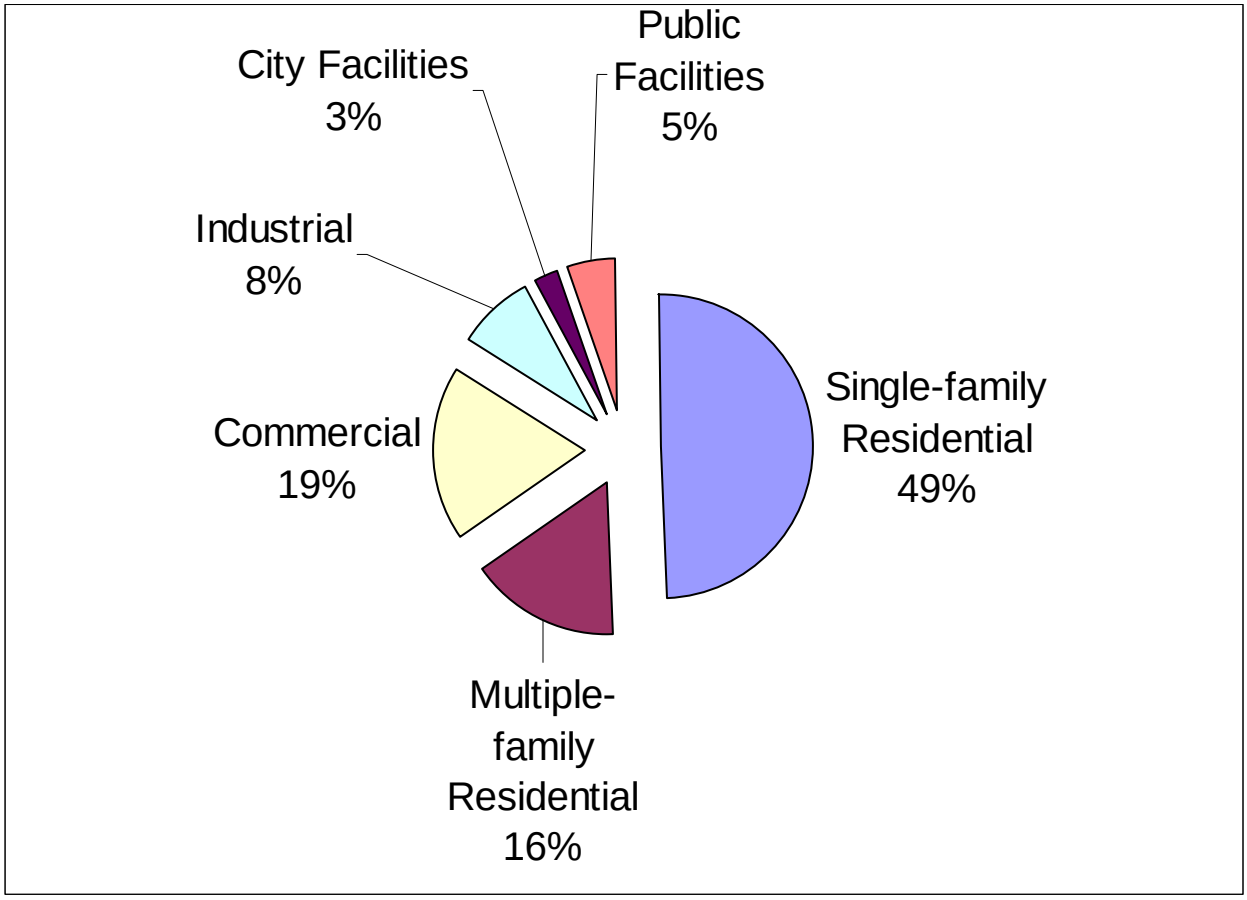
Based on the baseline projections, it is expected that total water consumption in the City will almost remain constant, and without the demand management programs increase by about 2.0% from its current level of 13,900 AF/Y to 14,100 AF/Y by the end of 2030. This is despite the modest increase of 10.3% expected in total number of accounts, which suggests that, on a use per account basis, water consumption is expected to go down. This baseline projection is due to ongoing conservation efforts expected to be taken by customers including the effects of the plumbing code. After incorporating the impact of water agency induced demand management program related activities, total sales are expected to decrease by almost 5% from the period 2000 to 2030.

Share of Total Consumption by Customer Type

Examination of 2004 consumption levels reveals that the residential sector (single- and multiple-family dwellings) is responsible for 65% of total water consumption in the City. The business sectors (commercial and industrial combined) consume 27%, and the public facilities and the City facilities consume the remaining 8%. Figure 2 below shows the breakdown of 2004 consumption by customer type.

Conservation Potential (URS 2004); SFPUC Wholesale Customer Recycled Water Potential (RMC 2004); and SFPUC 2030 Purchase Estimates (URS 2004).

Figure 2 – 2004 Water Use by Customer Type



Residential Sector

Water use in the residential sector has increased in total volume and percentage of overall usage between 2000 and 2004. This increase is due to an increase in the total number of accounts as use per account was unchanged for single-family dwellings and decreased by 15.5% in multi-family dwellings during this period.

Commercial Sector

Water use in the commercial sector has dropped both in terms of total volume and in terms of share in overall usage. This drop is mainly due to the water conservation efforts and enforcement of the landscape irrigation ordinance, as total number of accounts actually increased during the same period.

Industrial Sector

Between 2000 and 2004, water use in the industrial sector has decreased both in percentage of overall usage and in total water volume. This decrease is mainly due to the water conservation efforts and enforcement of the landscape irrigation ordinance, as total number of accounts actually increased during the same period.

City Facilities

Between 2000 and 2004, water use at City facilities has increased in percentage of overall usage and in total water volume; however, use per account has dropped significantly. This is partly due to a change in classification of certain accounts (because of a change in the billing system) and partly due to the conservation projects already undertaken.

Public Facilities

Between 2000 and 2004, water use at public facilities has increased in percentage of overall usage and in total water volume; however, use per account has dropped significantly. This is partly due to a change in classification of certain accounts (because of a change in the billing system) and partly due to the conservation projects already undertaken.

Sales to Other Agencies

The City does not plan on having any sales to other agencies.

Additional Water Uses - Recycled Water Use

Discussion of recycled water use is presented in Section 3 – Water Supply Sources under Water Recycling. Past use and future recycled water use projections are presented in Table 13 below. There are no existing plans to expand the use of recycled water in the City and, therefore, the table reflects no change in the use of recycled water in the future.

Table 13: Recycled Water Use (AF/Y)

	2000	2005	2030
Water Trucks	7	3	3
Greer Park	28	76	76
Golf Course	23	187	187
Duck Pond	0	24	24
RWQCP	560	560	560
Total	617	850	850

Unaccounted-for System Losses

Unaccounted-for system losses typically amount to about 7% of total purchases. In recent years, there has been an increase in this amount. Losses increased from 8.3% of wholesale purchases in year 2000 to 10.0% in year 2004. The City is looking into the possible causes of this increase and ways to minimize it in the future. Table 14 presents the historical and projected Unaccounted-for losses for the City's water system.

Table 14: Unaccounted-for Water								
	2000	**2004**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Unaccounted-for Water – (‘000 AF/Y)	1.3	1.5	1.1	1.1	1.1	1.1	1.1	1.1

Total Water Use

Table 15 shows total water use in the City.

Table 15: Total Water Use (‘000 AF/Y)								
	2000	**2004**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Retail Sales	14.1	13.3	13.7	13.5	13.4	13.5	13.4	13.5
Losses	1.3	1.5	1.1	1.1	1.1	1.1	1.1	1.1
Recycled Water Use	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total Water Use	16.0	15.6	15.6	15.4	15.3	15.4	15.3	15.4

Section 5 – Demand Management Measures

Law

> 10631 (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
>
> (1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following: (the law then lists the sixteen demand management measures).

The City is a signatory to the Memorandum of Understanding regarding Urban Water Conservation in California (MOU) and is a member of the California Urban Water Conservation Council (CUWCC). Since becoming a signatory of the MOU, the City saved more than 2,500 acre-feet of water through conservation programs. The City will strive to continue to implement programs that meet or exceed the current Best Management Practices (BMP).

Appendix B includes the City's reports to the CUWCC for the last three years regarding the implementation of the Best Management Practices (BMPs). The reports list the BMPs and describe the City's efforts on each BMP to improve the overall water efficiency within the City.

It is the goal of the City to continue to look for opportunities, innovative technologies and cost effective programs that best utilize the water conservation budget. The City has been working with other BAWSCA agencies to investigate methods for regional implementation of certain BMPs. To achieve its goals for cost effective water management, the City, working with BAWSCA, has analyzed over 32 different measures[22] beyond the current and proposed plumbing codes. The measures that were found to be cost-effective and chosen by the City to be implemented in future years include the following:

- Residential Water Surveys
- Residential Retrofit
- Washing Machine Rebates
- Public Information
- Evapotranspiration (ET) Controller Rebates
- Low Flow Restaurant Spray Nozzles
- Large Landscape Conservation Audits
- Rebates for Dual Flush Toilets
- Water Audits Hotels-Motels
- Commercial Water Audits

[22] SFPUC Wholesale Customer Water Conservation Potential Technical Report, December 2004.

- Industrial/Commercial/Institutional Ultra-Low Flush (ULF) Toilet Rebate
- Incentives for Replacement of Coin Operated Washers
- Award Program for Commercial Water Savings

Planned Demand Management Measures

The following sections discuss the Demand Management Measures (DMM) in detail. These measures target a majority of the current BMPs and will assist the City in saving water. It is estimated that these water conservation programs will help reduce water purchases from San Francisco Public Utilities Commission by 4% by the year 2030.

For each program, the benefit/cost ratio from the Total Resource Cost (TRC) perspective is shown. The TRC cost-effectiveness test compares the total cost of implementing a measure, regardless of who pays. The costs, therefore, include the cost of the device, any installation cost, and the implementation cost (e.g. advertising, tracking, performance monitoring, rebate processing, etc.) of the program. The benefits include the value of the saved water. In addition, the cost to CPAU, the "program cost", is shown for each measure. This is the cost that CPA would incur to implement the program and may include rebate costs as well as any other administrative costs to conduct the program.

Table 16 below shows the total water and wastewater savings for the planned DMMs for 2005 and every 5 years until 2030. Also shown in Table 16 are the implementation costs of the programs.

Table 16: DMM Water Savings Summary

	2005	2010	2015	2020	2025	2030
Total Water Savings (MGD)	0.13	0.37	0.51	0.56	0.58	0.60
Total Wastewater Savings (MGD)	0.09	0.25	0.34	0.37	0.40	0.43
Total Outdoor Savings (MGD)	0.04	0.12	0.17	0.18	0.18	0.17
Savings as a Percent of Water Demand	0.9%	2.6%	3.6%	3.9%	4.1%	4.1%
Utility Implementation Cost ($2004)	$173,210	$250,657	$252,092	$167,976	$143,116	$153,775

Residential Water Surveys

Implementation Status: Implementation of this measure started in 1994. The program is currently active.

Description of Measure: Program provides free site surveys ($50 to $130 value) to residential customers in both single-family and multi-family dwellings. Survey includes an interior evaluation involving showerheads, aerators, and/or toilet flappers and replacements when needed, and an exterior evaluation that includes an irrigation schedule. The program is actively marketed to residents by CPAU and Santa Clara Valley Water District.

Program Goals: This program targets the requirements of *BMP 1 – Residential Water Surveys*. The requirements include offering surveys to at least 20% of single-family (SF) and multi-family (MF) accounts, and actually surveying 15% of single-family and multi-family accounts. Based on that, the specific goals for the program is to cover 1.5% of the City residents each year consisting of new occupants as a result of housing occupancy turnover. CPAU plans to complete approximately 300 audits a year for the single- and multi-family segment.

Cost Effectiveness: The measure has a benefit/cost ratio of 2.0 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City's residents will save 0.046 million gallons of water per day (MGD) or 16.6 million gallons of water annually. This is based on the assumption that on a per unit basis, the measure saves 5% of indoor and 10% of outdoor water use.

Table 17: Residential Water Survey

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target	227 SF 30 MF	228 SF 30 MF	229 SF 30 MF	233 SF 30 MF	239 SF 31 MF	245 SF 32 MF	248 SF 32 MF	251 SF 33 MF
Program Costs (in constant 2004$)	$27,498	$27,643	$27,788	$28,224	$28,949	$29,639	$30,038	$30,437

Notes:
SF: Single-family residential
MF: Multi-family residential

Residential Plumbing Retrofit

Implementation Status: Implementation of this measure started in 1992. The program is currently active. This program is expected to continue until 2007 at which time the new plumbing code standards come into effect.

Description of Measure: The program consists of distribution of water savings devices, ($15 to $30 value) consisting primarily of showerheads, aerators, and/or toilet flappers through the Residential Water Surveys. Other means of distribution are through CPAU outreach events and web site requests. The program is actively marketed by CPAU and Santa Clara Valley Water District to the residents.

Program Goals: This program targets the requirements of *BMP 2- Residential Plumbing Retrofits*- to achieve 75% market penetration. The City has already achieved 62.3% market penetration and with the targeted 260 new participants per year, it will meet the BMP 2 requirements.

Cost Effectiveness: The measure has a benefit/cost ratio of 6.7 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City's residents will save 0.01 MGD or 4.2 million gallons per year. This is based on the assumption that on a per unit basis, the measure reduces water use of 21% in showers, and 2% in faucets and toilets.

Table 18: Residential Plumbing Retrofit

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	227 SF 30 MF	228 SF 30 MF	229 MF 30 MF	-	-	-	-	-
Program Costs (in constant 2004$)	$20,189	$20,295	$20,402	-	-	-	-	-

Notes:
SF: Single-family residential
MF: Multi-family residential

Residential Washing Machine Rebates

Implementation Status: Implementation of this measure started in 1999. The program is currently active. It will be continued until 2007 when California Clothes Washer Standards go into effect.

Description of Measure: This program targets the requirements of *BMP6 – Residential Washing Machine Rebates* that requires energy service providers to offer a cost effective financial incentive for high efficiency washers. Based on criteria from Energy Star® and the Consortium for Energy Efficiency (CEE), Inc., CPAU offers a two-tier rebate ($75 to $150 value) program based on the modified energy factor and water factor as set by the CEE Residential Clothes Washer Initiative. Customer rebates depend on the efficiency of the washers installed. This program is actively marketed by CPAU and Santa Clara Valley Water District to single- and multi-family residents.

Program Goals: CPAU targets 2.5% of residential customers for this program.

Cost Effectiveness: The measure has a benefit/cost ratio of 1.9 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City's residents will save 0.02 MGD or 5.8 million gallons of water per year. This is based on the assumption that on a per unit basis, the measure reduces laundry water use by 34%.

Table 19: Residential Clothes Washer Rebate

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	378 SF 49 MF	380 SF 49 MF	-	-	-	-	-	-
Program Costs (in constant 2004$)	$62,520	$62,849	-	-	-	-	-	-

Notes:
SF: Single-family residential
MF: Multi-family residential

Public Information

Implementation Status: Implementation of this measure started in 1991. The program is currently active.

Description of Measure: This program meets the requirements of *BMP 7 – Public Information* that requires utilities to implement and maintain a public information program. Through various types of outreach events and multiple media outlets, CPAU strives to inform residents and business owners the value of conserving water and available programs.

Program Goals: The goal of this program is for CPAU to attend multiple local events such as Earth Day fairs at local businesses, summer concerts, Arts and Crafts festivals, and parades. In addition, staff coordinates a minimum of two workshops on water conservation throughout the year.

Cost Effectiveness: The measure has a benefit/cost ratio of 5.9 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City's residents will save .05 MGD or 19.4 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 1% water use reduction per participant.

Table 20: Public Information

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	7,568	7,608	7,648	7,768	7,967	8,157	8,267	8,377
Program Costs (in constant 2004$)	$15,136	$15,216	$15,296	$15,535	$15,935	$16,314	$16,534	$16,753

Evapotraspiration Controller Rebates

Implementation Status: Implementation of this measure started in 1999. The program is currently active.

Description of Measure: Program provides rebates ($100 to $150 value) for Evapotranspiration (ET) Controllers for residential and commercial landscapes with functioning standard irrigation controllers. Program participants can opt for direct- or self-installation. The program is actively marketed by CPAU and Santa Clara Valley Water District to appropriate customers.

Program Goals: This program has the goal of achieving 10% market penetration of new accounts. This program targets the requirements of: *BMP 5 – Large Landscape Conservation* that requires that water service providers implement and maintain customer incentive programs for irrigation equipment retrofits.

Cost Effectiveness: The measure has a benefit/cost ratio of 1.4 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.03 MGD or 10.4 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 15% reduction in external water use.

Table 21: ET Controller Rebates

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	30 SF 4 MF 4 ICI	76 SF 10 MF 9 ICI	76 SF 10 MF 9 ICI	78 SF 10 MF 9 ICI	80 SF 10 MF 10 ICI	82 SF 11 MF 10 ICI	-	-
Program Costs (in constant 2004$)	$8,580	$21,560	$21,669	$21,996	$22,543	$23,050	-	-

Notes:
SF: Single-family residential
MF: Multi-family residential
ICI: Industrial/Commercial/Institutional

Low Flow Restaurant Spray Nozzles

Implementation Status: This measure is expected to launch in fall of 2005.

Description of Measure: The program installs high-efficiency pre-rinse spray valves ($50 to $180 value) to restaurants and kitchens in Commercial, Industrial, and Institutional segments. The program will be actively marketed by CPAU and Santa Clara Valley Water District to appropriate customers. The program will be terminated in 2007, as plumbing code standards will come into effect.

Program Goals: The City has approximately 200 restaurants. This program has a very aggressive goal of 150 installations by 2007. This program targets the requirements of *BMP 9 – Industrial, Commercial, and Institutional Conservation* that requires reducing baseline water usage by Industrial/Commercial/Institutional accounts overall by 10%.

Cost Effectiveness: The measure has a benefit/cost ratio of 34.5 under the Total Resource Cost Test.

Estimate of Conservation Savings: Throughout this program the City's residents will save 0.02 MGD or 8.3 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 50% reduction in water use in restaurants and kitchens.

Table 22: Low Flow Restaurant Spray Nozzles

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	35	35	35	-	-	-	-	-
Program Costs (in constant 2004$)	$7,369	$7,369	$7,369	-	-	-	-	-

Large Landscape Conservation Audits

Implementation Status: Implementation of this measure started in 1994. The program is currently active.

Description of Measure: The program offers free site surveys ($650 to $800 value) to evaluate water use and improve irrigation efficiency. It is targeted to large landscape owners with greater than one acre within the City. The program is actively marketed by CPAU and the Santa Clara Valley Water District.

Program Goals: This program has a goal of auditing approximately 31% of estimated acreage for Commercial, Industrial, and Institutional accounts. This program targets the requirements of *BMP 5 – Large Landscape Conservation* that require water service providers to provide audits to 15% of ICI accounts with mixed-use meters.

Cost Effectiveness: The measure has a benefit/cost ratio of 1.3 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.03 MGD or 10 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 30% reduction in external water use.

Table 23: Large Landscape Conservation Audits

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	23 ICI	24 ICI	24 ICI	24 ICI	24 ICI	24 ICI	24 ICI	24 ICI
Program Costs (in constant 2004$)	$6,500	$19,614	$19,614	$19,614	$19,614	$19,614	$19,614	$19,614

Notes:
ICI: Industrial/Commercial/Institutional

Rebates for Dual Flush Toilets

Implementation Status: Implementation of this measure started in 2005. Until 2007, the program costs are covered by a DWR grant that was received by our partner, the Santa Clara Valley Water District. For 2005 and 2006, there are no specific program targets.

Description of Measure: The residential program is based on rebates ($75 to $125 value) of selected High Efficiency Toilets (HET). The program is actively marketed by CPAU and Santa Clara Valley Water District.

Program Goals: This program has a goal of replacing 25% inefficient toilets, in the residential sector. This program targets the requirements of *BMP 14- Residential ULFT Replacement* which target implementation of programs for replacing existing high water using toilets with ultra low flush (1.6 gallons or less) toilets in single-family and multi-family residents.

Cost Effectiveness: The measure has a benefit/cost ratio of 1.5 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City's residents will save 0.07 MGD or 26.4 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 61% reduction in water use by toilets.

Table 24: Rebates for 6/3 Dual Flush Toilets

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	-	-	199 SF 26 MF	202 SF 26 MF	207 SF 27 MF	228 SF 30 MF	231 SF 30 MF	251 SF 33 MF
Program Costs (in constant 2004$)	-	-	$66,087	$67,122	$68,848	$75,909	$76,931	$83,521

Notes:
SF: Single-family residential
MF: Multi-family residential

Water Audits for Hotel/Motels

Implementation Status: Implementation of this measure is expected to be launched in 2006.

Description of Measure: The program proposes a partnership with regional agencies to encourage participation in free water use audits ($3,000 value) for hotels and motels through incentives and/or local recognition. The program would be marketed by CPAU and BAWSCA to appropriate customers.

Program Goals: This program targets the requirements of *BMP 9 – Industrial, Commercial, and Institutional Conservation* that require water service providers to survey at least 10% of ICI accounts and reduce ICI water use by 10% of baseline use. The City has 31 hotel/motels. CPAU has an aggressive program participation target of two hotels per year that will result in achieving a market penetration of 65% by 2015.

Cost Effectiveness: The measure has a benefit/cost ratio of 14.6 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.05 MGD or 17.9 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 15% reduction in water use.

Table 25: Water Audits for Hotel/Motels

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	-	2	2	2	2	-	-	-
Program Costs (in constant 2004$)	-	$7,875	$7,875	$7,875	$7,875	-	-	-

Commercial Water Audits

Implementation Status: Implementation of this measure began in Fall 2005. In 2005, the program costs are covered by a DWR grant that was received by our partner, the Santa Clara Valley Water District. For 2005, there are no specific program targets.

Description of Measure: The program offers free site visits ($3,000 value) to evaluate indoor water using devices. Additionally, if a business has over one acre of landscape, an outdoor audit would also be conducted. The program is actively marketed by CPAU and Santa Clara Valley Water District to appropriate customers.

Program Goals: This program has a goal of reducing ICI water use by 10%. This program targets the requirements of *BMP 9 – Industrial, Commercial, and Institutional Conservation* that require water service providers to survey at least 10% of ICI accounts and reduce ICI water use by 10% of baseline.

Cost Effectiveness: The measure has a benefit/cost ratio of 2.0 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.07 MGD or 26.1 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 12% reduction in water use.

Table 26: Commercial Water Audits

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	-	17	17	17	17	-	-	-
Program Costs (in constant 2004$)	-	$85,699	$85,985	$86,841	$88,329	-	-	-

ICI ULF Toilet Rebates

Implementation Status: Implementation of this measure started in 1995. This program is currently active, but is planned to be replaced after 2006 with a program to encourage the installation of dual flush, High Efficiency Toilets (HETs).

Description of Measure: The program provides full service toilet replacement program ($200 to $225 value) to high water using commercial facilities such as restaurants, food stores, and gas stations. The program is actively marketed by CPAU and Santa Clara Valley Water District.

Program Goals: This program has goal of reducing ICI water use by 10%. This program targets the requirements of *BMP 9 – Industrial, Commercial, and Institutional Conservation* that require water service providers to survey at least 10% of ICI accounts and reduce ICI water use by 10% of baseline use.

Cost Effectiveness: The measure has a benefit/cost ratio of 12.1 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.01 MGD or 5.5 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 60% reduction in toilet water use.

Table 27: ICI ULF Toilet Rebates

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	25	25	-	-	-	-	-	-
Program Costs (in constant 2004$)	$6,180	$6,200	-	-	-	-	-	-

Offer Incentives for Replacement of Coin Operated Washing Machines

Implementation Status: Implementation of this measure started in 2000. This program is currently active and will continue until 2007 when Washing Machine standards come into effect.

Description of Measure: The program currently offers rebates ($175 value) towards efficient large commercial clothes washing machines. Future incentive programs will be targeted at leasing companies that rent clothes washing machines in multi-family complexes. The program is actively marketed by CPAU and Santa Clara Valley Water District.

Program Goals: This program has a goal of reducing ICI water use by 10%. This program targets the requirements of *BMP 9 – Industrial, Commercial, and Institutional Conservation* which require water service providers to survey at least 10% of ICI accounts and reduce ICI water use by 10% of baseline use.

Cost Effectiveness: The measure has a benefit/cost ratio of 6.5 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.01 MGD or 1.7 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 35% reduction in washing machine water use.

Table 28: Incentives for Replacement of Coin Operated Washing Machines

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	275	276	-	-	-	-	-	-
Program Costs (in constant 2004$)	$6,125	$6,125	-	-	-	-	-	-

Award Program for Commercial Water Savings

Implementation Status: Implementation of this program is projected to launch in 2006. The program will not be active every year.

Description of Measure: This measure would entail running a regional award program ($1,000 value) to acknowledge businesses and/or institutions that have shown a substantial effort towards saving water.

Program Goals: This program has the goal of reducing ICI overall water use by 10%. This measure targets the requirements of *BMP 9 – Industrial, Commercial, and Institutional Conservation* that requires reducing baseline water usage by ICI accounts overall by 10%.

Cost Effectiveness: The measure has a benefit/cost ratio of 1.0 under the Total Resource Cost Test.

Estimate of Conservation Savings: It is estimated that through this program the City will save 0.01 MGD or 2.5 million gallons annually. This is based on the assumption that on a per unit basis, the measure will result in a 25% reduction in washing machine water use.

Table 29: Award Program for Commercial Water Savings

	2005	2006	2007	2010	2015	2020	2025	2030
Program Participation Target (# of accounts)	-	45	-	45	-	45	-	45
Program Costs (in constant 2004$)	-	$3,450	-	$3,450	-	$3,450	-	$3,450

Section 6 – Reliability Planning

Law

> 10631 (c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable.
>
> Provide data for each of the following:
>
> (1) An average water year, (2) A single dry water year, (3) Multiple dry water years.
>
> For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.
>
> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (b) An estimate of the minimum water supply available during each of the next three-water years based on the driest three-year historic sequence for the agency's water supply.

The weather-related reliability of the City water supply is very dependent upon the reliability of SFPUC's regional water supply system. The SFPUC defines reliability by the amount and frequency of water delivery reductions (deficiencies) required to balance customer demands with available supplies in droughts. The SFPUC plans its water deliveries anticipating that a drought worse than the worst drought yet experienced may occur. This section discusses these system-wide deficiencies.

The SFPUC's Hetch Hetchy supply is vulnerable to periodic, short-term outages. Due to the fact that Hetch Hetchy water is not filtered, it is subject to strict water quality standards set by the California Department of Health Services. As a result of weather events, turbidity levels can exceed standards requiring the Hetch Hetchy supply to be shut off until levels drop to within standards. Hetch Hetchy supply outages can last a week or longer. During these periods, the entire SFPUC supply comes from the Sunol Valley Water Treatment Plant and the Harry Tracy Water Treatment Plant, both of which are supplied by local reservoirs.

The City, working in cooperation with SFPUC and BAWSCA, completed a significant amount of analysis regarding the weather- and climate-related reliability of the water supply. Several of the analyses are described in previous sections of this report. The analysis includes the following:

- **Water Wells, Regional Storage and Distribution System Study (1999)** - This study completed by the City examined the ability of the City's water system to supply water during an 8-hour disruption of SFPUC supply.

- **The Water Supply Master Plan (2000)** The WSMP was a joint study by BAWSCA and the SFPUC to address the future water supply needs of the 30 agencies and 2.3 million people who are served via the SFPUC water system. The City was actively involved in the development of this plan, participating on the WSMP Steering Committee. This plan is further described below.

- **Alternative Emergency Water Supply Options Study (2001)** – This study completed by the City examined the ability of the City's distribution system to supply water during various lengths of supply disruption (e.g., 1 day, 3-days, 30 days) and included an analysis of the vulnerability of the City's distribution system.

Frequency and Magnitude of Supply Deficiencies

The City experienced severe droughts during 1976-77 and 1987-93. In response to these droughts the City has adopted a number of water conservation strategies. Full descriptions of the City's water conservation programs are included in Section 5 – Demand Management Measures and in Appendix B – CUWCC Best Management Practices (BMP) Reports.

The magnitude of future supply deficiencies is difficult to estimate. The total amount of water the SFPUC has available to deliver during a defined period of time is dependent on several factors which generally reduce to a comparison of 1) the amount of water that is available to the SFPUC system from natural runoff and reservoir storage and 2) the amount of that water that must be released from the SFPUC's system for commitments to purposes other than customer deliveries (e.g., releases below Hetch Hetchy reservoirs to meet Raker Act and fishery purposes).

The 1987-93 drought profoundly highlighted the deficit between SFPUC's water supplies and the demands on the SFPUC system. Based on the 1987-93-drought experience, the SFPUC assumes its "firm" capability to be the amount the system can be expected to deliver during historically experienced drought periods. In estimating this firm capability, the SFPUC assumes the potential recurrence of a drought such as occurred during 1987-93, plus an additional 18 months of limited water availability.

At current delivery levels, the SFPUC system can be expected to experience up to a 25% shortage 15 to 20% of the time, during multiple-year drought sequences. Therefore, the SFPUC is faced with the necessity to develop a long-term strategy to accommodate or rectify the potential of future water shortages throughout its wholesale and retail operations.[23]

[23] Draft SFPUC 2005 UWMP 100507, Section 5, Page 20

For moderate droughts (less than 20% system-wide shortages), the Interim Water Shortage Allocation Plan (IWSAP) will assist the City to plan for droughts. The IWSAP is described in Section 8 – Water Shortage Contingency Plan.

Plans to Assure a Reliable Water Supply

The City has completed several studies regarding water reliability. These studies are described in previous sections. As a result of these studies, the City is planning several million dollars of improvements to the City's emergency wells to ensure future water reliability.

In addition, the City is continuing to evaluate other water supply alternatives as part of its ongoing Water Integrated Resource Plan (WIRP). This analysis will include the impact of serious long-term drought on the total water supply.

SFPUC's Plans to Assure a Reliable Water Supply

The following information is extracted from the SFPUC's 2005 draft UWMP.

> As an established major water supplier for the Bay Area region, the SFPUC has a responsibility to secure and manage its existing system supplies and plan for future needs. Given the existing circumstance that the SFPUC's water supplies are less than current system demands and that demand growth is anticipated, the SFPUC and its customers must accept the challenge of an increasing gap between supplies and demands.
>
> In order to enhance the ability of the SFPUC water supply system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply, the SFPUC is undertaking the WSIP. The WSIP will implement capital improvements aimed at enhancing the SFPUC's ability to meet its water service mission of providing high quality water to its customers in a reliable, affordable and environmentally sustainable manner.[24]

SFPUC Regional Water Supply, Year 2005: Normal, Single Dry-year and Three-year Minimum Water Supply

Assuming a normal water condition occurs for the ensuing year, no deficiency in water deliveries would be anticipated. The SFPUC system water deliveries are anticipated to be approximately 267 MGD (approximately 299,000 acre-feet), all of which could be met through existing resources.

[24] Draft SFPUC 2005 UWMP 100507, Section 5, Page 20

The SFPUC plans its water deliveries anticipating that a drought worse than the 1987 through 1992 drought may occur. As a result, the SFPUC system operations are designed for providing sufficient carry-over water in SFPUC reservoirs after six years of drought. This design would enable the SFPUC to continue delivering water, although at significantly reduced levels, during and after such a drought.

The SFPUC currently operates under a plan that anticipates three stages of response to water supply shortages, ranging from voluntary customer actions to enforced rationing, the third stage envisioned to occur only during a drought period worse than previously experienced. Assuming the availability of existing supplies and the WSIP supplies summarized in Table 6 of Draft SFPUC 2005 UWMP[25], at current demand levels the SFPUC system can expect shortages of at least 10 to 20% in the first 3 multiple dry water years[26] as shown in Table 30.

The 1987-92 drought period includes one-year and three-year sequences that are among the worst hydrologic periods projected for the SFPUC system. If within the next year a single dry (critical) year occurs, the SFPUC system deliveries could be reduced by 10% as a precaution to continued drought. If within the next three years a critical thee-year sequence recurred, the SFPUC system deliveries could be reduced by 10 to 20%. Table 30 illustrates the SFPUC system water availability for the next three years under differing assumptions of hydrologic conditions.[27]

Table 30: SFPUC System Water Availability – Year 2005

		Multiple Dry Water Years		
Average/ Normal Water Year	**Single Dry Water Year**	**Year 1 2006**	**Year 2 2007**	**Year 3 2008**
299,000 100% of Normal	269,000 90% of Normal	269,000 90% of Normal	239,000 80% of Normal	239,000 80% of Normal
Unit of Measure: Acre-Feet/Year				

The customers of the SFPUC system, including the City, do not have a firm allocation of water from the SFPUC. This lack of allocation makes it very difficult for the City to perform long-term and/or drought planning. The Interim Water Shortage Allocation Plan (IWSAP) discussed in the Section 8 – Water Shortage Contingency Plan is developed to help the City and other BAWSCA agencies to have more certainty in the amount of water that will be available in a drought.

[25] Draft SFPUC 2005 UWMP 100507, Section 5, Page 34
[26] Note that if the drought were to continue for 7 years, there would be shortages of 25 percent in dry years.
[27] Draft SFPUC 2005 UWMP 100507, Section 5, Page 34

Section 7 – Supply and Demand Comparison Provisions

Law

> 10635 (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from the state, regional, or local agency population projections within the service area of the urban water supplier.

Supply and Demand Comparison

Since the City's primary water supply is the SFPUC, it is useful to examine the supply-demand comparison for the entire SFPUC system. The following information, including that in Tables 31 - 34 is extracted from the SFPUC 2005 UWMP draft.

Table 31 compares current and projected SFPUC system water supply and demand. It indicates that during normal precipitation years, the SFPUC has adequate supplies to meet its projected retail and wholesale water demands.

Table 31: SFPUC System Supply and Demand Comparison[28]
Normal Years (Non-drought Years)

	2005	2010	2015	2020	2025	2030
System Supply Totals	> 267	> 277	> 280	>286	>293	>300
System Demand Totals	267	277	280	286	293	300
Difference	0	0	0	0	0	0
Unit of Measure: MGD						

As previously stated, projects as described in the WSIP will be required to meet demands during multiple dry years. The new water sources assumed to be available in this SFPUC Plan, with implementation dates, are summarized in Table 32.

[28] Table 10, SFPUC Draft 2005 UWMP.

Table 32: SFPUC Water Supply Options for Years 2010 through 2030 UWMP Studies: Water Supply Reliability[29]						
Water Supply Option	2005	2010	2015	2020	2025	2030
Crystal Springs Reservoir Storage Recovered to 22 billion gallons	No	Yes	Yes	Yes	Yes	Yes
Westside Basin Groundwater (AF/Y)	0	4,500	7,000	8,100	8,100	8,100
Calaveras Reservoir Storage Recovered to. 31.5 billion gallons	No	No	Yes	Yes	Yes	Yes
Water Transfer (AF/Y)	0	23,200	23,200	29,000	29,000	29,000

Given the additional supplies assumed to be available, Table 33 illustrates the level of first dry-year water delivery shortage that could occur with the projected 5-year increments of water demands.

Table 33: SFPUC RWS Supply and Demand Comparison[30]- Single Dry-year						
	2005	**2010**	**2015**	**2020**	**2025**	**2030**
System Demand Totals	267	277	280	286	292	300
System Supply Total	240 90% of Demand	277 100% of Demand	280 100% of Demand	286 100% of Demand	292 100% of Demand	270 90% of Demand[1/]
Difference	27	0	0	0	0	30[1/]
Unit of Measure: MGD						

Multiple-year drought sequences could subject the SFPUC customers to greater levels of shortage. Table 34 illustrates the level of water delivery shortages that would be anticipated if a three-year dry hydrologic condition occurred.

[29] Table 6, SFPUC Draft 2005 UWMP.
[30] Table 10, SFPUC Draft 2005 UWMP.

Table 34: SFPUC System Supply and Demand Comparison[31] - Multiple Dry-years			
	Multiple Dry Water Years		
	Year 1	**Year 2**	**Year 3**
2005 System Demand	267 MGD	267 MGD	267 MGD
System Supply Total	240 MGD 90% of Demand	214 MGD 80% of Demand	214 MGD 80% of Demand
Year 2010 System Demand	277 MGD	277 MGD	277 MGD
System Supply Total	277 MGD 100% of Demand	249 MGD 90% of Demand	249 MGD 90% of Demand
Year 2015 System Demand	280 MGD	280 MGD	280 MGD
System Supply Total	280 MGD 100% of Demand	252 MGD 90% of Demand	252 MGD 90% of Demand
Year 2020 System Demand	286 MGD	286 MGD	286 MGD
System Supply Total	286 MGD 100% of Demand	257 MGD 90% of Demand	257 MGD 90% of Demand
Year 2025 System Demand	293 MGD	293 MGD	293 MGD
System Supply Total	293 MGD 100% of Demand	264 MGD 90% of Demand	264 MGD 90% of Demand
Year 2030 System Demand	300 MGD	300 MGD	300 MGD
System Supply Total	270 MGD 90% of Demand	240 MGD 80% of Demand	240 MGD 80% of Demand

The illustrations shown above depict anticipated SFPUC shortages on a system-wide basis. The impact on the City will depend on how the shortage is applied to the City. For droughts up to 20%, the Interim Water Shortage Allocation Plan (IWSAP) will be applied at least until 2009. The formula included in the IWSAP indicates that the cutback for the City will be similar to the system-wide cutback, but less than the average BAWSCA cutback. For system-wide shortages greater than 20%, the allocation formula of the IWSAP does not apply and a new formula will have to be developed by SFPUC and BAWSCA.

During a severe drought, the City could utilize groundwater to supplement SFPUC supplies. However, it is anticipated that only a small amount of groundwater would be utilized during a drought (e.g. < 10% of overall demand). During a severe drought the City would work with residents and business to significantly reduce water usage with wells as a supplemental resource. Additional information on the City's drought response is included in the Section 8 – Water Shortage Contingency Plan.

[31] Table 12, SFPUC Draft 2005 UWMP.

Section 8 – Water Shortage Contingency Plan

Law

> 10632. The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:
>
> (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

Background

Except for recycled water, the City does not currently produce any of its own water supplies, but is dependent upon its suppliers. The City's primary supplier is the San Francisco Public Utilities Commission (SFPUC). The SFPUC is the only supplier in normal years. The City wells are maintained in standby condition for use in emergencies. The Santa Clara Valley Water District (SCVWD) manages the county's groundwater and levies a pump tax for all water produced by the wells. The City has also approved and signed a mutual aid agreement for emergency water supplies with California's Water Agency Response Network (Coastal group) that has over 75 signatories.

To meet the requirements of the Urban Water Management Planning Act and for the purposes of this document, a distinction will be made between a catastrophic interruption of water supplies and a water shortage due to drought. A catastrophic interruption of water supplies may occur due to natural disaster such as an earthquake or due to a sudden problem with water quality or because of sabotage or terrorism. A water shortage due to drought is the more likely occurrence. The City has experienced two drought water shortages in recent years, in l976-77 and from l987 to l993.

Catastrophic Interruption of Supply

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

Regional System Reliability

The City has been very active in working with the SFPUC to analyze the supply reliability needs of the SFPUC system and in beginning to implement the most important reliability improvements. The City participated in San Francisco's Facility Reliability Study completed in 1999. This study was conducted by SFPUC to examine the vulnerability of its system to catastrophic events (e.g., earthquakes). The City was represented on the BAWSCA Facility Reliability Committee that was actively involved in the development of this study.

The City also participated in the development of the BAWSCA Local Resources Management Program. This project examined methods for developing local projects that increase supply and reliability within the SFPUC service territory.

The City was actively involved in the review of the SFPUC System Vulnerability Report. This study examined the vulnerability of the SFPUC system to catastrophic events (e.g., earthquakes). The study, released in January 2000, revealed that some areas in the regional system could be without water for up to 60 days.

To address these deficiencies, the SFPUC developed the Water System Improvement Program (WSIP) to repair and upgrade the regional system. The program contains projects that will repair, replace and seismically upgrade the regional water system's aging pipelines and tunnels, reservoirs and dams. The City has been actively involved with BAWSCA in the review of the WSIP as it is developed, revised and approved.

Local Distribution System Reliability

Given the vulnerabilities of the regional water system managed by the SFPUC, the City has examined how it would fare if the system sustained damage due to a catastrophic emergency such as a large earthquake. The City has completed several studies to identify any vulnerability in its local distribution system and to identify solutions to reduce or eliminate those vulnerabilities. Those studies are described in the Groundwater area in Section 3 – Water Supply Sources.

The studies identified a deficiency in the ability of the City's local system to meet water demands during a temporary shutoff of water from the regional water system operated by the SFPUC. The California Department of Health Services issued a recommendation that local systems be capable of providing water supplies to meet the system's water demands for an 8-hour period in addition to having enough water in storage to meet fire suppression demands. The City's system only has the ability to meet 2.5 hours of the City's water demands while maintaining sufficient reserve for fire flows.

The City Council approved a capital improvement program consisting of several recommended improvements related to addressing the City's emergency water supply deficiency including rehabilitating the five existing wells, drilling up to three new wells, and building an additional water storage reservoir. The City is in the process of implementing those improvements and is

currently in the environmental review stage of siting a new reservoir and new groundwater wells. It is expected that the environmental review for these projects will be complete by late 2006.

Emergency Response Plan

Response to a catastrophic interruption of supply is handled through a series of interconnected plans. All Disaster or Act of War Plans, from the state to local levels, use the Federal Civil Defense and Emergency Planning systems as role models with additions that take into consideration any unique conditions or situations which may exist within their jurisdictions.

At the national level, the Federal Emergency Management Agency (FEMA) controls all functions of Civil Defense or Emergency Planning for the Federal Government. FEMA will not assume control of an emergency until the President declares a State of Emergency or an Act of War occurs. At that point FEMA will assume control through the State of California Office of Emergency Services (State OES) and make available all of its resources.

At the state level, the State OES will control any disaster within the state after a State of Disaster has been declared by the governor and can make available all of its resources. The State OES further controls the Master Mutual Aid Agreement that can also be used in a local disaster (the City is a member of California's Water Agency Response Network, a mutual aid system for water utilities, in accordance with State requirements).

At the county level, the Santa Clara County OES will control the unincorporated areas of the County. They will coordinate mutual aid within the County, and act as an intermediary between local governments or utilities and the State mutual aid office.

On the city level, the City will control all emergencies according to its Emergency Response Plan. The Mayor, City Council or City Manager may declare an emergency at which time representatives of all City departments will report to the Emergency Operations Center.

The City's Emergency Response Plan incorporates the Utilities Department Water, Gas and Wastewater Operations Emergency Response Plan (the UER Plan), which covers any emergency curtailment of water supplies. The UER Plan is a detailed outline of actions to be taken and procedures to be followed by utility personnel in event of a water emergency. This plan is maintained in the office of Water, Gas and Wastewater Operations and must be updated every 12 months.

The UER Plan is designed as both an outline and a procedures manual. It covers the following primary functions:

1) Notification Procedures
2) Water Mutual Aid Agreement
3) Radio/Telephone /Communications
4) Water Receiving Station and Reservoir Check List
5) Boil Water Notifications
6) Highest Water Use Customer Load Reduction List
7) Water Interconnect Locations

8) Disinfecting of Water Mains

All City Utilities personnel whose duties include work on the system through maintenance or construction operations, or as Utilities Dispatchers, are highly trained and experienced in performing their normal or "common emergency" duties. If a disaster or Act of War were to occur, the City's construction standards may have to be lowered to make temporary repairs to expedite the restoration of the system, but the procedures and safety rules by which the work would be accomplished will not change. These temporary repairs would be upgraded and made permanent or replaced, as necessary, at a later date. The City's primary concern is the safety of the general public and all City personnel.

Water Shortage Contingency Analysis

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.
>
> 10632 (e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.
>
> 10632 (f) Penalties or charges for excessive use, where applicable.

Palo Alto's Experience with Drought Management

The City has had considerable experience implementing action plans during a period of water shortage, such as a drought. The City has always been able to comply with any rationing requirement imposed by SFPUC. During the 1976 to 1977 drought period, the City achieved reductions in citywide consumption of 16% in FY 1976-77 and 37% in FY 1977-78 compared to consumption in FY 1975-76. In the 1987-1993 drought period, the City's consumption was lower than consumption in 1987, the year just before SFPUC instituted mandatory rationing, by from 19% (in FY 1988-89) to over 35% (in FY 1991-92).

During these periods of water shortage, the community has responded exceedingly well to requests to use water in the most efficient way possible. As a result of experiencing these drought-time water supply shortages, many residents and businesses have implemented permanent improvements in water use efficiency.

During a water shortage period, the Director of Utilities is responsible for executing the Water Shortage Contingency Plan. For example, the Director of Utilities may form an ad hoc Water Committee. Representatives from appropriate City Departments and Utilities Divisions would need to be involved to oversee outreach and monitoring efforts. Additional resources will need to be dedicated to this effort both for internal and external execution of the plan.

A key element to developing water shortage contingency plans for the City is close coordination and cooperation with SFPUC and BAWSCA. It is critical to develop a coherent and coordinated regional response to water shortages in order to provide a consistent message to customers.

Regional Interim Water Shortage Allocation Plan

Under the Master Contract, reductions to wholesale customers are to be based on each agency's proportional purchases of water from the SFPUC during the year immediately preceding the onset of shortage, unless this formula is supplanted by a water conservation plan agreed to by all parties.

The Master Contract's default formula discouraged SFPUC's wholesale customers from reducing purchases from SFPUC during periods of normal water supply through demand management programs or development of alternative supplies. To overcome this problem, SFPUC and its wholesale customers adopted the Interim Water Shortage Allocation Plan (IWSAP) in 2000. The IWSAP applies to water shortages up to 20% on a system-wide basis and will remain in effect through June 2009.

The IWSAP has two components. The Tier One component of the IWSAP allocates water between San Francisco and the wholesale customer agencies collectively. This Tier One allocation is based on the level of shortage as shown in Table 35 below.

Table 35: SFPUC and Wholesale Customer Share of Available Water

Level of System Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Wholesale Customer Share
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

The Tier Two component of the IWSAP allocates the collective wholesale customer share among each of the 28 wholesale customers. This allocation is based on a formula that takes three factors into account, the first two of which are fixed: (1) each agency's Supply Assurance from SFPUC, with certain exceptions, (2) each agency's purchases from SFPUC during the three years preceding adoption of the IWSAP, and (3) the agency's rolling average of purchases of water from SFPUC during the three years immediately preceding the onset of shortage.

The IWSAP allows for voluntary transfers of shortage allocations between SFPUC and any wholesale customer and between wholesale customer agencies. Also, water "banked" by a wholesale customer, through reductions in usage greater than required, may also be transferred.

The IWSAP will expire in June 2009 unless extended by San Francisco and the wholesale customers. The projected amount of water which the City expects to receive from SFPUC during dry years after 2010 shown in Table 36 has been calculated by SFPUC on the assumption that the IWSAP will in fact be extended.

Table 36: Palo Alto Share of Available Water - AF/Y

	Purchase Request Year (2005)	One Critical Dry Year	Current Deliveries During Multiple Years		
			Year 1	Year 2	Year 3
System-wide Shortage	0%	10%	10%	20%	20%
BAWSCA Allocation	199,248	176,288	176,288	153,216	153,216
City of Palo Alto	14,930	14,370	14,370	12,488	12,488
Percent of Normal	100%	96.2%	96.2%	83.6%	83.6%

Palo Alto's Water Shortage Contingency Planning

The City's primary response to a water supply shortage will be to reduce consumption. The City's Water Shortage Contingency Plan describes the response at four water supply shortage stages. (Water use restrictions discussed in these stages can be found in Appendix E.)

- Stage I (5% to 10% supply reductions) calls for a low level of informational outreach and enforcement of the permanent water use ordinances.

- In Stage II (10% to 20%) there will be a stepped up outreach effort and the adoption of some additional water use restrictions. Drought rate schedules will be implemented.

- Stage III (20% to 35%) calls for increased outreach activities and additional emergency water use restrictions. Drought rates in each block would increase from those in Stage II. Fines and penalties would be applied to users in violation of water usage restrictions. In some cases, water flow restriction devices would be installed on customers' meters.

- Stage IV (35% to 50%) requires very close management of the available water supplies. Allocations of water for each customer will be introduced. Informational outreach activities would be operating at a very high level. Severe water use restrictions and a restrictive penalty schedule would be implemented.

Water Shortage Mitigation Options

Water shortage mitigation options can be classified under two categories: Supply Side Options and Demand Side Options. This section provides descriptions of many different actions and activities that are possible in reaction to a water supply shortage situation. The City's response to drought-time shortages depends upon the severity of the shortage. Following this section, specific actions are outlined for the various stages of a potential shortage.

Supply Side Options

The City's options to increase its short-term water supply are limited. The City's long-term supply options are referenced in the Section 3 – Water Supply Sources. This section discusses short-term alternatives to increase supply in the event of a water supply shortage.

City Wells

The status of the City's emergency wells is discussed in the Groundwater area of Section 3 – Water Supply Sources. During a drought period, it would be possible to use some water from the existing or new wells to supplement the supply from the SFPUC. However, no decision has been made to use the groundwater for this purpose.

Recycled Water

During a drought or a short-term water emergency, recycled water would be available to the City, however, a wide distribution of recycled water would require substantial infrastructure that would be difficult to construct in a short period of time. The City itself or private companies with tanker trucks can obtain permits to utilize reclaimed water from the PARWQCP. These companies can pick up reclaimed water and deliver it to customers who will pay for this service. Public awareness could be enhanced by greater publicity of the availability of this alternative to customers.

This recycled water would be available except in a catastrophic disaster (severe earthquake) that severs all sources of water (SFPUC, wells and storage) to the system thereby eliminating the source of water to the PARWQCP. However, in the event of a severe earthquake the delivery of recycled water would be a low priority.

Water Purchases from Other Suppliers

The City could conceivably purchase water from a new supplier in an extreme water supply shortage situation. However, this would require agreement with the SFPUC – and with all other jurisdictions between the source and the City – to transport this water. The SFPUC has made purchases of water from various suppliers in times of water shortages. The City and all other BAWSCA member agencies have received this water through the SFPUC delivery systems. It is unlikely that the City could negotiate a better deal than the SFPUC or BAWSCA in these extremely complicated arrangements. The Assessment of Water Resource Alternative developed as part of the City's Water Integrated Resource Plan reviews the City's options for water purchase and trading. The City will continue to investigate these options.

Demand Side Options

In droughts, the City expects to achieve significant amounts of demand reduction through its use of demand side options. These options include a combination of information outreach programs, drought rate schedules, demand side programs and water use restrictions.

Demand Side Management Programs:

Demand Side Management Programs can be offered using many different program design options and delivery mechanisms. Some examples are listed below.

Information Outreach Programs

When customers are asked to reduce their water consumption, they will be provided information on ways to achieve the reduction. Informational outreach efforts address this need by communicating to the customers how best to prioritize their water use needs and implement alternative ways to receive the same level of service while using less water.

Information and public outreach programs include utility bill stuffers, information on CPAU's web site, local print media campaigns, commercial targeted mailings, workshops and demonstrations, fact sheets on conservation technologies and practices, and coordination with product manufacturers and suppliers.

Incentive-based Demand Side Management Programs

In a persistent water shortage, most customers will take the "quick and easy" actions early on. More complex and expensive incentive programs to provide demand side management would be needed to achieve additional results. Although incentive programs require time to develop and promote, they can result in significant water savings. Depending upon current market saturations, some programs such as delivery of relatively inexpensive hardware (e.g. faucet aerators, showerheads, and toilet tank displacement devices) can offer quick drought-time savings. Other programs may include a toilet rebate program or incentives to remove lawn turf for less water-thirsty landscaping or to install advanced irrigation controllers.

Customer Water Use Audit Programs

Water audits are basically an informational service, providing customers with individualized, tailored, one-on-one analysis and recommendations including both indoor and outdoor water use analyses. Audits can be enhanced by the delivery of relevant, action-oriented information, supplier lists and even products for direct installation. In a water emergency or shortage, additional staff would be needed to provide water audits to residential and commercial customers. These personnel could be temporary or contract employees.

Drought Rate Schedules

Pricing is one of the most powerful tools that a utility can use to promote its conservation goals. Certain rate structures as well as water allotment plans can be developed to encourage conservation. Criteria to consider include those listed in Appendix D. These criteria have different weights depending on the water reduction goals. While each criterion relates to an

important objective, certain criteria need to be balanced against one another. For example, the ability to meet the "water usage reduction" criterion is impacted by the "cost minimizing" criterion with respect to enforcement and administrative staffing costs. Similarly, the "equity" criterion may involve the use of individual historical data or square footage or census data that may be unavailable except at great expense. Thus any rate structure or water allotment plan can be viewed as a balance between partly conflicting objectives in order to deal with the diversity of water needs and consumption patterns by Palo Alto residents and businesses.

Rate-based incentives have proved both efficient and effective during past water shortage periods. Based on the amount of reduction required by the SFPUC and the capabilities and limitations of the Utilities' computerized billing system, strategies will be determined for each customer class.

In determining drought rate structures, the most likely division is of single-family residential customers as one basic group and all other customer classes in another. The number of tiers in the schedules, the increase in cost per unit and the amount of a "penalty" rate would be set according to the required amount of water reduction.

Customer Class Targets

Customer class targets will mirror the required indoor/outdoor water reduction goals that exist for the City as a whole. However, whether there will be different rate schedules for each customer class or different rate increase percentages applied to existing customer rate classes will be determined by: (a) the severity of the water shortage, and (b) the capabilities and limitations of the utility billing system. Experience has shown that separating the single-family residential customers – which are more homogeneous than any other customer group – from all other customer groups is generally the only distinction needed.

Allocation/Allotment Methods

Any allocation/allotment plan or rate incentive plan would take into consideration the criteria listed in Appendix D. These criteria will be a guide to selecting the most efficient and effective water use reduction method under the particular circumstances of a specific drought situation.

Allocations Based on Percentage of Past Use

Plans that base a customer's allotment on a percentage of past use are sometimes perceived as fair and easy to administer. However, these plans have three significant shortcomings. First, selection of a base year is problematic. There have been two water shortage periods in the City since l976. It would be difficult to pick a base year unaffected by shortage year programs on the one hand, or gradually increasing water use after a drought (the "rebound effect") on the other. The second problem is that each year the turnover of new accounts is approximately 20 to 30% (mostly multi-family residents). In addition, many businesses have changed their practices to some extent over the years. Therefore to use this plan in 2005 and beyond would mean that a large percentage of water customers would have an allotment based on a previous occupant's usage, a previous operation, or some alternative situation. Handling the large volume of such cases can create administrative difficulties and perceptions of inequities as revised or new allocations are assigned to these customers. The third major flaw in the "percent of past use"

concept is that, regardless of base year selected, historically conservation-minded customers may feel penalized.

Equal Allotment for Each Home (for single-family residential)

This plan would set an identical allotment for each home designed to meet the target reduction for the class. The first tier in the rate structure would be set at this target amount. The second tier would be a "buffer" tier designed to accommodate seasonal water needs. The third and last tier would be a penalty rateblock price considerably higher than the first two tiers.

Since all homes would be treated the same, this plan suggests equity and fairness. In addition it would be inexpensive to administer, and easy to understand and implement. However, it would be perceived as unfair by relatively large families or those with large lots.

Under this plan, hardship exemptions would be limited to those who require more water for health or safety reasons. No additional allowances would be provided for the number of persons living in the household or the landscaping requirements of the particular size lot. Enforcement of this plan would involve installing a flow restrictor on those customers who continue to exceed the allotment beyond a two-month period.

Complete Per Capita Allotment Plan (for single-family residential)

Under this plan each person would be allotted a certain amount of water per month. In addition, each household would be allotted a certain amount of water per month for other essential needs including a base minimum amount for outdoor watering of shrubs and trees. Per capita information would be based on information supplied by the customers through a special mailing. The strength of this plan is that it would probably be more acceptable to the community than the equal allotment per household plan because it takes into account the relationship between water usage and the number of persons living in a household. Its weaknesses are the inability of the Utilities Customer Information System to record or manage "per capita" data and verification of per capita information.

Default Per Capita Allotment Plan (for single-family residential)

Under this plan each household would receive an allotment that would be sufficient for families of a default size. For households over that size, an additional amount would be allotted per month for the number of people over the default size. This plan is easier to administer than a complete per capita plan since the number of data entries is significantly reduced. Based on year 2000 population estimates and the last available demographic survey in the City, of the approximately 15,000 single-family residential accounts, about 10,000 accounts have households of three persons or fewer. Therefore, if the default size were three persons, only about 5,000 accounts would need additional allotments. Thus the plan has the advantage of reduced implementation cost and is administratively more feasible than the complete per capita allotment. The plan's weakness is its lack of detail or fine-tuning for households under the default size, which may be perceived as unfair, by larger households.

Mandatory Water Rationing Plans Applicable to Multi-Family Accounts, Business, and City Departments

Due to the lack of homogeneity of these customer classes, it is particularly difficult to construct rationing plans that meet all the criteria listed in Appendix D. In 1990, the City introduced Baseline Consumption Allowances (BCAs) for all customer classes except single-family residential accounts. This includes multi-family residential, commercial, industrial, institutional, and city facilities accounts. The BCA is intended to represent the indoor consumption of each customer.

It is important for any allocation plan to take into account the specific needs of these customer classes because of their diversity and unique requirements. The BCA does this. Rate structures using the BCAs can be constructed as appropriate to meet the reduction targets required and to provide the economic incentive necessary to prompt customer action. And, the targets and the associated rate block prices could be changed as the reduction requirement changes. Weaknesses of this method are that it may not accurately represent indoor water use. For example, exemptions would have to be considered for customers with cooling towers, since lack of water for cooling towers would effectively end the customers' ability to cool their building interiors, resulting in possible health and safety impacts of employees.

Excessive Use Penalties

Penalties for excessive use are expected to vary according to the customer class. For single-family residential customers exceeding percent-of-past-use, equal-allotment-per-home, or per capita water use, the penalty could be installation of a flow restrictor when usage continued to exceed the allotment beyond a 2-month period or specifically-designed punitive drought rates. Enforcement of this penalty would only occur after customers had been notified and any reasonable appeals had been processed.

For customers under a BCA allotment, the primary penalty and enforcement mechanism is in the rate structure itself. At six to ten times the basic per unit cost, excessive use results in an immediate financial penalty to the customer.

Water Use Prohibitions, Mandatory Restrictions

Adopting water use restrictions is another way to manage how customers use a limited resource. Restrictions can be classified as those preventing water waste, those "setting a tone", and those that prohibit low priority use in times of severe shortages.

Again, close coordination with our supplier is necessary. One of the considerations for selecting which water use restriction ordinances to adopt is what our suppliers recommend for the region. Both the SFPUC and SCVWD provide recommendations and the City will attempt to follow those recommendations so that regional consistency is achieved.

The ability to enforce restrictions is also a critical variable in the selection of water use regulations. For restrictions to be credible and obeyed, they must be enforced. Therefore certain restrictions, such as limits on indoor uses such as showering, are unacceptable.

Water use restrictions are achieved by using the methods, prohibitions and penalties described in the sections below. Appendix E lists permanent water use restrictions that the City currently has in place and those that could be adopted on an emergency basis in times of water shortage.

Stages of Action

Actions to be taken in response to a water shortage depend on the severity of the shortage. The staged responses (Stage I to Stage IV) depend to some extent upon the local conditions and the length of time that customers have had to focus their attention on the water shortage. For each stage noted below, activity levels in several key areas are described. Reduction targets referred to below would use the most recent non-drought year as the base year. If a different base year were to be selected, the programs might require modification. In all stages, action will be taken to ensure City facility water use is reduced by the appropriate amount.

Some factors which influence the effectiveness of any water management plan include: (1) the customer's behavior and perception of the need to conserve; (2) weather variables; (3) the length of the drought; (4) the customer's economic situation; (5) the extent to which the City achieves its utility revenue targets; (6) the percentage of exemptions or variances granted; (7) the role of the media; and (8) the customer's acceptance of the need for the program.

One lesson learned from the l987-93 drought is that the longer the water shortage, the greater the water use reduction achieved. This is likely due to a combination of factors including: (1) acknowledgement by the community that the situation is serious since it seems to be lasting; (2) realization that maintaining green lawns or other relatively unimportant landscaping is costly and not necessarily in the community's interest; (3) time for more people to get the message, a culture change over time; (4) increasing availability of conservation devices in local stores; (5) increasing examples of successful water conservation methods; and (6) more sophisticated response from the City as experience is gained.

Therefore, there is a need for some flexibility in selecting the exact strategy to be used to respond to a particular water shortage situation. Even with the same reduction target, the strategy in the first year of a drought would be different than that recommended for an additional year of a long running drought. It is very important early in a drought period to determine outreach messages and policy directions using a longer-term perspective. In this way, communications with customers throughout the drought period will be consistent and appropriate.

STAGE I: Minimum Water Shortage – 5% to 10% target water savings

The SFPUC requested voluntary reductions in this range in 1987, which the City was able to achieve. In that year, SFPUC did not impose rationing.

Information Outreach and Audit Programs

The City provides ongoing informational outreach and audit programs. At this water shortage stage, the focus of these programs would be on water saving information. A low level media information campaign would begin with the emphasis on reducing waste. As water consumption is monitored, the level of emphasis would be adjusted in order to meet the reduction goal.

The City has permanent ordinances in place that prohibit the waste of water. These ordinances are sufficient for this stage of water shortage. Enforcement would be on an "as reported" basis and mostly via reminder notices.

Incentive-based Demand Side Management Programs

Programs designed to assist customers in demand side management would be continued and augmented, to the extent necessary to provide the savings required by the City's water supplier. These programs may include a toilet rebate program or incentives to remove lawn turf for less water-thirsty landscaping or to install advanced irrigation controllers. The City would continue to monitor programs being developed by other utilities in order to take advantage of regional momentum and shorten internal development time.

Drought Rate Structures

No special drought rate structure is needed at this water shortage stage. The City's standard single-family rate structure already encourages conservation by having zero fixed charges and increasing block rates based on water consumption.

STAGE II: Moderate Water Shortage – 10% to 20% target water savings

The City was able to achieve this level of water reduction (19.1%) in the first year when rationing was imposed by the SFPUC in FY 1988-89. The program used at that time is basically the one outlined below.

Information Outreach and Audit Programs

The frequency of advertising and events comprising the information campaign would be increased. Water kits with low-cost devices will be available to customers.

Incentive-based Demand Side Management Programs

Programs designed to assist customers in demand side management would be continued and augmented, to the extent necessary to provide the savings required by the City's water supplier. These programs may include a toilet rebate program or incentives to remove lawn turf for less water-thirsty landscaping or to install advanced irrigation controllers. The City would continue to monitor programs being developed by other utilities in order to take advantage of regional momentum and shorten internal development time.

Drought Rate Structures

In response to previous water shortage conditions due to drought, the City established separate drought rate schedules for single-family residential and all other customers and increased the

price difference between lower and higher consumption tiers. For all customers except single-family residential customers, the consumption tiers were based on a Baseline Consumption Allowance (BCA) concept. This concept is described in the section, Water Shortage Mitigation Options, as applicable to multi-family, commercial, industrial, public facilities and City facilities accounts. These strategies have worked effectively in the past and will be the basis for developing future strategies.

Water Use Restrictions

The City would be more vigilant in enforcing the water use restrictions. A system of warning citations leading to possible installation of a flow restrictor would be followed. A small number of emergency water use restrictions would be added. (See Appendix E.)

STAGE III: Severe Water Shortage – 20% to 35% target water savings

The City achieved consumption reductions of 31.5%, 35.4%, and 32.7% in FY 1990-91, FY 1991-92, and FY 1992-93, respectively when the SFPUC instituted rationing. The water conservation program implemented at that time included the following major components:

Information Outreach and Audit Programs

All activities from Stage II would continue at escalated levels. In addition, emphasis would be put on targeted outreach to high water users and special categories of water users (e.g., car washes, restaurants, etc.).

Incentive-based Demand Side Management Programs

Existing demand side management programs would be continued. Staff would continue to closely monitor overall water savings in order to determine if additional levels of rebate amounts would provide additional savings, or whether other programs would be necessary.

Drought Rate Structures

This plan does not include rationing or customer allocations. Instead, inverted rates can provide the incentive to achieve the desired results along with an extensive information outreach effort. As in Stage II, rate schedules are likely to be separate for single-family residential customers and all others. Rateblocks would be structured to fit the overall water usage reduction requirement. Price signals within the rate structure would serve to alert customers of their reduction target.

For other than single-family residential customers, the rate schedule could relate to the BCAs assigned to each customer if the BCA strategy were to be used. Prices for each of the rate tiers would increase at a greater rate than in Stage II in order to provide an incentive and rate signal. In addition, the tiers themselves would decrease in size providing for customer targets reflective of the increased reduction requirement. The exact pricing mechanism would be developed according to the capabilities and limitations of the utility billing system.

The exact rates and rate blocks would be established upon receipt of the actual information from the SFPUC regarding both the reduction requirement and applicable penalties and based on the

utility's overall revenue requirements. Furthermore, a hardship exemption process would be a component of this plan. Billing credits for water leaks will be eliminated.

Water Use Restrictions

Additional "emergency" water use restrictions would be added to the existing permanent ordinances as provided in Appendix E. The amount of staff time dedicated to enforcement would be increased.

STAGE IV: Critical Water Shortage – 35% to 50% target water savings

A program to meet this level of water use reduction has not yet been implemented in the City. However, in the spring of 1991, the SFPUC adopted a program calling for reductions in this range. Although ultimately replaced with a less restrictive program, the City discussed what actions would be taken to meet the critical reduction targets. The program below outlines the major components of the plan to meet such a target.

Information Outreach and Audit Programs

All activities from Stage III would continue at further escalated levels. A greater focus will be placed on survival strategies and prioritization assistance for all customer classes.

Incentive-based Demand Side Management Programs

Depending on what programs have been implemented prior to this stage, or current market saturations for certain devices, a selected number of indoor conservation incentives will be offered. These may include rebates for and/or give aways of showerheads, toilet modifications or retrofits, process water use modifications and use of reclaimed water.

Drought Rate Structures

At this level of reduction, an allotment method would be considered for each customer. The allotments would be sufficient for the most critical, high priority uses of water and the availability of water for outside use would be dramatically reduced. As in Stage III, rate schedules are likely to be separate for single-family residential and all other customer classes. Various allotment methods are discussed in the previous section, Allocation/Allotment Methods.

For non single-family residential customer classes, the size of the rate blocks would decrease from Stage III as appropriate to meet the reduction goal.

Water Use Restrictions

Severe "emergency" water use restrictions, many of which will supersede previous ones, will be added. Enforcement will be more rigorous in terms of hours of enforcement, number of staff involved, and the speed with which penalties are applied. (See Appendix E.)

Recycled Water Use

Recycled water offers an alternative source of water to those customers with valuable landscaping. The availability of contractors who can haul recycled water will be advertised. In

addition, the City will rent tanker trucks to irrigate valuable City landscaping and street trees that will undoubtedly be stressed by a long-term drought, the likely precursor to this stage of a water shortage.

Revenue and Expenditure Impacts and Measures to Overcome Impacts

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier…
>
> 10632 (g) [An analysis of the impacts of each of the] proposed measures to overcome those [revenue and expenditure] impacts, such as the development of reserves and rate adjustments

Impact On Expenditures

Water utility expenditures can be generally categorized as fixed or variable expenses. The variable costs are almost entirely related to the costs of purchasing water supplies. The fixed costs primarily relate to the cost of operating and maintaining the distribution system.

As consumption falls, the fixed expenses must be spread over fewer units sold which can trigger a rate increase (see below). In addition, costs for the informational outreach programs during a water shortage increase. Estimates for those costs are relatively small for voluntary programs – $30,000 for Stage I and $55,000 for Stage II. For mandatory programs, enforcement and advertising efforts are escalated and the costs rise. Estimates are $100,000 for Stage III and $150,000 for Stage IV. The net effect is an increase in the expenses per unit of water sold.

Impact On Revenues

From a utility perspective, there is often a downside to water conservation – the erosion of sales revenue. As consumers reduce their usage in response to the drought, the utility will experience a decline in sales. This decline in sales revenue will necessarily be greater than the associated decline in fixed expenses. The impact of this sales erosion on revenues can be mitigated to some extent by drawing upon cash reserve balances or enacting a rate increase.

The preferable approach is to draw upon the utility's cash reserves, if they are sufficient, to cover the financial obligations of the utility. One approach to establishing a reserve for this purpose is to earmark penalty surcharge revenue (applicable for usage above allotment or target levels) as a funding source for this reserve. Other options include short term borrowing or financing long-

term capital projects through revenue bonds rather than through current rates. Each of these approaches has its advantages and disadvantages. The appropriate response depends upon the specific circumstances facing the utility at that moment and other factors.

Reduction Measuring Mechanism

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

Under normal water supply conditions, the amount of water coming into the City from the SFPUC regional supply line is metered at the Arastradero and Lytton turnouts. The daily meter readings are maintained at the Utility Control Center. Totals are reported monthly to CPAU's Resource Management Division for comparison to the billing amounts from the SFPUC.

During curtailment stages in a water shortage, supply figures are reported to the Utilities Resource Management Division on a daily basis with copies to the Utility Marketing Services office and the Water Committee. In water shortage periods, the Director of Utilities would form an ad hoc Water Committee with representatives of all divisions to oversee outreach and monitoring efforts. The Water Committee would provide timely reports to the City Council on the shortage and success of measures taken.

If curtailment reaches Stage III or Stage IV, daily supply figures are reported to the Director of Utilities in addition to the Resource Management Division with copies to Utility Marketing Services and the Water Committee. The Water Committee reports monthly to City Council or as frequently as information is requested by the City Council.

Water Shortage Contingency Ordinance/Resolution

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (h) A draft water shortage contingency resolution or ordinance.

The City has experienced two instances of water shortage due to drought in recent years. A shorter duration drought occurred in l976-77, and a longer rainfall deficit occurred between l987 and l993. Staff has now drafted an ordinance for use during implementation of a Water Shortage Contingency Plan. See Appendix C.

APPENDIX A - Resolution Adopting UWMP

APPENDIX B - CUWCC Best Management Practices Report

APPENDIX C - Water Shortage Contingency Plan Draft Ordinance

APPENDIX D - Water Shortage Contingency Plan Evaluation Criteria

CRITERIA TO EVALUATE WATER SHORTAGE RESPONSE PLAN

This appendix lists criteria expected to guide the selection of allocation/allotment strategies whenever water use reductions are needed. Not all of them may be applicable to every strategy but customer perception of equity is important in achieving the necessary reductions.

1. Reduce overall City consumption by reduction target required – this is the effective goal of any plan. To accomplish this goal the percentage reduction for the various customer classes will necessarily vary because their ratios of indoor / outdoor use varies.

2. Sufficient water available for personal use – the most important use of water is for basic drinking, health, and sanitary uses, and therefore, this is given the highest priority of use. This prioritization will drive both rate schedules and water use restrictions. However, within allowed limits (i.e., water use restriction ordinances), customers will be able to choose how they use their allotment between indoor and outdoor uses.

3. Acceptance by the community – many people tend to evaluate or accept a particular water-rationing plan in terms of how it would directly affect them. It is this aspect which makes it difficult to gain a popular consensus on any one plan. However, any plan must be generally accepted by the community to be successful. One important aspect of acceptance is the public's understanding of the program; thus, it is viewed as important to make the plan as uncomplicated as possible.

4. Minimize unemployment or business loss – water is extensively used in both commercial and industrial functions. If water is severely limited to these consumers, increased unemployment and business losses could result. Staff intends that, wherever possible, this should be avoided. Still, outside water use must be sacrificed greatly if only minimal indoor reductions are required. Cooling tower use for air conditioning must also be considered.

5. Landscaping investment losses – in cases of critical or severe shortage of water, it is expected that significant landscaping losses may arise. The use of reclaimed water should be encouraged for certain applications. In some cases, using the City's well system to augment the SFPUC supply will be an option to provide a minimum amount of water for landscaping. In this case, the goal should be to keep valuable and mature trees and plantings alive. Shrubs and lawns will be considered a lower priority.

6. Workable plan – the plan must be workable in order to accomplish its goal. It must take the following factors into account:

    a. Cost - the cost of any water plan to the public should be minimized.

b. Enforcement - enforcement is viewed as a key component of any plan. Those plans requiring fewer resources for enforcement would be preferable. However, the success of a plan is contingent upon effective enforcement and the utility must be provided the resources to meet the enforcement objective. The current staff can only absorb a certain level of additional responsibilities without unreasonably impacting service to the customer.

c. The plan must be practical and feasible from a data processing viewpoint and not subject to erroneous results due to incomplete or inaccurate databases. A realistic timeframe must be allowed to perform any necessary data entry or customer programming functions.

9. Flexibility – the water shortage is a dynamic situation and may get better or worse. Thus, it is necessary that any plan be adaptable to changes in targets or adjustable if original expectations are not being met.

10. Allowance for new services – some provision must be made in any plan to serve new establishments or those under construction.

12. Recover penalties applied by suppliers – revenue should be collected to the extent necessary to recover any penalties that may be charged by suppliers.

APPENDIX E - Water Shortage Contingency Plan - Use Restrictions

WATER USE RESTRICTIONS

This appendix lists the current long-term water use restrictions and additional restrictions that could be applied during a water supply shortage situations.

Existing Permanent Water use Regulations

1. Flooding or runoff of potable water is prohibited.
2. A shut-off valve is required for hoses used to wash vehicles, sidewalks, buildings, etc.
3. Potable water for construction uses is prohibited if reclaimed water is available.
4. Broken or defective plumbing and irrigation systems must be repaired or replaced within a reasonable period.

Additional Regulations for Emergency Water Shortage Situations

Water Use restrictions added for Water Shortage Stage II:

1. Landscape irrigation shall not be allowed between 10:00 a.m. and 6:00 p.m., except for drip irrigation, soaker hoses and hand watering.
2. Restaurants and other food service operations shall serve water to customers only upon request.

Water Use Restrictions added for Water Shortage Stage III:

All water use restrictions for Stage II above and the following:

1. Potable water other than when used from containers of five gallons or less, shall not be used to clean hard surfaced areas or building structures.
2. Potable water shall not be used to operate, clean, fill or maintain levels in decorative fountains or ponds.
3. Newly constructed pools, spas and hot tubs may not be filled.
4. Signs providing notice of water shortage emergency shall be displayed in all public restrooms and restaurants, and in hotel guestrooms.
5. Outdoor water use audits are required for those customers continuing to use more than target allotments for three months.
6. Commercial car washes must use recycled water systems, if economically feasible.
7. Verified water waste will serve as prima facie evidence that the allocation assigned to the water account is excessive and subject to reduction.
8. The use of potable water on golf courses is limited to putting greens and tees.
9. The use of potable water for street sweepers/washers is prohibited.

Water Use Restrictions added for Water Shortage Stage IV:

1. No new water service hookups unless customer pays for sufficient conservation elsewhere to offset anticipated water use.
3. No new landscaping installed at new construction sites. Bonds to be posted for landscaping after water shortage emergency is lifted.
4. Turf irrigation prohibited.

5. Owners/operators of private wells must adhere to the same water use restrictions as other residents and businesses dependent upon the City's potable supply.
6. Once-through cooling systems must be converted to recycling systems.
7. The washing of all vehicles is prohibited outside of a commercial washing facility that recycles its water.
8. Irrigation by sprinklers is prohibited at all times