CITY OF PALO ALTO

URBAN WATER MANAGEMENT PLAN UPDATE AND AMENDMENT

DECEMBER 1990

Adopted By The
City of Palo Alto City Council
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February 25, 1991

PREPARED BY THE UTILITIES DEPARTMENT
RESOURCE PLANNING DIVISION
UNDER THE DIRECTION OF
RICHARD YOUNG, DIRECTOR OF UTILITIES

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LEGEND

ACRONYM	DESCRIPTION
ABAG	Association of Bay Area Governments
ARB	Architectural Review Board
AWWA	American Water Works Association
BAWUA	Bay Area Water Users Association
BCA	Baseline Consumption Allowance
CCF	Hundred Cubic Feet
DSM	Demand-Side Management
DWR	Department of Water Resources
MGD	Million Gallons per Day
RWQCP	Regional Water Quality Control Plant
SAG	Suburban Advisory Group
SCVWD	Santa Clara Valley Water District
SDWA	Safe Drinking Water Act
SFWD	San Francisco Water Department
USGS	United States Geological Survey
UWMP	Urban Water Management Plan

1. EXECUTIVE SUMMARY

PURPOSE

The Urban Water Management Planning Act, Assembly Bill 797, required water utilities, including Palo Alto, to prepare and adopt an urban water management plan containing prescribed elements by December 31, 1985. The plan must be filed with the California Department of Water Resources (DWR). In addition, the law requires Palo Alto to review its plan at least once every five years and make changes or amendments as appropriate. This plan is a major update and amends the 1985 Urban Water Management Plan (UWMP) adopted by the City in its entirety.

AB797 requires water utilities to compare the costs of new and expanded supply resources with alternatives such as reclaimed water and conservation programs. Palo Alto's 1990 updated and amended UWMP complies with and contains all the required components of AB797. The UWMP outlines historical, existing and anticipated future conditions as they relate to demand, supply and operations, and evaluates alternatives for responding to those conditions.

Development of the UWMP is consistent with Goal VI, Objectives 8 and 9, of the City of Palo Alto Utilities Department Strategic Plan and with Palo Alto's Comprehensive Plan.

BACKGROUND

The City of Palo Alto Water Utility was formed in 1896 when the City began operation of the municipal well system. Well water was the City's sole source through the year 1938 when the supply was supplemented with purchases from the San Francisco Water Department's (SFWD) Hetch Hetchy water system. In 1962, continuous operation of the wells was terminated and the SFWD became the City's sole supplier.

In the last few decades, the Water Utility has been operating, for the most part, as a distribution service wherein maintenance and infrastructure activities dominated. The City's wells were maintained as an emergency source of supply. Water quality monitoring and facilities maintenance kept pace with evolving situations and regulations. The drought of 1976-77 and the current drought focus attention on water as a limited resource, stimulating a higher level of water awareness among the City's private and corporate citizens. Recently, however, the heretofore stable environment of the local water industry has begun to change.

The high rate of growth in population and commercial/industrial activity in California is pushing the limits of the West's limited water resources. State action may alter century-old water rights and modify the state's existing water allocations. Furthermore, increasingly stringent drinking water standards may require extensive capital investments in treatment facilities. This all comes at a time when much of the infrastructure of Palo Alto is reaching the end of its lifecycle and will continue to require extensive and costly rehabilitation.

Long-term water utility planning is critical in the face of this changing environment. The 1989 Water Utility Plan (WUP) was adopted in November 1989 as an attempt to capture the essence of that environment. The WUP made recommendations for guiding the City's Water Utility through the uncertain future. This UWMP expands on the WUP by providing an economic analysis comparing expanded supplies to alternatives including reclaimed wastewater and new conservation programs. A first step in planning for the future is forecasting the City's long-term water needs. A twenty-year water consumption forecast, completed in January 1990, projects virtually no growth over 1984 levels. Variables affecting the forecast include rainfall, temperature and population. While the areas surrounding Palo Alto have experienced significant growth, the City has maintained and is expected to continue to maintain a relatively stable population. In addition, the City is an urban area with no agricultural customers served by the Water Utility. The forecast represents a slight decrease in per capita consumption, reflecting the City's commitment toward continued emphasis on increasing efficiency of use.

The nature of the City's contract with the SFWD means that if, in fact, demand stays close to current levels, the City will be guaranteed a large portion of that demand. Nonetheless, a gap is still anticipated between supply and demand. This gap, in addition to the circumstances involving the SFWD system, requires that the City be proactive on supply issues.

In the near term, the mid-1990s, the SFWD system may face a peaking capacity shortage due to the size limitations of its cross-valley transmission facilities. During high- demand periods, which coincide with hot summer weather patterns, the transmission system may reach its hydraulic capacity limit. In the long term, the SFWD system will be unable to meet currently projected levels of demand. Additionally, the State Water Resources Control Board's Bay-Delta Hearings, which are currently in progress, could impact the SFWD's water rights such that further entitlements would be limited or prohibited.

As a result, supply alternatives to Hetch Hetchy are being pursued. Alternatives include the Santa Clara Valley Water District (SCVWD), the City well system and water reclamation. The utilization of any of these sources would involve initial capital outlays for transmission facilities and possible compromises in water

quality. Consideration of these sources lends itself well to the concept of the segmentation of the water market into uses with high- and low-quality requirements.

Another option that can be used in conjunction with the alternative supply-side measures is the adoption of demand-side programs. Demand-side management (DSM), like sources of supply, can reduce the gap between supply and demand, but has the advantage of fewer political and environmental impacts.

CONCLUSIONS

The requirement to write the UWMP gives Palo Alto the opportunity to describe its water management plans for the next five years. Although Palo Alto has had demand-side management programs in place for years, the current drought and uncertainty about long-term supply availability prompts an expansion of those programs.

The Utility plans to embark on an aggressive set of programs beginning in 1991 to increase long-term water use efficiency in Palo Alto. Different programs target each customer class to effectively address the water end-use characteristics of each group.

Evaluation of alternatives culminated in the selection of many cost-effective options for Palo Alto to pursue. The water savings estimated are significant and long-term. These programs help meet the goal of ensuring that all water consumed in Palo Alto is used in the most efficient manner possible as is necessary for a limited natural resource.

2. PHYSICAL SYSTEM DESCRIPTION

WATER DELIVERY AND STORAGE SYSTEMS

San Francisco Water Department Connections

There are four connections to the SFWD pipelines where Palo Alto's water distribution system receives its potable water supply. These are shown on Figure 1 as the Lytton, California, Page Mill and Arastradero Stations.

The pressure-regulating valves and fluoridation equipment at these stations are inspected every other day. The regulating valves are overhauled every three to four years. Repairs at the connection facilities are performed on an as-needed basis with no preventative maintenance program due to current staffing levels. A consultant has been selected to make recommendations relative to updating the water receiving stations and the related monitoring systems.

Wells

The four top-producing wells were fitted with chlorine and fluoride injection pumps and were operated continuously during the summer of 1988 in response to drought conditions and SFWD rationing. In spite of the 31-year-old equipment and past maintenance on an as-needed basis, these four wells were able to pump sufficient water, in conjunction with strong conservation efforts, to meet consumption needs and still avoid any penalties from the SFWD.

During normal years the wells are test-pumped three or four times a year. These four wells have been recommended for refurbishing to maintain them in good operating order.

Reservoirs

Reservoirs located in the City's higher elevations are operated on a continual basis from April through November. In November, the reservoirs are filled and the booster pump stations are secured for the winter due to minimal demand during this period. In March, the water, which has been stored during the winter months for emergency purposes, is drained back into the system. The reservoirs are then refilled for use during the summer months. Repairs at the reservoir facilities are performed on an as-needed basis. The five foothill water reservoirs are currently undergoing internal recoating and seismic protection improvements.

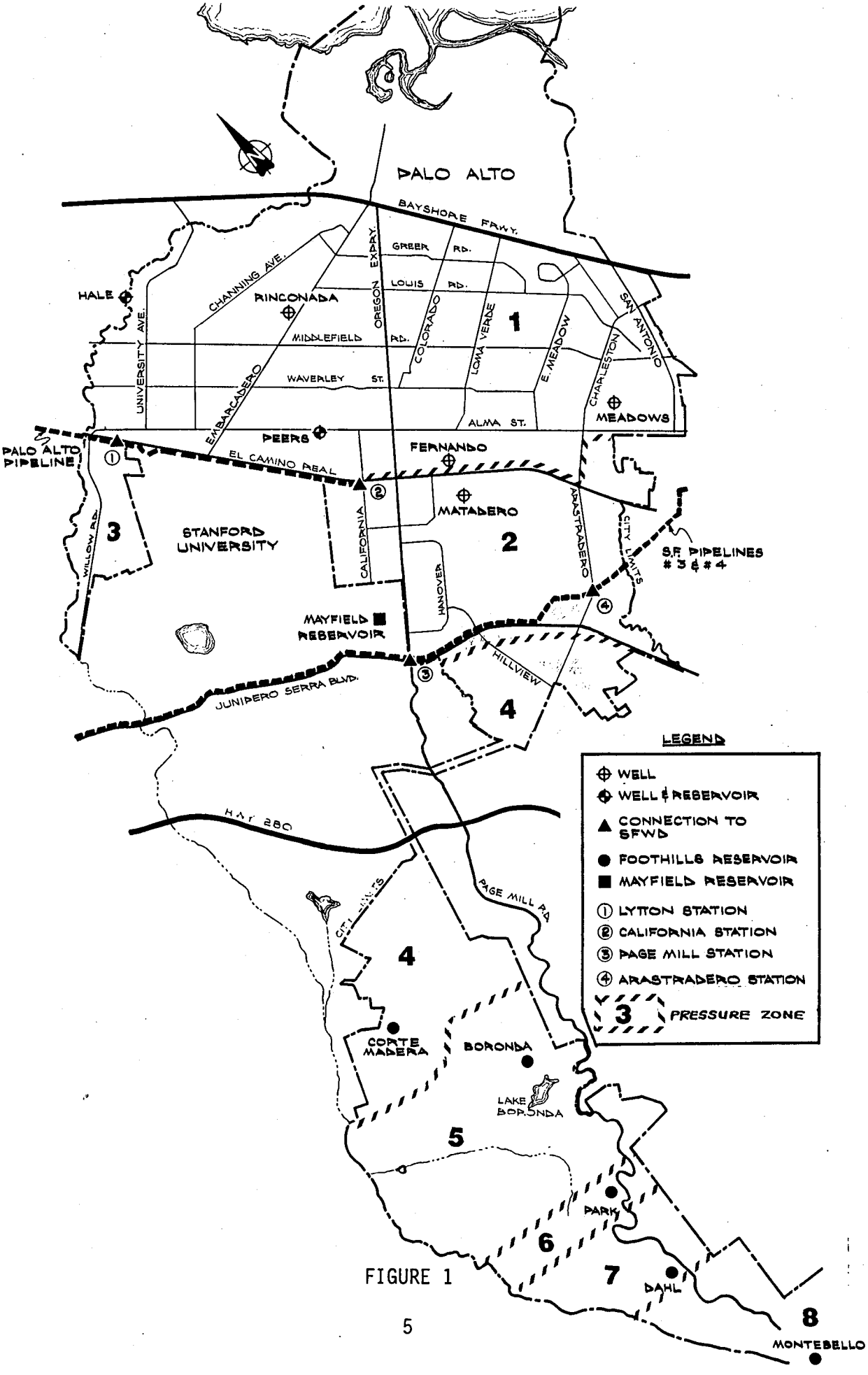
PALO ALTO
BAYSHORE FWY.
GREER RD.
LOUIS RD.
MIDDLEFIELD RD.
WAVERLEY ST.
ALMA ST.
HALE
RINCONADA
MEADOWS
PEERS
FERNANDO
MATADERO
STANFORD UNIVERSITY
MAYFIELD RESERVOIR
JUNIPERO SERRA BLVD.
HWY 280
PAGE MILL RD.
CORTE MADERA
BORONDA
LAKE BORONDA
PARK
DAHL
MONTEBELLO
CHANNING AVE.
UNIVERSITY AVE.
EMBARCADERO
OREGON EXPWY.
COLORADO
LOMA VERDE
E. MEADOW
CHARLESTON
SAN ANTONIO
EL CAMINO REAL
CALIFORNIA
ARASTRADERO
CITY LIMITS
HANOVER
HILLVIEW
WILLOW RD.
PALO ALTO PIPELINE
S.F. PIPELINES #3 & #4
1
2
3
4
5
6
7
8
LEGEND
WELL
WELL & RESERVOIR
CONNECTION TO SFWD
FOOTHILLS RESERVOIR
MAYFIELD RESERVOIR
① LYTTON STATION
② CALIFORNIA STATION
③ PAGE MILL STATION
④ ARASTRADERO STATION
3 PRESSURE ZONE

FIGURE 1

WATER QUALITY

3.

As the water wholesaler, SFWD is responsible for verifying that raw water sources and treated water at their treatment facilities are in compliance with the Safe Drinking Water Act (SDWA). To that end, a complete analysis of general mineral, metal, and nitrate concentrations of all water sources is conducted at least annually by SFWD. Herbicide and pesticide concentrations are checked at least every three years and radioactivity is tested every four years. In addition, SFWD checks the turbidity of all treated water on a daily basis.

As the water retailer, Palo Alto is currently responsible for monitoring color, odor, turbidity, chlorine residual, temperature, conductivity and pH on a monthly basis. The City tests fluoride and bacteriological quality weekly at representative customer taps.

OPERATION OF THE DISTRIBUTION SYSTEM

Main Flushing

Water mains throughout the City are flushed on an annual basis, except in drought years. The process of flushing the entire distribution system is performed within a one-week period. Fire hydrants are opened in order to flush out any sediment that may have collected during the winter months when water usage is low. An estimate is made of the quantity of water used in this process and, therefore, is not considered to be a part of the system losses or unaccounted-for water.

Backflow Prevention

Title 17 of the California Administrative Code requires assignment of staff to investigate potable water/wastewater cross-connection problems. Responsibilities include continually surveying the water system for cross-connection potential, and maintaining and enforcing the cross-connection program. The City's cross-connection program has been approved by the State and the system survey is underway.

Water Valve Operation

Of the 3,900+ water main valves, approximately one third are inspected and exercised annually. This does not meet AWWA standards that require that all valves within a water distribution system be inspected and operated annually. As staff time allows, valves found to be non-functional are replaced on an as-needed basis.

3. FORECAST

A long-term forecast of total City water consumption is produced annually. The most recent forecast, done in January 1990, predicts virtually no growth through the twenty year period (Figure 2). Reasons for this leveling out include the slowing of population growth and building activity and the conservation ethic resulting from the two recent drought periods (1977-78 and 1987-90). This forecast is the most likely case. Actual use will vary with deviations from expected values in temperature, rainfall, and population growth, the latter of which is significantly influenced by City Council policy.

The most notable aspect of the forecast is that the base case predicts total City consumption will remain below pre-1977 drought levels throughout the next twenty years.

HISTORICAL WATER USE

The two drought periods have had a profound effect on Utility and customer attitudes as well as the mechanism used in water consumption. 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. Additionally, the recent drought has added significantly to the development of extensive demand-side planning activities in the water utility industry.

Figure 3 shows that the percentage of consumption of each customer class has remained virtually constant for the last twenty years and, based on the City-wide Land Use and Transportation Study, no major shifts in this trend are expected.

Examination of FY 89-90 consumption (Figure 4) reveals that the residential sector (single- and multiple-family dwellings) is responsible for 50% of total City sales. The commercial and industrial sectors consume 39% and public and City facilities use the remaining 11%. Further breakdown of a single family residential home (Figure 5) shows that irrigation, showers and toilets represent over 80% of the typical home requirements.

HISTORICAL SUPPLY DEFICIENCIES

The City of Palo Alto's water utility has experienced no regular or frequent supply deficiencies during the period of record. However, curtailments were requested by our supplier during the 1976-77 drought and the current drought period. The 25% curtailments in 1976-77 were achieved by voluntary reductions, the

CITY OF PALO ALTO WATER CONSUMPTION
Historical and Projected

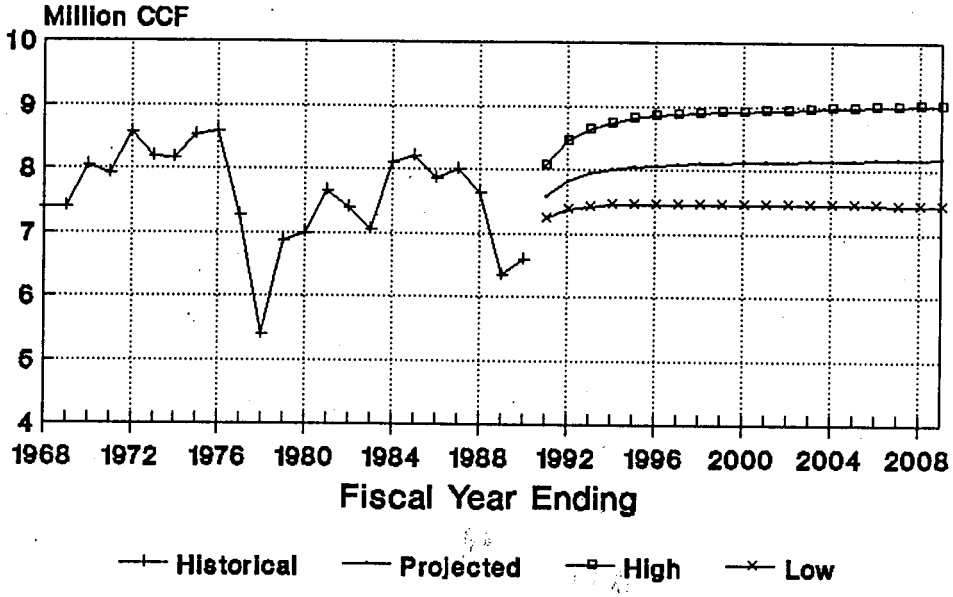

Figure 2

CITY OF PALO ALTO WATER UTILITY
CONSUMPTION BY CUSTOMER CLASS

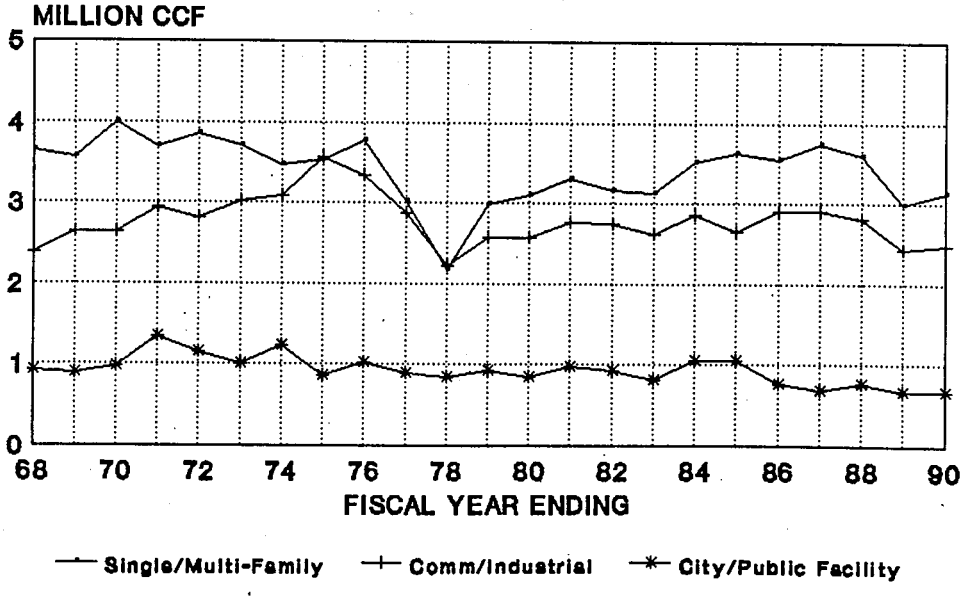

FIGURE 3

CITY OF PALO ALTO WATER UTILITY
FY 1989/90 Sales By Customer Class

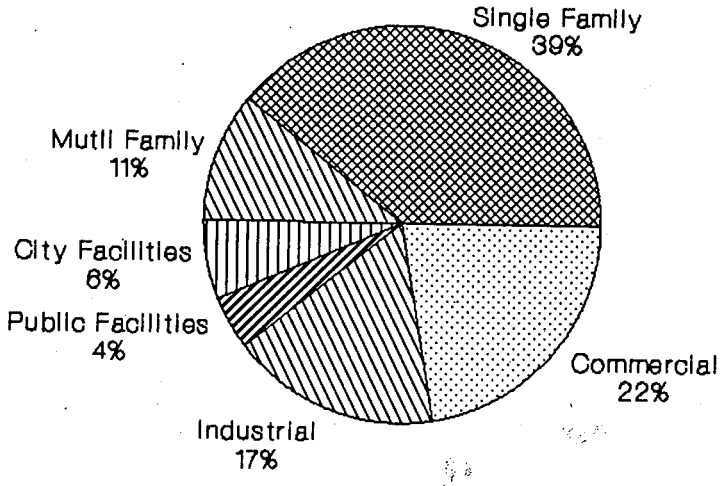

FIGURE 4

TYPICAL RESIDENTIAL WATER USE

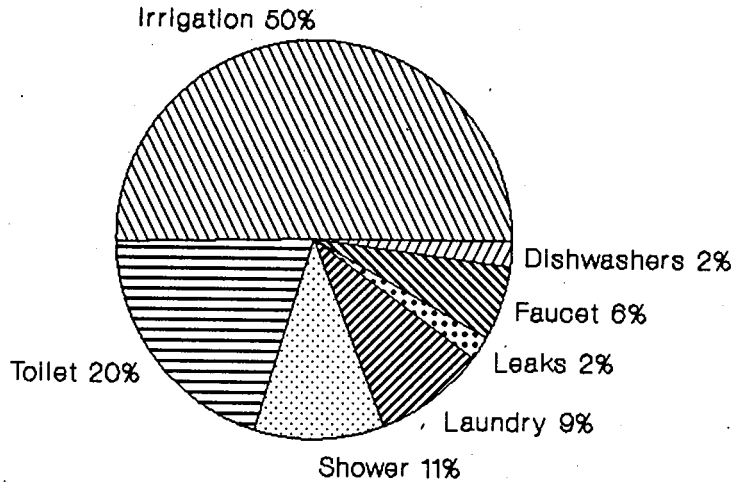

FIGURE 5

establishment of an inverted block water rate schedule, the development of a conservation program, and mandatory allocations and penalties. For the 25% curtailments effective during the current drought, Palo Alto implemented a Drought Rate Schedule and expanded Public Information and Conservation Education programs.

FORECAST METHODOLOGY

A regression analysis was performed that relates the historical purchases to City population, local rainfall, and local temperatures. In conjunction with the use of variables accounting for seasonal and drought conditions, these factors combine to closely approximate historical purchases.

The base projections reflect the following conditions: drought restrictions ending in May 1991; normal temperature and rainfall as defined by the State Climatologist; and population growth as published by the Association of Bay Area Governments (ABAG).

High and low projections were developed using likely high and low values of the independent variables. High and low values for rainfall and temperature are based on the five-year average high and low durations from normal. Population bandwidths were derived from discussions with Planning Department staff. Using variable width bands tends to smooth out the transition from current levels to the high and low cases, in comparison to standard deviation bands that produce dramatic incongruities from current to high and low values.

The most notable element of this forecast is the current drought. Although consumption has remained below pre-1977 drought levels, the extent to which consumption rebounds to pre-1988 drought levels will greatly impact the accuracy of the forecast as well as its effectiveness as a planning tool. Since the demographic circumstances of the City are close to buildout, there is a high degree of comfort regarding the slow growth rate. Thus, it is the level rather than the slope of the forecast about which there is the most uncertainty. Examination of Figure 2 shows that the forecast seems to ignore the possibility of future droughts. Given the recent history and assuming the state will have an increasing propensity towards shortages (increasing population, increasing demand, but static supply), it is reasonable to assume a number of shortages in the next 20 years. This possibility is discussed more in Section 5 where planning scenarios are developed.

4. EXISTING RESOURCES

SUPPLY-SIDE RESOURCES

San Francisco Water Department

Contract

Since 1962, Palo Alto has purchased essentially all of its water from the SFWD with two short-term exceptions when wells were used. In 1974, Palo Alto filed a lawsuit against its water supplier, the City and County of San Francisco, in protest of an increase in water rates that was higher for suburban wholesale customers than it was for direct retail customers. Palo Alto is one of 30 water agencies, or suburban purchasers, that purchase water wholesale from SFWD. All other suburban purchasers later joined Palo Alto in the suit.

In 1984, settlement negotiations resulted in the "Settlement Agreement and Master Water Sales Contract Between the City and County of San Francisco and Certain Suburban Purchasers in San Mateo, Santa Clara and Alameda Counties" (Agreement). The Agreement was approved in 1984 and will remain in effect for 25 years.

Supply Assurance

When the Agreement was signed in 1984, each agency's minimum water allocation, or supply assurance, was set. The Agreement stipulates that, every three years, this supply assurance is to be adjusted to reflect the average amount of water used by each agency during the preceding three-year period. Adjustments are made for increases only; an agency whose average purchases have decreased from the preceding period will continue to receive its prior allocation.

The first three-year period was recently completed and the new allocations are based on usage during fiscal years 1984-85, 1985-86 and 1986-87. Palo Alto's guaranteed annual water purchase amount has been increased from 7,580,463 hundred cubic feet (CCF) or 15.54 million gallons per day (MGD) to 8,020,744 CCF or 16.44 MGD (Figure 6).

It should be noted that the period covered by the three-year provision can be changed by unanimous consent of the purchasers if any of the years are abnormal. For example, the current drought years will not be considered in the next calculation.

PROJECTED SOURCES AND USES
Supply Assurance vs. Projected Demand

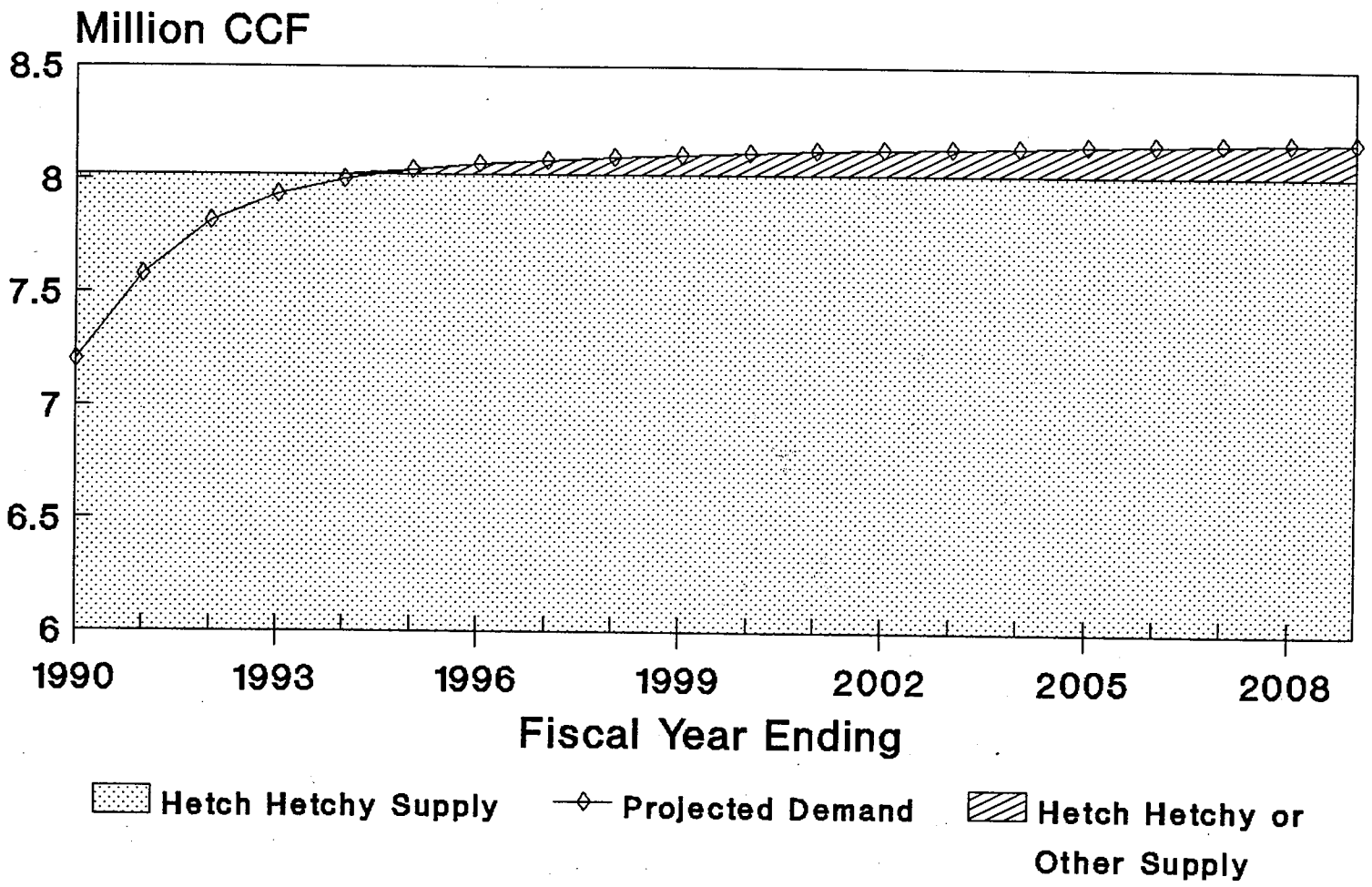

FIGURE 6

The increases in supply assurance will continue until the 30 suburban agencies reach a combined total allocation of 184 MGD. As of July 1, 1987, the latest figure unaffected by drought-related conservation, agencies were purchasing 170 MGD. Once the water agencies reach the 184 MGD level, all water above each individual agency's allocation will be charged at a higher unit rate. This higher rate will reflect the SFWD's loss in power sales revenue that may directly or indirectly result from the sale of water above the 184 MGD level to the suburban agencies and a subsequent decrease in hydroelectric generation.

Although the Agreement states that the SFWD guarantees water deliveries only up to 184 MGD for the 30 suburban agencies, the system is capable of delivering additional water. Based on the Bay Area Water Users Association Planning Committee's involvement in the SFWD Master Resource Plan, it is known that the system can currently deliver a total of 325 MGD to both suburban and direct San Francisco customers. While the Agreement recognizes the SFWD's long-term commitment to supply potable water to the suburban agencies, it does not address the relationship between the existing system capabilities and the contractual limitations. Staff will continue its involvement with the Planning Committee in an effort to better define this unresolved contractual issue.

Administration

The Agreement recognizes two advisory groups. The first group is the Suburban Advisory Group (SAG) that is made up of one representative of each suburban purchaser. The Agreement states that SFWD and SAG shall meet for discussions on an annual basis to keep the suburban purchasers apprised of SFWD plans and programs.

The second group is the five suburban representatives that are selected by the SAG to represent the suburban purchasers in the month-to-month administration of the Agreement with SFWD. Palo Alto has been appointed as one of the five suburban representatives.

A group that is not formally recognized by the contract but which coordinates the agencies' collective planning efforts is the Bay Area Water Users Association (BAWUA). BAWUA is an association of the thirty water agencies served by SFWD. Recently, BAWUA has taken steps to become incorporated in order to expand its rights, powers, and protections.

By providing staff and time to lead the suburban representatives and BAWUA, Palo Alto remains involved in and has opportunities to influence issues that will directly impact the City's ability to provide potable water into the future.

Wells

The City of Palo Alto established its well system in 1896. The entire water supply for the City was derived from wells until 1938 when the purchase of Hetch Hetchy water from SFWD was initiated. In 1962, the continuous operation of the well system was terminated and SFWD water became the City's main source of supply. Nonetheless, ten city wells were maintained until 1988 as an emergency water supply (Figure 1). Four of the wells were sealed in 1988 and 1989 after a study indicated that they were no longer serviceable.

Since the introduction of SFWD water into the City system, the remaining six wells have been used minimally for water production. The exceptions have been during a 1976 SFWD strike and again during the summer of 1988 when the wells were used to supplement the City's water supply due to reduced water allocation from SFWD (Figure 7).

A Report on the Condition of the City of Palo Alto Well System (Report) was prepared in early 1988. The purpose of the Report was to review the adequacy of the City's ten wells. The Report and its recommendations were approved by the City Council.

Recommendations were made for improvements to four wells (Hale, Rinconada, Peers Park, and Meadows) and abandonment of four well sites (Park, Tower, Seale and Middlefield). The Park well was sealed in 1988 and the Tower, Middlefield and Seale wells were sealed in June 1989. Further water quality evaluations on two wells (Matadero and Fernando) will be made prior to a final recommendation to abandon or improve them.

Santa Clara Valley Water District (SCVWD)

The City of Palo Alto, by virtue of its location in Santa Clara County and the existence of the City well system, is considered a SCVWD retail water agency. Although Palo Alto does not directly receive water deliveries from SCVWD water treatment facilities, SCVWD assesses a groundwater withdrawal charge (pump tax) when the City wells are used.

Demand-Side Resources

Demand-side management can provide a means of meeting Palo Alto's water use needs with less water. Also demand-side management can be considered a source of additional water supply for the simple reason that water conserved by current users becomes available for new users and uses. This conserved water supply is of higher-quality than alternative supply sources such as groundwater or imported water. Further, using this supply is environmentally sound and avoids the political

1988 Palo Alto Water Supply
SFWD and City Well System

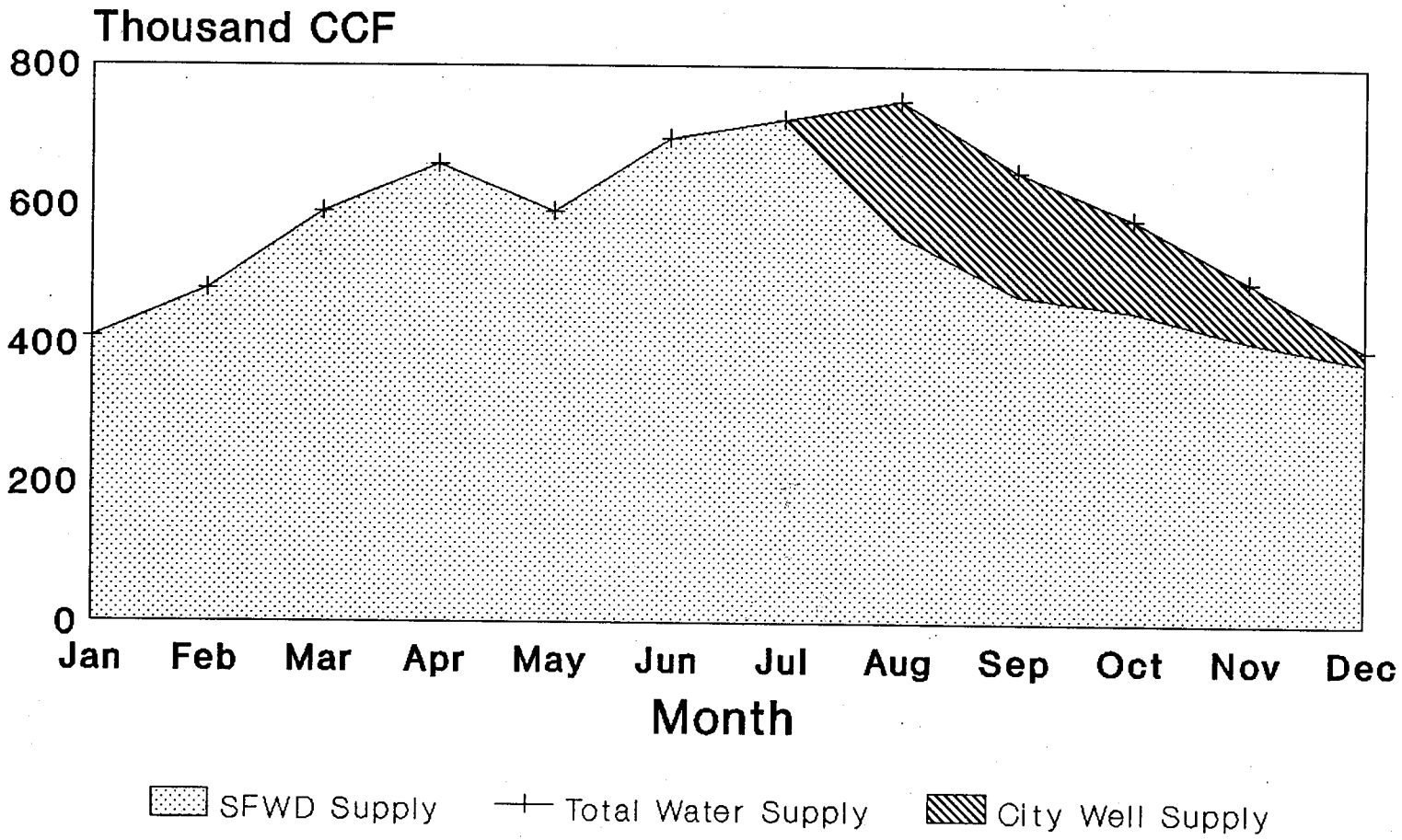

Figure 7

problems associated with most new water supply projects. Active DSM programs can also provide the City with a hedge against future droughts by lowering basic water requirements for all customers.

By analyzing consumption patterns and both customer and utility needs, a palette of DSM activities have been designed and implemented. These have enabled Palo Alto to continue to serve high quality water to its customers.

DSM encompasses a wide range of activities, programs and services designed to increase water use efficiency, reduce overall water use and influence when water is used. Promotional and education programs, financial incentives, product installations, guidelines, regulations and strategic rate setting as well as drought/ emergency planning are examples of DSM.

The flexibility of DSM is one of its greatest assets. Levels of DSM efforts, and the resulting water use impacts, can be adjusted quickly to accommodate uncertainty and rapid change in load growth, weather conditions and availability and price of other supply sources. By contrast, most other supply sources do not offer such flexibility because of contract restrictions, construction lead times, and investment commitments.

Some disadvantages associated with using DSM as a source of supply include reliability and acceptability. The Utility loses a level of control when the source lies in the individual customer's use patterns and, therefore, also looses a level of reliability. Additionally, DSM programs are successful only to the extent that they are embraced by the customer. Programs designed to elicit significant behavior modification or to introduce new or unfamiliar technologies may meet with customer resistance.

Since the 1977 drought period and continuing to date, staff has developed water conservation informational resources for residents and businesses as well as regulations to guide the City towards maximally efficient landscape water use. The following section describes a list of current and past DSM programs implemented by the City of Palo Alto.

General Public Information

Palo Alto has an extensive collection of educational factsheets, brochures and product suppliers guides designed to advise residents and businesses on all aspects of indoor and outdoor water management. Information is regularly updated and expanded. The City also maintains a library of water management books, videos, magazines, etc., available as a resource to both staff and customers. Conservation messages are disseminated via utilities bills and videos that are run on local cable

channels. Conservation posters, signs, stickers, bookmarks, etc., are made available to the public. A roving display circulates among City facilities and various customer sites to promote efficient water management.

News releases and advertisements are used to bring attention to water supply developments and conservation opportunities. Targeted mailings, including letters and newsletters, are sent to specific customer classes and groups to deliver tailored water conservation information. Between 10 and 16 utility bill inserts providing water supply and conservation information are issued every year, (ten in 1990). Response cards are frequently enclosed to encourage customers to request more information or on-site services.

Palo Alto has received recognition for its information resources. In 1989, it won the Northern California Xeriscape Award of Excellence for its Public Information program. Other water agencies have incorporated Palo Alto's factsheets, brochures, and guides into their own information campaigns.

Metered Connections

One hundred percent of the water connections are metered in Palo Alto. This has been true for over 35 years. Charging customers for water they actually consume provides customers a way to control their water bills and creates an incentive to use water efficiently.

Water Rate Design

Among a variety of ratemaking criteria common to the industry, the criterion of promoting the efficient use of service greatly influences Palo Alto's rate design compared with other California water utilities. This is evidenced by the fact that Palo Alto is among a small minority of California water utilities that incorporates an inverted rate structure in its rate design. This rate structure charges incrementally higher prices for higher-usage increments.

Palo Alto provides water service to customers under a rate schedule that consists of a monthly service charge based on the customer's meter size and a schedule of six consumption rate blocks with ascending prices for higher-usage levels. The initial rate block provides a minimum "baseline allowance" of 400 cubic feet priced at the lowest commodity rate.

This form of rate structure was introduced in 1976, in part to promote the efficient use of water. Then, as well as today, most utilities in California employed a descending water rate structure that lowers the prices as consumption rises. The City has viewed this declining block rate structure to be inefficient in

this era of declining natural resources and high marginal costs to procure additional water resources. Thus, the inverted rate structure is likely to continue as the rate design of choice for Palo Alto.

In addition, Palo Alto introduced a "Drought Rate Schedule" in May 1990. The schedule was made effective by the City Council for the duration of the current drought period.

Customers, however, are currently not under mandatory rationing from the utility. Residential customers are requested to stay within the usage allowed in the two lowest rate tiers; usage at higher tiers is charged at significantly higher rates. Non-residential customers are assigned baseline consumption allowances (BCAs) that are based on indoor usage. The BCA drives the rate schedule for each customer with up to 90% of the BCA falling into the lowest cost tier, between 90% and 150% into the next lowest cost tier, etc. The highest rates are charged as consumption goes above two times the BCA. The higher-rate tiers provide revenue for Palo Alto to pay SFWD's financial penalties, should Palo Alto, as a whole, exceed its allocation from SFWD. The schedule allows for hardship exemptions to the Drought Rate Schedule.

Minimal Water Kits

Water kits that include toilet bags, leak detector tablets and basic home conservation information are advertised and available upon request. Shower flow restrictors are not included in these kits because they produce unsatisfactory showers and unsatisfied customers. In lieu of the restrictors, specific information on high-efficiency showerheads and where to buy them is included.

Landscape Guidelines

The Utilities Department has worked together with the Planning Department to produce a set of Landscape Guidelines for use in planning new and renovated landscapes in Palo Alto. The City's Architectural Review Board (ARB) reviews all plans requiring a City permit (mostly commercial properties) to ensure they comply with these guidelines. The guidelines call for selection of plant materials appropriate to Northern California's semi-arid climate, correct planning practices, mulching, and use of low-volume irrigation systems.

In addition to the specific guidelines, a User's Guide has been prepared describing the rules, procedures and options in greater detail. The User's Guide also serves to explain and promote water-efficient landscape practices to the residential sector.

On-Site Services

The Energy Services staff of the Utilities Department provides on-site water audits and consultation visits for both residential and commercial customers. Landscape audits are patterned after those developed by the California Department of Water Resources Master Water Auditor program and cover irrigation system efficiency and appropriate turf selection. Indoor water-saving measures are also identified.

Workshops

Workshops for various types of customers are developed to target specific needs in the community. Examples are workshops covering residential water use, principles of xeriscaping and commercial indoor process water use.

Demonstrations

A collection of product samples and demonstration devices is maintained to help customers become familiar with what is available. This collection includes a demo unit with a number of low-volume showerheads connected to a one pipe frame; thus, water flow from the various models can be compared. Additionally, there is a demo unit comparing low- and high-flow showerheads to demonstrate the difference in water use between the two models. Toilet dams, different models of aerators and toilet flush mechanisms, as well as low-volume irrigation components, are available for customer perusal.

Direct Installation Program

A program the City offers seasonally involves direct installation of basic residential conservation measures. These measures include low-volume showerheads and faucet aerators. Promoted in utility bill inserts and occasional ads in local newspapers, installation is performed by either local high school students or a small number of temporary personnel specially trained by the utility staff. Customers pay a subsidized cost for the items. This program is not operated annually and its most recent run was in the fall of 1987.

Recognition Awards

Commercial and industrial customers who have undertaken extensive or innovative water conservation efforts are recognized at an annual luncheon hosted by the Energy Services section. City staff also prepares nominations of deserving companies for water conservation awards presented by other local or national groups.

Water Management Committee

In 1987, a Water Management Committee was formed to conduct water management planning for the City. Coordination of the City response to the current drought fell to this committee. Committee members represent all appropriate City divisions -- Parks, Facilities Maintenance, Planning, RWQCP, and Utilities Customer Service and Billing, Energy Services, Energy Planning, and Rates -- in order to share information and solicit feedback on various elements of the plan to respond to the drought and mandatory restrictions from SFWD. This committee has been an effective way to communicate with all City departments and the City Council about City-wide water management plans.

Water Use Ordinances

In 1989, a permanent ordinance regulating water use was added to the municipal code of the City of Palo Alto. The ordinance prohibits flooding of gutters or other unlandscaped areas, washing or hosing down vehicles or hard outdoor surfaces unless the hose has an operating automatic shut-off valve, use of potable water in construction if reclaimed water is available, and requires that broken plumbing or leaks be repaired as soon as possible.

With continuation of the current drought, an emergency ordinance was passed in mid-1990. Until rescinded by the City Council, the emergency restrictions include: (1) prohibition of landscape watering between 10:00 a.m. and 6:00 p.m.; (2) prohibition against use of potable water (other than from containers of five gallons or less) for cleaning walks, driveways, parking lots, or other hard surfaces; (3) no use of potable water to clean or maintain decorative fountains or ponds; (4) no serving of water in restaurants unless requested by the customer; and (5) a prohibition on filling newly-constructed pools, hot tubs and spas with water from the Palo Alto Water Utility.

A series of postcard notices and more severe violation notices have been developed for use in notifying citizens who violate either ordinance. If customers ignore warning notices, flow restrictions are installed. In addition, "Gush Busters" have been hired to patrol the City by bicycle and moped. Their work entails both enforcement of the ordinances and education of persons who may be wasting water.

Special Events

Special events are held for the general public and specific groups. For example, a water awareness fair with demonstrations, exhibits, and a "Rain Dance" was held at the Palo Alto Civic Center Plaza in November 1990. Energy Services provides

exhibits, demonstrations and factsheets for "Water Awareness Days" at local corporate or commercial offices. Energy Services staff also make presentations upon request to local groups such as the Board of Realtors, Senior Center, the Soroptimists and garden clubs.

Hotel/Motel/Restaurant Customers

A special effort has been made to work with this sector of the business community. Factsheets and water conservation booklets aimed specifically at these facilities have been distributed. Also table tent cards with conservation messages are made available free of charge to restaurants and visitor accommodations. The restaurant cards discuss how much water it takes to wash, fill and ice an 8-ounce glass of water and tell patrons that water will be served only upon request. The hotel cards alert visitors to drought and water supply issues and request that people use water-wise practices while in town.

Schools Outreach Program

The Utility has been actively involved in educating local school children for many years. This outreach program directly reaches about 400 students each year in grades K-12 through classroom presentations and hands-on demonstrations. Additional students are reached through special poster contests, school assemblies and environmental fairs. A special Water Detective "do-it yourself" home audit booklet was created and sent home with all elementary school children (about 4000) prior to their 1990 summer vacation.

Nearly 175 elementary school teachers, librarians, media center technicians and principals receive our educational newsletters that include articles, experiments and activities on various water topics. Energy Services also has a reference library of curriculum materials like software, videos, films, curriculum guides, demonstrations, etc., that are available on loan to teachers. Class sets of water education materials are also provided to teachers upon request. An interactive energy software program was reprogrammed with a water conservation component and made available to school children and consumers.

Reclaimed Water

The process for public purchase of reclaimed water has been simplified by working with the manager of the City wastewater treatment plant. Permitting was streamlined and a source of supply made clearly accessible.

Currently Green Park is being irrigated with a blend of potable and reclaimed water. Plans exist to deliver blended water to irrigate the City Golf Course which is adjacent to the treatment plant.

City Facilities

Indoor retrofits include changing showerheads and installing displacement devices in tank toilets. Flush-reducing valves were tried in toilets but were removed due to user complaints; faulty technology is considered the culprit. Conservation reminder signs and stickers are distributed throughout City facilities. As a result, leaks are being more promptly reported to facilities management staff and are quickly fixed.

Most of City water use is for irrigation of parks and other landscaped areas. Work has begun on the long and expensive process to renovate the City's aging, inefficient irrigation systems. A central irrigation control unit is being installed that will eventually be hooked up to all park irrigation systems. Currently, it is being set up to control a newly expanded (7-acre) park that will also be irrigated with a 50/50 blend of potable and reclaimed water. Landscape at the City's Water Quality Control Plant is irrigated entirely with reclaimed water. Irrigation systems at a major park (Mitchell) and the City's Cultural Center have been renovated.

Many of the City park plantings are drought-tolerant. A program is under way to create identification signs for these plants as a means of educating the public when they visit these parks.

5. MARGINAL COST OF NEW OR EXPANDED SUPPLY

Economic Analysis Technique

The technique used to evaluate future water supply options and alternatives consists of comparing the marginal cost of additional supply sources and the cost of alternatives. Since this analysis requires making assumptions about the future, clearly uncertainty exists. Therefore, it is impossible to determine exact cost:benefit ratios, net benefits, etc., for each alternative.

This uncertainty about the future has been addressed by creating more than one future scenario. These planning scenarios are then used to test the alternatives and the range of results helps planners decide how volatile the alternatives are. For example, if an alternative looks positive under all planning scenarios, it is perhaps a better choice than one that looks good under some, but not other, scenarios.

Production Cost Model

A production cost model for the water utility was created as a planning tool. It calculates the production cost of meeting forecasted loads for a 20-year planning horizon. Production costs are costs incurred in the production of the resource in question and are usage-related (i.e., total production cost falls if less resource is used and rises if more resource is used). For example, the wholesale cost of water from each source is included. Distribution system maintenance costs are not included since they are not dependent upon water flows. Capital costs of developing reclaimed water, for example, are also not included.

Production cost models are useful in demand- and supply-side planning, especially to determine production cost savings due to programs such as conservation or reclaimed water development. The cost of the program (including capital costs, operation and maintenance costs, and program costs such as advertising) is part of the analysis and is calculated independently. Savings and costs can then be compared and criteria such as benefit:cost ratios and net present values can be evaluated.

Appendix E contains a detailed description of the production cost model for Palo Alto.

Development of Planning Scenarios

The Palo Alto Water Utility is faced with many uncertainties. In order to appreciate how these uncertainties affect planning decisions, three scenarios for the future have been developed.

The most likely scenario, called "likeliest," contains the best guess about what is expected in the future. The "low-production-cost" scenario assumes generally lower load growth and less expensive water commodity costs. The "high-production-cost" scenario assumes high growth, expensive water costs and limited water available from SFWD.

Appendix F details the parameters and values used to define each scenario.

Marginal Cost of Supply

The marginal cost of supply is equal to the production cost change resulting from a change in water usage. Production cost here is defined as the cumulative discounted 20-year cost of production. This is, then, the net present value of the production cost of meeting forecasted loads for the 20-year planning period.

The results are dependent upon whether the change in water usage is inside use or outside use. This is true since inside water use incurs wastewater expenses while outside water use does not. The average overall use for Palo Alto is about 40% outside and 60% inside on an annual basis. The results of this analysis are shown below:

CHANGE IN PRODUCTION COST

FOR 100,000 CCF/YEAR CHANGE IN WATER USE

Scenario	100% Outside Water Use	100% Inside Water Use	Average Overall Water Use
High P.C.	$ 1,725,000	$ 2,110,000	$ 1,935,000
Likeliest	$ 929,000	$ 1,263,000	$ 1,156,000
Low P.C.	$ 586,000	$ 861,000	$ 781,000

Translated into $/CCF, the marginal cost of additional or expanded supply is shown in the chart below.

MARGINAL COST OF SUPPLY ($/CCF)

Scenario	100% Outside Water Use	100% Inside Water Use	Average Overall Water Use
High P.C.	$ 0.86	$ 1.06	$ 0.97
Likeliest	$ 0.46	$ 0.63	$ 0.58
Low P.C.	$ 0.29	$ 0.43	$ 0.39

This analysis assumes that the marginal resource (last increment of water purchased) would be purchased from the SFWD. When Palo Alto's long-term contractual allocation from SFWD is reached, the cost of additional water includes the cost of foregone electric revenue to SFWD.

However, this water may not be available or deliverable to Palo Alto due to environmental or political objections. Therefore, it is prudent to assume that the long-term marginal water resource for Palo Alto is the marginal water resource for Northern California.

According to the State Department of Water Resources (DWR), this source is likely to be Auburn Dam. The costs for this source are estimated to be $585/acre-foot ($560 for construction and $25 for local treatment and distribution) or $1.34 per CCF. This amount will be used for evaluating demand-side alternatives using WaterPlan™, the software from DWR. Results from this evaluation are in Section 7 of this UWMP.

6. FUTURE RESOURCES

SUPPLY-SIDE RESOURCES

San Francisco Water Department Near-Term Water Supply Situation

Peaking

In the early- to mid-1990s there exists the possibility that the SFWD water supply system will have difficulty meeting peak flows during hot summer days when demand for water is greatest. The peaking problem will be caused by a "bottle neck" in SFWD water transmission facilities. Specifically, there are only three pipelines that convey water from the foothills of the Sierras to the Bay Area. It is anticipated that, in the coming decade, peak summer system demands will exceed the hydraulic capacity (325 MGD) of the three existing pipelines.

One solution is to construct a fourth pipeline. However, political and environmental groups in California may be opposed to this construction for various reasons. This option will require more exploration in the 1990's.

Another approach, which SFWD is investigating, is the addition of storage facilities in the suburban service areas that could be used to meet peak needs. In addition, individual water agencies may have to operate their own distribution and local storage facilities in order to meet local peak demands.

Filtration

The U.S. Environmental Protection Agency has modified the Safe Drinking Water Act, which will require the filtration of all surface water systems, such as SFWD's. The California State Department of Health, which enforces the Federal water quality regulations, is requiring SFWD to filter all water delivered to the suburban service area. A conservative estimate of the cost for filtration of SFWD water is $200-$300 million. Implementation will be required by 1993-94.

San Francisco Water Department Long-Term Water Supply Situation

Bay-Delta Hearings

Currently, the State of California, through a series of hearings before the State Water Resources Control Board, is evaluating water flows, water rights, reservoir

operation and return flows as a mechanism to address the Sacramento-San Joaquin-San Francisco Bay-Delta area's water quality issues. These Bay-Delta Hearings, as they have been named, consist of four phases to gather data and testimony about the water quality in the Bay-Delta and to determine how water rights might be adjusted in order to preserve the fragile ecosystem of the Bay-Delta. The hearings are scheduled to conclude by the mid-1990's.

The possibility exists that the State may modify SFWD's water rights on the Tuolumne River and/or require operation of the Hetch Hetchy reservoir system such that more fresh water would flow into the Delta. Such operations could mean reduced or maintained (i.e., no allowances for increases) water deliveries to the customers of SFWD. Considering that Palo Alto is one of the largest wholesale customers of SFWD, this could have significant repercussions on the amount of water available to our customers.

Facilities Improvements

The 30 suburban purchasers account for two-thirds of the SFWD system consumption. The other third is used by the City and County of San Francisco. Virtually all of the growth and increased demand for water will be in suburban purchasers' service territories since the City and County of San Francisco consumption is projected to be nearly flat into the next century. The long-term ability of SFWD to meet projected water demand may be dependent upon expansion of their existing facilities.

In order to meet the projected water demands into the next century, expansion of SFWD facilities will most likely need to occur (Figure 8). The realization of this expansion will depend upon two factors: SFWD's ability or desire to expand the system and overcoming the political and environmental forces that would oppose expansion of the SFWD system.

Wells

Although the City is relying on well equipment that is 31 or more years old, the wells have been maintained in good working order and produce water that meets drinking water standards. It is, therefore, appropriate to examine the feasibility of expanding their role in the Utility's supply mix. Depending on future demand, price, and City policy decisions, the extent to which the wells are used could range from emergency purposes only to full utilization.

Although well water meets drinking water standards, aesthetic qualities of the water were a problem when wells were used in 1988. These problems were due to sediment in the pipes being mixed with the water because of the turbulence

SFWD SYSTEM FORECAST
Historical and Projected

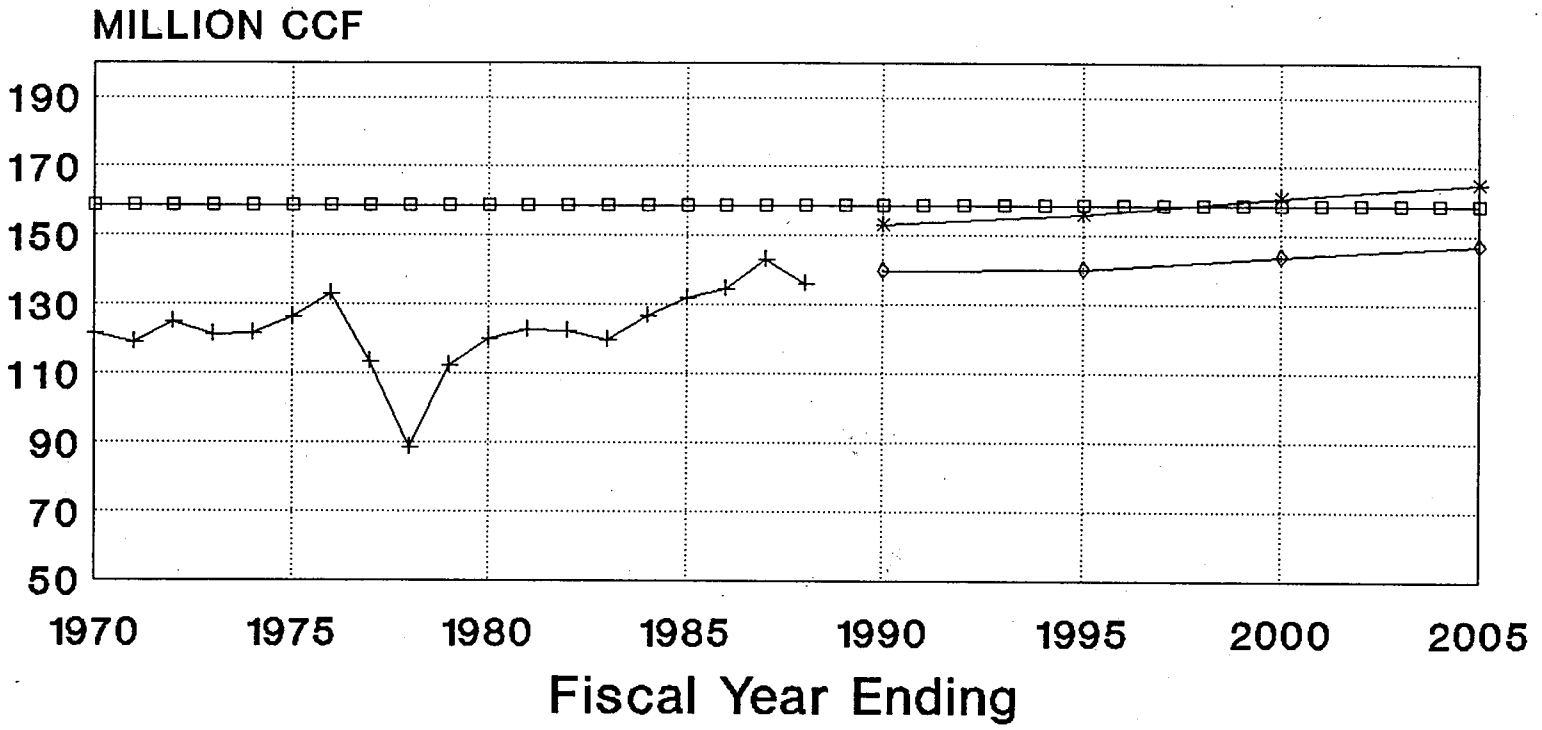

FIGURE 8

Source: SFWD

introduced into the system by the pump operation. Pressure controlling valves on the pumps have addressed this problem.

Palo Alto is in an advantageous situation in that it can count its wells as one of multiple sources of supply. As increasing demands challenge existing supplies, securing high-quality water may be as difficult as securing adequate quantities. One possible response is the segmentation of the marketplace where higher-quality water (SFWD supply) can go toward high-quality requirements (i.e., drinking water) and lower-quality (including non-potable) water is supplied exclusively for uses that can use lower-quality water (i.e., irrigation, building cooling).

Such a segmentation scheme could be implemented initially on a small scale in Palo Alto by using the wells for irrigating parks and other large turf areas. The extent of the implementation could range anywhere from irrigating the parks where two of the wells are located (Peers, Rinconada) to distribution throughout the City. Development of new wells is another possibility. A dual system of delivery may be required to segregate supplies for specific uses.

United States Geological Survey Groundwater Survey

The United States Geological Survey (USGS), responding to a request by the City of Menlo Park, is proposing a study of the groundwater aquifers in eastern San Mateo County and northern Santa Clara County. Currently, data regarding the hydrogeology, water quality and characteristics of the aquifers in this area is incomplete. The objectives of the regional study are to define aquifer properties, the quality of groundwater and the potential for local groundwater development. The potential benefits would allow prudent long- and short-term development of groundwater for potable and non-potable uses and identification of effects of urbanization on recharge and contamination of groundwater. The proposed study would be complementary to a study already under way in the City and County of San Francisco.

The scope of work, study boundaries and participants in the study has been defined as has the approximate total cost. This project is on hold pending the USGS receiving funding.

Santa Clara Valley Water District (SCVWD)

Given the limitations of Palo Alto's contract with SFWD and the minimal possibilities for expansion of the SFWD system, SCVWD could be a future source of water. Alternatives for additional future water supplies carry with them several complicated issues. For example, the SFWD Agreement stipulates that Palo Alto

cannot purchase water from any other supplier without the written permission of SFWD or without giving SFWD the opportunity to supply the additional water. In other words, SFWD has the first right of refusal as Palo Alto's primary water supplier. This contractual issue must be considered in future evaluations, in addition to other issues such as cost, quality and quantity. This should not be a stumbling block to obtaining supplies but could enter into any negotiations that occur.

DEMAND-SIDE RESOURCES

As iterated in Section 4, DSM can be considered an alternative water supply source. The advantages of DSM being a higher-quality and environmentally benign resource often outweigh the disadvantages such as some loss of control over reliability and acceptability. The costs and benefits of DSM programs should be evaluated from the perspectives of the customer, the agency and society. The customer perspective compares the expenditures made by customers participating in a program to the water and dollar-saving benefits they achieve. For customers to be motivated by a program, it must provide direct benefits to them.

A second perspective is that of the utility or agency, who offers a DSM program. For a conservation program, this agency perspective considers the utility's cost to purchase water compared to the cost of implementing the program, as well as the impacts of lost revenue from the reduced sales due to conservation. Although conservation programs reduce the amount of water a utility must purchase, they do not necessarily reduce fixed utility operating costs. Therefore to generate enough revenue to cover those costs, minor rate increases are often a result of conservation programs.

The third perspective is that of the City of Palo Alto as a whole and is called the societal perspective. This societal perspective is the one that Palo Alto has chosen to weight most heavily in deciding the nature and extent of the conservation programs it proposes to pursue. The societal perspective strives to find the least-cost source of water. Using this perspective, society benefits from a conservation program when the cost of saving water is lower than the cost of supplying that same water. The societal perspective differs from the agency perspective in that it does not have to consider agency lost revenue.

DSM encompasses a wide variety of activities, including promotional education programs, financial incentives, strategic rate setting and emergency drought planning. Its inherent flexibility allows for adjustment to variable load growth, weather conditions and supply sources, as well as accommodation for uncertainty.

Palo Alto has long had a group in the Utilities Department that administers and implements DSM programs. This group, Energy Services, maintains contact with

all of the customer classes and offers assistance for all of the utilities delivered -- electricity, natural gas and water. This group is able to communicate quickly and effectively with utilities customers about short-term events (e.g., electric interruptions, natural gas curtailments, or drought restrictions) and longer-term programs (e.g., resource conservation assistance, new and emerging resource efficient products, or rebate programs to encourage efficiency improvements).

Since Energy Services already exists, many of the programs planned could be accomplished by redirecting staff priorities. However, a shift in priorities will mean greater costs to the water utility and reduction of conservation services focusing on the electric and gas utilities. Also, budgets for advertising, incentive payments, and product purchases will need to be increased to accommodate enhanced levels of DSM activities.

Fiscal realities, however, can be a large constraint for DSM program planning and implementation. The budget process is a deliberate planning effort which results in a two-year budget that establishes City priorities. Plans made now may not result in actual program implementation for several years.

The section that follows describes ten demand-side programs that are planned to reduce water use City-wide. Note that all aspects of each planned program (environmental, social, health and safety, economic, technological, schedule and budget) are discussed. Following these descriptions is a list of programs that staff considered, but chose not to pursue.

7. WATER RESOURCE MANAGEMENT PLAN

WATER MANAGEMENT PROGRAMS TO IMPLEMENT IN THE NEXT FIVE YEARS

As described previously, the City of Palo Alto already has an active water conservation program and intends to continue existing activities and services. The programs defined below would represent enhancements to the basic services already provided. The budget figures, therefore, reflect incremental costs to provide these enhancements. For example, water audits are already being done, so costs listed would cover time and materials for new features, e.g., installing devices during on-site audits, and/or salary costs for performing more audits than existing staff could complete.

Economic evaluations were performed on some programs using WaterPlan™, a software package distributed by the DWR. WaterPlan™ results show the benefit/cost ratio for society, the utility and the participant. Assumptions used in these analyses and the results from WaterPlan™ are contained in Appendix H.

An underlying philosophy determining when and where financial incentives will be offered is that the City should pay only for state-of-the-art technology. For example, while information will be available on all high-efficiency showerheads, rebates or free installations will only be offered for ultra-low-flow models.

Finally, a general comment needs to be made on scheduling. Essentially, all programs discussed are rated high and are expected to be started within the next year or so. This scheduling reflects Palo Alto's commitment to long-range water management. The schedules described indicate that more effort will be placed in the first year or two to reduce outdoor water use. However, should drought conditions continue, it is inappropriate to encourage new landscaping, even if it is drought-tolerant, since all new plantings require significant amounts of water to become established. Therefore, the City would change the schedule and focus on indoor retrofitting as long as the current drought continues.

Summary List of Programs

1. Using Reclaimed Water
2. Use of City Wells for Large Landscaping Irrigation
3. Landscape Retrofit Program for Residential and Multi-Family Commercial Customers
4. Water Management Program for City Facilities
5. Major Accounts Customized Program
6. Multi-Family Indoor Water Management Program
7. Single-Family Residential Indoor Water Management Program
8. Commercial Customer Indoor Water Management Program
9. Schools Water Awareness Program
10. Product and Service Supplier Incentives Program

Alternative: Using Reclaimed Water

Description: The City of Palo Alto operates and is a part-owner of the Palo Alto Regional Water Quality Control Plant (RWQCP), a tertiary treatment facility that treats wastewater from Palo Alto and other surrounding communities. This plant's capacity is about 40 MGD and the present load is less than 25 MGD. There is a reliable pumping capacity of about 4 MGD to deliver reclaimed water. An existing pipe carries reclaimed water through Palo Alto to Mountain View, a neighboring community and part-owner of the plant, which blends it with potable water for use on a golf course. In January 1991, Palo Alto tapped this line to irrigate its newly-expanded Greer Park.

Presently, reclaimed water can be picked up at the RWQCP by trucks for construction and other permitted uses. This water could be distributed further to many water-intensive, non-potable applications throughout Palo Alto. Examples of such applications include irrigation, wetlands maintenance, cooling and process water, and toilet flushing. Further treatment of the water could make it acceptable for groundwater aquifer recharge. In addition, an expanded delivery system could transport water to adjacent communities such as Stanford University, which already has a non-potable distribution system in place.

Economic: A reclaimed water feasibility study jointly funded by the City of Palo Alto Water Utility and the RWQCP is currently under way. The study will result in the Reclaimed Water Master Plan. This will identify the potential uses and users in the service territory, the acceptability of

reclaimed wastewater available from the RWQCP for specific uses, and the estimated cost to install a reclaimed water distribution system.

Currently, the RWQCP offers reclaimed water free of cost to wholesale customers at the RWQCP fenceline. Therefore, the price of using reclaimed water consists of the costs to construct and maintain the distribution system. Until the Reclaimed Water Master Plan is completed, these costs are not known. When they are known, the cost of reclaimed water will be compared with the marginal cost of additional supply to determine the cost-effectiveness of increased reclaimed water use.

Environmental: The environmental effects are complex and unclear at this time. On one hand, using reclaimed water to irrigate turf and landscaping conserves the state's supply of pure drinking water. In addition, reducing the treated water discharged into San Francisco Bay helps meet the forthcoming stringent regulations regarding heavy metals. On the other hand, diverting treated wastewater from the Bay to irrigate landscaped areas produces questions of both the effect of less incoming water on the Bay's ecosystem as well as the long-term effects of using water with higher metal content on that landscaping. These issues are more regional, state-wide, and national, in scope and cannot be resolved by the City alone on a local level.

Social: To allay fears relating to the use of reclaimed wastewater, a public relations campaign will need to be conducted to ensure successful implementation of a reclaimed water distribution system.

Health/Safety: Using reclaimed water requires meeting various health and safety guidelines. Title 22 standards must be met as well as requirements of the Department of Health Services and the Regional Water Quality Control Board. The SCVWD's regulations would be involved if reclaimed water is being considered for groundwater recharge.

Customers: The impact on customers will depend on the rate structure developed for the distribution of reclaimed water. This subject will be investigated in the Reclaimed Water Master Plan.

Technological: This subject will be investigated in the Reclaimed Water Master Plan.

Rating: The Reclaimed Water Master Plan will include a benefit/cost analysis of various reclamation options. When complete, the feasibility study will help guide decisions on the implementation and phasing of a reclaimed water distribution system. This project is rated highly, as is

evidenced by the commitment to spend $150,000 on the feasibility study.

Savings: A rough estimate of savings potential is about 10% of the water consumption in Palo Alto or 700,000 CCF (1,600 acre-feet) per year if a distribution system is in place and able to serve large non-potable uses. A reasonable estimate of economic potential is about 300,000 CCF per year.

Program: As a first step, the City will conduct a feasibility study concluding with a report, the Reclaimed Water Master Plan. It is expected that an ordinance will be implemented when appropriate, requiring reclaimed water be used for certain applications.

Schedule: In February 1991, the consultant will be selected to prepare the Reclaimed Water Master Plan. The expected delivery date of the Reclaimed Water Master Plan is October 1991. In May 1991, a "50%" report is due that will identify all projects which can be implemented in less than one year. If necessary, an ordinance will be developed and enacted after reviewing the consultant's recommendations. A schedule for the phased installation of a reclaimed water distribution system will be included in the final study.

Budget: The Palo Alto Water Utility and the RWQCP have each allocated $75,000 for the feasibility study. Staff time for project management and data collection to support the study is expected and is included in budgeted duties.

Capital funds for distribution system funding have not been budgeted. The estimated cost and how to finance the project will be determined after the feasibility study has been concluded.

Summary: The City is in the process of hiring a consultant to conduct a feasibility study for the use of reclaimed water. Until the study is complete, it is unknown to what extent the City should pursue the development of reclaimed water.

The City is an active participant in regional task forces and hearings on the subject of reclaimed water development. Palo Alto is strongly committed to a complete investigation of the use of reclaimed water in Palo Alto, in the territories of other partners of the RWQCP, and possibly in other neighboring communities.

Alternative: **Use of City Wells for Large Landscaping Irrigation**

Description: The City of Palo Alto owns four wells that are capable of pumping ground water. Together, the wells can produce about 25% of the annual, non-drought yearly consumption if operated at 80% capacity. The wells are maintained at standby status for use in emergencies. The wells pump water either directly into the City water distribution system or into a storage tank first and then a booster pump pumps from the tank into the distribution system. Although certified for drinking water, the water is of lower quality than that received from SFWD. Using this water for parkland irrigation conserves the higher-quality water for other uses.

Economic: The well water costs almost as much as Palo Alto's imported supply because of fees payable to the Santa Clara Valley Water District. An evaluation of feasibility and capital costs must be done. The economics of this project will vary depending upon the feasibility and costs of using reclaimed water instead of well water for similar end-uses.

Environmental: Unlike much of Santa Clara County, Palo Alto is not likely to have problems with subsidence due to groundwater pumping. Saltwater intrusion from the Bay, however, is a possibility after extensive pumping.

Social: Customers would be expected to react favorably to the use of lower-quality well water for irrigation and, thus, lessening the likelihood this water would be needed for the drinking supply.

Health/Safety: Well water is tested regularly and meets all health and safety guidelines. Title 22 Standards must be met as well as requirements of the Department of Health Services and the Regional Water Quality Control Board.

Customers: The likely customer for this water will be the City itself for irrigating the parks near the wells. Using this water for park irrigation will save water purchased from SFWD, but increase water purchased from the Santa Clara Valley Water District via the pump tax exacted. Therefore, little money will be saved by the City and, hence, the taxpayers, but using this water will lessen City-wide impacts whenever mandatory restrictions are placed on the City by SFWD.

Technological: The technical feasibility of connecting the wells to use the water for irrigating adjacent land must be determined. The valves and controls must still allow water to be able to be pumped into the water distribution system in order to maintain the wells' emergency standby status.

Using the wells to irrigate City Parks may cause some operational problems within our existing system. When the wells are used to supply water to the water distribution system, they run for a long period of time, usually days. We would not want to use the current City wells to supply the pressure to drive the park irrigation systems. The large volume wells we currently operate are not designed to operate on short intervals but, rather in a long-term steady state. Trying to put booster pumps on Hale or Peers Park wells would also cause the deep turbine wells to cycle on and off to fill the small reservoirs at these sites. Building larger reservoirs at the well sites would allow the wells to fill the tanks and smaller booster pumps could deliver the water to the few users on line.

It may be better to install small wells at each park site to be used to supply the water for the park irrigation systems. The smaller wells could be designed to fit the irrigation demand at each park and would be cheaper in labor, electrical power consumption, chemicals and maintenance to operate. By constructing small wells at each park site, the Utilities Department Operations staff would not have to chlorinate or fluoridate the pumped water.

Rating: This project merits consideration, but the availability of staff time and budget monies is limited. Therefore, this is rated lower than the other alternatives.

Savings: Absent irrigation system efficiency improvements, this alternative will not save water. However, the high-quality SFWD water will be saved and the lower-quality well water will serve an end-use that does not require high quality.

Program: Wells will be studied as to water production capability, proximity to City parks that could use the water for irrigation, technical feasibility, and costs of constructing necessary pipe systems and controls.

Schedule: Utilities staff will work with the Parks Division and other customers to attempt to identify irrigated sites located near the wells and the technical feasibility of using the well water. These findings will be contained in a report that will identify parameters for evaluation. The

availability of utilities staff for this project is limited due to higher priority projects (i.e., gas and water main replacement) that are planned. Therefore, a study is unlikely to be pursued for several years. The feasibility of the reclaimed water option will be a driving factor determining the urgency of this study.

Budget: No funds are being budgeted for this study at this time. It is likely the study will be done by existing Utilities Engineering staff, as time permits.

Summary: Depending upon the feasibility of the reclaimed water alternative, the City may investigate the use of well water for major landscape irrigation. Implementing such a program would not necessarily save water, but it would use lower-quality water for irrigation, preserving more high-quality supply for consumption.

Alternative: Landscape Retrofit Program for Residential, Multi-Family and Commercial Customers

Description: Landscape irrigation by our customers consumes almost 35% of the City-wide water supply. A targeted program to improve efficiency of irrigation and appropriate landscaping for our customers would result in large water savings. Palo Alto is not a growing community, but has many established residences and businesses. Many of these properties are landscaped with large turf areas and non-native plant species.

In light of the current drought and in consideration of the conservation of future precious resources, drought-tolerant landscaping and efficient irrigation must be promoted. The City already has a variety of water-conserving landscape information resources, including lawn-watering guides and over 30 other handouts on specific topics. The City conducts workshops and provides individual consultations to customers as well. The goal of this new landscape retrofit program is to provide greater incentive to customers to replace existing plantings with more water-efficient alternatives, while still maintaining a beautiful and diverse Palo Alto landscape.

To promote water-efficient landscape in new construction, the City has landscape guidelines in place that must be met by commercial and multi-family property owners who want permit approval. In early 1991, a version of these guidelines will be developed for residents and included in packets handed out with building permit information. For

residents, the guidelines will be strongly encouraged but not mandatory.

The proposed retrofit program would have five key components: (1) incentives to remove irrigated turf; (2) incentives for irrigation system retrofits; (3) irrigation and planting design assistance; (4) demonstration projects and case studies; and (5) certification of properties that meet specific landscape guidelines. This program is targeted towards all our water customers who currently have inefficient landscaping and irrigation systems or who, for other reasons -- i.e., previous landscaping was destroyed during a home remodel -- are planning new landscapes.

Economic: While the water saving potential of landscape change is very great, the cost of water is very low relative to the cost of landscape work. Therefore, the economic justification of the retrofit program requires a long-term perspective. For customers who are going to change their landscaping anyway, there is virtually no extra cost to achieve tremendous water savings through xeriscaping. Also, because environmental concerns (e.g., preserving a dwindling resource) and aesthetics goals (e.g., not having an ugly brown lawn during droughts) are major factors in landscape retrofit decisions, economic considerations are less critical.

Environmental: In addition to reducing the need for additional sources of water, this program reduces the need for fertilizers, pesticides, and labor. The physical environment will be enhanced in the long term by appropriate plantings efficiently irrigated that survive well through periodic droughts. Hardscape eliminates the environmental and aesthetic benefits plants provide; although strategic use of hardscape will be encouraged, complete replacement of planted areas with hardscape will not.

Social: As people learn about the wide variety of green and colorful drought-tolerant plant materials, as well as discover ways to strategically use limited turf, it will become increasingly easier to promote plantings appropriate for our semi-arid climate. Society as a whole will benefit dramatically from the resulting reductions in outdoor irrigation, the single greatest water use in Palo Alto.

Other parties who regulate or advise on landscape issues will need to be involved in and supportive of the program for it to succeed. These parties include the Palo Alto ARB, the Stanford Lands Management

Group and local landscape designers and contractors. Educational efforts will be targeted toward these groups.

Health/Safety: There are no known adverse health or safety consequences from this program.

Customers: Customers who participate will save dramatically on their summer water bills and be able to maintain attractive landscaping even in times of drought.

Technological: Xeriscape information and irrigation technology exist to achieve major savings. No barriers exist on this front.

Rating: Despite the relative high cost of this program, it is rated high because it can be implemented by existing staff and it promotes water-efficient landscape practices that are critical to any effective long-term water management effort.

Savings: If irrigation by our customers could be cut in half through long-term programs (over several decades), more than 1,000,000 CCF (2730 acre-feet) of water could be saved. These savings amount to about 15% of total City-wide water use. Based on our preliminary program targets, the parts of the program modeled by WaterPlan™ should yield an estimated annual savings of 181,000 CCF after five years.

Program: In order to save water used for irrigation, the utility will provide incentives to customers who replace turf with shrubbery, drought-tolerant plantings, or hardscape. Incentive payments will also be available to customers who replace wasteful or inefficient irrigation systems with drip irrigation, low precipitation sprinklerheads, soaker hoses, or automatic controls with moisture sensors. The goal will be to reward landscape changes that conform with established landscape guidelines.

The utility will provide irrigation and planting design assistance in the form of guidelines, workshops, co-funding of consultant services, suppliers lists, City demonstration and test gardens, turf audits, and design and analysis software. In addition, the utility will sponsor demonstration projects at selected customer sites and create recognition/certification programs for customers who follow xeriscape principles.

Schedule: Assuming drought conditions ease, the City would expect to design and implement major program elements in time for the Fall 1991 planting season. Participation rates and program activity level would be expected to escalate each year thereafter, until a leveling off in 1995. If effective, the program would continue past 1995.

Budget: The primary program cost would be the incentive payments, which will depend on the type and level of program participation. When the program design is more fully established, incentive costs can be more accurately estimated. No additional staff would be needed.

Summary: Outdoor irrigation is a primary water end-use in Palo Alto. To reduce this consumption, an aggressive program, including financial incentives, is proposed to encourage customers to retrofit existing landscapes and irrigation systems according to xeriscape principles.

Alternative: Water Management Plan for City Facilities

Description: The City owns many buildings, parks, and a golf course that use approximately 6% of the total City water use. Irrigation accounts for about 75% of total City facility water consumption. When the City itself is the water customer, the public outreach efforts are not necessary to effect efficiency improvements. Instead, City management must be convinced of the validity and appropriateness of specific water efficiency improvements.

The City has about 250 acres of parklands, almost all of which is currently irrigated by inefficient, outdated systems. Automatic sprinklers still require manual adjustment of their controls, which makes it very labor-intensive to modify schedules in response to hot or rainy periods. A new control system would allow the Parks Division to quickly and precisely control water use and apply only what is needed. In addition, irrigation piping and sprinklers need to be retrofitted or replaced. Many City sites, such as median strips, are ideal candidates for xeriscaping.

The City owns many buildings (i.e., City Hall, libraries, theaters, firehouses, the Utility Control Center, a municipal service center, and community and recreation centers) that are the workplaces for about 1000 City employees as well as meeting places for members of the community. Many water conservation opportunities exist in these buildings. For example, toilets, showerheads, and faucets can be

replaced with more water-efficient fixtures. In the larger facilities, cooling system retrofits may result in water savings.

Economic: Since the City is both the agency and the customer, the economics are straightforward. No concerns of lost revenue exist because the savings to the City are equal to the marginal cost of water and are not dependent upon the utility's retail rate structure. Based on preliminary program targets, the economic analysis from WaterPlan™ shows a high benefit:cost ratio from a societal perspective.

Environmental: An improved irrigation system with a new irrigation controller will enable the City to maintain park landscaping with minimal water consumption. Increased water efficiency would allow the City to better survive drought periods while being able to maintain living turf in public parks and playing fields, living trees in parks, and adequate water for consumption by employees and the public at City-owned facilities. For cooling system retrofits, water savings in air conditioning condensers often result in savings of water treatment chemicals.

Social: Water awareness among citizens will increase when they see the City "practicing what it preaches." Also, residents and businesses can learn from the City's experience.

Health/Safety: There are no known adverse health and safety impacts from this alternative.

Customers: By saving the City money, taxpayer money is saved, or additional services for the same amount of money can be provided to the customers.

Technological: The technology exists to perform these retrofits. For the new irrigation control system for the parks, the "brain" consists of a computerized remote control unit combined with a weather station that monitors temperature, humidity, rainfall, and wind speed and direction. The weather information helps to determine the evapotranspiration rate for various plants and the appropriate amount of water that should be applied. Water efficient fixtures such as ultra-low-flush toilets, ultra-low-flow showerheads, and automatic shutoff faucets are not experimental technologies. They have been proven in many installations throughout California.

Rating: This program is rated high due to the economic cost-effectiveness and the philosophical appropriateness of the City itself providing an example to Palo Alto residents and businesses.

Savings: If 35% of irrigation consumption and 15% of indoor consumption can be reduced, about 120,000 CCF (275 acre-feet) annually could be saved at City facilities. A 25% savings of irrigation consumption is expected from centralizing irrigation controls alone. Based on preliminary program targets, the parts of the program modeled by WaterPlan™ result in estimated savings of 19,000 CCF/year after five years.

Program: The City will proceed by ensuring that all City-owned facilities are fitted with water efficient technologies. Specifically, these will consist of (1) xeriscaping specific properties; (2) developing demonstration gardens according to xeriscape principles with underground drip system; (3) retrofitting irrigation system components; (4) installing a central irrigation system controller with weather station; (5) auditing City facilities; (6) retrofitting faucets with infrared or other self-closing shutoff controls and valves; (7) replacing all tank-type toilets with ultra-low-flush fixtures; (8) replacing all showerheads with ultra-low-flow fixtures; and (9) evaluating cooling system condenser retrofit alternatives for water and treatment chemical savings.

Schedule: A 1987 study by Blevins & Associates, which evaluated the costs and benefits of centralizing the City's irrigation system controls, will be updated in 1991. The computer hardware for the control system will be installed in early 1991 and connected to Greer Park soon after. Connecting the controls to additional parks, along with other City facility improvements, will be proposed through the capital improvement program portion of the bi-annual City budget process.

Budget: The cost to fully implement a City-wide central controls system will likely be from $350,000 to $500,000. Specific proposals for all improvement projects, including indoor retrofits, will be presented for Council approval during the FY 92-94 budget process. Temporary staff may need to be hired to help complete water audits, set up initial irrigation schedules, etc.

Summary: The City's facilities and parks make ideal locations to install and publicize the latest cost-effective indoor and outdoor water management technologies and practices. Each improvement then becomes a demonstration site to educate customers about available options, provide evidence of the feasibility and effectiveness of the actions taken and display the City's commitment to water management.

Alternative: **Major Accounts Customized Program**

Description: The Utilities Energy Services section has a Major Accounts group that provides resource management assistance to larger commercial and industrial customers. Each of these major customer accounts has an assigned Utilities Resource Advisor who maintains contact with them in regard to all the utilities (water, wastewater, natural gas, and electricity) provided by the City. These major customers are not homogeneous and are best served on a case-by-case basis.

Major account customers consume about 30% of the total City water use. About 30% of the major account water use is outdoor and 70% is indoor. A large fraction of the indoor use is process water use. The processes are varied and specific to each business. Each customer must be individually analyzed in order to identify water saving opportunities.

Currently, the wastewater of many large customers is monitored by the RWQCP. Discharge standards of certain substances into the South Bay are becoming more and more stringent. A major change is that the standards will be mass-based rather than dilution-based standards. This means that reducing the total amount of discharged substances is required, rather than simply decreasing the concentration of substances in water. Waste minimization efforts are being conducted by the RWQCP to reduce the discharge of specific regulated substances. Customers can no longer meet the standards by dilution with water. As customers review their processes for compliance with the discharge requirements, it is expected that major water savings can occur.

Economic: The economic impacts of water efficiency improvements are project specific. This program will survey customer sites and identify water conservation opportunities. Possible projects will be evaluated for economic viability to determine appropriate level of utility support.

Environmental: Water use reductions at businesses help to conserve City- and state-wide water and lessen the demand for future, more-environmentally-destructive water projects. A thorough review of water use for process needs may also result in savings of treatment chemicals or energy requirements in addition to water savings.

Social: Businesses that spend money to conserve water will be viewed positively by the public. Good corporate citizenry gives an example to the community and shows a commitment to helping solve regional problems.

Health/Safety: No process changes will be undertaken to save water if there are negative impacts on health and safety.

Customers: Participating customers will save on their water and sewer bills, allowing them to operate their businesses more efficiently.

Technological: Technological factors will be a part of each customized plan. Clearly, only changes that can be accomplished technically will be pursued. It serves no one to install technologies that won't work or cause other problems. Peer matching helps to solve this problem when similar customers share information about products and contractors.

Rating: This program is rated highly because it concentrates on large water users, resulting in a very cost-effective use of staff and incentive resources on specific projects.

Savings: Due to the customized nature of the program, it is difficult to estimate the savings potential. If major account customers could save 25% of their indoor water use, the savings would be about 0.5 million CCF (1150 acre-feet) per year.

Program: The Utilities Resource Advisors, along with retained consultants as needed, will conduct a thorough review of all process water requirements and research alternative water efficient technologies and practices. The water savings, utility avoided cost, customer bill savings, and project cost will be evaluated to determine utility participation in the funding of any given project. It is expected that projects identified that have short payback periods for the customers will be paid for by the customers. The utility will evaluate other projects to determine whether and how much financial incentive will be offered by the utility to achieve the savings. Incentives will be offered on a $/CCF saved basis.

To facilitate the sharing of information between customers, a peer matching program will be instituted. In this program, customers will be linked with their counterparts in similar businesses -- both inside and outside Palo Alto -- who have successfully made efficiency improvements.

Schedule: The Utilities Resource Advisors have already completed water audits for some of the major account customers. However, the availability of utility incentives was not contemplated at the time of these audits. Staff will begin immediately conducting water audits to identify specific projects and prepare of cost and savings estimates.

Budget: The Major Accounts program already exists and customer contact is being maintained. This program will add no new staff, but will shift priorities of existing staff to concentrate on completing water audits for each customer. Money will be budgeted to hire specialized consultants for more complex audits and reviews. Utilities money for incentives will be budgeted when program details are specified and the City Council approves the expenditures.

Summary: Major account customers use indoor water for complex and varied processes. A customized program, expanding on existing activities, would be incorporated to perform water audits on each customer to identify the potential for indoor water savings. As a result of these audits, projects can be evaluated and the appropriate mix of peer matching, utility co-funding and incentives can be applied to implement feasible projects. Additionally, matching up these customers with other similar companies with successful conservation programs will further stimulate change.

Alternative: Multi-Family Indoor Water Management Program

Description: Multi-family usage accounts for 11% of total City-wide water use. Many of these accounts do not have separate meters for each housing unit. During times of drought, it is difficult for tenants to relate personal conservation efforts to their own bill savings. This customer group has needs that differ from single-family residential in many significant ways. Landowners or homeowner associations may pay the utilities bill directly, so tenants may not see either the bill itself or a consumption history. In addition, this class of customer uses less water outdoors, so indoor conservation opportunities are the primary ones to be pursued. For many of the measures discussed, hotels and motels are being treated as multi-family properties.

Economic: Landlords have direct control over the equipment used in individual units and so economies of scale are realized when one owner is convinced to install retrofits in a multi-family property. Water cost savings often directly accrue to owner/operator profits. If utility costs are paid by tenants, even indirectly, then they get economic benefit as well.

Environmental: This alternative has no known negative environmental impacts and should make this customer group more aware of its effects on the environment. To the extent that savings occur in inside use, savings of sewer treatment costs accrue in addition to water savings.

Social:	Working together towards a common community goal -- saving water -- helps to make this customer group feel a part of the community.
Health/Safety:	There are no known adverse impacts from this alternative to health and safety.
Customers:	Customers, either landlords or tenants, who pay their own bills will save money as water use is reduced. It is hoped that, in the cases where the landowner or homeowner association pays the reduced bill, rents or fees would decrease to the tenants.
Technological:	The technologies being proposed are not new, but have been proven and demonstrated in many areas in the nation and in California.
Rating:	This program is rated high because it addresses a customer class with significant indoor use but minimal control over tenant water use practices. Existing staff can implement this program.
Savings:	If indoor usage can be reduced by 25%, about 130,000 CCF (300 acre-feet) of water will be saved. In addition, energy and sewage treatment costs are reduced. Based on preliminary program targets, the parts of the program modeled by WaterPlan™ yield annual savings estimates of 14,300 CCF after five years.
Program:	Staff currently performs on-site water audits and provides water conservation information. The proposed program consists of (1) a stepped-up information campaign to encourage toilet tank retrofits and the installation of ultra-low-flow showerheads; (2) utility rebates on ultra-low-flow showerheads and ultra-low-flush toilets; (3) retrofit kits available for purchase at wholesale costs (same as residential program); (4) a demonstration project where the utility would pay for efficiency improvements for one complex; and (5) evaluation of both a meter change-out program to separately meter irrigation and separately meter individual units, including a possible mandate for separate meters in new construction. (Other outdoor multi-family water use programs are incorporated into the Landscape Retrofit Program.)
Schedule:	Audits are currently provided and rebates will be added in late 1991 or 1992, depending upon when full program proposal receives City Council approval.
Budget:	Current staff can handle all proposed elements of this program. Additional costs for promotional materials and incentive payments will be incurred.

Summary: A program to target water use reduction in the multi-family sector must be tailored to the circumstances of these customers, including landlord/tenant issues and common areas versus individual dwelling units. A combination of incentives and targeted outreach is being proposed.

Alternative: Single-Family Residential Indoor Water Management Program

Description: Palo Alto's single-family residences use about 40% of the total City water use. Approximately 45% of the water is used outside. This customer group constitutes the vast majority of City residents.

Economic: The costs and savings of indoor retrofits are very predictable for this customer class and actions typically have quick paybacks. Customers benefit economically when capital costs are either reduced due to utility wholesale purchase of devices or eliminated due to free installations. WaterPlan™ results show very high net benefit for society from this program. The barriers are usually not, therefore, economic as much as the lack of information about reliable, effective products and where to get them. The utility benefits from program components, such as direct installation, which increase the verifiable savings per program dollar expended.

Environmental: This alternative has no known negative environmental impacts and will heighten this customer group's awareness of its effects on the environment. To the extent that savings occur in inside use, savings of sewer treatment costs accrue in addition to water savings and conservation of future water resources.

Social: The majority of Palo Alto residents live in single-family dwellings. By influencing the behavior of this customer group, overall social consciousness rises.

Health/Safety: There are no known adverse impacts from this alternative to health and safety.

Customers: Customers who pay their own bills will save money from reducing their water use. Customers will appreciate the reduced purchasing hassle and increased reliability of utility-provided products.

Technological: The technologies being proposed are not new, but have been proven and demonstrated in many areas in the nation and in California.

Rating: This program is rated high because it uses existing staff to easily expand the scope of current programs. Although additional staff would be needed seasonally, those minimal costs are offset by potential water savings.

Savings: If indoor usage can be reduced by 25%, about 375,000 CCF (860 acre-feet) of water will be saved. In addition, energy and sewage treatment costs are reduced. Based on preliminary program targets for the parts of the program modeled with WaterPlan™, annual savings are estimated to be 64,000 CCF after five years.

Program: The program will continue the City's long-existing information campaigns to encourage efficient resource use, but would be expanded to include more workshops on water-reducing technologies and practices. Water audits will continue, but include the offer to install without cost, high-efficiency showerheads, toilet dams, and faucet aerators. These same devices will be offered for sale in kits at wholesale cost from the utility or community groups. When possible, volunteers (such as scout troops) would be used to deliver conservation information and devices. In addition, rebates for the purchase of ultra-low-flush toilets and ultra-low-flow showerheads will be offered. Rebates are offered for showerheads to allow customers the option of purchasing ones that match their specific decor. For residents with pools, pool covers will be encouraged with informational factsheets and suppliers lists.

Schedule: Audits are currently provided and the direct installation and rebate components will be added in late 1991 or 1992, depending upon when a detailed program proposal receives Council approval.

Budget: In addition to current staff, it is proposed that, in 1992 and beyond, a temporary staff person be hired on a seasonal basis to perform additional water audits and installations. Other program aspects can be handled by current staff. Additional costs for program promotion and incentives will be incurred.

Summary: Residents can dramatically reduce indoor water use with toilet and shower retrofits. This program uses direct installations, kits, and rebates to take the purchasing guesswork out of acquiring appropriate devices.

Alternative: **Commercial Customer Indoor Water Management Program**

Description: This program would target the indoor use of small- and medium-sized commercial businesses. These businesses seldom have an employee in charge of utilities consumption and expenses. They often do not have the expertise or time to research products or practices that will conserve water. These businesses consume about 15% of the City's total water use, using 30% outside and 70% inside.

Economic: Most water use by these customers is indoor and can often be reduced cost-effectively by bathroom fixture retrofits. The utility benefits from direct installations, which guarantee water savings.

Environmental: This alternative has no known negative environmental impacts and should heighten this customer group's awareness of its effects on the environment. To the extent that savings occur in inside use, savings of sewer treatment costs accrue in addition to water savings and conservation of future water resources.

Social: Working together towards a common community goal -- saving water -- helps make this customer group feel a part of the community.

Health/Safety: There are no known adverse impacts from this alternative to health and safety.

Customers: Customers who pay their own bills will save money from reductions in water use. These customers have very little time available to evaluate water conservation alternatives and technologies, so the utility does this for them. Paying up-front capital costs is usually a problem for these customers and this barrier is diminished by utility financial incentives.

Technological: No special technological barriers are anticipated to implement this program. Peer matching and staff follow-up will help to ensure that products installed will perform as expected.

Rating: This program is rated high because existing staff can easily expand the scope of current programs to provide assistance to small businesses short on cash and time. Although additional temporary staff would be hired seasonally, those minimal costs are offset by potential water savings.

Savings: If reductions total 25% of inside water use, annual water savings total 230,000 CCF (530 acre-feet). Energy and sewage treatment costs are saved as well. Based on preliminary program targets, for the parts of

this program modeled by WaterPlan™ estimated annual savings are 12,000 CCF/year after five years.

Program: The utility will continue and accelerate its audit program for these customers to identify water efficiency improvement opportunities. Audits will include the offer to install a retrofit kit (similar to residential program). Purchase of retrofit kits at wholesale costs will also be available. Rebates on ultra-low-flush toilets and ultra-low-flow showerheads will be provided.

Peer matching between customers who face similar constraints will be arranged to allow customers to learn from each other and share information and experiences. Rebates for equipment retrofits, such as converting single-pass cooling loops, will also be considered for this program.

Schedule: Audits are currently provided and the direct installation and rebate components will be added late in 1991 or 1992, depending upon when a detailed program proposal receives Council approval.

Budget: In addition to current staff, it is proposed that from 1992 on, a temporary staff person be hired on a seasonal basis to perform additional water audits/installations. Other program aspects can be handled by current staff. Additional costs for program promotion and incentives will be incurred.

Summary: This program to accelerate indoor water use reductions by business focuses on utility analysis, installations, and rebates to remove the guesswork and lessen initial cost for installing water-efficient devices.

Alternative: Schools Water Awareness Program

Description: Schools are an important place to disseminate water information because students learn a basic water awareness that they retain for life. In this way, educating young people about the realities of limited resources benefits the community in the long run. Also, students bring the concepts and practices they learn home to parents and other family members. Currently, the City's schools program consists of classroom presentations, hands-on demonstrations, tours, classroom materials, educational newsletters, interactive software programs and a resource library -- all available to local educators at no cost.

The proposed program involves continuing Palo Alto's long-standing K-12 schools education program, but expanding it to include water use analyses that the students can actually do at the schools themselves. The program will not only educate the students, but also help the school to save water by recommending water-efficient device installations. This program educates the end-users, namely the students, and then asks them to help to change water-using behavior at the school itself. Further, these students will carry their changed behavior home and, eventually, into the work place.

Economic: The incremental cost of this expanded program is small since staff is already actively involved with schools. The schools benefit from the work students do to assess water-saving opportunities and help implement changes.

Environmental: Teaching environmental awareness to the young people in the community yields environmental benefits in terms of their improved life-long behaviors and decision-making in regard to resource use. Introducing water-wise practices and products to this group of people inevitably affects the student, their family, the school, and the community.

Social: Part of the role of the schools is to teach young people how to be responsible citizens. This involves making them aware of key issues facing the community, one of which is improving water resource management.

Health/Safety: There are no known adverse health and safety consequences to this program.

Customers: The water customers in this enhancement to our general schools program are the schools themselves, which will benefit by saving water, money and possibly maintenance. In addition, the information obtained in this program will benefit the student and be brought home to the rest of the family to, hopefully, influence home water-use behavior.

Technological: The schools have old, outdated fixtures and irrigation systems, so replacement by water-efficient technologies would reduce water use while not requiring extensive technical knowledge to operate. All likely technologies to be implemented have existed for many years and are proven effective.

Rating: This program is rated highly because it can be implemented with existing staff and requires minimal materials costs, yet represents an important investment in developing a water-aware community.

Savings: Depending upon the level of implementation, this program could result in savings at school properties totalling about 20,000 CCF (45 acre-feet) per year. Additionally, the students will bring a greater water awareness home to their families that may result in further savings.

Program: The current schools program would continue, but with added components, the main one being to have students themselves perform water audits on their own school. The water audit will involve identifying all uses of water at the school, estimating the water used for each use, and, finally, defining alternative water efficient products or practices that can be implemented at the school. Utility staff will assist students in performing the audits. Primary and secondary school students will be teamed up to conduct the audits so that different age and skill levels can join forces, learn and teach.

The City will also consider providing assistance packages that could include incentives for combined projects, such as leak-detection programs and demonstration gardens. The City will also investigate offering teacher training sessions and working with local college students to produce additional teaching resources, such as video and computer programs.

Schedule: Beginning in 1991, enhanced schools program activities will be implemented as existing staff allow.

Budget: Incremental costs for program enhancements will be minimal and consist primarily of costs for materials. These material costs would likely be under $5,000 per year.

Summary: The currently active Schools Outreach Program will be enhanced with a program to use students to audit and effect changes at their own school sites. Expanded services to provide materials and training for teachers will be developed.

Alternative: Product and Service Suppliers Incentives Program

Description: An important loop is left open if the utility encourages the installation of water-saving retrofits, but customers cannot find devices and services locally. Equipment vendors, retail stores, maintenance contractors,

landscape architects, and the "green industry" are a few of the important participants in influencing customer decisions about efficiency improvement investments. The utility can leverage its influence on customer behavior by working with these suppliers.

Economic: When customers readily find conservation products and services, they are more likely to act. The economics of other promotional programs are enhanced by effective coordination with suppliers.

Environmental: There are no known negative environmental consequences of this alternative. For the products that conserve indoor water use, sewage treatment costs are also reduced.

Social: If suppliers are convinced that they are making a good business decision, they will stock resource efficient products and provide resource efficiency improvement services. When people see the products and services readily available, the awareness of society increases about resource management.

Health/Safety: Federal safety and health regulations apply to resource efficient products, so there are no known adverse health or safety impacts from this program.

Customers: Customers benefit by more easily acquiring materials and services to reduce water use and, as a result, paying reduced water bills.

Technological: Suppliers have an incentive to stock and service products that will work as promised. The products to be promoted will be those that have been proven in installations elsewhere.

Rating: This program is rated very highly because it can be implemented by existing staff, the proposed costs are minimal, and the compounding of other program benefits is great.

Savings: It is difficult to assess savings from this program as it is uncertain when and how customer purchase decisions are made. For example, a customer may have had a utility audit that recommended installation of certain devices. If the customer easily finds and buys all needed devices at a local hardware store that stocks them because of this utility program, the program should get credit for some of the savings. However, it is unknown whether, if the store hadn't stocked the water-efficient devices, the customer would or would not have proceeded to search elsewhere for them. Another way the program could influence savings is when customers become aware of and purchase products for

the first time while shopping at a store which stocks them because of the utility's program.

Program: Since Palo Alto is a natural gas and electric utility in addition to a water utility, this program will apply to products that save energy as well as water. Suppliers who are willing to stock specified products will be kept informed of utility programs and will be included in utility-paid-for advertising. This advertising will be in the form of special lists made available to utility customers as well as media time and space. In addition, the utility will purchase some items and sell them on a consignment basis at supplier businesses who provide sales space. The utility will designate items that provide significant resource savings as "certified" or winners of a "Seal of Approval." Also, the utility will conduct targeted outreach to service and product suppliers to educate them about conservation devices and practices.

Schedule: Supplier programs will be implemented by staff as time permits, with advertising activity to begin in 1991 and other components added in later years.

Budget: No increased staff or budget is required for the planned advertising, but funds will need to be budgeted for the purchase of items to offer on consignment. In addition, incentives to suppliers may prove to be the most effective way to influence their actions and, in that case, incentive funds may need to be budgeted.

Summary: Educating and motivating suppliers to stock products and supply services being recommended by the utility is essential to "closing the loop" started by utility programs to promote customer conservation action.

WATER MANAGEMENT PLANS NOT CHOSEN FOR IMPLEMENTATION

Exchanges or Transfers

Palo Alto has not investigated the issues relating to exchanges and transfers of water between agencies. These investigations will be done in conjunction with the City's main supplier of water, SFWD, and BAWUA.

Management of Pressures/Peaks

The potential problem of peak deliveries by SFWD to its suburban wholesale customers is being discussed with SFWD and BAWUA. Presently, there is little data to determine the extent of the problem, if any exists, or an estimated future date when problems may arise. Again, the City of Palo Alto plans to work with SFWD and BAWUA to define and find solutions to this problem.

Flow Restrictors

Flow restrictors inserted into non-conserving showerheads or faucets reduce water use by constricting the opening water can flow through. Since these devices are very inexpensive, the water savings are extremely cost-effective for all parties -- the agency, the participant, and society. However, Palo Alto has found that these devices result in an unsatisfactory shower and are quickly removed. The dissatisfaction leaves a bad impression in customers' minds and leads to skepticism with regard to other devices that promise to conserve resources. Palo Alto will not provide or promote flow restrictors for these reasons. The Utility wishes to promote products that retain or improve user satisfaction and wishes to separate the concepts of conservation from the experience of sacrifice.

Industrial Cooling Water Use - Air-Cooled Condensers

Using air-cooled condensers rather than water-cooled condensers for commercial/industrial cooling or air conditioning saves water. However, air cooled condensers on cooling systems use substantially more electricity than water cooled condensers. Condensers are the final heat sink for cooling systems. Efficiency of these systems increases as the temperature of the heat sink decreases. During Palo Alto's dry summertime cooling seasons, water cooled condensers are able to take advantage of low wet-bulb temperatures rather than the higher ambient, or dry-bulb, temperatures seen by air cooled condensers.

As an electric and gas utility, as well as a water utility, and as a government entity concerned about resource conservation, the City of Palo Alto will not recommend that its utility customers pursue an option that saves one resource at the expense of another.

8. CONCLUSION

The 1990 UWMP provides an overview of issues and concerns facing the Utility. The historical supply situation is described, but it is clear that the days of unlimited, cheap sources of water are over. Uncertainties about the future include both quantity and quality of water. As state-wide water resources are reviewed, especially under the increased scrutiny due to the current drought, it is clear that water must be used in the most efficient way possible.

Palo Alto's UWMP describes its commitment to the pursuit of long-term water conservation. Although long active in promoting the efficient use of resources, Palo Alto will now dedicate more staff time and money to the goal of making every drop count. The demand-side programs presented in the UWMP are many and varied in their approach. Mini-programs target each customer class and vary the approach and tactics to achieve savings depending upon that particular customer class' characteristics.

The software provided by DWR, WaterPlan™, was used to estimate cost-effectiveness of many of the programs and measures planned. However, not all planned programs could be modeled using the software. WaterPlan™ calculates cost-effectiveness from the perspectives of the water utility, the participant, and society. The society perspective is the one chosen by the City of Palo Alto to determine program cost-effectiveness. This perspective shows programs to be cost-effective if the cost of the conserved water (cost of installed device divided by the lifetime water savings) is less than the marginal cost of water.

For those measures modeled in WaterPlan™, savings estimates are 300,000 CCF/year after five years or about 5% of forecasted load. Assuming that the programs not modeled save at least as much water, the total savings would be about 10% of forecasted load after five years. In addition, when the utility gains experience with the incentive and installation programs planned, it is expected that targeted programs can be modified to increase savings with little increased effort.

When all the programs analyzed by WaterPlan™ are grouped together, their costs outweigh their economic benefits. However, the otherwise positive results are skewed by the poor economics of the landscape retrofit program.

Landscape retrofits can yield substantial water savings and, as a result, significantly reduced water bills. However, the cost of water is so low compared to the cost of retrofitting landscape that it takes a very long time for water savings to pay for landscape retrofit costs. Nevertheless, many customers can be motivated to make landscape changes for reasons beyond utility bill savings. These reasons include saving a dwindling, precious resource, reducing

maintenance time or costs and the ability to maintain a beautiful landscape in dry years. It is in the utility's interest to promote landscape retrofits for the same reasons.

Excluding the results for the landscape retrofit measures, WaterPlan™ results show that the rest of the programs planned by the City of Palo Alto are cost-effective. Society's net present value (present value of program benefits minus present value of program costs) is $3,743,000. In other words, the avoided cost for the saved water outweighs the cost of the efficient devices plus the program costs by that much. Water saved over the 20-year planning horizon totals 2.358 billion gallons or 3.2 million CCF.

Implementation of the programs is planned over a period of the next five years. Some of the recommended programs will require further study to determine detailed courses of action. In addition, it is expected that programs other than those outlined in the UWMP may be pursued. As new information is developed, plans may change, but the common denominator will always remain improving water use efficiency in Palo Alto.

APPENDIX A

1985 URBAN WATER MANAGEMENT PLAN

C I T Y O F P A L O A L T O

UTILITIES DEPARTMENT

RESOURCE PLANNING DIVISION

URBAN WATER MANAGEMENT PLAN

December, 1985

URBAN WATER MANAGEMENT PLANNING ACT
BASIC PLAN

A. GENERAL INFORMATION

Name of Utility: CITY OF PALO ALTO

Address: P.O. BOX 10250
PALO ALTO, CALIFORNIA
94303

Telephone: (415) 329-2618

Name of Person Completing Plan: Kenneth J. DeDario

Population Served: 56,400

Number of Service Connections: 18,893

Date of Last Census or Inventory: 1984

B. WATER USE RECORDS

Historical Water Use:

- Period of Available Records: Year: 1960 to present.

- Water Use Records are: Daily X

Monthly X

Annual X

Other

- Source of Records: Water Sales: X

Source Meter(s): X

Other:

- Water Sources: (check all appropriate)

  o Groundwater ___X___

  o Current No. of Active Wells ___0___
  (Note: All ten wells are maintained as emergency/standby water sources only.)

  o Surface Water _____

  o Purchased Water ___X___

Historical Data*

Fiscal Year**	Total Use
1975	8527 KCCF
1976	8700 KCCF
1977	7285 KCCF
1978	5398 KCCF
1979	6881 KCCF
1980	6992 KCCF
1981	7669 KCCF
1982	7392 KCCF
1983	7060 KCCF
1984	8104 KCCF
1985	8208 KCCF

Current Water Use*

- Most Current Year of Record: 1985
- Total Water Use: 8208 KCCF

Projected Water Use*

Year: 1985 Water Use: 8208 KCCF

Year: 1990 Water Use: 9510 KCCF

Year: 1995 Water Uses: 10600 KCCF

* Includes unaccounted-for water use and is based upon historical data and utility records

** Fiscal Year ending June 30

Water Use Percentages***

Customer Class	Percent
Residential:	43.4
Industrial:	22.5
Commercial:	12.8
Governmental:	6.6
Other: (City)	6.4
Unaccounted-for:	8.3

*** Data from current year of record - Fiscal Year 1983/84

C. CURRENT CONSERVATION MEASURES

Current conservation measures in practice today which the Palo Alto Utility implements are indicated below. Programs not currently in use are indicated and addressed in Section D. ALTERNATIVE CONSERVATION MEASURES.

-Water meters: 18,893 % of system: 100

- Source meters: 13 % of sources: 100

- Water use records by user type (commercial, etc.): YES

- Leak detection program: NO

- Meters installed only on new connections in the system: YES
(Meters are installed on all connections to the system)

- Public education school programs: NO

- Public information (general) programs: YES

- Rate structure to encourage conservation: YES
  (Inverted block water rate structure)

- New connection restrictions or conditions: NO
  (Some limitations on Master Metering)

- Home retrofit of plumbing fixtures: YES

- Wastewater reclamation and reuse: YES

- System pressure control program: YES

- Landscape irrigation program: YES

- Other (please describe): N/A

D. ALTERNATIVE CONSERVATION MEASURES

1. Leak Detection Program: This option would have no negative environmental, social or health impacts. A technological impact may exist in that equipment and personnel have not in the past been assigned in this Utility for leak detection work. The estimated economic impact indicates that a one-person leak detection program including equipment and transportation would cost $50,000-$60,000 annually. Average unaccounted-for water loss over the past nine years is 7.4 percent.

2. Public Education School Programs: Since the City already has an effective school program dealing with gas and electricity conservation issues, there would be minimal expense in adding a water conservation component. This program would have positive customer impact with no negative economic, environmental, social, health, or technological results.

3. New Connection Restrictions: Restrictions other than Master Metering limitations are not needed at this time; adequate supplies of quality water exist. No health or technological issues are evident. Growth issues currently exist within the City.

E. SUPPLY DEFICIENCY ANALYSIS

Source Capacity: Palo Alto's water supply at this time is limited only by contractual agreement between the Suburban Water Users, of which Palo Alto is a member, and the City and County of San Francisco. Palo Alto's current vested interest in an available 184 mgd is 15.536 mgd. The vesting schedule calls for adjustments every three years.

Standby Well Capacity: Palo Alto currently maintains 10 standby wells with a total capacity of 8.5 mgd.

Source Type and Average Year Production:

Surface Water	0	KCCF
Groundwater	0	KCCF
Purchased Water	7440	KCCF

(Average over 1980-1984 Fiscal Years)

The Palo Alto Water Utility has experienced no regular or frequent supply deficiencies during the period of record.

The Palo Alto Water Utility did experience voluntary curtailment of 25 percent during the 1976-1977 drought period.

Impacts and actions taken by Palo Alto during the 25 percent curtailment period included:

- Voluntary Cut Backs
- Establishment of an Inverted Block Water Rate Schedule
- Development of a Conservation Program
- Mandatory Allocations and Penalties

At this time, Palo Alto has no direct plans regarding the development of new source capacity to meet drought shortages or projected demands.

Palo Alto will continue to purchase water from San Francisco as needed, and therefore continue to increase the size of the vested interest in the Suburban Water User's 184 mgd contracted available capacity. Sufficient data is not yet available to determine when additional capacity, beyond 184 mgd, will be required by the Suburban Water Users.

F. IMPLEMENTATION SCHEDULE

WATER MANAGEMENT CONSERVATION PROGRAM

The Bay Area Water Users Association and San Francisco Water Department have agreed to cooperate on a system-wide Water Management Conservation Program. This Water Management program will be part of each utilities submittal for the Urban Water Management Plan and will be specific to each utilities' own service area. The specific details for each measure designed for the Palo Alto service area will be the subject of future Staff Reports for Council action.

Conservation Measure	Implementation Goal
I. Education and Public Information	
A. Water Conservation Working Committee	January 1, 1986
B. Conservation Literature	July 1, 1987
1. General Water Conservation Brochure	
2. Landscape Brochure with Plant List	
3. Brochures for Specific Water Users	
C. Previous Year's Use on Water Bill (Note: This is already being done on a monthly basis)	January 1, 1987
D. Promotional Measures	
1. Public Relations (media)	January 1, 1987
2. Public Speaking Presentations	January 1, 1987
3. Demonstrations of Low Water Use Landscapes	January 1, 1988
4. Promotional Campaign with Nurseries	January 1, 1988
5. Awards for Conservation Programs and Projects	January 1, 1988
E. Work with Large Water Users	January 1, 1987
F. In-School Education	September 1, 1986
G. Information on Federal and State Laws and Programs	January 1, 1987

II. Water Management Programs

A. Water Loss Reduction Techniques	
1. System-wide Water Audit	January 1, 1987
2. Leak Detection Program	July 1, 1987
a. For Department's System	
b. For Customers' Side	
3. Meter Calibration and Replacement Program	July 1, 1988
4. Corrosion Control	July 1, 1988
B. Metering All Customers (Note: All customers are being metered)	January 1, 1986
C. Device Distribution	July 1, 1987
D. Meter Loan Program, Large Water Users	July 1, 1987

III. Regulations

A. Environmental Impact Reports and Statements (New developments)	January 1, 1987
B. Water Conservation Ordinances	January 1, 1988
1. Requirements for Large Water Users	
2. Low Water-Use Landscapes	

APPENDIX B

TEXT OF LEGISLATION

AB797 -- URBAN WATER MANAGEMENT PLANNING ACT

AND

AB2660 -- 1990 AMENDMENT TO AB797

Assembly Bill No. 797

CHAPTER 1009

An act to add and repeal Part 2.6 (commencing with Section 10610) to Division 6 of the Water Code, relating to water conservation.

[Approved by Governor September 21, 1983. Filed with Secretary of State September 22, 1983.]

LEGISLATIVE COUNSEL'S DIGEST

AB 797, Klehs. Water: management planning.

(1) Under existing law, local water suppliers may, but are not required to, adopt and enforce water conservation plans.

This bill would require every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare and adopt, in accordance with prescribed requirements, an urban water management plan containing prescribed elements. The bill would require the plan to be filed with the Department of Water Resources, and would require the department to annually prepare and submit to the Legislature a report summarizing the status of the plans. The bill would require each supplier to periodically review its plan in accordance with prescribed requirements, would specify requirements for actions or proceedings arising under the bill, and would specify related matters.

The bill would make legislative findings and declarations in this connection.

The provisions of the bill would remain in effect only until January 1, 1991.

(2) Article XIII B of the California Constitution and Sections 2231 and 2234 of the Revenue and Taxation Code require the state to reimburse local agencies and school districts for certain costs mandated by the state. Other provisions require the Department of Finance to review statutes disclaiming these costs and provide, in certain cases, for making claims to the State Board of Control for reimbursement.

This bill would impose a state-mandated local program as its requirements would be applicable to local public agencies.

However, the bill would provide that no appropriation is made and no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Part 2.6 (commencing with Section 10610) is added to Division 6 of the Water Code, to read:

REPRINT

PART 2.6. URBAN WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. The Legislature finds and declares as follows:

(a) The waters of the state are a limited and renewable resource subject to ever increasing demands.

(b) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The conservation and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The conservation and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to achieve conservation and efficient use.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Conservation" means those measures that limit the amount of water used only to that which is reasonably necessary for the beneficial use to be served.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate reasonable and practical efficient uses and conservation activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for

implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 7 (commencing with Section 4010) of Part 1 of Division 5 of the Health and Safety Code.

CHAPTER 3. URBAN WATER MANAGEMENT PLANS

Article 1. General Provisions

10620. (a) Every urban water supplier serving water directly to customers shall, not later than December 31, 1985, prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier after December 31, 1984, shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water to customers may adopt an urban water management plan or participate in areawide, regional, watershed, or basinwide urban water management planning; provided, however, an urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

10621. Each urban water supplier shall periodically review its plan at least once every five years. After the review, it shall make any amendments or changes to its plan which are indicated by the review. Amendments or changes in its plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall include all of the following elements:

(a) Contain an estimate of past, current, and projected water use and, to the extent records are available, segregate those uses between residential, industrial, commercial, and governmental uses.

(b) Identify conservation measures currently adopted and being practiced.

(c) Describe alternative conservation measures, if any, which would improve the efficiency of water use with an evaluation of their costs and their environmental and other significant impacts.

(d) Provide a schedule of implementation for proposed actions as indicated by the plan.

(e) Describe the frequency and magnitude of supply deficiencies, including conditions of drought and emergency, and the ability to meet short-term deficiencies.

10632. In addition to the elements required pursuant to Section 10631, a plan projecting a future use which indicates a need for expanded or additional water supplies shall contain an evaluation of the following:

(a) Waste water reclamation.

(b) Exchanges or transfer of water on a short-term or long-term basis.

(c) Management of water system pressures and peak demands.

(d) Incentives to alter water use practices, including fixture and appliance retrofit programs.

(e) Public information and educational programs to promote wise use and eliminate waste.

(f) Changes in pricing, rate structures, and regulations.

10633. The plan shall contain an evaluation of the alternative water management practices identified in Sections 10631 and 10632, taking into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

Evaluation of the elements in Section 10632 shall include a comparison of the estimated cost of alternative water management practices with the incremental costs of expanded or additional water supplies, and in the course of the evaluation first consideration shall be given to water management practices, or combination of practices, which offer lower incremental costs than expanded or additional water supplies, considering all the preceding evaluation factors.

Article 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. (a) An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water conservation and management methods and techniques.

(b) In order to assist urban water suppliers in obtaining needed expertise as provided for in subdivision (a), the department, upon request of an urban water supplier, shall provide the supplier with a list of persons or agencies having expertise or experience in the development of water management plans.

10642. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. An urban water supplier shall file with the department a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department within 30 days after adoption.

The department shall annually prepare and submit to the Legislature a report summarizing the status of the plans adopted pursuant to this part.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part, or within 18 months after commencement of urban water service by a supplier commencing that service after January 1, 1984.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be

commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans prepared and adopted under this part. Nothing in this part shall be interpreted as exempting projects for implementation of the plan or for expanded or additional water supplies from the provisions of the California Environmental Quality Act.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board in obtaining that information. The requirements of this part shall be satisfied by any water conservation plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing water management or conservation plan which includes the contents of a plan required under this part.

10654. All costs incurred by an urban water supplier in developing or implementing its plan shall be borne by it unless otherwise provided for by statute.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. This part shall remain in effect only until January 1, 1991, and as of that date is repealed, unless a later enacted statute, which is chaptered before January 1, 1991, deletes or extends that date.

SEC. 2. No appropriation is made and no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution or Section 2231 or 2234 of the Revenue and Taxation Code because the local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act.

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Assembly Bill No. 2661

CHAPTER 355

An act to amend Sections 10631, 10632, and 10644 of, to add Section 10645 to, and to repeal Section 10656 of, the Water Code, relating to water.

[Approved by Governor July 18, 1990. Filed with Secretary of State July 19, 1990.]

LEGISLATIVE COUNSEL'S DIGEST

AB 2661, Klehs. Water management planning.

(1) Under the Urban Water Management Planning Act, which is to remain in effect only until January 1, 1991, every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually is required to prepare and adopt, in accordance with prescribed requirements, an urban water management plan containing prescribed elements. The plan is required to be filed with the Department of Water Resources, and the department is required to annually prepare and submit to the Legislature a report summarizing the status of the plans. Each supplier is required to periodically review its plan in accordance with prescribed requirements.

This bill would delete the January 1, 1991, termination date, thereby imposing a state-mandated local program since the requirements of the act are specifically applicable to local public agency water suppliers. The bill would revise the required elements of the plan and would make related changes. The bill would require the water supplier and the department to make the plan available for public review within 30 days after filing of the plan with the department. The bill would require the department in its annual report to highlight the outstanding elements of individual plans and would also require the department to prepare reports and provide data for specified legislative hearings. The bill would require the department to provide a copy of the report to each supplier which has filed its plan with the department.

(2) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Section 10631 of the Water Code is amended to

read:

10631. A plan shall include all of the following elements:

(a) Contain an estimate of past, current, and projected water use and, to the extent records are available, segregate those uses between residential, industrial, commercial, and governmental uses.

(b) Identify conservation measures currently adopted and being practiced.

(c) Describe alternative conservation measures, including, but not limited to, consumer education, metering, water saving fixtures and appliances, lawn and garden irrigation techniques, and low water use landscaping, which would improve the efficiency of water use with an evaluation of their costs and their environmental and other significant impacts.

(d) Provide a schedule of implementation for proposed actions as indicated by the plan.

(e) Describe the frequency and magnitude of supply deficiencies, based on available historic data and future projected conditions comparing water supply and demand, including a description of deficiencies in time of drought and emergency, and the ability to meet deficiencies.

(f) To the extent feasible, describe the method which will be used to evaluate the effectiveness of each conservation measure implemented under the plan.

(g) Describe the steps which would be necessary to implement any proposed actions in the plan.

SEC. 2. Section 10632 of the Water Code is amended to read:

10632. In addition to the elements required pursuant to Section 10631, a plan projecting a future use which indicates a need for expanded or additional water supplies shall contain an evaluation of the following alternatives:

(a) Waste water reclamation.

(b) Exchanges or transfer of water on a short-term or long-term basis.

(c) Management of water system pressures and peak demands.

(d) Issues relevant to meter retrofitting for all uses.

(e) Incentives to alter water use practices, including fixture and appliance retrofit programs.

(f) Public information and educational programs to promote wise use and eliminate waste.

(g) Changes in pricing, rate structures, and regulations.

SEC. 3. Section 10644 of the Water Code is amended to read:

10644. An urban water supplier shall file with the department a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department within 30 days after adoption.

Plans filed under this section shall describe the basis for the decision of the urban water supplier to add, change, or retain conservation measures.

The department shall annually prepare and submit to the Legislature a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall highlight the outstanding elements of individual plans. The department shall provide a copy of the report to each urban water supplier which has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

SEC. 4. Section 10645 is added to the Water Code, to read:

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

SEC. 5. Section 10656 of the Water Code is repealed.

SEC. 6. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act. Notwithstanding Section 17580 of the Government Code, unless otherwise specified in this act, the provisions of this act shall become operative on the same date that the act takes effect pursuant to the California Constitution.

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APPENDIX C

1989 WATER UTILITY PLAN RECOMMENDATIONS

APPENDIX C

1989 WATER UTILITY PLAN RECOMMENDATIONS

The City of Palo Alto City Council adopted the 1989 Water Utility Plan on November 27, 1989. The WUP was designed to serve as a planning guide to be used in meeting future Water Utility requirements. The following recommendations were contained in the WUP and were intended to serve as a guide to Utility planning in the face of the many challenges the Water Utility faces in its uncertain future.

1. Maintain leadership role in the Bay Area Water Users Association.

2. Refurbish the wells that are recommended to remain in the water system and maintain them in a condition and manner consistent with their intended use.

3. Continue working with the SFWD and the Bay Area Water Users Association Planning Committee to address contractual issues and to study the feasibility of facilities that may alleviate the peaking problem.

4. Evaluate the operational feasibility of using existing City storage and distribution facilities for water supply during peak periods.

5. Closely monitor the proposed modification to the Safe Drinking Water Act.

6. Monitor and participate in the Bay-Delta hearing process for the purpose of maintaining the existing Hetch Hetchy supply.

7. Perform a study of Palo Alto's anticipated supplemental needs in order to prepare for the situation when the SFWD system reaches full capacity.

8. Analyze the feasibility of developing new wells.

9. Continue working with the SCVWD staff and examine the feasibility of interconnecting with the SCVWD for future treated water deliveries.

10. Analyze the feasibility of using reclaimed water as a source of supply for certain applications.

11. Support and participate in the proposed United States Geological Survey groundwater study.

12. Continue to pursue demand-side programs for the purpose of promoting efficient use of the City's water resources.

13. Continue to examine rate design in terms of effectiveness in meeting the principal criteria employed by the City, and perform timely comprehensive cost of service studies.

14. Proceed with the current plans on the reservoir improvement project to provide improved seismic integrity and corrosion protection.

15. Proceed with the study regarding recommendations for updating the receiving stations and related monitoring systems.

16. Continue the development and implementation of a comprehensive large meter maintenance program.

17. Reevaluate staffing levels to insure adequate ongoing preventative maintenance involving valve replacement, meter calibration and replacement, fire hydrant upgrades and flow-testing.

18. Proceed with the in-house study regarding the appropriate main replacement cycle.

19. Update the Water Utility Emergency Operations Plan to meet current industry standards.

APPENDIX D

WATER CONSUMPTION

HISTORICAL AND PROJECTED

CITY OF PALO ALTO WATER CONSUMPTION
HISTORICAL AND PROJECTED 1968 THROUGH 2009
(IN MILLIONS OF CCF)

HISTORICAL YEAR	HISTORICAL CONSUMPTION	PROJECTED YEAR	PROJECTED BASE	PROJECTED HIGH	PROJECTED LOW
1968	7.39	1990	7.20	7.41	7.08
1969	7.40	1991	7.58	8.07	7.24
1970	8.05	1992	7.82	8.44	7.37
1971	7.93	1993	7.94	8.63	7.43
1972	8.57	1994	8.00	8.73	7.45
1973	8.18	1995	8.04	8.80	7.46
1974	8.16	1996	8.07	8.85	7.46
1975	8.53	1997	8.09	8.87	7.47
1976	8.58	1998	8.10	8.89	7.46
1977	7.29	1999	8.11	8.91	7.46
1978	5.40	2000	8.12	8.92	7.46
1979	6.88	2001	8.13	8.93	7.46
1980	6.99	2002	8.14	8.94	7.46
1981	7.67	2003	8.14	8.95	7.46
1982	7.39	2004	8.15	8.97	7.45
1983	7.06	2005	8.15	8.98	7.45
1984	8.10	2006	8.16	8.99	7.45
1985	8.20	2007	8.17	9.00	7.45
1986	7.85	2008	8.17	9.01	7.45
1987	8.01	2009	8.18	9.02	7.45
1988	7.65				
1989	6.35				

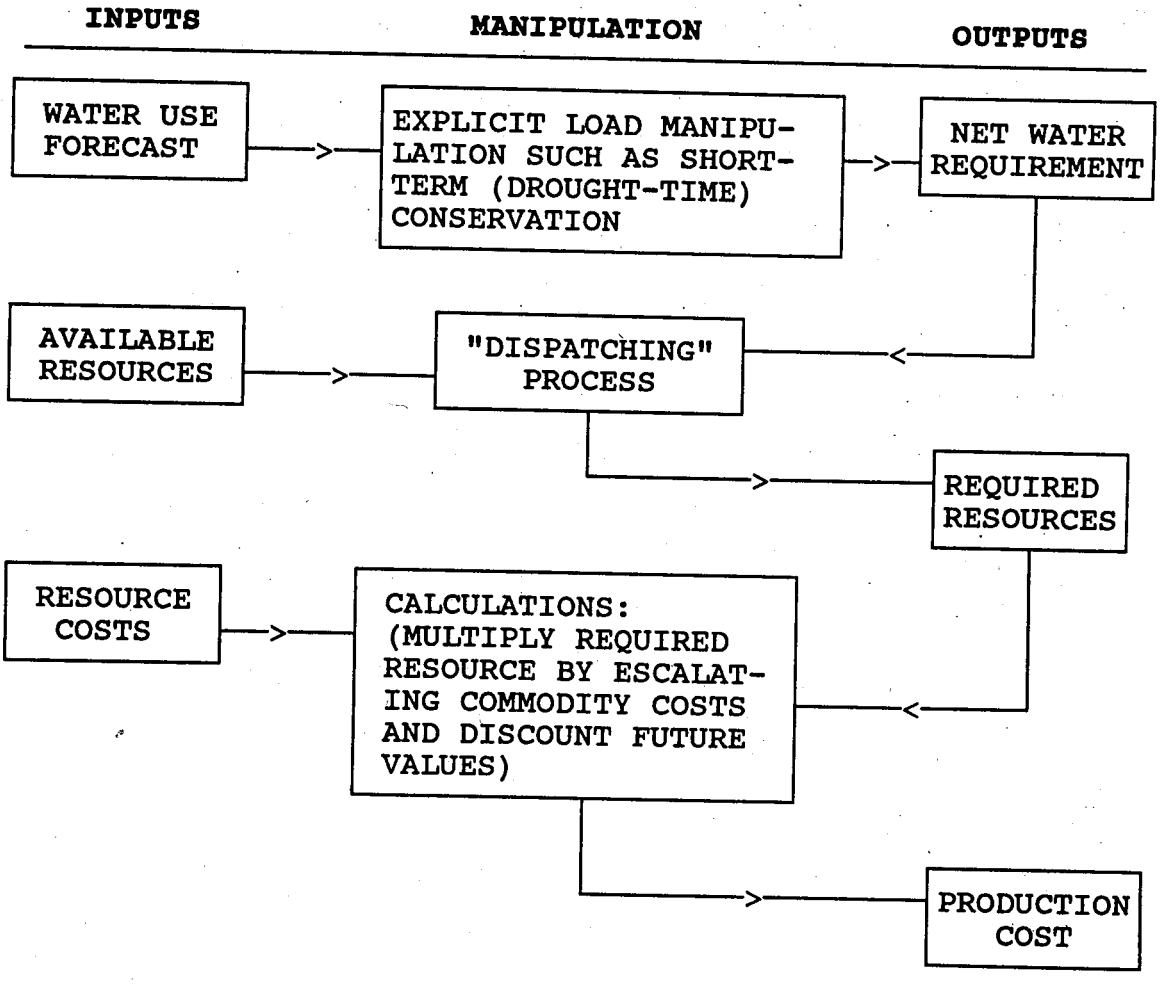
APPENDIX E

PRODUCTION COST MODEL DESCRIPTION

PRODUCTION COST MODEL

OVERVIEW

Basically a production cost model consists of user defined data bases that are manipulated by the model to produce useful outputs. These data bases contain assumptions about the future (i.e., forecasts of water use, resource availability, and resource costs). Users can adjust assumptions and rerun the model to determine the effect of changing the parameters. The heart of the model is the dispatching process which subjects the available resources to the forecasted load. The output from this section shows how future loads will be metered. The resources required multiplied by the cost of each resource is equal to the production cost. The model is set up as shown schematically in the diagram below:



INPUTS

Inputs are provided by the user and can be changed to create different scenarios to analyze various strategies. Sensitivity analyses are performed by changing certain parameters to test how they affect production cost.

Water Use Forecast: The monthly forecast for each month of the 20-year analysis period is required.

Available Resources: This section contains the maximum amount of each resource available each month.

Resource Costs: This section contains the first year commodity costs of each resource as well as escalation rates for each year for each resource. These can be different for each month to model seasonally changing costs or different for each year if there is a reason to believe that costs will increase (or decrease) more rapidly in some years than others.

OUTPUTS

Net Water Requirement: After any explicit changes to the forecast load have been done, the result is the net water requirement. These changes are described below.

Required Resources: This section is the result of the "dispatching" of available resources to meet the net requirements. It shows which resources and how much of each are required to meet load. This output is essentially a loads and resources balance.

Production Cost: This section shows monthly, annual, and cumulative production costs in nominal and discounted dollars.

MANIPULATION

Explicit Load Manipulation: This section adjusts the forecast before resources are dispatched. For example, to model short-term conservation during times of drought, the user can describe the level of load reductions that occur. In this example, then, the load is equal to the forecast minus this short-term conservation and it is this net load that must be satisfied by the available resources.

Dispatching Process: This is the main body of the model. This section goes down through the list of "available resources" and uses them up until the "net water requirement" is satisfied. The "dispatch order" designates which resource is used first, second, third, etc. If the available resources are not sufficient to meet the load, a shortfall is noted. For example, if the load for July 1995 is 900,000 CCF, Resource #1 availability is 1,100,000 CCF, there is 40,000 CCF of reclaimed water developed, and no other resources are available, the model will specify that all reclaimed water is used and 860,000 CCF of Resource #1 water is used. If, however, only 800,000 CCF of Resource #1 is available, the model will show that all available reclaimed and Resource #1 water is used and that there is a shortfall of 60,000 CCF.

Calculations: This section multiplies the required resource amounts by the resource costs to calculate production cost.

APPENDIX F

PLANNING SCENARIO PARAMETERS

SCENARIO DEVELOPMENT

Three planning scenarios were developed to analyze various strategies. The three scenarios include a "most likely" case as well as two boundary conditions. The planning scenarios developed have the following attributes:

	Attribute	High-Production Cost Scenario	Likeliest Scenario	Low-Production Cost Scenario
1.	Forecast	High	Base	Low
2.	Maximum allocation from SFWD (1,000 ccf)	7,580	8,021	10,000
3.	Cost of SFWD water over allocation = under allocation cost plus ___	$.21/ccf	$.15/ccf	$.12/ccf
4.	SFWD escalation rate	8%/yr.	5%/yr.	3%/yr.
5.	Wastewater treatment escalation rate	7%/yr.	5%/yr.	3%/yr.
6.	Number of droughts in 20-year planning horizon	4	3	0
7.	Drought #1 reduction	15%	15%	N/A
8.	Drought #2 reduction	10%	10%	N/A
9.	Drought #3 reduction	25%	25%	N/A
10.	Drought #4 reduction	25%	N/A	N/A

APPENDIX G

SERVICE AREA INFORMATION WORKSHEETS

CITY OF PALO ALTO
SERVICE AREA DATA

APPENDIX G

	HISTORICAL			CURRENT
Fiscal Year Ending	1975	1980	1985	1990
DEMAND BY SECTOR				
Single Family				
Meters	13,340	14,760	14,852	14,900
Units (CCF's)	3,024,886	2,610,166	2,916,108	2,465,544
% of Total	37.90%	38.79%	39.66%	39.30%
Gal/day/meter	465	362	402	339
Multi Family				
Meters	1,663	1,477	1,620	1,665
Units (CCF's)	538,264	584,494	671,659	663,927
% of Total	6.74%	8.69%	9.13%	10.58%
Gal/day/meter	663	811	850	817
Commercial				
Meters	1,435	1,632	1,695	1,750
Units (CCF's)	1,093,089	1,066,937	1,339,493	1,401,448
% of Total	13.69%	15.86%	18.22%	22.34%
Gal/day/meter	1,561	1,340	1,619	1,641
Industrial				
Meters	271	254	243	260
Units (CCF's)	2,236,658	1,582,471	1,666,414	1,069,017
% of Total	28.02%	23.52%	22.66%	17.04%
Gal/day/meter	16,914	12,768	14,054	8,426
City Facilities				
Meters	259	247	243	265
Units (CCF's)	342,069	287,611	360,580	400,626
% of Total	4.29%	4.27%	4.90%	6.39%
Gal/day/meter	2,707	2,386	3,041	3,098
Public Facilities				
Meters	202	196	173	67
Units (CCF's)	747,250	596,824	398,843	272,982
% of Total	9.36%	8.87%	5.42%	4.35%
Gal/day/meter	7,581	6,240	4,725	8,350
TOTAL SALES				
Meters	16,670	18,536	18,826	18,907
Units (CCF's)	7,982,216	6,728,503	7,353,097	6,273,554
TOTAL PURCHASES				
Units (CCF's)	8,527,000	6,994,000	8,198,000	6,590,000
Unaccounted-for	544,784	265,497	844,903	316,446
% Unaccounted	6.39%	3.80%	10.31%	4.80%

CITY OF PALO ALTO
SERVICE AREA DATA

APPENDIX G

	HISTORICAL				CURRENT	PROJECTED			
Fiscal Year Ending	1970	1975	1980	1985	1990	1995	2000	2005	2010
SOURCES OF SUPPLY									
San Francisco Water Dept (ccf)	8,054,000	8,527,000	6,994,000	8,198,000	6,590,000	7,042,000	6,620,000	6,154,000	5,683,000
Ground Water									
Usable?	YES	YES	YES	YES	YES	YES	YES	YES	YES
Aquifer overdraft?	NO	NO	NO	NO	NO	NO	NO	NO	NO
Aquifer overdraft %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Service area over usable aquifer	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Waste Water Reclamation									
Reclaimed Delivered (ccf)	0	0	0	0	0	1,000,000	1,500,000	2,000,000	2,500,000
WATER SUPPLY									
Gross Quantity (ccf)	8,054,000	8,527,000	6,994,000	8,198,000	6,590,000	8,042,000	8,120,000	8,154,000	8,183,000
Daily use (mill of gal)	17	17	14	17	14	16	17	17	17
Annual use (mill of gal)	6,024	6,378	5,232	6,132	4,929	6,015	6,074	6,099	6,121
Annual use (acre feet)	18,489	19,575	16,056	18,820	15,129	18,462	18,641	18,719	18,786
SERVICE AREA INFORMATION									
Size (square miles)	25.159	25.710	25.980	25.980	25.980	25.980	25.980	25.980	25.980
Population	56040	52700	55225	56815	57366	57650	58300	59000	59700
Growth rate		-5.96%	4.79%	2.88%	0.97%	0.50%	1.13%	1.20%	1.19%
Annual per capita use (ccf)		151	122	129	115	139	139	138	137

APPENDIX H

ECONOMIC ANALYSIS OF DEMAND-SIDE PROGRAMS

RESULTS FROM WATERPLAN™

CITY OF PALO ALTO
ECONOMIC ANALYSES OF DEMAND-SIDE PROGRAMS
SERVICE AREA INFORMATION FOR WATER PLAN

APPENDIX H

FINANCIAL DATA			
Perspective	Real Discount Rate	Cost	Escalation Rates
Society	3%	Cap & Incentive	0.0%
Agency	7%	Installation	0.0%
Residential	20%	O & M	0.0%
Commercial	25%	Admin & Deliver	0.0%
Industrial	25%		

BASE YEAR: 1987
FORECAST
HORIZON: 1991-2011
WEATHER: Redwood City

BASE YEAR CONSUMPTION				
	Total Connections	Average Use per Connection	Total Consumption	Annual Growth Rate
Perspective		(ccf)		
Residential	16580	217	3596623	1.18%
Commercial	1715	803	1377157	1.18%
Industrial	286	5106	1459578	1.18%
Other			716175	1.18%

PRIMARY RATES		
	Rate	Growth Rate
Water		
Residential	$1.41/ccf	6.3%
Commercial	$1.43/ccf	6.3%
Industrial	$1.48/ccf	6.3%

PRIMARY MARGINAL COST		
	Cost	Growth Rate
Water	$1.34/ccf	7.32%

SECONDARY RATES - BASE YEAR		
Utility	Rate	Growth Rate
Electric	$0.0562/kWh	4.57%
Gas	$4.55/mil Btu	7%
Sewer Rate		
Residential	$0.52/ccf	9.95%
Commercial	$1.18/ccf	
Industrial	$2.00/ccf	

SECONDARY MARGINAL COSTS		
Utililty	Cost	Growth Rate
Electric	$0.035/kWh	5%
Gas	$2.45/mil Btu	5%
Sewer Rate	$0.17/ccf	5%

WATER HEATING SATURATIONS		
Perspective	Electric	Gas
Residential	8%	92%
Commercial	15%	85%
Industrial	10%	90%

PROGRAM NAME/ Individual Measures Contained in Program	MEASURE COSTS INCURRED BY: Capital	Installation	O&M	DELIVERY Cost	Unit/ Prog	OTHER Incentive Paid by Agency?	Package Provided/ Installed	PACKAGES DELIVERED Year 1991	1992	1993	1994	1995	ADMINISTRATIVE COSTS Year 1991	1992	1993	1994	1995	TOTAL ADMIN COST PER PROGRAM
LANDSCAPE RETROFIT PROG, RES/COMM/MF													$10,000	$6,100	$4,100	$3,900	$3,700	$27,800
Auto Controllers & Valves	C	C	C	$10	U	$125	P	0	15	30	30	40						
Xeriscaping, Existing Residential	C	C	C	$50	U	$2,000	P	5	30	60	65	70						
Xeriscaping, Existing-Comm/MF	C	C	C	$80	U	$10,000	P	1	10	25	30	40						
Irrigation Audits—Comm/Multi-family	C	C	C	$80	U	N	P	20	25	50	60	80						
Xeriscaping Incremental Cost	C	C	C	$50	U	N	P	2	15	30	35	40						
WATER MGMT PLAN, CITY FACILITIES													$3,200	$3,200	$2,400	$1,600	$1,600	$12,000
Toilet Replacement with ULF - City	A	A	A	$200	T	N	I	2	10	10	30	50						
Self Closing Faucets - City	A	A	A	$200	T	N	I	0	30	30	40	20						
Irrigation Audits - City	A	A	A	$8,000	T	N	P	3	30	30	0	0						
Xeriscaping, Existing - City	A	A	A	$1,500	T	N	I	0	1	1	1	0						
INDOOR WATER MGMT PROG, MULTI FAMILY													$500	$1,500	$2,000	$1,500	$500	$6,000
Moderate Kit Program - MF	C	C	C	$10	U	N	P	100	300	400	500	300						
Toilet Tank Displacement Dam																		
ULF Showerhead																		
Leak Detect Tab-20%leak, 50%fix leak																		
Faucet Aerator																		
ULF Showerhead Replacement - MF	C	C	C	$10	U	$10	P	20	50	100	100	100						
ULF Toilet Replacement - MF	C	C	C	$5	U	$100	P	0	20	50	100	150						
INDOOR WATER MGMT PROG, SINGLE FAMILY													$1,900	$4,700	$1,900	$1,900	$1,900	$12,300
ULF Toilet Replacement - Res	C	C	C	$30	U	$100	P	0	25	50	75	100						
ULF Showerhead Replacement - Res	C	C	C	$10	U	$10	P	20	50	100	100	100						
Moderate Kit Program	C	C	C	$10	U	N	P	100	300	400	500	300						
Toilet Tank Displacement Dam																		
Ultra-Low-Flow Showerhead																		
Leak Detect Tab-20%leak, 50%fix leak																		
Faucet Aerator																		
Limited Kit Program—Free to all	A	C	C	$1	U	N	P	1000	500	500	500	500						
Toilet Tank Displacement Bag																		
Leak Detect Tab-20%leak, 50%fix leak																		
Water Audit w/install - Res	A	A	C	$50	U	N	I	75	250	250	250	250						
Low-Flow Showerhead																		
Faucet Aerator																		
Leak Detect Tab-20%leak, 50%fix leak																		
Lawn Watering Guides																		
Toilet Tank Displacement Dam																		

PROGRAM NAME/ Individual Measures Contained in Program	MEASURE COSTS INCURRED BY:			DELIVERY		OTHER		PACKAGES DELIVERED					ADMINISTRATIVE COSTS					TOTAL ADMIN COST PER PROGRAM
	Cap-ital	Intall-ation	O&M	Cost	Unit/ Prog	Incentive Paid by Agency?	Package Provided/ Installed	1991	1992	Year 1993	1994	1995	1991	1992	Year 1993	1994	1995	
INDOOR WATER MGMT PROG, COMMERCIAL													$3,000	$10,600	$4,200	$3,700	$2,500	$24,000
Moderate Kit Program – Comm	C	C	C	$10	U	N	P	5	10	10	10	10						
Toilet Tank Displacement Dam																		
Ultra-Low-Flow Showerhead																		
Leak Detect Tab-20%leak, 50%fix leak																		
Faucet Aerator																		
Water Audit w/install, Small – Comm	A	A	C	$60	U	N	I	20	150	150	150	150						
Ultra-Low Flow Showerhead																		
Toilet Tank Displacement Dam																		
Faucet Aerator																		
Leak Detect Tab-20%leak, 50%fix leak																		
ULF Toilet Replacement – Comm	C	C	C	$30	U	$100	P	5	25	50	100	100						
ULF Showerhead Replacement – Comm	C	C	C	$10	U	$10	P	5	15	20	20	20						
TOTAL ANNUAL ADMINISTRATION COST													$18,600	$26,100	$14,600	$12,600	$10,200	$82,100

LEGEND	
C	Consumer
A	Agency
N	No incentive
U	Cost per Unit
T	Cost for Total Program
P	Measure Provided Not Installed
I	Measure Provided and Installed

Landscape Retrofit Program for Residential, Commercial & Multi Family

Water Management Program	PV of Total Cost to (1000 $)	Total Savings (million gallons)	Benefit Cost Ratio	Net Present Value (1000 $)	Payback Period (years)	Internal Rate of Return (%)
PERSPECTIVE: SOCIETY						
PLAN IN TOTAL	6314	1583	0.7	-2176	24.1	-2.4
Auto Controllers & Valves	130	470	9.7	1134	1.0	653.3
Xeriscaping Existing - Res	1253	80	0.2	-1040	117.5	NC
Xeriscaping, Existing - Comm/MF	4871	765	0.4	-2807	47.1	-6.5
Irrigation Audit - Comm/MF	17	226	27.9	467	0.2	NC
Xeriscaping, Incremental Cost	17	42	6.7	96	3.0	58.3
PERSPECTIVE: AGENCY						
PLAN IN TOTAL	4080	1583	0.7	-1263	0.0	NC
Auto Controllers & Valves	826	470	1.0	12	0.0	12.6
Xeriscaping Existing - Res	530	80	0.3	-388	0.0	NC
Xeriscaping, Existing - Comm/MF	2202	765	0.6	-838	0.0	NC
Irrigation Audit - Comm/MF	421	226	0.9	-23	0.0	NC
Xeriscaping, Incremental Cost	77	42	1.0	-2	0.0	2.9
PERSPECTIVE: PARTICIPANT						
PLAN IN TOTAL	3731	1583	0.4	-2146	17.2	0.5
Auto Controllers & Valves	50	470	4.4	167	0.8	NC
Xeriscaping Existing - Res	837	80	0.4	-527	74.8	NC
Xeriscaping, Existing - Comm/MF	2837	765	0.3	-1994	36.4	-4.8
Irrigation Audit - Comm/MF	0	226	INF.	190	0.0	NC
Xeriscaping, Incremental Cost	7	42	3.4	18	1.9	107.8

Water Management Plan for City Facilities

Water Management Program	PV of Total Cost to (1000 $)	Total Savings (million gallons)	Benefit Cost Ratio	Net Present Value (1000 $)	Payback Period (years)	Internal Rate of Return (%)
PERSPECTIVE: SOCIETY						
PLAN IN TOTAL	122	96	1.9	107	4.6	22.5
Toilet Replacement w/ULF-City	12	11	3.6	30	11.4	15.5
Self Closing Faucets-City	7	2	1.1	1	17.0	4.8
Irrigation Audit - City	50	61	2.5	73	2.0	74.6
Xeriscaping, Existing - City	42	22	1.3	14	15.1	7.2
PERSPECTIVE: AGENCY						
PLAN IN TOTAL	283	96	0.6	-115	0.0	NC
Toilet Replacement w/ULF-City	29	11	0.7	-9	0.0	-3
Self Closing Faucets-City	10	2	0.4	-6	0.0	NC
Irrigation Audit - City	157	61	0.7	-51	0.0	NC
Xeriscaping, Existing - City	77	22	0.5	-39	0.0	NC
PERSPECTIVE: PARTICIPANT						
PLAN IN TOTAL	0	96	INF.	81	0.0	NC
Toilet Replacement w/ULF-City	0	11	INF.	6	0.0	NC
Self Closing Faucets-City	0	2	INF.	3	0.0	NC
Irrigation Audit - City	0	61	INF.	61	0.0	NC
Xeriscaping, Existing - City	0	22	INF.	11	0.0	NC

Indoor Water Management Plan for Multi Family Units

Water Management Program	PV of Total Cost to (1000 $)	Total Savings (million gallons)	Benefit Cost Ratio	Net Present Value (1000 $)	Payback Period (years)	Internal Rate of Return (%)
PERSPECTIVE: SOCIETY						
PLAN IN TOTAL	126	144	4.3	417	4.3	34.9
Moderate Kit Program – MF	42	64	5.7	196	2.1	89.7
ULF Showerhead – MF	7	10	6.2	36	3.0	56.1
ULF Toilet Replacement – MF	71	70	3.7	191	11.1	16.1
PERSPECTIVE: AGENCY						
PLAN IN TOTAL	295	144	0.9	-38	0.0	-0.4
Moderate Kit Program – MF	125	64	0.9	-11	0.0	-6.3
ULF Showerhead – MF	23	10	0.8	-6	0.0	NC
ULF Toilet Replacement – MF	143	70	0.9	-16	0.0	2.1
PERSPECTIVE: PARTICIPANT						
PLAN IN TOTAL	65	144	2.8	117	1.7	647.4
Moderate Kit Program – MF	19	64	5.5	87	1.0	914.4
ULF Showerhead – MF	2	10	7.7	16	0.0	NC
ULF Toilet Replacement – MF	44	70	1.3	15	4.9	33.9

Indoor Water Management Plan for Single Family Homes

Water Management Program	PV of Total Cost to (1000 $)	Total Savings (million gallons)	Benefit Cost Ratio	Net Present Value (1000 $)	Payback Period (years)	Internal Rate of Return (%)
PERSPECTIVE: SOCIETY						
PLAN IN TOTAL	242	442	6.6	1351	1.9	170.5
ULF Toilet Replacement – Res	62	55	3.3	142	12.4	14.5
ULF Showerhead – Res	10	10	4.1	32	4.5	34.6
Moderate Kit Program – Res	69	128	6.9	407	1.7	129
Limited Kit Program Free to all	13	59	10.6	122	0.5	NC
Water Audit W/install – Res	77	190	9.5	659	1.4	187.8
PERSPECTIVE: AGENCY						
PLAN IN TOTAL	899	442	0.9	–115	0.0	–4.3
ULF Toilet Replacement – Res	117	55	0.8	–18	0.0	0.8
ULF Showerhead – Res	23	10	0.8	–6	0.0	NC
Moderate Kit Program – Res	236	128	1.0	–9	0.0	–0.9
Limited Kit Program Free to all	112	59	0.9	–10	0.0	NC
Water Audit W/install – Res	400	190	0.8	–62	0.0	–9.3
PERSPECTIVE: PARTICIPANT						
PLAN IN TOTAL	82	442	8.3	596	0.6	NC
ULF Toilet Replacement – Res	35	55	1.3	11	5.0	33.4
ULF Showerhead – Res	5	10	3.9	14	1.0	679.7
Moderate Kit Program – Res	38	128	5.5	173	1.0	914.4
Limited Kit Program Free to all	3	59	27.3	90	0.1	NC
Water Audit W/install – Res	0	190	INF.	307	0.0	NC

Indoor Water Management Plan for Commercial Sector

Water Management Program	PV of Total Cost to (1000 $)	Total Savings (million gallons)	Benefit Cost Ratio	Net Present Value (1000 $)	Payback Period (years)	Internal Rate of Return (%)
PERSPECTIVE: SOCIETY						
PLAN IN TOTAL	150	94	2.3	197	6.1	17.6
Moderate Kit Program – Comm	2	4	6.9	11	1.7	124.4
Water Audit W/install, Small	64	57	3.3	145	3.3	41.9
ULF Toilet Replacement – Comm	59	31	1.9	55	21.2	8.6
ULF Showerhead – Comm	2	2	5.2	8	3.6	44.8
PERSPECTIVE: AGENCY						
PLAN IN TOTAL	273	94	0.6	-106	0.0	NC
Moderate Kit Program – Comm	7	4	1.0	-0.26	0.0	-1.2
Water Audit W/install, Small	160	57	0.6	-58	0.0	NC
ULF Toilet Replacement – Comm	81	31	0.7	-26	0.0	-3.3
ULF Showerhead – Comm	5	2	0.7	-1	0.0	NC
PERSPECTIVE: PARTICIPANT						
PLAN IN TOTAL	32	94	4.2	103	0.7	NC
Moderate Kit Program – Comm	1	4	5.5	5	1.0	867.3
Water Audit W/install, Small	0	57	INF.	93	0.0	NC
Water Audit Industrial Process	0	132	INF.	147	0.0	NC
ULF Toilet Replacement – Comm	30	31	1.1	2	5.2	32.9
ULF Showerhead – Comm	1	2	5.4	3	0.4	NC

Summary of All Water Management Plans

Perspective	PV of Total Cost to (1000 $)	Total Savings (million gallons)	Benefit Cost Ratio	Net Present Value (1000 $)	Payback Period (years)	Internal Rate of Return (%)
Society	6954	2358	1.0	-104	15.1	3.0
Agency	5831	2358	0.7	-1636	0.0	NC
Participant	3909	2358	0.7	-1249	9.0	11.4

Year	Agency Direct Costs ($)	Foregone Revenues ($)	Total Costs to Agency ($)	Water Savings (1000 gallons)
1991	64685	22808	87493	12034
1992	284574	92971	377545	46058
1993	505020	213396	718416	99366
1994	566610	351136	917745	153795
1995	669160	527709	1196868	217362
1996	1440	535337	536777	207407
1997	720	518911	519631	189112
1998	0	481712	481712	165144
1999	0	446823	446823	144074
2000	0	397991	397991	120717
2001	0	422039	422039	120422
2002	0	447853	447853	120213
2003	0	476068	476068	120213
2004	0	506060	506060	120213
2005	0	537942	537942	120213
2006	0	562427	562427	118225
2007	0	522218	522218	103253
2008	0	404515	404515	75243
2009	0	251829	251829	44071
2010	0	40261	40261	6666
2011	0	42797	42797	6666

APPENDIX I

COUNCIL RESOLUTION

RESOLUTION NO. 6966

RESOLUTION OF THE COUNCIL OF THE CITY OF PALO ALTO AMENDING, DIRECTING FILING, AND AUTHORIZING IMPLEMENTATION OF THE CITY OF PALO ALTO URBAN WATER MANAGEMENT PLAN

WHEREAS, the Urban Water Management Planning Act, Water Code section 10610 et seq., requires every urban supplier of water providing more than 3,000 customers or supplying more than 3,000 acre feet of water annually, to prepare an Urban Water Management Plan ("Plan"), the primary function of which is to describe and evaluate reasonable and practical efficient water uses and conservation activities; and

WHEREAS, the Urban Water Management Planning Act requires periodic review of the Plan at least once every five years, followed by any amendments or changes to the Plan which are indicated by the review; and

WHEREAS, the City is an urban water supplier and in 1990 reviewed its 1985 Plan and circulated for public review proposed amendments to the Plan, and a properly noticed public hearing regarding Plan amendments was held by the City Council on February 25, 1991;

NOW, THEREFORE, the Council of the City of Palo Alto does RESOLVE as follows:

SECTION 1. The 1990 Urban Water Management Plan, as amended, is hereby adopted.

SECTION 2. The City Manager is hereby authorized and directed to file the Plan with the California Department of Water Resources within 30 days after its adoption.

SECTION 3. The City Manager is hereby authorized to cause implementation of the Urban Water Management Plan, as amended, provided however that the Water Management Programs identified in Section 7 of the Plan will not be implemented unless the City receives reasonable assurance from the San Francisco Water Department that the City's future water allocations will not be adversely affected.

SECTION 4. The Council finds that, pursuant to Water Code section 10652, adoption of the Plan is not subject to the California Environmental Quality Act.

INTRODUCED AND PASSED: February 25, 1991

AYES: Andersen, Cobb, Fazzino, Kniss, Levy, McCown, Renzel, Sutorius, Woolley

NOES:

ABSTENTIONS:

ABSENT:

ATTEST:

City Clerk

APPROVED AS TO FORM:

City Attorney

APPROVED:

Mayor

City Manager

Director of Utilities

APPENDIX J

BIBLIOGRAPHY

APPENDIX J

BIBLIOGRAPHY

1. 1985 Urban Water Management Plan
2. 1989 Water Utility Plan
3. Report on the Condition of the City of Palo Alto Well System
4. Utilities Department Strategic Plan
5. Department of Water Resources WaterPlan™ User's Manual and Water Consumption Assumptions
6. City of Palo Alto Comprehensive Plan