staff report

EARTHQUAKE IMPACTS ON HETCH-HETCHY SYSTEM =

9

February 13, 1986

THE HONORABLE CITY COUNCIL
Palo Alto, California

City of Palo Alto Water Utility Plan

Members of the Council:

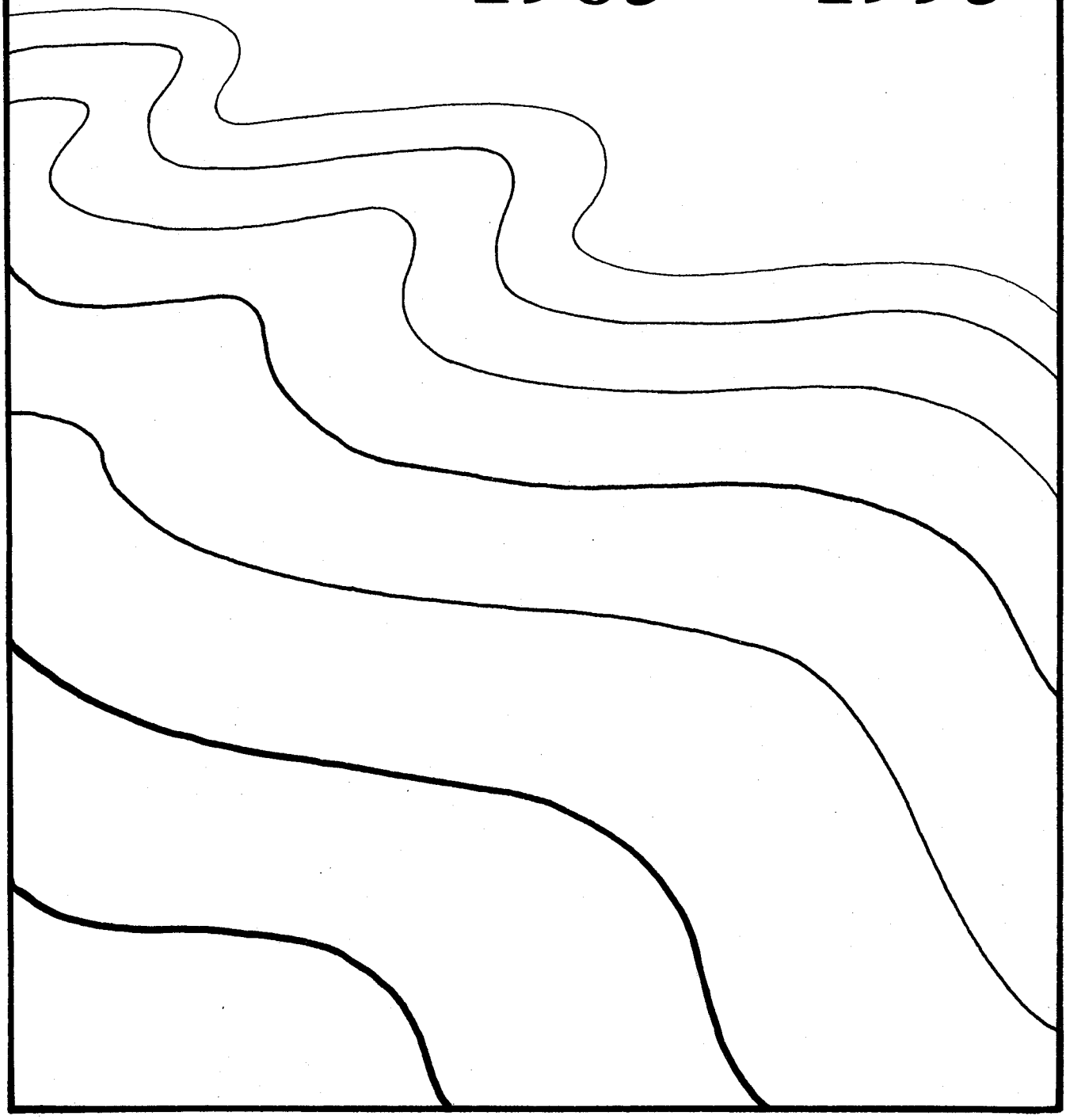
This report recommends Council approval of the City of Palo Alto Water Utility Plan. The document is the planning guide to be used in determining the best course of action for the City to follow with respect to its future water utility requirements for the period 1985 through 1995.

Background

At a workshop on October 15, 1985, staff presented the 1985 Water Utility Plan to Council. Comments expressed at that workshop have been incorporated. This plan is the basic guide for the City of Palo Alto Water Utility. It sets forth the Utility's requirements for the future and charts a course of action to meet those requirements. It provides a comprehensive understanding of the present City of Palo Alto Water Utility, and a plan whereby future needs and concerns of the City's water consumers are addressed. The plan includes a look at the present and future operations, maintenance and design of the water system the City owns and operates. The report gives the history of the Palo Alto Water Supply and discusses our present supply and where it comes from as well as Palo Alto's future allocation.

In the 1983-84 Regular Session of the California Legislature, AB-797 was passed and chaptered as part of the California Water Code (Section 10610 et. seq.). This statute (commonly known as the Urban Water Management Planning Act) required all urban suppliers with more than 3,000 service connections, or water use of more than 3,000 acre-feet per year served directly to consumers, to submit an Urban Water Management Plan not later than December 31, 1985. The Palo Alto Water Utility was required to file that Basic Plan. Palo Alto's

Water Utility Plan
1985 ~ 1995



City of Palo Alto Utilities Department

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

UTILITIES DEPARTMENT

RESOURCE PLANNING DIVISION

WATER UTILITY PLAN

1985 - 1995

February, 1986

WATER UTILITY PLAN

SECTION

TABLES AND FIGURES

TABLES

FIGURES

I. Executive Summary

Palo Alto's 1985 Water Utility Plan (WUP) is the basic planning guide for the City of Palo Alto Water Utility. It sets forth the Utility's requirements for the future and charts a course of action to meet those requirements.

The WUP has been presented to the City Council at public workshops. Comments and suggestions received at those sessions have been incorporated into the plan.

The City of Palo Alto's water system has been in operation for 88 years. The system is well designed and meets all the residential, commercial, industrial, and fire demands of the City. The system also meets all provisions of the State Health and Safe Drinking Water Acts. The area serviced by the water utility is essentially fully developed. Modest growth is occurring mainly in multi-family residential projects and in redevelopment of some commercial properties. For the period 1965-1977, growth in water usage was 2.8 percent. Since 1977, the annual growth in water use has increased to 4.5 percent. Annual water purchases are projected to grow at 3.0 percent for the next five years and 2.2 percent thereafter. Forecasts indicate that additional sources of water will not be required until the late 1990's or thereafter.

From 1896 to 1962 Palo Alto relied upon local wells for its water supply. Since 1962, however, all water has been supplied by contract from the Hetch Hetchy Project of the City of San Francisco. The Hetch Hetchy Project, authorized in 1913 under the Raker Act (U.S. HR 7207), is located in the High Sierras within the Yosemite National Park. It is a high quality resource capable of producing 400 million gallons per day (mgd). Thirty suburban utilities contract with San Francisco and are organized into the Bay Area Water Users Association. This association meets regularly and works closely with Hetch Hetchy officials on behalf of its members. The existing transmission facilities, capable of delivering only 300 mgd, will be fully utilized by the mid 1990's. A new pipeline, the San Joaquin Valley Pipeline No. 4, is needed to allow full utilization of the existing water rights of 400 mgd. This pipeline will also provide required capacity for maintenance shutdowns of the existing pipelines.

TABLE I
Water System Facts

Customer Services (All Classes)	18,900
Fire Hydrants	1,649
Palo Alto's Fire Class Rating	II
San Francisco Supply Points	4
San Francisco Supply Capacity Total	53.3 mgd
Wells	10
Wells, Capacity	8.5 mgd
Reservoir Storage	11.3 mg
Average Daily Consumption	16.9 mgd

(mg = million gallons, mgd = million gallons per day)

Mains (In Diameters)

2" - 4 "	34.8 miles
6" - 10"	153.4 miles
12" - 20"	35.0 miles
24" - 30"	3.0 miles

Services (In Diameters)

1" - 10"	80.6 miles

Fire Services (In Diameters)

4" - 10"	1.6 miles

Total All Pipes	308.4 miles

Recommendations

The long-term adequate supply of quality water is essential to the well-being of Palo Alto customers. The recommendations contained in the WUP conform to existing City policies as set forth in the Palo Alto Comprehensive Plan 1980 - 1985, Chapter 7. The recommendations are:

A. Staff shall monitor and report as appropriate to the Council on:

   (1) The California State legislature regarding legislation restricting, diverting, or limiting access to the water supply.

   (2) The deliberations of the State Water Resources Department.

   (3) The administration of the City's contractual rights for existing and future Hetch Hetchy Project water.

   (4) The progress of the Bay Area Water Users Association's efforts and the Hetch Hetchy construction program including the No. 4 Valley Pipeline.

   (5) Attitudes on water use for food production, and/or possible competing urban, local and state-wide allocation of water.

B. Efficient use of water shall be stressed in water utility programs and be incorporated in the City's building codes. "Efficient use" means those management measures that result in the prevention of waste or unreasonable use of water. The City should consider revision of its disconnection practices in order to promote efficient use of water.

C. Water aquifers are important for emergency and long-term supplemental supplies; therefore, the City should:

   (1) Concentrate on the prevention of contamination of underground water aquifers.

   (2) Encourage replenishment of aquifers.

   (3) Investigate acquiring the rights to aquifers that are upstream of industrial facilities and inhabited areas.

D. The City should continue with inspections, maintenance and modernization programs to keep the physical plant in excellent operating condition to protect its integrity for the public health and safety.

E. Continue to maintain the City's existing high fire protection rating.

F. The City should begin the engineering studies necessary for the addition of more storage in its water system. In the long-term the City will be required to level out its daily fluctuation upon the Hetch Hetchy supplies. Of more importance is the need for emergency water should the normal supply be interrupted.

G. Concern for earthquake preparedness and other emergencies is important. The City must provide multiple sources of water, storage and emergency power for the Water Utility. The existing wells are a source of supply for emergencies or for the time when the Hetch Hetchy supply is fully utilized. These facilities should be well maintained and equipped to operate from emergency power sources. These wells should be periodically operated and tested for water contamination, purity, and to verify the performance of the aquifer. Methods for blending these well supplies with the other water should be investigated.

H. Use of reclaimed wastewater (processed and extracted from treated sewage) is an important application of overall water conservation policy. Continued review of opportunities to use this water beneficially should receive high priority.

I. The water testing program should be reviewed for adequacy and frequency. There should be particular attention paid to those parts of the system which have sensitive water conveyance materials. During the water main flushing operation, samples shall be taken and analyzed to determine if any material being transported or in solution may constitute a health hazard.

J. The City should review its policies and enforcement procedures for:

(1) cross connections and back flow prevention.

(2) connect and disconnect practices.

(3) metered and unmetered service.

(4) single contingency situation serving sensitive areas where loss of any one portion of the system would prevent serving by an alternate route.

(5) method, locations and types of disinfectant added to water supply.

II. Purpose and Scope

The purpose of this document is to provide a comprehensive understanding of the present City of Palo Alto Water Utility, and a plan whereby the future needs and concerns of the City's water consumers are addressed.

This plan includes a look at the present and future operations, maintenance and design of the water system the City owns and operates. The source of the water (San Francisco's Hetch Hetchy System) will be examined from a quantity standpoint taking into consideration contractual rights, allocations of the supply and necessary capital additions of the Palo Alto local distribution system. Policy implications of continuing to use this source are discussed in terms of protecting these aspects of the supply source.

Since the San Francisco Hetch Hetchy system is our principal source of supply, the City will be concerned about the quantity available to us under the new 25 year contract and any impacts on that system brought about by political and/or physical considerations. Continuing the use of this supply as presently planned will have certain policy implications such as supporting San Francisco in futher development of transmission capability, development of allocation principles among the contractors in the face of varying growth rates in water consumption, and impacts on our local system construction requirements for storage capacity.

III. History of Palo Alto Water Supply

In 1896, two years after incorporation of the City of Palo Alto, a bond issue was approved for purchase of the small private water companies serving a majority of the area's population.

Since that time, the system has expanded by construction of new facilities, additional purchases of private water companies, and annexation of water districts. Currently, the system serves approximately 56,400 people living in the service area between the San Francisco Bay and Black Mountain.

The initial water supply in Palo Alto came from deep wells; the wells adequately served the City until 1938 when the decline of the ground water table made the purchase of supplementary water from outside sources necessary. From that time, until 1962, Palo Alto purchased increasing amounts of San Francisco water to supplement water available from local wells.

In 1962, in order to provide softer water for consumers, (well water averages 200 parts per million (ppm) hardness; Hetch Hetchy water averages 35 ppm) the source of supply was changed to 100 percent San Francisco water. The San Francisco supply consists of 80 percent snowfield runoff from the Sierra Nevada Mountains to the Hetch Hetchy reservoirs in Yosemite National Park and 20 percent from local rainfall runoff stored in the Coast Range, Calaveras and San Antonio Reservoirs. In December of 1984, a new 25 year water sales agreement between the City of Palo Alto and the City and County of San Francisco was executed.

When Palo Alto converted to the Hetch Hetchy system as the main source of supply, ten City wells, drilled between 1925 and 1956, were kept and maintained for standby and emergency water sources. Pumping capacity of these wells total 5,880 gallons per minute (gpm). Six of the ten wells currently on standby also have reservoirs on site. The total capacity of these reservoirs is 718,000 gallons.

The first major water storage reservoir was put into service in 1928. This reservoir, known as the Mayfield Reservoir, is a 4,000,000 gallon, rectangular, ground level reservoir located on Stanford University land next to Nixon School. The Mayfield Reservoir continues to serve Palo Alto today and was rehabilitated and analyzed for earthquake safety in 1982. Five additional above ground tank reservoirs with a total capacity of 6,500,000 gallons were subsequently constructed in the Palo Alto Foothills.

All sources of water are treated with the disinfecting agent chlorine before introduction into the Palo Alto distribution system. Fluoride injection, at a rate of one ppm has been utilized for the control of dental decay since 1959.

IV. Demand Forecast

A demand forecast for water use in Palo Alto during the period 1985-1995 was formulated based on historical water usage in Palo Alto during the period 1979-1984. The particular period of 1979-1984 was selected for analysis because of the 1976-78 drought and the discontinuity in historical water use during that period. This discontinuity is shown in Figure I and represents an abnormal condition.

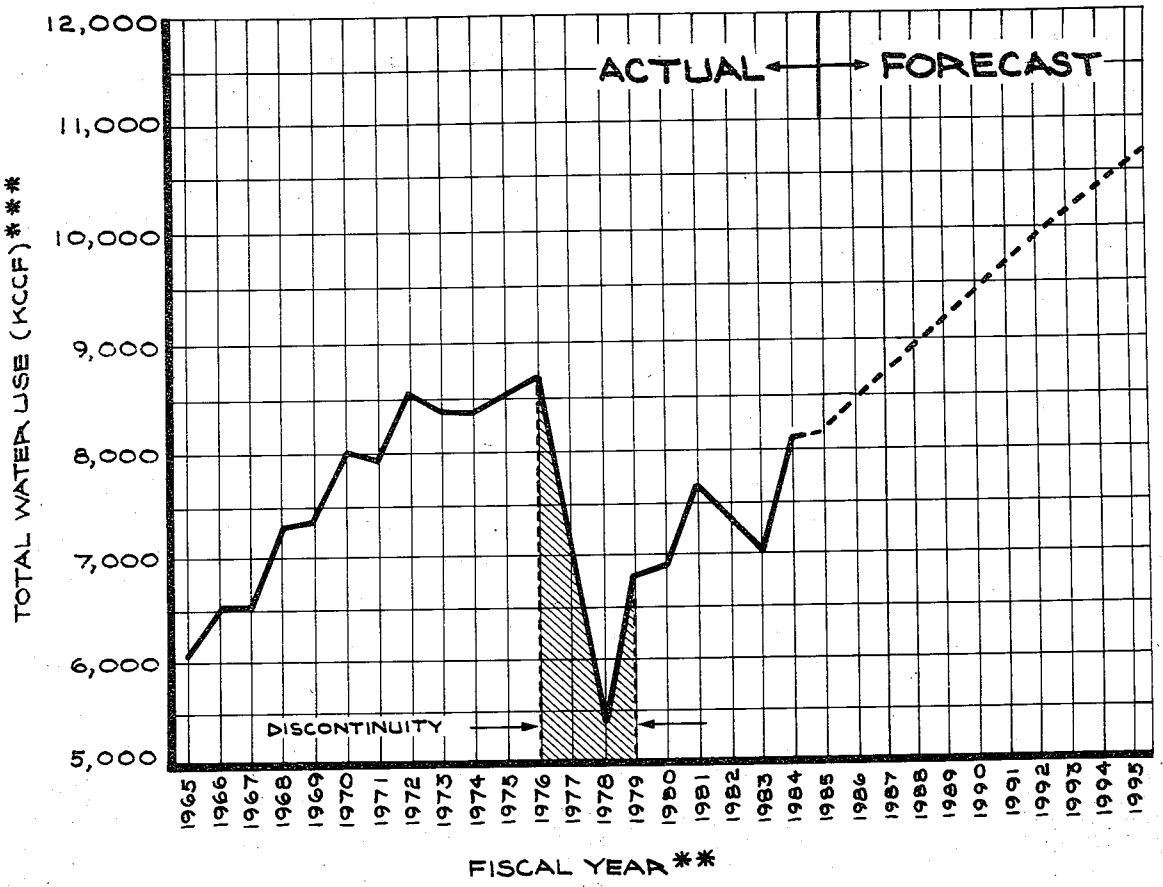
The analysis of water use for the twelve years prior to the drought indicated a 2.8 percent annual growth rate while the past eight years show a 4.5 percent annual growth in water use. The forecast of the future is complicated by the severity of the 'drought event' that has shaped everyone's view on water, its uses, even life styles and landscaping practices. With each passing year less public emphasis is placed on water conservation, and this, coupled with building, rebuilding and changing demographics, suggests a diminishing growth rate in the years ahead. The City has yet to reach the level of water use that existed in 1975/76 prior to the drought. The estimated growth for the next 5 years, 3.0 percent, is higher than that which existed prior to the drought but lower than the postdrought period. Thereafter, 2.2 percent growth has been assumed which is lower than the predrought period. The forecast would need to be increased should the foothills area within the City be developed.

The growth rate in number of services has remained basically unaffected by the 1976-1978 drought period and therefore the forecasted number of services is based on data from the 1975-1984 period. Forecasts of service requirements by customer class for the period 1985-1995, are indicated in Figure II. This overall growth projection is 0.11 percent.

An analysis of the services data for the single family residential dwelling class shows a low annual growth rate of 0.1 percent. This is understandable because few of these units are being built while many are being removed for higher density multi-family units and commerical developments. The multi-family class shows a growth rate of 3.1 percent for the reasons discussed above. The commercial class suggests a growth rate of 0.9 percent annually. The governmental class shows a slight negative growth rate. This is mainly the result of school closures.

FIGURE I

WATER USE IN PALO ALTO *



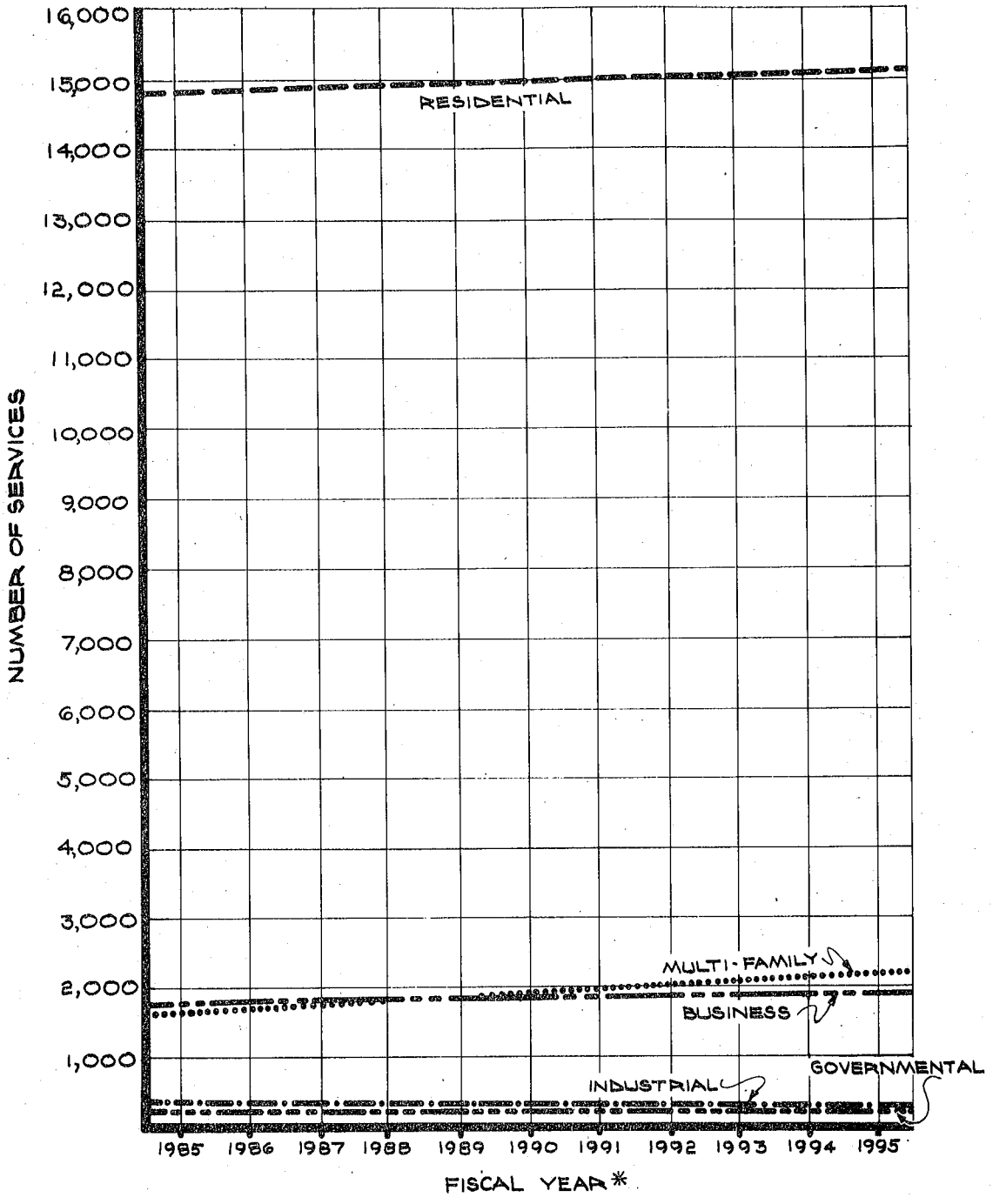
* AS REPRESENTED BY PURCHASES BY THE CITY

**ENDING JUNE 30TH OF YEAR SHOWN

***1KCCF = 100,000 CUBIC FEET = 748,000 GALLONS

FIGURE II

FORECAST OF NUMBER OF SERVICES FOR EACH CATEGORY OF SERVICE



* ENDING JUNE 30TH OF YEAR SHOWN

The estimated consumption for the individual customer classes is shown in Figure III. The commercial and industrial classes have been growing and are expected to continue at 0.9 and 3.3 percent, respectively. The multi-family residential class is estimated to grow the fastest at 5.3 percent annually for the reasons indicated earlier. The single family residential class is expected to grow initially at 2.9 percent and decline each year thereafter.

The total consumption for the single family residential class is assumed to grow until slightly higher than that prior to the drought. This is the result of the diminishing "save water" ethic by the customers and an almost static number of customers.

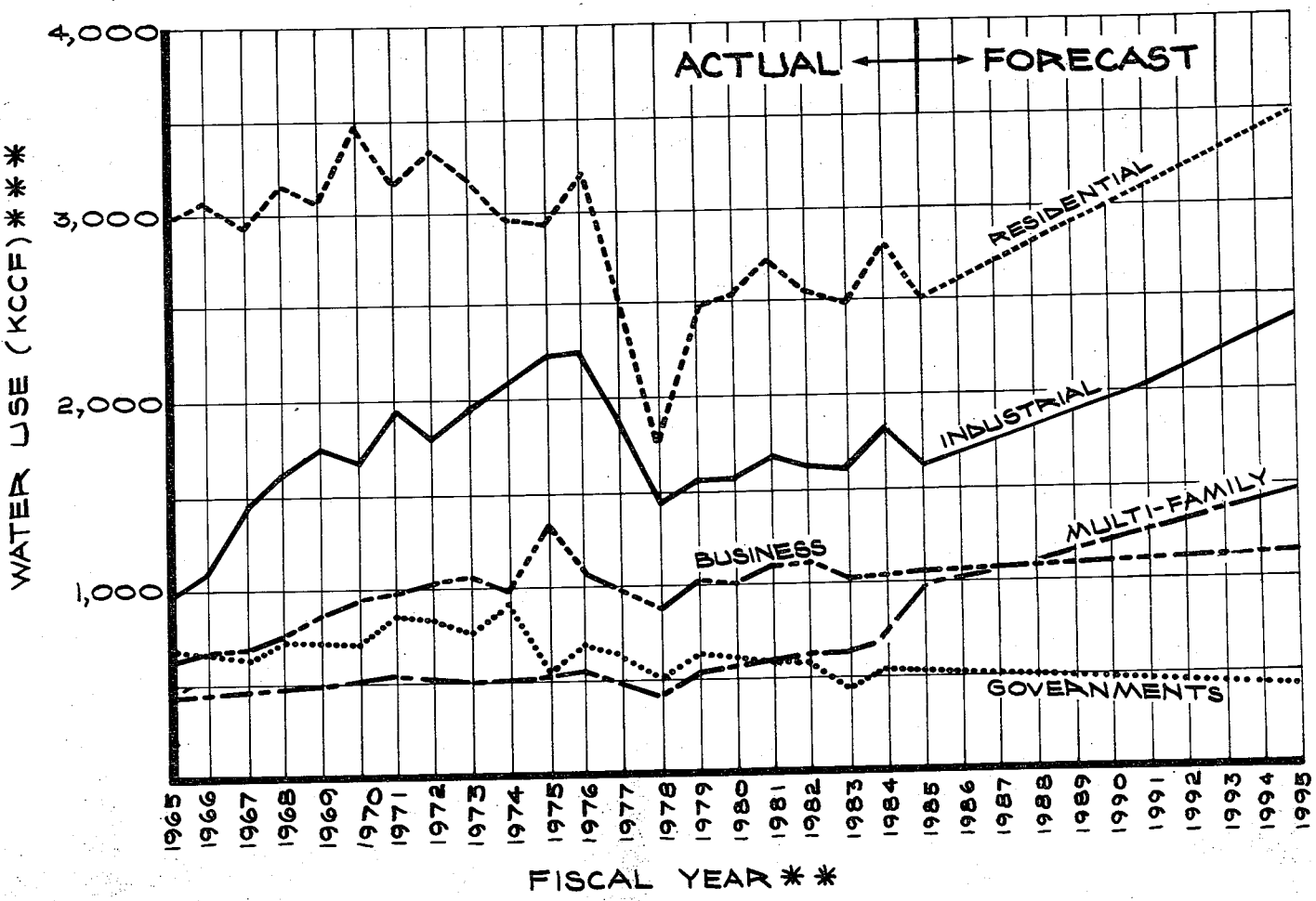
The remaining public facilities and City departments are estimated to show a combined slight increase in the future.

A breakdown of water sales for the 1984-85 fiscal year is shown in Table II. Information in Table II represents sales by customer class for the most recent period on record and provides a good indication of current water use statistics.

In summary, an examination of the forecast of consumption and the number of services indicates that both will increase through 1995. Consumption levels are forecasted to increase at a greater rate (1985 to 1990 at 3.0 percent; 1990 to 1995 at 2.2 percent) than new service installations (0.11 percent).

FIGURE III

WATER USE FOR EACH CATEGORY OF SERVICE*



*AS REPRESENTED BY SALES BY THE CITY

**ENDING JUNE 30TH OF YEAR SHOWN

***1KCCF = 100,000 CUBIC FEET = 748,000 GALLON

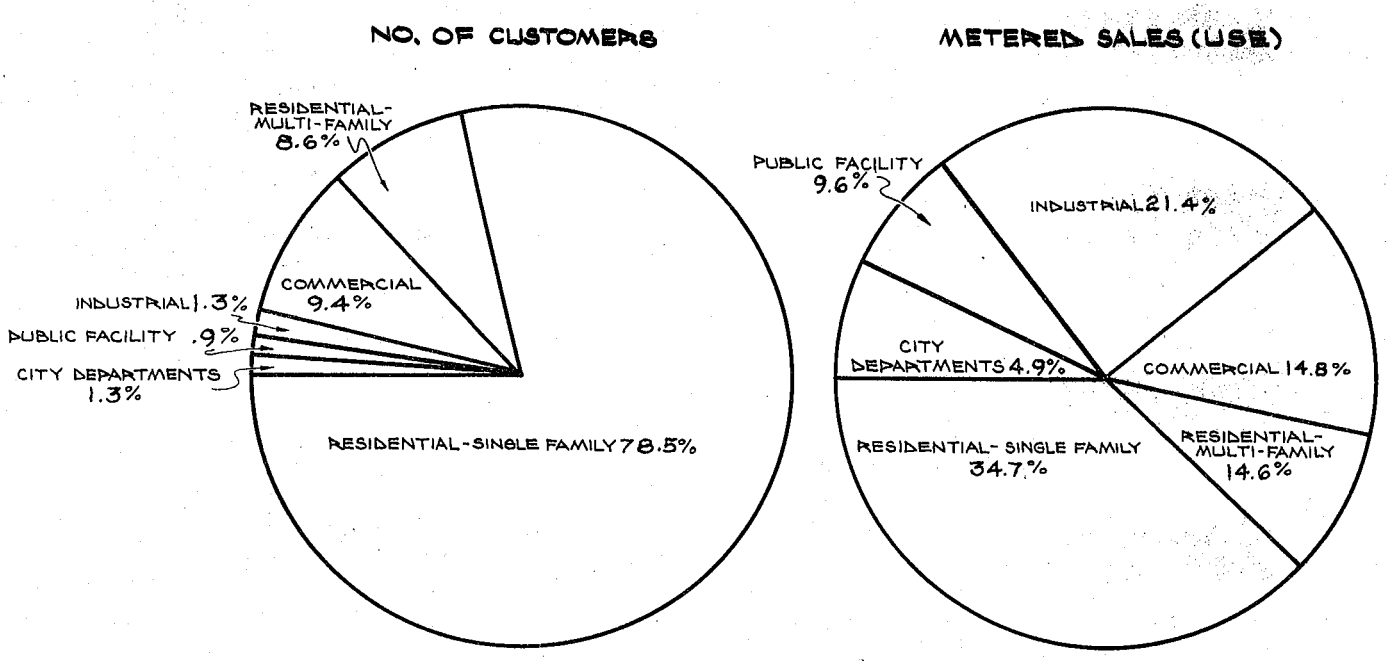
TABLE II

CURRENT WATER STATISTICS 1984-85

Customer Class	Metered Sales (Use)	Percent
Residential-Single Family	2,550.28	34.7
Residential-Multi Family	1,071.01	14.6
Commercial	1,085.84	14.8
Industrial	1,571.02	21.4
Public Facility	703.26	9.6
City Departments	356.65	4.9
	7,338.06 KCCF*	100.0%

Customer Class	No. of Customers	Percent
Residential-Single Family	14,875	78.5
Residential-Multi Family	1,629	8.6
Commercial	1,779	9.4
Industrial	247	1.3
Public Facility	178	.9
City Departments	254	1.3
	18,962	100.0%

* KCCF = 100,000 cubic feet = 748,000 gallons



V. Supply

A. Present Supply

Palo Alto is currently supplied water from the City of San Francisco Hetch Hetchy and Coast Range Systems. In 1984, a new 25 year water sales agreement was executed between Palo Alto and the City and County of San Francisco.

The San Francisco supply system consists of the following:

(1) Hetch Hetchy Facilities

The Hetch Hetchy water system is primarily supplied from the 360,360 acre-foot reservoir behind the O'Shaughnessy Dam on the Tuolumne River in Yosemite Park. Approximately 80 percent of the San Francisco water supply is derived from this source. The 268,800 acre-foot Lake Lloyd and the 27,100 acre-foot Lake Eleanor, also located in Yosemite Park, are operated by San Francisco and were utilized as a supplement to the main source in the drought of 1976.

(2) Conveyance of Hetch Hetchy Water

Water stored behind O'Shanghnessy Dam travels through tunnels to the Oakdale area. At this point the San Joaquin Piplines Numbers 1, 2 and 3 cross the valley floor to the Tesla area where tunnels carry the water to the Sunol area. The total distance is 148 miles, all by gravity (no pumping required), 77 miles is in tunnels and 71 miles in pipelines. There are four pipelines from the Sunol area to deliver the water and only three cross the San Joaquin Valley. There are provisions for a fourth valley pipeline and when it is completed all tunnels and pipelines will be operating at their designed capacity of 400 mgd. Until then the three valley pipelines limit the transport of Hetch Hetchy water to 300 mgd.

(3) Coast Range Facilities

(a) Sunol Valley Filter Plant

San Francisco also operates the Sunol Valley Filtration Plant, in Alameda County, which treats water supplied from storage behind the 50,990 acre-foot San Antonio Reservoir and the 96,820 acre-foot Calaveras Reservoir, located on the Alameda Creek Watershed. These facilities provide 20 percent of San Francisco's imported water supply.

(b) Crystal Springs Dam

In addition, San Francisco operates the 69,300 acre-foot Crystal Springs Reservoir, the 19,000 acre-foot San Andreas Reservoir, and the 8,100 acre-foot Pilarcitos Reservoir, all located on the San Francisco Peninsula. These reservoirs provide water to San Francisco coastside communities and cities on the Upper Peninsula.

(4) Transmission Facilities Serving Palo Alto

(a) Palo Alto Pipeline

In 1938, a 36 inch Palo Alto Pipeline was installed to serve the City of Palo Alto with Hetch Hetchy water. This pipeline connects to San Francisco Pipelines Nos. 1 and 2 on El Camino Real in Redwood City, and terminates at the City's California Avenue Water Station, a vault located at the intersection of El Camino Real and California Avenue. This line serves both the City's Lytton Water Station and the California Water Station.

Lytton Station (capacity 7.2 mgd)

This station receives water from the Palo Alto Pipeline and reduces the water pressure to serve the Stanford Hospital and shopping center area (Palo Alto Service Area III), and the north portion of Service Area I located between El Camino Real and the Bay. See Figures IV, V and VI.

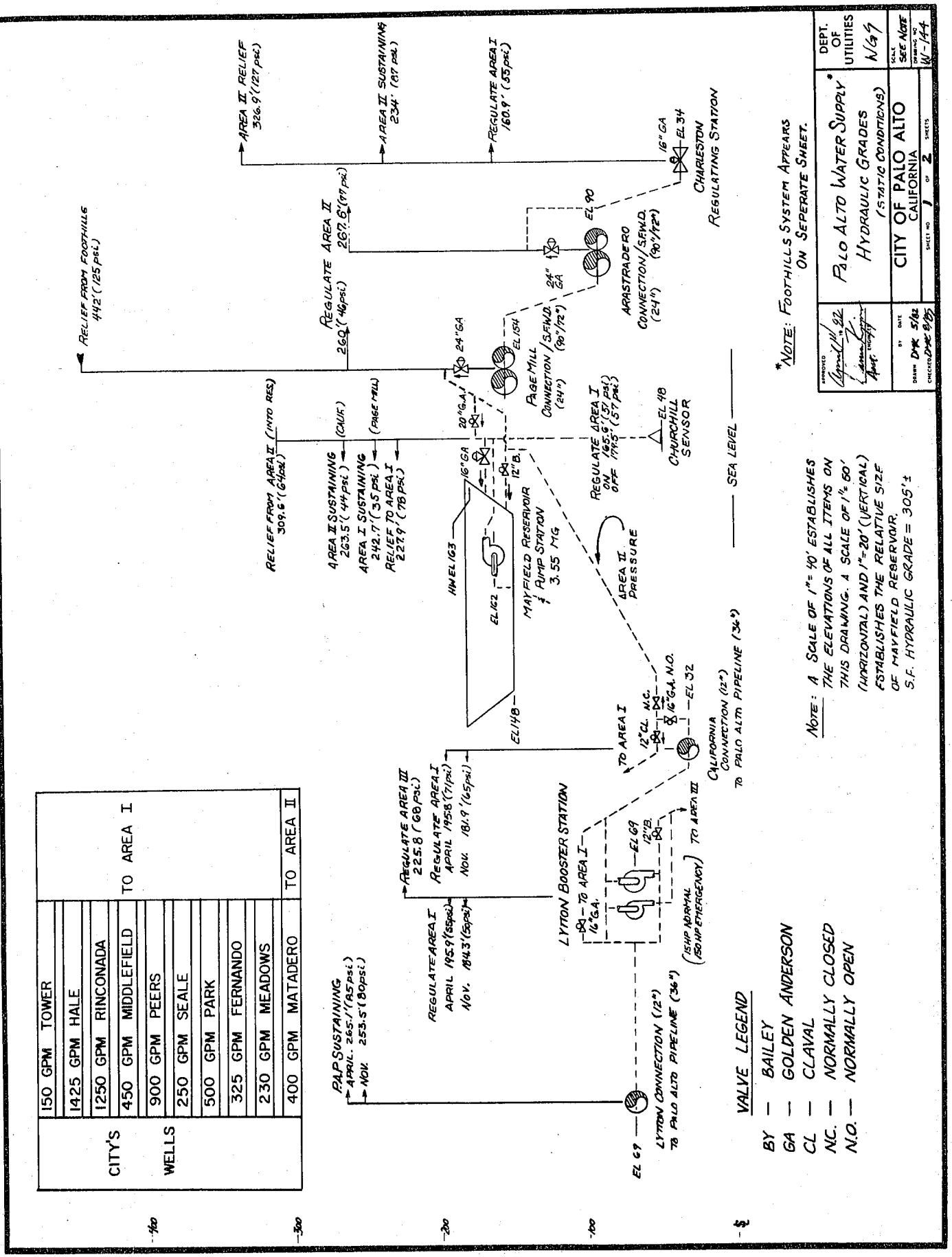
California Station (capacity 8.7 mgd)

This station receives water from the Palo Alto Pipeline and serves water to Area I between El Camino Real and the Bay. This Station also provides emergency service to Service Area II, located between El Camino Real and the Foothill Expressway.

(b) Pipelines No. 3 & 4

San Francisco Pipeline No. 3 (72") and No. 4 (90") pass through Palo Alto on a route approximately parallel and adjacent to Foothill Expressway and serve two additional Palo Alto Water Stations: Arastradero and Page Mill.

FIGURE IV


CITY'S WELLS
150 GPM TOWER
1425 GPM HALE
1250 GPM RINCONADA
450 GPM MIDDLEFIELD
900 GPM PEERS
250 GPM SEALE
500 GPM PARK
325 GPM FERNANDO
230 GPM MEADOWS
400 GPM MATADERO
TO AREA I
TO AREA II
RELIEF FROM FOOTHILLS 442'(125 psi.)
AREA III RELIEF 326.9'(127 psi.)
REGULATE AREA II 269'(116psi.)
267.6'(117 psi.)
AREA II SUSTAINING 234' (107 psi.)
REGULATE AREA I 160.9' (55psi.)
RELIEF FROM AREA II (INTO RES.) 309.6'(64psi.)
AREA II SUSTAINING 263.5'(44 psi.) (CHLOR.)
AREA I SUSTAINING 242.7'(35 psi.) (PAGE MILL)
RELIEF TO AREA I 227.9' (78 psi.)
20"G.A.
24"GA
24" GA
EL 154
EL 90
PAGE MILL CONNECTION / S.F.W.D. (90'/72")
ARASTRADERO CONNECTION / S.F.W.D. (24") (90'/72")
16" GA
EL 34
CHARLESTON REGULATING STATION
16"GA
12"B.
HW EL 163
EL 162
MAYFIELD RESERVOIR & PUMP STATION 3.55 MG
EL 148
REGULATE AREA I ON 165.6'(57 psi.) OFF 177.5'(57 psi.)
EL 48 CHURCHILL SENSOR
AREA II PRESSURE
SEA LEVEL
PAP SUSTAINING APRIL 265.1'(115 psi.) NOV. 253.5'(109psi.)
REGULATE AREA III 225.8'(68 psi.)
REGULATE AREA I APRIL 195.9'(85psi.) NOV. 184.3'(80psi.)
REGULATE AREA III APRIL 195.8'(71psi.) NOV. 181.9'(65psi.)
LYTON BOOSTER STATION
16"G.A.
TO AREA I
EL 69
12"B.
(SHP NORMAL (150 HP EMERGENCY))
TO AREA III
12"CL N.C.
16"G.A. N.O.
EL 32
CALIFORNIA CONNECTION (12") TO PALO ALTO PIPELINE (36")
EL 69
LYTON CONNECTION (12") TO PALO ALTO PIPELINE (36")
VALVE LEGEND
BY — BAILEY
GA — GOLDEN ANDERSON
CL — CLAVAL
NC. — NORMALLY CLOSED
N.O. — NORMALLY OPEN
NOTE: A SCALE OF 1"= 40' ESTABLISHES THE ELEVATIONS OF ALL ITEMS ON THIS DRAWING. A SCALE OF 1"= 60' (HORIZONTAL) AND 1"= 20' (VERTICAL) ESTABLISHES THE RELATIVE SIZE OF MAYFIELD RESERVOIR. S.F. HYDRAULIC GRADE = 305'±
*NOTE: FOOTHILLS SYSTEM APPEARS ON SEPERATE SHEET.
PALO ALTO WATER SUPPLY* HYDRAULIC GRADES (STATIC CONDITIONS)
CITY OF PALO ALTO CALIFORNIA
DEPT. OF UTILITIES W&G
SCALE SEE NOTE
DRAWING NO W-144
SHEET NO 1 OF 2 SHEETS
APPROVED
BY DATE
DRAWN DJK 5/82
CHECKED DJK 8/85
400
300
200
100
0

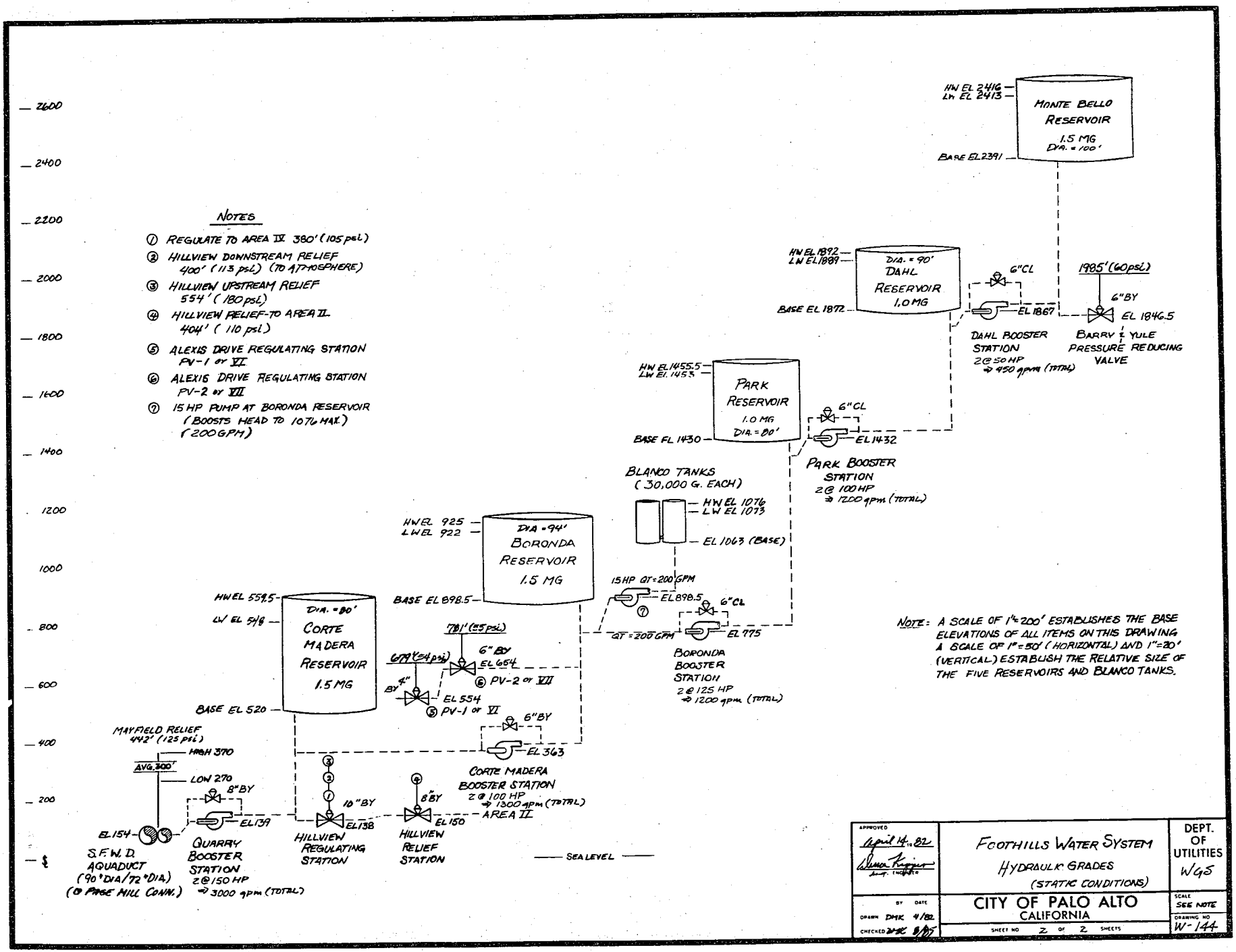
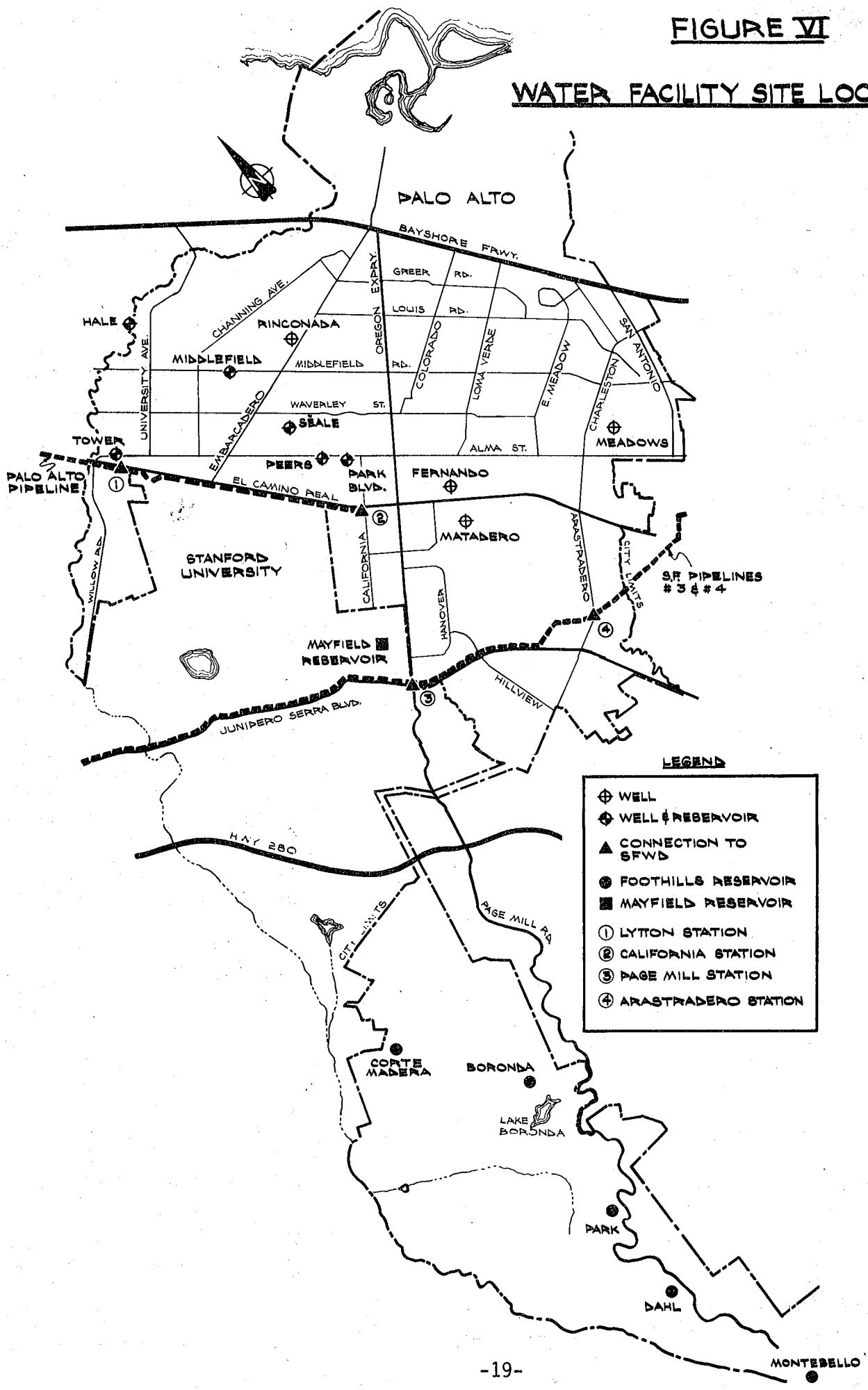

2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
NOTES
① REGULATE TO AREA IV 380' (105 psi)
② HILLVIEW DOWNSTREAM RELIEF 400' (113 psi) (70 ATMOSPHERE)
③ HILLVIEW UPSTREAM RELIEF 554' (180 psi)
④ HILLVIEW RELIEF-TO AREA II 404' (110 psi)
⑤ ALEXIS DRIVE REGULATING STATION PV-1 or VI
⑥ ALEXIS DRIVE REGULATING STATION PV-2 or VII
⑦ 15 HP PUMP AT BORONDA RESERVOIR (BOOSTS HEAD TO 1076 MAX.) (200 GPM)
HW EL 2416
LW EL 2413
MONTE BELLO RESERVOIR
1.5 MG
DIA. = 100'
BASE EL 2391
HW EL 1892
LW EL 1889
DIA. = 90'
DAHL RESERVOIR
1.0 MG
BASE EL 1872
6"CL
EL 1867
DAHL BOOSTER STATION
2@50 HP
⇒ 450 gpm (TOTAL)
1985' (60 psi)
6"BY
EL 1846.5
BARRY & YULE PRESSURE REDUCING VALVE
HW EL 1455.5
LW EL 1453
PARK RESERVOIR
1.0 MG
DIA. = 80'
BASE EL 1430
6"CL
EL 1432
PARK BOOSTER STATION
2@100 HP
⇒ 1200 gpm (TOTAL)
BLANCO TANKS
(30,000 G. EACH)
HW EL 1076
LW EL 1073
EL 1063 (BASE)
HW EL 925
LW EL 922
DIA = 94'
BORONDA RESERVOIR
1.5 MG
BASE EL 898.5
15 HP QT = 200 GPM
EL 898.5
⑦
6"CL
QT = 200 GPM
EL 975
BORONDA BOOSTER STATION
2@125 HP
⇒ 1200 gpm (TOTAL)
HW EL 559.5
LW EL 548
DIA. = 80'
CORTE MADERA RESERVOIR
1.5 MG
BASE EL 520
781' (55 psi)
6"BY
EL 654
⑥ PV-2 or VII
679' (54 psi)
4"BY
EL 554
⑤ PV-1 or VI
6"BY
EL 363
CORTE MADERA BOOSTER STATION
2@100 HP
⇒ 1300 gpm (TOTAL)
AREA II
MAYFIELD RELIEF
442' (125 psi)
HIGH 370
AVG. 300'
LOW 270
8"BY
EL 139
EL 154
S.F.W.D. AQUADUCT
(90" DIA/72" DIA)
(@ PAGE MILL CONN.)
QUARRY BOOSTER STATION
2@150 HP
⇒ 3000 gpm (TOTAL)
10"BY
EL 138
HILLVIEW REGULATING STATION
8"BY
EL 150
HILLVIEW RELIEF STATION
SEA LEVEL
NOTE: A SCALE OF 1"=200' ESTABLISHES THE BASE ELEVATIONS OF ALL ITEMS ON THIS DRAWING. A SCALE OF 1"=50' (HORIZONTAL) AND 1"=20' (VERTICAL) ESTABLISH THE RELATIVE SIZE OF THE FIVE RESERVOIRS AND BLANCO TANKS.
APPROVED
April 14, 1982
FOOTHILLS WATER SYSTEM
HYDRAULIC GRADES
(STATIC CONDITIONS)
DEPT. OF UTILITIES
WGS
BY DATE
DRAWN DHK 4/82
CHECKED 8/85
CITY OF PALO ALTO
CALIFORNIA
SCALE SEE NOTE
SHEET NO 2 OF 2 SHEETS
DRAWING NO W-144

FIGURE V

FIGURE VI

WATER FACILITY SITE LOCATIONS



Arastradero Station (capacity 17.3 mgd)

This underground station on Arastradero Road near Gunn High School delivers water to Service Area II located betweeen El Camino Real and Foothill Expressway.

Page Mill Station (capacity 20.1 mgd)

This station is located in an underground vault at the intersection of Page Mill Road and the Foothill Expressway. The station delivers water at San Francisco system pressure to:

1. Palo Alto's Quarry Pump Station for service to the foothills area of Palo Alto,
2. Stanford Industrial Park area between El Camino Real and the Foothill Expressway (Service Area II), and
3. The area north of El Camino Real (Service Area I) via a pressure reducing station located on Stanford property at the Mayfield Reservoir Facility.

(5) Comments

(a) Safeguards

Palo Alto must be alert to any events that may lead to a reduction in the effectiveness of the Hetch Hetchy project watershed, storage and delivery system. Such a reduction could affect water available to San Francisco and the Suburban Water Users. It is also necessary for Palo Alto to protect its' contractual share of the available water through diligence in contract administration and constructive involvement in the San Francisco Bay Area Water Users Association.

(b) The Future Use of Reclaimed Wastewater

One element of long-range future planning for a water supply is the use of reclaimed wastewater. The City must remain aware of environmentally safe technologies which will permit more efficient use of this water source.

In keeping with Palo Alto's historic conservation policies, the City should begin to explore beneficial uses for reclaimed wastewater. This will require the City to continually review processes, literature, health codes, potential applications, and test installations. This may include using reclaimed waste

water for irrigation purposes on City, Midpeninsula Regional Open Space District, or Stanford lands.

(c) On-site Storage

Thirty suburban utilities presently rely upon the Hetch Hetchy System for a major part of their peak hourly flows. This often results in nearly overloading the supply facilities. Adequate local storage facilities will be of increasing importance as demands on the Hetch-Hetchy system increase.

The Palo Alto System, see Figures IV, V and VI, consists of the four water stations and the following:

(1) Storage Reservoirs

(a) Mayfield Reservoir

The Mayfield Reservoir Facility, constructed in 1928, consists of a rectangular reinforced concrete ground level structure covered with a sloped corregated metal roof. The total capacity of the reservoir is 4,000,000 gallons.

In 1960, a booster pump and associated piping were added to the facility to store well water produced during off-peak periods and return it to Area I via a 27 inch transmission line when demand was high. The addition of a booster pump at Mayfield assists in the emergency fire and service needs of Area I and provides storage for equalizing the demand on the San Francisco aqueduct system. Major telemetry installations for the transmission of pertinent flow, pressure and depth data were installed at the Mayfield Facility in 1960. An evaluation of the seismic (earthquake) stability of the soil embankments surrounding Mayfield Reservoir was completed in 1982.

(b) Foothill Reservoirs

The Foothill Reservoir system consists of five reservoirs and two wood-stave tanks as shown in Table III. The reservoirs were constructed as a result of a Capital Improvement Program initiated in 1962. The total capacity of these reservoirs, is 6,560,000 gallons. Of this amount, 60,000 gallons are stored in two 30,000 gallon wood-stave tanks. The wooden tanks were

purchased in 1966 from the Blanco Water Company and are currently scheduled for replacement by a new water main in 1986.

A network of pumping stations, transmission mains and presssure regulating stations were also constructed to support this 6.56 million gallon storage system and to tie the foothill reservoirs into the distribution system.

TABLE III
Foothill Reservoirs

Reservoir	Reservoir Capacity (gallons)	Construction Type	Date
Blanco Tanks *	60,000	Wood Stave	N/A
Boronda	1,500,000	Concrete	1960
Corte Madera	1,500,000	Steel	1969
Dahl	1,000,000	Steel	1964
Montebello	1,500,000	Steel	1964
Park	1,000,000	Steel	1964

* Blanco tanks are scheduled for removal in 1986.

(c) Well Site Reservoirs

Six of the ten standby/emergency well installations have reservoirs on site. The total capacity of these reservoirs is 718,000 gallons. Of this amount, 83,000 gallons of capacity at the Park Boulevard well is temporarily out of service until June 1986 due to leakage, bringing the present total available well site storage capacity to 635,000 gallons.

The well site reservoirs were initially designed to provide equalization between system demand requirements and supply availability. Today the storage available at each of the well sites is considered to be lifeline storage, that is, storage available during times of emergency (as perhaps the only source of potable water).

(2) Well System

The City presently maintains a ten well system for standby and emergency purposes. The existing system's wells are rated between 150 and 1425 gpm (8.47 mgd). This amount is sufficient to satisfy more than 55 percent of the City's

current average demand. All but one of the wells are located north of El Camino Real in Service Area I. The remaining well is situated adjacent to Matadero Creek in Service Area II. Six of the ten well stations include equalizing reservoirs which were constructed to moderate pumping rates caused by fluctuations in system demand.

As indicated in Table IV, all the wells were put into service at least 25 years ago, and require continued maintenance. Originally, the wells were automatically operated by on-site control stations. However, most of the controls and metering equipment have deteriorated and have become obsolete. Therefore, each well must be manually operated by City personnel when the need arises.

TABLE IV
Groundwater Facilities - Wells

Well	Year Operational	Capacity (gpm)	Reservoir Capacity/Type (gallons)
Fernando	1955	325	-
Hale	1955	1425	295,000/RC
Matadero	1956	400	-
Meadows	1956	230	-
Middlefield	1932	450	78,000/RC
Park Boulevard	1931	500	83,000/RC*
Peers Park	1958	900	7,000/ST**
Rinconada	1954	1250	-
Seale	1928	250	100,000/RC
Tower	1925	150	155,000/RC
	TOTAL	5880	718,000

ST = Steel
RC = Reinforced Concrete
* Park Boulevard Reservoir is currently out-of-service
** Installed to allow removal of entrapped air

Each of the existing wells is equipped with chlorine feed facilities to ensure adequate disinfection of the groundwater during occasional usage. Other types of treatment such as filtration and water softening are not required or are not cost effective. Prior to 1962, when the wells were being used, fluoride was also added to the well water. These floridation facilities have since been removed. The absence of fluoride in drinking water over short periods of time, such as during standby or emergency use, has almost no effect on the incidence of dental decay.

Although the City wells have not been used frequently since the 1960's, the well water is tested on a regular basis. Review of the water quality data received by the City for samples taken in March 1985, indicates that all the system wells are in compliance with the primary standards and meet the Safe Drinking Water Act. However, a number of the wells have water which exceeds the recommended secondary standards (not health related) for such aesthetic parameters as color, iron and manganese, and total dissolved solids. In addition, more than half of the wells produce water considered to be "very hard" by commonly accepted criteria. The concentrations of synthetic organic chemicals (SOC's) in the test samples indicate no industrial contamination of the aquifers has occurred in the area.

The quantity of water available from the well system at any time is dependent on the number of wells operational and the available continuous yield of each well. For normal residential and commercial service, a reasonable flow and pressure must be maintained at all times. Industrial and other large users may be able to cut back water consumption during a short-term emergency, but there will likely be an economic impact if this condition is prolonged. Adequate flow and pressure must also be maintained at all times for fire protection and other emergency services. Most of these goals can be accomplished with adequate available storage, prudent operation of the distribution system and selective use of supply sources.

Based on the expected yield, the three principal wells in the system are Hale, Rinconada and Peers Park, capable of producing 1425, 1250, and 900 gpm, respectively. By comparison, no other system well yields more than 500 gpm on a continuous basis. In addition, these wells serve water to Pressure Zone I which includes the principal residential and commercial areas of the City.

It should be reiterated that in an emergency situation, the pressure and quantity of a water supply can be the most important consideration, as aesthetic qualities become secondary.

The location of system wells is important for two reasons. First, they must provide a reasonable pressure and quantity to specific areas in the system and second, they must serve the areas or zones which may potentially be most severely affected by the emergency interruption. Although every conceivable condition cannot be determined, it is important to plan for the most likely and critical occurrence. In the Bay Area and Palo Alto, this condition would be a major earthquake.

The City of Palo Alto is located near the San Andreas Fault Zone on active fault lines, including the Cascade Fault and Santa Clara Fault. The Palo Alto Comprehensive Plan shows that the major portion of the City (Zones 1 and II) is considered an area of moderate risk with the potential for very strong shaking, and moderate amounts of ground failure or subsidence. All the system wells are located in this area and could be susceptible to major damage during an earthquake. In addition, three of the six storage reservoirs and much of the foothills transmission pipeline are located in high risk seismic areas with the potential for violent shaking and land slides. It is therefore possible that much of the City's storage would be unusable for a period of time after an earthquake, making the surviving wells even more important. A more detailed investigation would be required to define which wells would likely receive the least damage in an earthquake. To protect the distribution system from contamination requires that adequate power pumping capacity and supplies of potable water be available at all times to maintain pressure in the pipelines.

Previous master planning studies and lifeline analysis have provided general guidelines for development and operation of a water system under emergency conditions. In general, attempts should be made to provide sufficient storage or standby production capacity to supply one-half the average daily demand for each system service zone.

(3) Water Treatment

(a) Chlorination

San Francisco chlorinates the main Hetch Hetchy supply at Red Mountain Bar in the Sierra Nevada Range to rid the water supply of any bacteria. This gives a travel (contact) time of approximately 24 hours before the treated water reaches consumers on the Peninsula. Water supplies from the Coast Range, Calaveras and San Antonio Reservoirs are filtered and chlorinated at the Sunol Valley Filtration Plant in Alameda County.

When Palo Alto wells are used as an emergency or supplementary supply, chlorine is added at the well sites to assure the purity of the water.

(b) Lime Treatment

San Francisco adds lime to the Hetch Hetchy supply at the Rock River Lime Treatment Plant in the lower Sierras. This treatment of alkaline lime raises the pH of the Hetch Hetchy water making it less corrosive to the concrete lining and iron materials present in the San Francisco water transmission systems and in the water distribution systems of the cities served.

(c) Fluoridation

In 1957, the citizen voters of Palo Alto adopted a measure to add fluoride to the City's water supply in order to reduce the incidence of dental cavities. Since 1959, fluoride has been added at San Francisco water receiving stations to levels in accordance with the City's permit from the State Department of Health. Fluoridation of water produced at Palo Alto's ten wells was discontinued following the switch to 100 percent San Francisco water.

(4) Fire Protection

One principal measure of the efficiency of a municipal water system is its ability to furnish an adequate supply of water to the Fire Department during times of conflagration. The Public Protection Classification System is used by the Insurance Service Organization (ISO) to measure the major elements of a city's fire suppression system on a relative scale of one to ten, with ten representing less than the minimum recognized protection. This grading process is

repeated in each city at intervals of five to ten years. In the survey of 1985, the City of Palo Alto was upgraded and awarded a classification of two. This is a very high rating in comparison to most cities.

B. Future Supply

(1) San Francisco's Supply

At the present time, suburban users of the Hetch Hetchy water system are quaranteed an annual quantity of 184 mgd in which to grow into. Palo Alto is presently guaranteed an annual quantity of 7,580,463 hundred cubic feet of water (15.5 mgd) from San Francisco. Unless agreed to otherwise, Palo Alto's allocation is to be upgraded every three years, and a new supply assurance determined based upon the average of the prior three years of consumption. This amount will increase until the total suburban share of water reaches 184 mgd (or higher if the capacity of the Hetch Hetchy San Joaquin Valley pipeline facilities are expanded). If suburban consumption increased uniformly in all areas, Palo Alto's ultimate capacity allocation would be 19.3 mgd. Palo Alto average consumption in fiscal 1984-85 was 16.8 mgd. All suburban purchases in calendar year 1981 were 148 mgd.

(2) Storage

As consumer demands approach the available water supply, it will be encumbent upon all water users to reduce their peak demand from the San Francisco system. Future rates will probably be developed to discourage contracting agencies from peaking on the system. It is therefore wise for Palo Alto to plan for this circumstance. At the present time the City maintains the 4.0 million gallon Mayfield Reservoir from which water may be pumped at an 11 mgd rate to aid in meeting peak system demands.

Utility Engineering staff will review the need for storage and other facilities in view of the recent ISO grading reclassification, and for emergency supply in the unlikely event of interruption of the Hetch Hetchy supply.

The City maintains, at five of the ten wells, small reservoirs with a combined capacity of 0.72 million gallons. If peaking storage becomes critical in the future it would be possible to modify these facilities to aid in reducing the peak demand on the San Francisco system.

(3) Wells (Emergency Power)

The 1983 Palo Alto Water Study recommended maintaining and operating Hale, Rinconada, Peers Park, Meadows, Matadero and Park Boulevard wells as standby emergency supply sources for the Palo Alto water system. Three main criteria for the standby power at Palo Alto are: (1) adequate capacity, (2) transportability, and (3) reliability. Based on recommendations made by Montgomery Engineers, two of three 250 kilowatt (kw) generators have been purchased and three of five receptacles for the generator/well interface have been installed at Hale, Rinconada and Peers Park wells. The third generator will be delivered and the remaining receptacles will be installed by June 1986. Should the need arise, other generators do exist in other City jurisdictions and may be available. Additionally, a receptacle was installed at the Quarry Booster Station enabling water to be pumped to residences in the lower foothills during times of long-term power outages. During an emergency, the maximum capacity available from the three generator sets would be 3575 gpm or 5.15 mgd (approximately 30 percent of Palo Alto's 1984 average daily consumption). Available capacity during an emergency would depend upon the specific energy conditions at that time.

(4) Conservation and Efficient Use

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

The City of Palo Alto has and still utilizes water conservation programs. The effectiveness of these programs is evidenced by the fact the City has grown but uses less water than it did ten years ago just prior to the initiation of these programs.

(a) Water Meters for Sales

Water meters have been in use since 1909 to monitor sales to Palo Alto consumers.

(b) Source Meters and Production Purchases

The City's well field and connections to San Francisco water have long been metered to establish total rate of production from sources, and to control the addition of fluoride and chlorine. Monthly comparisons are made between San Francisco water meters and City of Palo Alto meters to assure accuracy in measurement.

(c) Sales By Consumer Class

The City maintains and publishes an accounting of utility sales by customer class in the City's Annual Report.

(d) Leak Detection

The City does not have an active leak detection program. Principal reasons for not having a leak detection program in the past are the low level of unaccounted water (generally less than 7 percent) and the fact that most of the City lies over a ground plane of tight adobe soils where water leaks move rapidly to the surface. Utility industry experience would allow up to 15 percent of the gross water transported in a distribution system to be lost and not arrive at customer premises.

(e) New Customer Meters

Meters are installed on every new connection to the water system.

In addition, the City has implemented an aggressive program requiring metering of temporary water use (i.e., road and building construction, freeway landscape irrigation, street and tree irrigation, and dust control).

(f) Rate Structures

The City has maintained an inverted block water rate structure since 1976 to encourage water conservation.

(g) Water Consumption

The City provides past history of monthly water consumption on each utility bill sent to the customers.

(h) New Connection Restrictions

The City has no restrictions on new service connections but does have some limitations on Master Meter installations.

(i) Retrofit of Plumbing Fixtures

The City's Conservation Program recommends using low flow shower heads and faucet restrictors to reduce water consumption. Palo Alto's Building Inspection Division enforces State law with respect to requirements of low flow devices utilized in new construction. Particular attention is being paid to the new expanding multi-family installations.

(j) Wastewater Reclamation and Reuse

The City participates in the operation of a wastewater reclamation facility that has the potential to reclaim approximately four mgd. Unfortunately, this water has not proven to be attractive for use on the nearby golf course because of the high sodium absorption ratio encountered. The sewer plant receives two thirds of its water from adjacent cities who make heavy use of water softeners. Some reclaimed water is in use at the City of Mountain View's Shoreline Park. It is anticipated that some reclaimed water may also be used as Palo Alto's Baylands Park is developed.

(k) System Pressure Control Program

The City is divided into a number of pressure zones with the goal of maintaining a minimum pressure of 40 pounds per square inch (psi) and a maximum pressure of 80 psi. In general, most water service falls under this criteria; however, there are several small sections where service pressures reach a level of 100 psi or above.

The Utility's engineers utilize a computer network analysis program to simulate system pressures and flows under various static conditions. This tool is very useful in providing efficient design scenarios.

(l) Landscape Irrigation Program

During the drought of 1976, the City established a plan recommending drought tolerant yard plantings and a program to recommend benefical time of day irrigation. Additionally, large industrial customers were encouraged to use slightly degraded water for landscape irrigation. For instance, the water from the last rinse operation would be saved for landscape purposes rather than discharged into the sewer.

(m) Other

The drought of 1976 brought about several changes in water use. These changes were adopted and have become common procedures in Palo Alto today.

(i) Cooling: Prior to 1976, it was common industry practice to use potable water in a once-through cooling process to cool induction furnaces utilized in the crystal growth process. Many of these processes were changed to the cooling tower process. Additionally, cooling towers were installed to service cooling coils that previously had used single pass flow for air temperature control.

(ii) Cascade Rinsing: Prior to the 1976 drought, rinsing of plated components was primarily accomplished by a single rinse/discharge of essentially potable water. These processes have since been converted to utilize the cascade rinse process where slightly degraded rinse waters are utilized progressively to rinse more contaminated components. This process has resulted in considerable water savings to the electronics plating industry. The quantity of water discharged into the sewers has been reduced to about one third of previous amounts from this operation while the solids have remained the same. This has not effected the sewage treatment operations.

VI. Operations and Maintenance

A. Responsibilities

The Water Utility is responsible for the operation and maintenance of the following utility components:

(1) Receiving Stations
(2) Distribution System
(3) Booster Pump Stations
(4) Reservoirs
(5) Standby Wells

Three Utility Operation Sections currently maintain and operate the system to ensure system reliability. These sections include Water Transmission, Water-Gas Maintenance and the Water Meter Shop.

B. System Monitors

The four receiving stations are continuously monitored for high and low pressures and flows. System status is transmitted to the Regional Water Quality Control Plant (RWQCP) where the information appears on a display board and on circular recording charts. Booster station and storage reservoir status information is also transmitted to and monitored at the RWQCP. In addition, standby wells can also be monitored at the RWQCP during periods of well operation.

All information presently monitored at the RWQCP will be incorporated into the new Supervisory Control and Data Acquisition (SCADA) system.

Water quality is monitored on a routine basis for bacteriological and physical-chemical components.

C. Existing Programs

For public health and safety to be protected and maintained, the water utility system must have the highest integrity. The design of the system and the materials utilized are very important. Continuing maintenance of these materials and equipment is necessary to insure that the design features are appropriate and contamination does not occur.

In addition, customer's activities and piping arrangements can introduce contaminants into the potable water. The utility must ensure that cross-connection and back flow prevention regulations are stringently enforced.

(1) Main Flushing

Water mains throughout the City are flushed on an annual basis. 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 which may have collected during the winter months when water usage is low. The last flushing was completed in March 1985. An estimate is made of the quantity of water used in this process and therefore it is not a part of the losses or unaccounted for water.

(2) Water Meters

There are 16,500 residential meters in the system of which approximately 1,200 are exchanged annually. This represents a replacement cycle of approximately 14 years. The replacement cycle will be reviewed as discussed in Section VI D 5(d) Future Programs. The American Water Works Association's meter accuracy standards are: minimum flow, at least 95 percent registered; and normal flow, 98.5 percent to 101.5 percent registered. In addition, 104 large water meters, which include sizes 3 inches and larger, are inspected and tested at least annually. Calibration and repair of large water meters is performed on site.

(3) Facility Inspections

(a) Hetch Hetchy Connections

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.

(b) Booster Pump Stations

All sites are inspected weekly. Pumps at these stations are tested bi-annually. Associated regulating valves are overhauled on an annual basis. Repairs at the pump facilities are performed on an as-needed basis.

(c) 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, prior to being operated on a continual basis, the reservoirs are drained in order to remove water which has been stored during the winter months for emergency purposes. Repairs at the reservoir facilities are performed on an as-needed basis.

(d) Standby Wells

Eight of the ten City standby wells are tested on a semi-annual basis. The other two wells, Fernando and Matadero, are tested annually.

The wells were last used for production purposes in 1976 for a two week period during the San Francisco Water Department strike. Currently, the wells remain ready for emergency utilization. Repairs at the well facilities are performed on an as-needed basis.

(4) Valve Operation

Diversion-isolation valves, located between pressure zones, are operated bi-annually to ensure proper operation.

Currently, 31 of 3900 valves, or 1 percent, within the distribution system are non-functional. A program to address the problem of non-functional valves is discussed on page 39 of the Water Utility Plan.

(5) Galvanized Services

In 1982, approximately 700 galvanized services with flexible lead goose-neck transition sections were identified in the distribution system. There may be potential problems associated with lead service transitions in the system, therefore a priority replacement program was developed and is currently underway. The galvanized services are being replaced at a rate of 100 services per year. In 1984, 104 galvanized services were replaced with copper.

(6) Water Quality Monitoring

(a) Sources and Treated Water

As the water wholesaler, the San Francisco Water Department verifies the raw water sources and the treated water at their treatment facilities for compliance with drinking water standards. For that purpose, a complete analysis of general mineral, metal, and nitrate concentrations of all water sources and treated effluents is conducted at least annually by San Francisco. Herbicides and pesticides are checked at least every three years and radioactivity is tested every four years. In addition, San Francisco checks the turbidity of all treated water daily.

(b) Distribution System

As the water retailer, Palo Alto maintains a well equipped laboratory staffed with skilled personnel to check the quality of the water delivered to the consumer's tap. The laboratory, located at the Regional Wastewater Treatment Facility, is approved by the State Health Department for the examination of water and wastewater. Color, odor, turbidity, chlorine residual, temperature, conductivity, and pH are checked monthly, and fluoride and bacteriological quality are checked weekly at representative customer taps. In addition, chlorine residual and bacteriological quality are checked several times each week at the laboratory tap. Both San Francisco and Palo Alto check the distribution system quarterly for trihalomethanes, a class of organic compounds formed by the disinfection of surface water with chlorine. The complete monitoring program is summarized in Table V.

TABLE V
Monitoring Program For Palo Alto Water Supply

WHAT	WHERE SAMPLED	HOW MANY AND HOW OFTEN	WHO DOES THE TESTING
GENERAL MINERAL (iron, magnesium, manganese, calcium, foaming agents, pH, sulfate, sodium, conductivity, hardness, and alkalinity)	Sources	Yearly	San Francisco Water Department
INORGANIC CHEMICALS (metals and nitrate)	Sources	Yearly	San Francisco Water Department
ORGANIC CHEMICALS (pesticides and herbicides)	Sources	Every 3 years	San Francisco Water Department
TURBIDITY	Sources	Daily	San Francisco Water Department
RADIOACTIVITY	Sources	Every 4 years	San Francisco Water Department
GENERAL PHYSICAL (color, odor, turbidity)	Customer taps	20/month	Palo Alto
FLUORIDE	Customer taps	20/week	Palo Alto
BACTERIOLOGICAL	Customer taps	30/week	Palo Alto
	Water Quality Control Plant	3/week	Palo Alto
CHLORINE RESIDUAL	Water Quality Control Plant	5/week	Palo Alto
TRIHALOMETHANES	Distribution System	4/quarter 2/quarter	Palo Alto San Francisco Water Department

(c) Standby Wells

Palo Alto conducts a complete physical, mineral, metal, and nitrate analysis of the well water every three years. In addition, an annual check for volatile organic chemicals and chemical groups is conducted by Palo Alto pursuant to AB 1803 and Section 4026.2 of the California Health and Safety Code.

Well water is chlorinated and tested for bacteriological quality prior to any introduction to the distribution system.

D. Future Programs

Future programs described herein were developed to enhance the performance of the Water Utility.

(1) Reservoir Study

A study of the condition of five foothills reservoirs is planned for FY 1985-86. This program will include an examination of the structural integrity of the reservoirs from a corrosion and seismic standpoint. Preliminary investigations indicate interior tank surfaces show signs of deterioration. This program is addressed in the 1985-90 Capital Improvement Program.

(2) Main Replacements

The water main replacement program is scheduled to be accelerated during the 1985-86 fiscal year and is so reflected in the 1985-90 Capital Improvement Program. This program is based on staff performing engineering and contract construction management. The field work will be accomplished by independent contractors.

Current budgeting reflects funding for replacement of water mains on an approximate cycle of 200 years.

The first two years of the replacement program includes engineering studies regarding the present condition of the water mains and alternate repair and/or replacement methods.

Based on the recommendations of these studies, future funding may be increased in order to reduce the replacement cycle below 100 years.

(3) Standby Wells

The age, operating characteristics, and water quality of the ten standby well sites do not make it feasible to continue to maintain all ten of the wells for standby purposes.

A Water System Engineering Study which was completed in 1983, recommended that the following wells be maintained and operated as standby water supply sources for the Palo Alto Water system: Hale, Rinconada, Peers Park, Meadows and Matadero.

Although the Study recommended abandonment of the Park Boulevard well, staff is considering rehabilitation of this site. Rehabilitation costs will be determined by Utility engineering staff during the 1985-86 fiscal year. The City may not continue the existing multiple use of this site with the Peninsula Conservation Center but is considering multiple use for low cost housing and emergency water supply purposes.

Monies are budgeted in the 1985-90 Capital Improvement Program for well site rehabilitation. Budgeted amounts are intended for use at the above-referenced sites. It is anticipated that additional amounts above those budgeted may be required after a thorough review of the emergency supply situation has been completed.

Recommendations whether to abandon certain wells will be addressed in a future Staff Report to Council.

(4) New Acquifers/Replenishment

There is good reason to investigate the possibility of acquiring rights to additional acquifers. These aquifers would be further from contaminating sources, preferably upstream of industries and inhabited areas. The need for these new resources may not be evident today but in the long-term (25-50 years or more) they could be invaluable.

The replenishment of aquifers should also be investigated. The City has aquifers for emergency use and as supplemental sources in the future. A means to insure that the aquifers are not empty when called upon is essential. There is sufficient reclaimed wastewater available to replenish the acquifers provided appropriate technology is used.

(5) SCADA System

The Water Utility is scheduled for installation of a Supervisory Control and Data Acquisition (SCADA) system. This project is addressed in the 1985-90 Capital Improvement Program.

The SCADA project will supplement and replace much of the present telemetry equipment which was installed in the 1950's. The existing system is technologically antiquated and many repair or replacement parts are no longer available. The SCADA system will be located in the Operations Center at the Municipal Service Center. The Operations Center will be a combined facility housing SCADA for all utilities.

The Water Utility will share the expense of this equipment and facility with other Utility funds in proportion to usage.

(6) Proposed Future Programs (Operations)

(a) Preventative Maintenance Program

A preventative maintenance program should be established to replace the existing program of making repairs on an "as needed" basis.

(b) Distribution Valve Inventory

A computerized distribution and diversion/isolation valve inventory program should be established to track valve locations, valve conditions, valve histories and maintenance rotations (opening and closing of valves).

(c) Non-functional Valve Replacement

A program should be established to provide for the removal and replacement of non-functioning distribution valves. As discussed previously, these non-functional valves represent approximately one percent of the total number of distribution valves in the system.

(d) Water Meter Replacement Cycle

Computerization of all residential and large meter cards is being evaluated. The computerization of this information would provide the tools necessary for development of programs to assist in evaluating the meter replacement cycle.

VII. Recommendations

The long term adequate supply of quality water is essential to the well-being of Palo Alto's customers. These recommendations conform to existing City policies as set forth in the Palo Alto Comprehensive Plan 1980 - 1985, Chapter 7. They are:

A. Staff shall monitor and report as appropriate to the Council on:

(1) The California State legislature regarding legislation restricting access to the water supply, diverting, or limiting access to the water supply.

(2) The deliberations of the State Water Resources Department.

(3) The administration of the City's contractual rights for existing and future Hetch Hetchy Project water.

(4) The progress of the Bay Area Water Users Association's efforts and the Hetch Hetchy construction program including the No. 4 Valley Pipeline.

(5) Attitudes on water use for food production, and/or possible competing urban, local and state-wide allocation of water.

B. Efficient use of water shall be stressed in Water Utility Programs and be incorporated in the City's building codes. "Efficient use" means those management measures that result in the prevention of waste or unreasonable use of water. The City should consider revision of its disconnection practices in order to provide efficient use of water.

C. Water aquifers are important for emergency and long-term supplemental supplies; therefore, the City should:

(1) Concentrate on the prevention of contamination of underground water aquifers.

(2) Encourage replenishment of aquifers.

(3) Investigate acquiring the rights to aquifers that are upstream of industrial facilities and inhabited areas.

D. The City should continue with inspections, maintenance and modernization programs to keep the physical plant in excellent operating condition to protect its integrity for the public health and safety.

E. Continue to maintain the City's existing high fire protection rating.

F. The City should begin the engineering studies necessary for the addition of more storage in its water system. In the long-term the City will be required to level out its daily fluctuation upon the Hetch Hetchy supplies. Of more importance is the need for emergency water should the normal supply be interrupted.

G. Concern for earthquake preparedness and other emergencies is important. The City must provide multiple sources of water, storage and emergency power for the Water Utility. The existing wells are a source of supply for emergencies or for the time when the Hetch Hetchy supply is fully utilized. These facilities should be well maintained and equipped to operate from emergency power sources. These wells should be periodically operated and tested for water contamination, purity, and to verify the performance of the aquafer. Methods for blending these well supplies with the other water should be investigated.

H. Use of reclaimed wastewater (processed and extracted from treated sewage) is an important application of overall water conservation policy. Continued review of opportunities to use this water beneficially should receive high priority.

I. The water testing program should be reviewed for adequacy and frequency. There should be particular attention paid to those parts of the system which have sensitive water conveyance materials. During the water main flushing operation, samples shall be taken and analyzed to determine if any material being transported or in solution may constitute a health hazard.

J. The City should review its policies and enforcement procedures for:

(1) cross connections and back flow prevention.

(2) connect and disconnect practices.

(3) metered and unmetered service.

(4) single contingency situations serving sensitive areas where loss of any one portion of the system would prevent serving by an alternate route.

(5) method, locations and types of disinfectant added to water supply.

VIII. Urban Water Management Plan

In the 1983-84 Regular Session of the California Legislature, AB-797 was passed and chaptered as part of the California Water Code (Section 10610 et. seq.). This statute is commonly known as the Urban Water Management Planning Act (UWMPA) and requires all urban purveyors with more than 3,000 service connections, or water use of more than 3,000 acre-feet per year served directly to consumers to prepare and submit a Urban Water Management Plan not later than December 31, 1985.

The Palo Alto Water Utility is required to file the Basic Plan as specified by Section 10631-33.

The UWMPA sets forth the minimum requirements of the plan in Sections 10631-33, California Water Code. Additional provisions for plan submission and public input are also contained in Sections 10640-44 and 10620-21.

The Bay Area Water Users Association and the San Francisco Water Department have agreed to cooperate on a system-wide Water Management Conservation Program. This program will be part of each utilities submittal for the Urban Water Management Plan and will be specific to each utility's own service area. It is recommended that Palo Alto tentatively adopt these conservation measures and integrate them with existing activities. The specific details for each measure designed for the Palo Alto service area will be the subject of future Staff Reports for Council action.

Palo Alto's Urban Water Management Plan is presented here as it was submitted to the California Department of Water Resources.

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	