MONTARA WATER AND SANITARY DISTRICT

2004 WATER SYSTEM MASTER PLAN

OLIVIA CHEN CONSULTANTS, INC.

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1.0 INTRODUCTION

1.0 Introduction

The Montara Water and Sanitary District (MWSD or District) provides water, sewer, and trash disposal services to the coastal communities of Montara, Moss Beach, and adjacent areas located north of Half Moon Bay and south of Pacifica, in San Mateo County, California. The Board of Directors adopted the following statement as the District's mission:

> *To sensitively manage the natural resources entrusted to our care, to provide the people of Montara and Moss Beach with reliable, high-quality water, wastewater, and trash disposal services at an equitable price, and to ensure the fiscal and environmental vitality of the district for future generations.*

Montara Water and Sanitary District

The District owns and operates water storage, treatment, and distribution facilities ("water system" or "water infrastructure") that provide potable water to about five thousand people. The water system serves approximately 1,650 accounts, over 90 percent of them residential connections, distributed among seven pressure zones. The water served comes from one surface source, Montara Creek, and several wells that withdraw water from the Montara Creek and Denniston Creek groundwater basins.

The system includes a surface water source, a water treatment plant, ten groundwater wells (eight active and two standby), three portable water storage tanks, and over 15,000 feet of distribution pipelines

1.1 Purpose

The purpose of this Water System Master Plan (Master Plan) is to address water supply issues at MWSD. The Master Plan describes and assesses the existing water infrastructure, examines current and projected water demands, and outlines viable alternatives that will allow the District to fulfill its mission. This Master Plan is prepared in compliance with the requirements of the Domestic Water Supply Permit Amendment issued to the District by the California Department of Health Services (DHS) on August 1, 2003. The Permit Amendment stipulated the following requirements for the Master Plan:

> *"MWSD shall prepare and submit, by January 1, 2004, a study or a master plan to address the water supply issues in the water system.*
>
> *The plan shall include an evaluation of MWSD's ability to comply with the water supply requirements specified in the California Waterworks Standards. Specifically, Sections 64562, 64463, 64564, 64565, 64566, and 64568, Title 22, CCR, must be addressed in the evaluation.*
>
> *The plan shall also include an evaluation, with its recommendations, of the water system's projected water supply, storage, and demands over the next 15 years.*

Furthermore, the plan shall include MWSD's policies and procedures for the consideration, evaluation, and determination of approving new service connections to the water."

The objectives of this Master Plan include addressing the following key issues for the Water System and the planning approach is shown in Figure 1-1:

- Address existing water supply and reliability issues to ensure adequate daily service and fire protection
- Address system seismic reliability and emergency response
- Provide a plan for lifting the moratorium on new water connections
- Provide a plan for addressing the demands at buildout

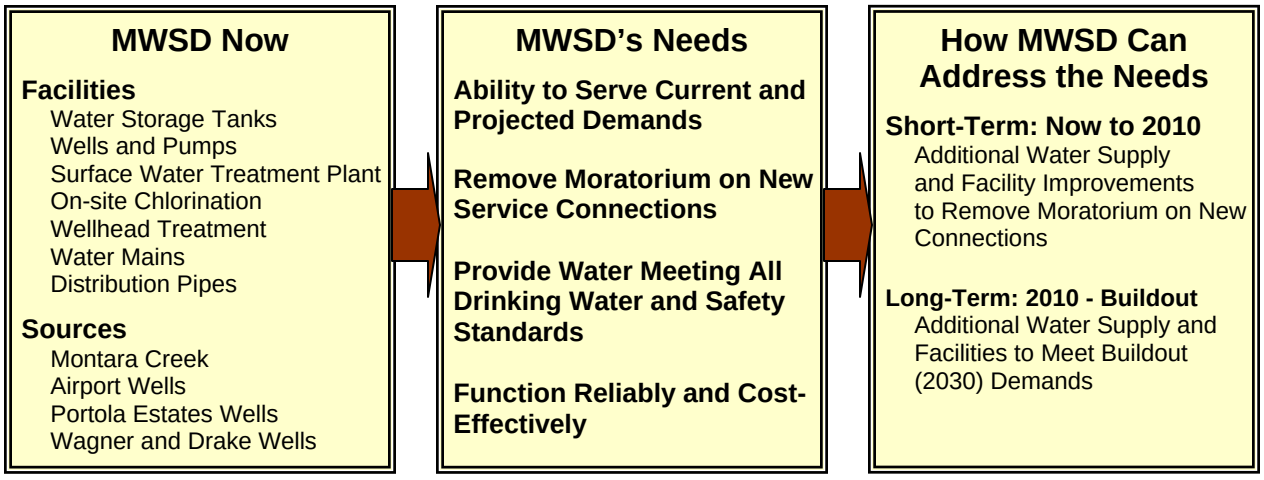


Figure 1-1. Master Plan Approach and Scope

Facilities required to address the water system needs must be sized to provide sufficient quantities of water at adequate pressures while meeting the system demands. For the purpose of this Master Plan, the ability of the system to meet demands has been evaluated based on various flow scenarios, including:

- Average Day Demand
- Maximum Day Demand
- Peak Hour Demand, and
- Fire Flow.

Water quality considerations have a major impact on the type and location of the facilities recommended for implementation as part of the Master Plan. Ensuring water system operational and seismic reliability through careful monitoring and control of equipment and process units and backup equipment and backup power provisions is essential in meeting the water supply and water quality requirements.

1.2 Background

In May 2002, the Montara Sanitary District filed a condemnation action to acquire the local water system. The District's filing came after the voters of Montara and Moss Beach, with 81 percent of the votes in favor, authorized the issue of up to $19 million in general obligation bonds to purchase and rehabilitate the water system.

The Board of Directors of the Montara Sanitary District, in a special meeting held on May 29, 2003, approved a Settlement and Asset Purchase Agreement with the California-American Water Company (Cal-Am), which owned the water system serving Montara, Moss Beach, and adjacent areas. The Agreement was negotiated under the auspices of the County of San Mateo Superior Court.

The Agreement approved on May 29, 2003 authorized the Montara Sanitary District to take possession of Cal-Am's Montara water system and all its assets on August 1, 2003. In a document dated August 1, 2003, DHS approved the application for a permit amendment requested by the now re-named Montara Water and Sanitary District. Domestic Water Supply Permit No. 02-04-98P-4110010, issued on February 23, 1998 to Citizens Utility Company of California and amended in 2002 when Cal-Am acquired the system, was again amended to recognize a change in ownership and operation from Cal-Am to MWSD.

Previous Studies
Several studies preceded this master planning effort and have evaluated alternative water supply options for the District service area:

- The 1996 *Water System Master Plan Update* prepared by Montgomery Watson for Citizens Utility Company of California evaluated new wells in the Montara and Denniston basins; rehabilitation of existing wells; water transfers[1]; water purchases from neighboring districts; increased diversion from Montara Creek; new local surface water diversions; and seawater desalination.
- The 1999 *Montara Water Supply Study for Montara Sanitary District* prepared by the California Department of Water Resources (DWR) examined the development of new groundwater and surface water sources; new water contract; water transfers; dewatering Devil's Slide; seawater desalination; use of recycled water for irrigation and aquifer recharge; and increased water conservation.
- The 1999 *Preliminary Feasibility Assessment of Groundwater in the Martini Creek, McNee Ranch and Upper Montara Area*, prepared by Balance Hydrologics for the Montara Sanitary District, indicated that additional local groundwater may be available, recommended conjunctive use of surface and groundwater resources, identified several potential well locations for further study, and recommended measuring flows on Martini Creek.

[1] The primary types of water transfers are water rights or entitlement transfers that involve purchasing an appropriated water right or a contract entitlement. Some quantity of imported supply would be available from the transfer every year, usually more in wet years than in dry years. Water purchased from distant agencies would be transferred to the purchaser through the conveyance systems of other utilities.

- The 2000 *Water System Master Plan Update* prepared by Montgomery Watson for Citizens Utility Company of California elaborated on the alternatives put forth by the previous studies.
- The 2002 *Montara Water Supply Source Study, Groundwater Alternatives* prepared by Bookman-Edmonston for Cal-Am discussed 42 potential sources of groundwater.

The studies cited above were consistent in many of their findings. There is a general consensus that groundwater represents the least costly, most readily available water supply. Although some of the studies venture guesses as to the probable capacities of wells at various locations, the studies also concluded that further investigations are required to define the extent and reliability of the groundwater resource. The first four studies advocated use of surface water sources to the maximum extent possible; lack of sufficient hydrologic information precluded the preparers of the reports from estimating volumes of surface water available for development. Most of the studies raised water quality concerns about potential surface and groundwater sources.

The earlier studies deemed water transfers and water wheeling a feasible source of water for Montara. The 2000 *Master Plan Update,* however, concluded that there were no reliable supplies available to purchase. Recent (Fall 2003) correspondence from the Bay Area Water Supply and Conservation Agency (BAWSCA) stated that agency has no ability to convey water transfers to MWSD.

Dewatering Devil's Slide was evaluated by the 1996 *Master Plan Update* and the 1999 DWR study. The project would involve constructing a 3-mile or longer pipeline to convey water to Montara from Caltran's dewatering of the slide area. The feasibility, cost-effectiveness, and long-term applicability of the project are still in question.

The 2000 study excluded the use of recycled water as a non-feasible solution to meet the short-term needs of the District. The study recommended keeping water reclamation as a potential long-term solution.

Water conservation was discarded as a reliable source of additional supply. MWSD historically has a low per capita rate of water consumption and further significant reductions would be difficult to achieve.

Seawater desalination has been proposed, discarded, and proposed again. The 1996 study proposed desalination. The alternative was subsequently found too costly. The 2000 study evaluated this alternative again at length. The study concluded that seawater desalination may become more cost-effective in the future and should be further evaluated. Participation in a regional seawater desalination project with other mid-coast water purveyors was suggested as a long-term water supply option.

Moratorium on New Service Connections

The identification of supplemental water sources has been a central issue in the Montara/Moss Beach area since 1986, when the California Public Utilities Commission (PUC) as the agency having jurisdiction over the water system under the previous ownership, established a moratorium on new water connections based on the finding that water supplies were inadequate

to meet demands on the system. The moratorium was fully supported by DHS and remains in place in January 2004. Prior to finalizing the water system acquisition process, the District proactively initiated a study and procured permits for groundwater exploration. The drilling of test wells is currently underway in the Martini Creek groundwater basin.

2.0 EXISTING WATER SUPPLIES AND FACILITIES

2.0 Existing Water Supply Sources and Facilities

MWSD's existing water system includes surface and groundwater sources, water storage tanks, a surface water treatment plant, well-head treatment units, distribution pipelines, and a booster pump station. Figure 2-1 presents a schematic of the District facilities. The color coded areas represent the various pressure zones, 7 total. Figure 3.1, page 18 shows a detailed map of the pressure zones.

Figure 2-1. MWSD Water System Schematic (Removed due to security protection concerns.)

2.1 Water Sources

MWSD currently withdraws water from one surface source and several groundwater wells:

- *Montara Creek* provides the surface water source. MWSD diverts water from the creek at a diversion point north of Montara. The water is conveyed from the diversion point to the Alta Vista Water Treatment Plant (AVWTP) site through a 6-inch-diameter raw water pipeline. Montara Creek flows are diverted into a 77,000-gallon concrete raw water tank where suspended solids are allowed to pre-settle prior to treatment at the AVWTP. Treated water is stored in the 462,000-gallon Alta Vista storage tank, and then conveyed to the distribution system. MWSD's water rights allow diversions from Montara Creek of up to 200 gallons per minute (gpm).
- *Groundwater* is currently extracted at seven locations: North Airport Well, South Airport Well, Airport Well 3 (known as Airport wells), Drake Well, Portola Estates Wells I and IV, and Wagner Well. There are three additional wells in place, Park and Portola Estates II and III; the first two are out-of-service due to higher-than-acceptable iron and manganese levels and have not contributed to system production in the last five years; Portola Estates III was taken out of service in February 2003 for rehabilitation work. The work was completed on February 2004. The South Airport Well was successfully rehabilitated and restored to its rated capacity in December 2003. Park and Portola Estates II wells are permitted as standby by the DHS.

2.2 Source Capacities

MWSD's water sources have a total rated capacity of 504 gpm. From 2000 to 2003, these sources averaged a combined production of 353 gpm. A summary of maximum, average, and minimum monthly production for each source is presented in Table 2-1. Current water demands are summarized in Section 3.2

Montara Creek

The capacity of the surface water source, Montara Creek, is unknown. There are no stream flow gages on the creek in the vicinity of Montara. The District has the right to divert up to 200 gpm but the availability of such a flow rate is uncertain. In addition, California Department of Fish and Game requirements are likely to limit diversion rates at certain seasons to protect endangered

species. AVWTP production records for 2000-2003 indicate that the system has treated as little as 36 gpm, which was the average monthly flow rate in October 2001, and as much as 73 gpm, the average monthly flow rate in May 2000. The AVWTP has a rated operating capacity of 75 gpm. The average flow rate into the plant from 2000 to 2003 was 60 gpm.

The volume of raw water treated at the Alta Vista plant has no direct correlation to the surface water source capacity. There are no records available to indicate what portion of creek flows are diverted to the plant. The District and their predecessors have been able to operate the treatment plant at or near its 75 gpm capacity for a number of years, and MWSD operated at about 90 percent capacity during the summer of 2003, indicating that 75 gpm is a reliable yield for Montara Creek. Determination of actual surface source capacity, however, will require flow monitoring for an extended period of time.

Groundwater Wells

MWSD wells have a combined rated capacity of 429 gpm. The seven wells currently in operation have a total rated capacity of 386 gpm. Actual production records for 2000 to 2003 show variable yields from District wells due to operational constraints and maintenance issues. As a result, wells sometimes produced well below their rated capacities. Three of the wells (South Airport, Drake, and Portola Estates I) sustained yields at or slightly above their rated capacities for several months at a time. According to monthly production records, District wells have produced as little as 222 gpm, which was the average monthly production rate in January 2002, and as much as 337 gpm, the average monthly production rate in May 2000. The average production from the District's seven active wells in 2003 was 297 gpm, or about 77 percent of their rated capacity.

In summary, the District relies on the following source capacities:

Seven wells active in Winter 2003 =	386 gpm
One inactive well, re-activated in February 2004 =	10 gpm
Surface water from Montara Creek =	75 gpm
Total source capacity =	**471 gpm**

Total current reliable capacity with the largest source out of service = 386 gpm

Table 2-1. MWSD Water Source Capacity and Monthly Production from 2000 to 2003[a]

Surface Water Source	Rated Capacity	January			February			March			April			May			June		
		Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min
Montara Creek Diversion Alta Vista Treatment Plant	75	68	59	50	66	58	50	69	61	50	72	63	46	73	62	44	70	61	41
Groundwater Sources / Wells																			
Airport, North	100	90	77	63	94	78	64	93	77	62	92	77	60	91	75	57	90	75	59
Airport, South	55	54	39	12	**56**	43	25	**56**	45	30	**57**	44	34	**60**	50	40	**61**	50	41
Airport 3	100	70	68	64	73	70	65	75	73	71	79	74	69	83	75	71	82	73	67
Drake	35	**38**	24	0	**38**	24	0	**38**	25	0	**38**	24	0	**39**	25	0	**38**	25	0
Park	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portola Estates I	10	**11**	9	8	10	7	0	10	6	0	**11**	9	8	**11**	9	8	10	8	7
Portola Estates II	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portola Estates III	10	7	5	2	7	5	2	7	4	0	7	4	0	7	4	0	7	4	0
Portola Estates IV	16	13	12	11	13	12	11	13	12	11	12	12	11	13	12	11	13	12	10
Wagner 3	70	56	51	47	56	52	49	57	53	50	61	57	50	62	57	49	61	57	50
Total - Water Sources	504	407	346	257	413	349	266	418	356	274	429	364	279	439	368	279	432	365	276

Surface Water Source	Rated Capacity	July			August			September			October			November			December		
		Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min
Montara Creek Diversion Alta Vista Treatment Plant	75	71	60	38	72	61	38	70	61	38	70	58	36	70	56	37	62	56	48
Groundwater Sources / Wells																			
Airport, North	100	86	77	64	88	79	64	86	77	62	89	76	62	87	76	63	87	73	62
Airport, South	55	**57**	47	40	**56**	46	40	54	39	21	53	36	21	53	33	14	52	33	14
Airport 3	100	80	73	69	78	73	67	77	69	64	79	71	66	78	70	67	76	69	66
Drake	35	**38**	24	0	**38**	24	0	**38**	24	0	**38**	33	29	**38**	33	28	**38**	26	0
Park	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portola Estates I	10	**11**	9	7	10	9	7	10	8	7	10	8	7	8	5	0	10	8	7
Portola Estates II	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portola Estates III	10	6	4	0	6	4	0	6	4	0	6	4	0	6	4	0	5	3	0
Portola Estates IV	16	13	12	11	13	12	11	12	11	11	12	11	11	12	10	6	12	11	11
Wagner 3	70	60	56	47	61	55	47	59	52	45	59	53	49	57	52	47	57	51	47
Total - Water Sources	504	423	362	276	421	362	274	413	346	249	416	350	281	409	338	262	399	330	254

[a] Rated (original design) capacities from Citizens Utility Company of California's Water System Master Plan Update, October 2000. Monthly well production from MWSD monthly production summaries (exceedance of rated capacity in **bold**).

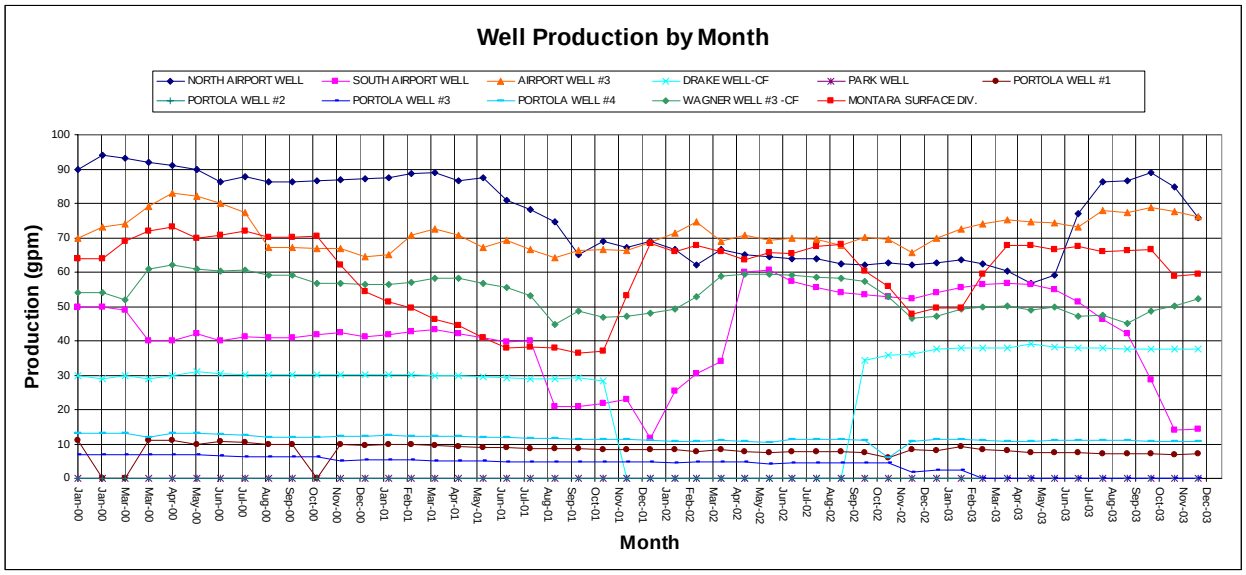


Figure 2-2. Average Monthly Yields from MWSD Wells - Jan 2000 to Dec 2003

The reliability and durability of well capacities need to be confirmed through pump tests. Flow monitoring in Montara Creek will be necessary to determine whether the District can access its rights to additional surface water.

2.3 Storage, Treatment, and Distribution Facilities

MWSD customers in seven different pressure zones are supplied through a distribution system that receives water from three storage tanks and seven groundwater wells. A schematic diagram of the water distribution system and the seven pressure zones is presented in Figure 2-3.

Raw Water Storage. Raw water diverted from Montara Creek is stored in a 77,000-gallon concrete raw water storage tank, which serves for initial sediment settling and peaking upstream of the treatment plant, providing about 15 hours of detention time.

Treated Water Storage. The MWSD water system has three treated water storage tanks with a combined capacity of 662,000 gallons. Tank characteristics are summarized in Table 2-2.

Table 2-2. Treated Water Storage Tank Characteristics

Tank	Material	Tank Diameter (ft)	Base Elev. (ft)[a]	Overflow Elev. (ft)	Storage Capacity (Gallons)	Year Built
Portola Estates	Wood	34	560	575	100,000	1981
Alta Vista	Steel	53	470	498	462,000	1976
Schoolhouse	Concrete	32	180	197	100,000	1959

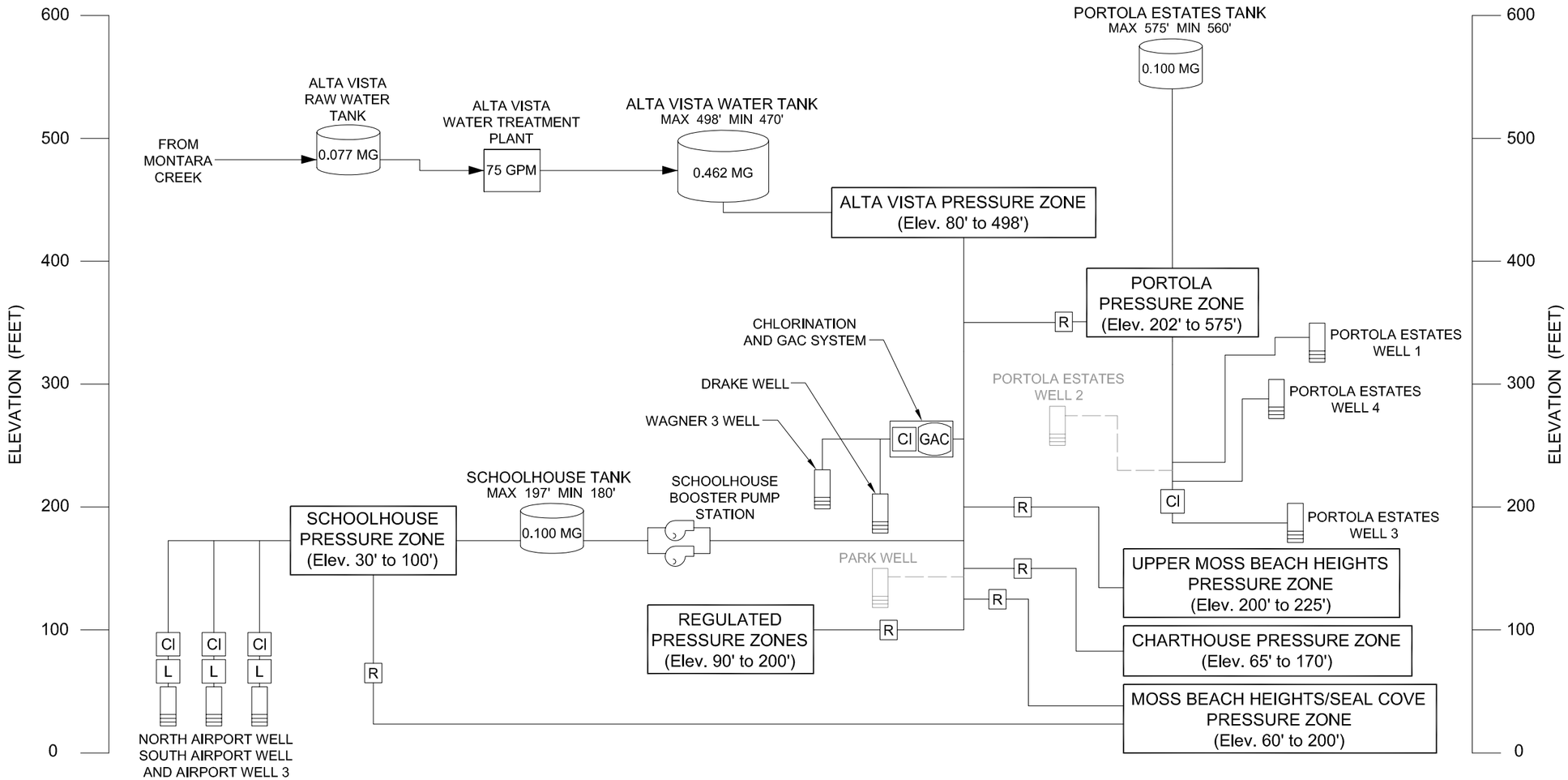
[a] Base elevations from Montara Water System Map prepared by Citizens Utility Company of California in February 1999. Datum is NGVD 1988 as presented in USGS Quadrangle "Moss Beach."

All three existing treated water storage tanks and the raw water tank require various improvements to extend their service life and ensure operational and seismic reliability:

- Structural strengthening to bring the facilities in compliance with current codes – all four tanks;
- Internal and external coatings and tank access improvements to bring in compliance with the Occupational Safety and Health Administration (OSHA) requirements – Alta Vista Tank;
- Structural repair or replacement – Schoolhouse Tank.

Water Treatment Facilities. DHS-approved treatment facilities and associated processes include a surface water treatment plant and several well-head treatment units.

- Alta Vista Water Treatment Plant, using coagulation, contact clarification, filtration, and chlorination to treat surface water from Montara Creek; the plant draws raw water from a 77,000-gallon concrete tank.



LEGEND

CI	CHLORINATION SYSTEM
	PUMP
R	PRESSURE REDUCING VALVE
GAC	GRANULAR ACTIVATED CARBON SYSTEM
L	LIMESTONE CONTACTORS
MG	MILLION GALLONS
GPM	GALLONS PER MINUTE
- - -	STANDBY

Montara Water and Sanitary District

Figure 2-3
Schematic Diagram of MWSD Water Distribution System and Pressure Zones

- Blending treatment of water with elevated nitrate levels from North Airport Well with the low nitrate water from South Airport Well and Airport Well 3.
- Three individual limestone contactor systems for corrosion control at Airport 3, South Airport, and North Airport wells.
- One granular Activated Carbon (GAC) treatment and chlorination system to treat water from Drake Well and Wagner Well for MBTE removal.
- Individual chlorination systems at South Airport, Airport 3, and North Airport wells.

Distribution System. For the year ending December 31, 2002, water system under previous ownership reported a total of 1,656 metered service connections, with 5/8 by ¾-inch meters on 1,631 of them, plus a few larger meters up to 4-inches in size. Water is conveyed to customers through a network of pipes over 151,000 feet long, with pipes ranging in diameter from 2 to 16 inches. The total lengths of pipe, classified by pipe material and diameter, are summarized in Table 2-3.

Table 2-3. Lengths of Water System Pipes by Material and Inside Diameter [a]

	Length (ft) of Pipe of Diameter (in)								Total Lengths (ft)
Pipe Material	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**16**	
Cast Iron (cement lined)				964					**964**
Concrete				336	803	137			**1,276**
Copper	31								**31**
Standard Screw	16,519		931		12,767				**30,217**
Cement - Asbestos			8,805	55,607	26,771				**91,183**
Welded Steel						167	70	53	**290**
Wood/galvanized Iron	20	20							**40**
Other	100		460	6,688	14,943	4,572	250		**27,013**
Total Lengths (ft)	**16,670**	**20**	**10,196**	**63,595**	**55,284**	**4,876**	**320**	**53**	**151,014**

[a] From Cal-Am's 2002 Annual Report of District Water System Operations, excluding service piping.

Water from the higher pressure zones, those supplied by the Portola Estates and Alta Vista tanks, supplies areas at lower elevations through multiple pressure-reducing valves (PRVs). There are a total of 25 active PRVs in the water system, with the characteristics as presented in Table 2-4.

Table 2-4. Pressure Reducing Valves [a]

Location	Manufacturer/Model	Size (in)	Downstream Pressure Setting (psi)	Elevation (ft) [b]
Etheldore and Lancaster	Cla-Val 100	6	115	
Etheldore and Lancaster	Bailey 30A	2	125	
3rd and East	Unknown	6	85	130
5th and East	Bailey 400	4	65	166
5th and East	Bailey 30A	2	75	166
Farralone and 6th	Bailey 400	4	65	138
Farralone and 6th	Bailey 30A	2	75	138
7th and Main	Unknown	2	55	133
6th and Main	Baker	4	65	133
Main and 8th	Baker	4	90	57
11th and Farralone	Bailey 30A	2	105	103
11th and Farralone	Cla-Val	6	95	103
12th and Farralone	Bailey 30A	2	95	92
12th and Farralone	Bailey 400	6	85	92
13th and Farralone	Bailey 30A	2	105	68
13th and Farralone	Bailey 400	6	95	68
14th and Farralone	Bailey 30A	2	80	49
14th and Farralone	Bailey 400	6	70	49
Alamo	Cla-Val	8	75	347
Sierra and Lincoln	Bailey 400	8	95	114
Sierra and Lincoln	Bailey 30A	3	105	114
Cabrillo Hwy and Marine	Unknown	8	56	69
Buena Vista and Lincoln	Unknown	6	86	146
Vermont and Sierra	Unknown	6	55	184
Sunshine Valley	Unknown	8	30	246

[a] From January 1992 Citizens Utility Company of California Montara District – Pressure Reducing Stations Inventory List provided by Chuck Little, Superintendent of Operations at MWSD.

[b] Elevations from USGS Quadrangle "Moss Beach," digitized by DeLorme.

3.0 CURRENT AND FUTURE WATER DEMANDS

3.0 Current and Future Water Demands

Water demand projections provide the basis for sizing and prioritizing improvements to the water facilities. Location of demand and characteristic variations in demand are also important in selecting proper facilities for dependable water services for District customers.

3.1 Regulatory Framework

Regulations pertaining to the quantity of water supplied by the District to meet customer demands include Sections 64562, 64564, and 64566 of Title 22, Chapter 16 of California Code of Regulations. These sections specify that the District has to deliver sufficient quantities of water to satisfy maximum day demand, and that system pressures have to remain at no less than 20 pounds per square inch (psi) under peak hour demand or average day demand plus design fire flow.

The National Fire Code, Insurance Service Office, and local Fire Department identify storage requirements for fire fighting. The storage requirements are based on a fire flow of 2,000 gpm for a two-hour duration. The 2,000 gpm corresponds to a land use of multiple residential, one and two stories, and light commercial or light industrial development.

The geographic location of MWSD brings the District under the jurisdiction of the California Coastal Commission. Coastal Development Permit (CDP) is required under the California Coastal Act for any new development in the coastal zone, including most activities associated with changes to the MWSD water infrastructure, such as a change in the intensity of water use or access to water; the placement of any solid material or structure; a change in land use density or intensity; and removal of major vegetation.

The San Mateo's County Local Coastal Program (LCP) establishes the population growth limits by stipulating the land use and development density limits and maximum density of development. Additionally, the LCP limits expansion of public works facilities to serve the buildout population specified in the program. The LCP now in effect was certified by the Coastal Commission and approved by the Board of Supervisors of the County of San Mateo in June 1998.

3.2 Current Water Demands

Current water demands and water use characteristics in the MWSD service area are presented below. Average and maximum daily, peak hourly, and minimum fire flow demands were calculated from monthly production records for the period January 2000 to October 2003. Unaccounted for water was estimated for 2000 and 2002, years for which metered consumption records were available. U.S. Census data were used to estimate per capita water demands. Data from the June 1998 LCP were used to estimate how water use is distributed among the various sectors in the community (i.e. residential, commercial, institutional, parks and beaches, floricultural). The distribution of water use by pressure zone was also estimated based on the approximate number of service connections in each zone.

Average and Peak Demands

Table 3-1 presents MWSD's average and peak water use based on the production and operation records for the past four years.

Table 3-1. Current MWSD Water Use

Demand	Water Use		Peaking Ratio
	Gallons per Minute	Total Gallons	
Average Daily (2000-2003)	271	390,240	1.0
Maximum Daily[a]	423	609,120	1.6
Maximum Hour[b]	700	42,000	2.6
Minimum Fire (2 hours)	2,000	240,000	N/A

[a] Based on daily production data for 365 days in 2002 and 304 days in 2003.

[b] Calculated from hourly production records for the period 9 a.m. July 20 to 9 a.m. July 21, 2003, obtained from District's Supervisory Control and Data Acquisition System (SCADA).

Unaccounted-For-Water

Data on the volume of water delivered to metered customers was available for 2000 and 2002. Table 3-2 compares these volumes to total water production. The difference between total production and metered sales represents unaccounted-for-water. Since water used by public authorities was included in the metered volumes, the unaccounted-for-water represents primarily system losses, together with water used for fire flow testing, hydrant flushing, and main repair. The unaccounted-for-water for 2000 was similar to the average for the previous 9 years. Unaccounted-for-water increased significantly in 2002, possibly due to increased number and severity of main breaks and leaks. For the purpose of estimating future demands, current system losses for the District have been assumed at 14 percent of total production.

Table 3-2. Unaccounted-For Water

Description	Average (1991-1999)[a]	Year 2000	Year 2002
Total water production (million gallons)	133	139	142
Metered sales (million gallons)	122	126	115
Unaccounted-for water (million gallons)	11	13	27
Unaccounted-for water as percent of total production	8 percent	9 percent	19 percent

[a] From Water System Master Plan Update, October 2000, Citizens Utilities Company of California

Per Capita Demands

Water demand per person was calculated from census data and production records. Pertinent data from the U.S. Census Bureau's 2000 census is presented in Table 3-3.

Table 3-3. 2000 Census Data for Montara and Moss Beach

Community	Total Population	Average Household Size	Average Family Size	Total Housing Units	Occupied Housing Units
Montara	2,950	2.80	3.10	1,034	1,010
Moss Beach	1,953	2.64	2.98	771	740
Totals	**4,903**	**-**	**-**	**1,805**	**1,750**

There were 1,620 connections in the MWSD system at the end of 2000 with meters sized for residential use. The 2000 Census reported 1,750 occupied housing units. Presumably there were at least 130 housing units (1,750 – 1,620) not connected to the MWSD water system and using their own wells for water supply.

The total population served by the District is less than the 4,903 reported in the 2,000 Census, due to the number of housing units not connected to the system. The number of people living in the unconnected housing units can be approximated at 353, based on the household sizes reported in the Census. The number of people served by the District, therefore, can be estimated at 4,550 (4,903 – 353) at the end of the year 2000.

The daily per capita water use in the MWSD area in the year 2000 was 84 gpcd (gallons per capita per day), based on a total production of 139 million gallons for the year and 4,550 people served. This per capita use is significantly higher than the 59 to 70 gpcd estimated for the years 1991-1999 in the 2000 Master Plan Update prepared by Citizens Utilities Company of California. The difference lies in population estimates: the 2000 Master Plan Update assumed 3.5 people per household for a population served in excess of 5,700.

Water Use Characteristics

Table 3-4 presents the types of water use in the MWSD service area. Volumes of water for institutional, floricultural, commercial, and park/beach uses were taken from the Local Coastal Program dated June 1998.

Table 3-4. Current Water Use Distribution at MWSD

Type of Use	Gallons per Day
Institutional	13,600
Floricultural	20,000
Commercial	2,000
Parks and beaches	4,700
Subtotal	**40,300**
Other Uses (Residential and Unaccounted-for)[a]	349,940
Total average daily water use 2000-2003	**390,240**

[a] Computed as the difference between average daily use of 390,240 gallons and water uses from Local Coastal Program adding up to 40,300 gallons

Demands per Pressure Zone

Average daily water use per pressure zone is shown in Table 3-5. The distribution of water use per pressure zone is based on the estimated number of service connections in each zone. The boundaries of individual pressure zones are shown in Figure 3-1.

Table 3-5. Estimated Water Demand by Pressure Zone

Pressure Zone	Percent of Connections in Zone	Gallons per Day
Alta Vista	52	202,925
School House	17	66,341
Moss Beach/Seal Cove	16	62,438
Charthouse	5	19,512
Portola	4	15,610
Upper Moss Beach	3	11,707
Regulated Zones	3	11,707
Totals	**100**	**390,240**

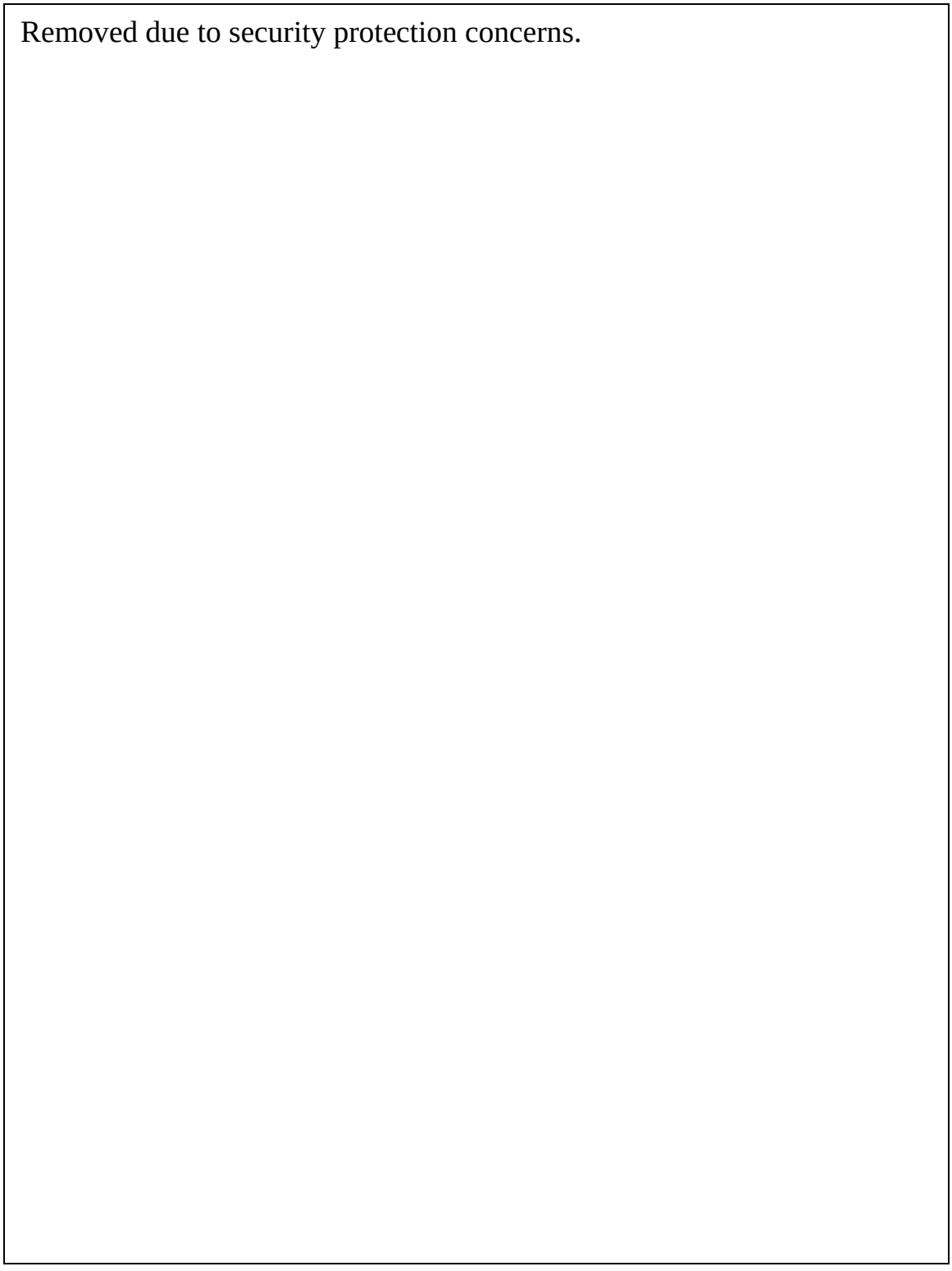


Figure 3-1. MWSD Pressure Zones

3.3 Future Water Demands

Future demands were estimated for the year 2010, 2020, and buildout. A 0.7 percent population growth in the MWSD area (Montara and Moss Beach combined) was assumed from 2000 to 2010. This was the growth rate estimated in the 2000 Master Plan Update and corresponds to the rate of growth for San Mateo County between 1990 and 2000. In addition, the need to serve the area located by the Half Moon Bay Airport has been included in the future demand estimate. This area was part of the water system service area under the previous ownership and was acquired by the District with the water system. District's application for annexation is being filed with LAFCO.

An annual rate of growth of 1.75 percent was assumed for years following 2010. The population at buildout, according to the Local Coastal Plan, is estimated at 7,432. At a rate of growth of 1.75 percent per year, the buildout population would be reached by the year 2030. This rate of growth is consistent with the fact that population is likely to increase at a faster rate after the moratorium on service connections is lifted, presumably by 2010. The 1.75 percent rate of growth is lower than the neighboring Half Moon Bay, which has seen rates of growth of 2 and 3 percent over the past two decades, respectively. The population figures used for estimating water demands are presented in Table 3-6 and shown graphically in Figure 3-2.

Table 3-6. Population Figures Used to Estimate Water Demand

Year	Total Population	Average Annual Rate of Growth Over Previous Decade, percent
1980	3,840[a]	
1990	5,554[a]	3.6
2000	4,903[a]	-1.1
2010	5,257[b]	0.7[b]
2020	6,253[c]	1.75[c]
Buildout (2030)[c]	7,432[c]	1.75[c]

[a] From U.S. Census data
[b] Assuming 0.7 percent annual rate of growth
[c] Assuming 1.75 percent annual rate of growth

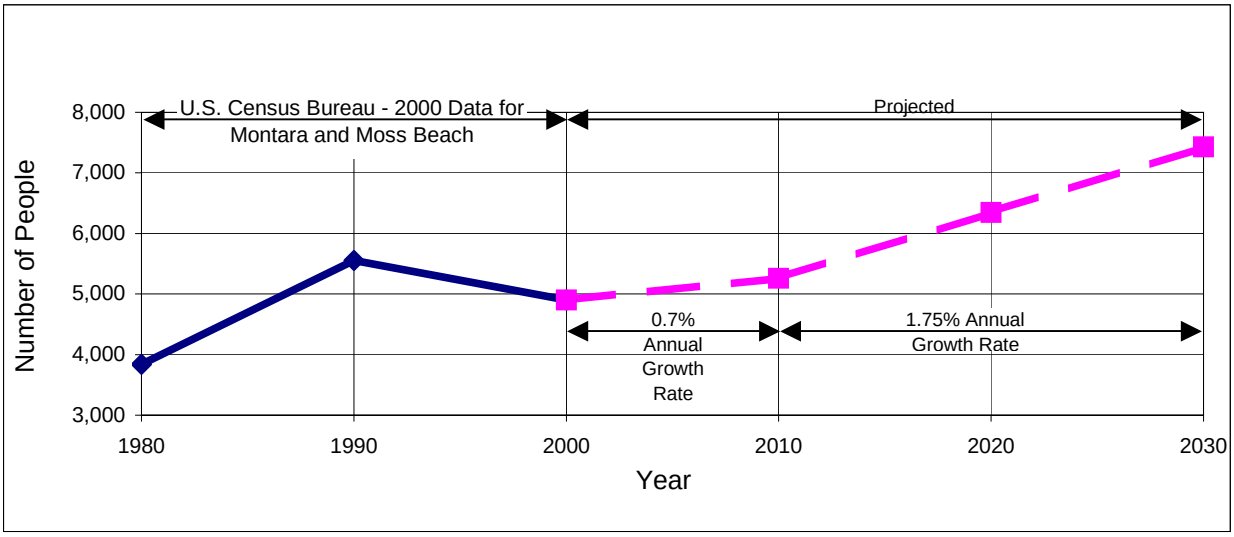


Figure 3-2. Projected Population Growth to Buildout

Estimated Water Demands at Buildout

Table 3-7 shows the estimated water demands at buildout. Demand figures are based on the following assumptions:

- 2003 figures correspond to the average demands between 2000 and 2003 from Table 3-1.
- 2010 figures assume:
  - The entire population in the Montara/Moss Beach area is connected to the MWSD water system.
  - Per capita consumption remains at the 2000 level of 84 gpcd. This implies that until the year 2010 people will continue to use water the same way they have for the past few years. It also implies that system losses remain at roughly the same level as they are in 2004.
  - Peak daily demand at 1.6 times the daily average; peak hourly demand at 2.6 times the daily average. This implies that water use patterns will not change significantly between 2004 and 2010.
  - ALFCO's approval of the adjusted District service area boundaries.
- 2020 figures assume:
  - The entire population in the Montara/Moss Beach area is connected to the MWSD water system.
  - System losses have been reduced through the replacement of old and defective pipes.
  - Per capita consumption increases to 88 gpcd, implying that the reduction in system losses is offset by slightly higher use in the residential, commercial, and institutional sectors.
- Buildout (2030) figures assume a per capita consumption of 93 gpcd, the lower bound of the range 93-134 gpcd estimated in the Local Coastal Program dated June 1998.

Table 3-7. Estimated Water Demands to Buildout

	Volume (Gallons)			
Demand	**Year 2003**	**Year 2010**	**Year 2020**	**Buildout (2030)**
Average Daily	390,240	441,588	550,264	691,176
Maximum Daily [a]	609,120	706,541	880,422	1,105,882
Maximum Hour [b]	42,000	47,839	59,612	74,877
Minimum Fire (2 hours)	240,000	240,000	240,000	240,000
Annual Water Production	142M	161M	201M	252M

[a] At 1.6 times the average day demand
[b] At 2.6 times the average day demand

Water Use Characteristics at Buildout

Table 3-8 presents the types of water use in the MWSD service area at buildout. Volumes of water for institutional, floricultural, commercial, and park/beach uses were taken from the Local Coastal Program of June 1998.

Table 3-8. Water Use Distribution at Buildout

Type of Use	**Gallons per Day**
Institutional	13,600
Floricultural	40,000
Commercial	29,400
Parks and beaches	4,700
Industrial	85,200
Subtotal	**172,900**
Other Uses (Residential and Unaccounted-for) [a]	518,276
Total (average daily water use)	**691,176**

[a] Computed as the difference between average daily use of 691,176 gallons and water uses from Local Coastal Program adding up to 172,900 gallons.

4.0 DISTRIBUTION SYSTEM ANALYSIS

4.0 Distribution System Analysis

Chapter 4 – Removed from Public Copy for security protection reasons.

5.0 POTENTIAL IMPROVEMENTS

5.0 Potential Improvements

The results of analysis presented in previous sections demonstrate that MWSD's water system requires improvements to address the existing deficiencies, improve water supply reliability and response under daily operational scenarios, fire flow and seismic and other emergency conditions. These potential improvements include the rehabilitation of the existing infrastructure, addition of new facilities, development of new sources of supply, improvement of water treatment facilities, and implementation of repair and replacement, and preventive maintenance programs.

5.1 Treatment Facilities

Water quality greatly impacts the amount of water that can be supplied from MWSD's sources, in particular the Airport wells and the Alta Vista Water Treatment Plant (AVWTP). The Airport wells represent the source with the highest water quality concerns for MWSD and DHS. Surface water quality from Montara Creek also represents a water quality concern, since it impacts the performance and output from the AVWTP.

The three Airport wells have four water quality constituents of concern to MWSD: (1) corrosion potential, (2) nitrates, (3) manganese, and (4) 1,2,3-trichloropropane (TCP). Typically, nitrate levels are highest in the wells during the winter. Both operational measures and treatment technologies can be used to lower the concentrations of the constituents in the drinking water. Table 5-1 lists the operational measures and available technologies for each constituent.

Table 5-1. Summary of Operational and Treatment Alternatives for Airport Wells

Water Quality Concern	Operational Alternatives	Water Treatment Process Alternatives
Corrosion	N/A	Air Stripping Soda Ash Addition
Manganese	Flushing	Multi-media Filtration Cartridge Filtration Ion Exchange
Nitrate	Shut down North Airport 2 Well, when feasible	Blending Ion Exchange
TCP	Shut down Airport 3 Well, when feasible	Blending GAC Filtration

A combination of operational and treatment methods will be necessary to fully mitigate the water quality concerns in the Airport wells to the satisfaction of DHS. Discussions with DHS regarding these issues are currently underway by the District.

The raw water source for the AVWTP is an impoundment of the Montara Creek. During the winter months, AVWTP is typically shut down due to the raw water turbidity increase during heavy rains, resulting in shorter filter runs. Turbidity is the reduction of clarity in water due to the presence of suspended or colloidal particles. Turbidity is commonly used as an indicator for

the general condition of the water. The increase in surface water turbidity occurs during spring runoff and seasonal precipitation events as a result of increased overland flow and erosion. A more robust treatment process train at AVWTP, including pre-treatment processes such as clarification (settling tank) and larger filtration units may potentially accommodate higher raw water turbidity with little reduction in filter performance. This would allow AVWTP to be used year round as a more reliable water supply source. A cost/benefit analysis of additional treatment processes for both the Airport wells and the AVWTP should be performed to define the most cost effective alternatives.

5.2 Supply Enhancements

Water resources can be developed from surface and groundwater sources, and from alternate sources such as seawater desalination. Specific potential supply enhancement projects are discussed below.

Surface Water
Montara, Martini, San Vicente, and Denniston creeks flow through the Montara area. Denniston and San Vicente creeks supply water to the Coastside County Water District (CCWD). Montara Creek supplies water to the MWSD. The District has extraction rights on the Montara Creek for up to 200 gallons per minutes. The District has no water rights on the Martini Creek; diversion rights are currently held by private landowners along the creek and by the California Department of Parks and Recreation.

Diverting water from Montara and Martini creeks is only practical if the creeks flow year round. Construction of dams to capture and store winter stream flows for future release in the summer time is impractical. Adequate sites for a dam would have to exist. Dams are expensive and permits for their construction and operation are difficult to obtain.

The District diverts and treats water from Montara Creek year round. In winter months, when flows in the creek are more plentiful, diversions from the creek decrease due to turbidity problems that the Alta Vista Water Treatment Plant is unable to resolve. Diversion of wintertime flows, therefore, would require changes and/or additions to the treatment plant.

Diversion of Martini Creek water will most likely require the construction of treatment facilities. Although limited water quality data are available, it is reasonable to anticipate water quality similar to that of the raw water from Montara Creek.

There are no stream flow gages on either Montara or Martini creeks. The volumes of water available from either stream are unknown, although a preliminary assessment prepared by Hydrofocus in 2000 for private property owners estimated the total flow through Martini Creek at 1,060 acre-feet for water year 1999. Data on stream flows, their seasonal variation, availability during dry years, and impact on surrounding environment need to be collected to properly assess the feasibility of using surface water from these streams as a reliable source of supply.

The feasibility of new or enhanced diversions from either creek has to be assessed through data collection. Continuously recording stream flow gages at the Montara and Martini creeks would provide important flow data. A year-round sampling/testing program at the two creeks would

provide relevant water quality information. Three to five years of data might be sufficient to determine the feasibility of diverting significant quantities of surface water from these two sources.

Groundwater

Further development of local groundwater resources represents the best option for meeting short-term water supply needs. Several other well sites that may potentially provide combined flow rates upward of 200 gpm include:

- The McNee Ranch in the Martini Creek watershed was identified as a potential site for a number of wells. The DWR estimated a yield of approximately 80 acre-feet per year which could support 12 potential well sites. Well exploration work is this basin is currently underway by the District.
- The Wagner Valley 2 well site located adjacent to Riviera Road in the upper reaches of Wagner Valley may produce in excess of 40 gpm. The general site is in close proximity to the distribution system in the Alta Vista pressure zone. The property would have to be acquired. A pumping rate of 60 gpm has also been suggested for this well.
- The Wagner Valley 3 well site located adjacent to Riviera Road in the upper reaches of Wagner Valley may produce in excess of 70 gpm. The general site is in close proximity to the distribution system in the Alta Vista pressure zone. The property would have to be acquired. A pumping rate of 50 gpm has additionally been suggested for this well.
- The Alta Vista site located in the hills above Old San Pedro Road and the Alta Vista Tank. Water from this well site is not likely to require treatment, according to the 2002 study. The property has 11 acres and is owned by the District.

Well rehabilitation is another important source of water supply. The Portola 2, Portola 3, and Park wells are good candidates for rehabilitation. Wells currently in operation could also be rehabilitated to increase their production and/or minimize water quality concerns. The development of a well rehabilitation/ replacement program is already under way.

Desalination

Desalination is a process that removes dissolved minerals from seawater, brackish water, or treated wastewater. Seawater desalination may be considered a long-term option, particularly if the opportunity arises to develop this resource on a regional basis. The capital, operating, and maintenance costs for this alternative may appear high at this time. Technological advancements, however, may make this option significantly more attractive in the near future. Desalination plants are available in small, portable setups that generate 100-200 gpm, and in large plants that generate several million gallons per day.

The price of water produced by desalination plants in California ranges from $1,000 to $4,000/acre-foot, according to the California Coastal Commission, which has approved several such projects. As a point of reference, the District currently produces about 430 acre-feet per year. The cost to produce water from desalination depends on the technology used and the plant capacity, among other factors. The costs include capital and operating and maintenance costs. For long-term projects, capital costs would most likely be amortized over an assumed plant life of 20 to 30 years.

A number of technologies have been developed for desalination, including reverse osmosis (RO), distillation, electro-dialysis, and vacuum freezing. Two of these technologies, RO and distillation, are being considered for public water supplies in California.

Several issues need to be examined to assess the feasibility of seawater desalination as a source of potable water for the Montara area:

- Type of technology most appropriate for District use
- Environmental permitting
- Location of desalination plant
- Surface or groundwater intakes
- Brine disposal strategy
- Regional or District undertaking
- Costs of construction, operation, and maintenance.

5.3 Water System Planning and Design Criteria

Planning and design criteria adopted by the District's Board of Directors at the December 18, 2003 meeting, have been utilized for the purpose of this Master Plan and are summarized in Tables 5-2 and 5-3. Specific recommendations on system improvements provide in Section 6 are based on the assessment of existing facilities, water source capacities, current and projected water demands, storage needs, and system analysis contained in previous sections combined with operating, planning, and design criteria.

Table 5-2. Planning Criteria

Parameter	2004	2010	Buildout
Average day demand, gpm	271	318	602
gallons	390,240	457,500	866,500
Maximum day demand, gpm	423	509	963
gallons	609,120	732,000	1.39M
Peak hour demand, gpm	700	827	1,565
gallons	42,000	50,000	93,900
Fire flow, gpm for two hours	2,000	2,000	2,000
Equalization storage, gallons	304,500	366,000	695,000
Fire storage, gallons	240,000	240,000	240,000
Emergency storage, gallons	1.2M	1.5M	2.8M
Total Storage, gallons	1.7M	2.1M	3.7M
Storage facility material	Steel		
Storage facility construction	Above Ground		
Distribution system piping material	Ductile Iron or PVC		

Distribution system piping depth of cover	4 feet
Distribution system piping min. diameter	6 inches

Table 5-3. Design Criteria

Demand	Pressure (psi)	Head Loss (ft/1000 ft)
Maximum day	50	No higher than 5
Fire flow	20	No higher than 10

5.4 Storage and Pumping Improvement Projects

Based on the planning and design criteria specified above, the District has an estimated water storage volume deficiency of 1.1 million gallons. The needed additional facilities can be implemented at existing tank sites. Site constraints and connections to the distribution system need to be further assessed to arrive at realistic cost estimates.

All three existing tanks are in varying stages or disrepair and require immediate attention. In addition, the tanks are not compliant with the current Uniform Building Code (UBC) and require seismic strengthening and repair work. The District has no ability to repair the dilapidated structures and bring them in compliance with the code due to lack of redundancy and flexibility in the water system. All tanks need major repair work requiring taking them off line and draining for extended time. This rehabilitation work is contingent upon the District's ability to construct new storage facilities.

A pump redundancy study should be performed as soon as possible. The system relies very heavily on the booster pumps at the Schoolhouse tank site to lift water into the Alta Vista pressure zone and tank. Failure or malfunction of those pumps will have serious detrimental effects on system performance.

A new pump station capable of lifting airport well flows into the Alta Vista pressure zone and tank should be implemented if supported by the redundancy study. The new pump station could be designed to help the distribution system handle fire-fighting emergencies.

5.5 Water Main Replacement Projects

Potential improvements to the distribution system include:

- Replacement of undersized pipes
- Replacement of obsolete pressure-reducing valves
- Implementation of a leak detection and repair program
- Implementation of a valve exercising program
- Development of a data base to track main repairs and help prioritize main replacements.

6.0 RECOMMENDATIONS

6.0 Recommendations

6.1 Implementation Plan

The implementation plan proposed in this section is structured to address the following key issues for the Water System:

- Existing water supply and reliability deficiencies to ensure adequate daily service and fire protection for District customers;
- System seismic reliability and emergency response deficiencies;
- Provide a plan for lifting the moratorium on new water connections; and
- Provide a plan for addressing the demands at buildout.

The implementation plan presented below is based on the potential improvements identified in the water system analysis work. The implementation plan is designed to provide MWSD with a reliable water supply in the near term and the capability of meeting the water needs of the buildout population in 20+ years. A number of analyses, assessments, and investigations will be required before the design and construction of improvement projects, to better define system needs and generate adequate data to select cost-effective solutions. These studies or pre-design tasks are critical to the planning effort and should have the highest priority. The implementation of the reliability improvements selected through these studies is anticipated to occur in a 5-year planning horizon. Implementation of improvements required to supply the buildout population may be expected in 20 years.

The District faces water quality, supply, storage, and distribution system challenges. The projects and actions described below would allow the District to fulfill its mission and meet regulatory requirements. The feasibility of the long-term improvements has to be verified over the next three years.

A summary of the projects recommended for implementation is provided in Table 6-1. A detailed discussion on each of the recommended projects follows.

Table 6-1. Recommended Projects

Projects	Estimated Cost, 2004 1,000 dollars
Near-Term Projects - 2010	
Capital Projects – New Facilities	
Airport Wells Treatment Facility	$450
New Groundwater Well Development Program	$550
Emergency Intertie with CCWD or NCCWD	$150
School House Tank Replacement and Site Improvements	$500
Portola Tank Replacement and Site Improvements	$500

Alta Vista Tank No. 2 and Site Improvements	$750
Security Improvements (placeholder)	$100
New Facilities Subtotal	***$3,000***
Capital Projects – Renewal and Replacement	
Alta Vista Raw Water Pipeline Replacement	$300
Well Rehabilitation and Replacement (placeholder)	$100
System Reliability and Safety Program	$100
Distribution Main Rehabilitation and Replacement (placeholder)	$500
Renewal and Replacement Subtotal	***$1,000***
Capital Project Permitting	$500
Studies	
Desalination Feasibility Study	$150 [a]
Alta Vista Treatment Plant Improvement Feasibility Study	$10
Near-Term Projects - 2010 Total	**$4,660**
Long-Term Projects - 2030	
Capital Projects – Renewal and Replacement	
Storage Tank Rehabilitation Program	$1,500
Distribution Main Replacement Program	$1,000
Renewal and Replacement Subtotal	***$2,500***
Capital Projects – New Facilities	
Additional New Storage Facilities	$1,000
Distribution/Transmission System Improvements	$500
Additional Water Supply Development	$1,500
New Facilities Subtotal	***$3,000***
Studies	
Alternative Energy Sources Study	$100
Tank Siting Study	$150
Long-Term Projects - 2030 Total	**$5,750**
MASTER PLAN TOTAL	**$10,410**

[a] Grant-Funded

6.1.1 Near-Term Implementation Plan

The purpose of the near-term projects recommended for immediate implementation by the District includes:

1. Addressing the existing water supply and reliability deficiencies to ensure adequate daily service and fire protection for existing customers
2. Addressing system seismic reliability and emergency response capabilities, and
3. Providing a plan for lifting the moratorium on new water connections by year 2010.

The discussion on the proposed projects with brief descriptions of each project follows.

Capital Projects – New Facilities

These include the highest priority projects required by current regulations, laws, and legislation, and projects serving to protect health and safety of the District employees and the public, and the necessary projects required to address the existing system deficiencies. Implementing these projects together with the Renewal and Replacement Program would allow the District to significantly improve the system reliability in meeting existing customer demands and to lift the moratorium on new connections by the year 2010.

Airport Wells Treatment Facility Project. This project addresses water quality concerns at the three wells commonly known as the airport wells. The first phase of this project is proposed for immediate implementation starting Winter 2004. A detailed discussion of the water quality issues at the airport wells and the proposed action plan is provided in the Draft Report entitled *Montara Airport Wells Water Quality and Water Treatment Feasibility Study and Implementation Plan* dated January 2004 by Olivia Chen Consultants, Inc.

New Groundwater Well Development Program. The McNee Ranch in the Martini Creek watershed was identified as a potential site for a number of wells. The DWR estimated a yield of approximately 80 acre-feet per year, which could support 12 potential well sites. Well exploration work is this basin is currently underway by the District.

Emergency Intertie with CCWD or NCCWD. This project may provide a significant increase in water supply reliability for the District. A mutually beneficial agreement for an intertie capable of supplying water to the District in case of a supply shortage caused by an event in the District service area and posing a threat to the District customers would have to be developed and negotiated by the two agencies prior to constructing an intertie.

Storage Improvements. The District faces an estimated water storage volume deficiency of 1.1 million gallons. Additional storage facilities to address the deficiency and significantly improve water system reliability are recommended for implementation in two phases. Phase I includes near-term improvements that can be implemented at existing tank sites. Specific projects include:

- **School House Tank Replacement**. The existing tank is in poor condition and has reached the end of its useful life. An additional tank of the same capacity (100,000 gallons) is recommended at the site.
- **Portola Tank Replacement**. Additional storage at the Portola Tank site is critical to improving the District's fire protection capabilities. Recommended project includes adding a second 100,000-gallon storage tank at Portola or replacing the existing wood tank with a new steel 200,000-gallon storage tank.
- **Alta Vista Storage Tank No**. 2. Additional storage at the Alta Vista site is required for reliability and redundancy and to allow rehabilitation of the existing facilities. This project includes permitting, design, and construction of a second 450,000-gallon tank at the Alta Vista Tank site.

Security Improvements Program (Placeholder). This placeholder is included on the list of the priority recommended projects pending completion of the Vulnerability Assessment by the District by June 2004.

Capital Projects - Renewal and Replacement Projects

Alta Vista Raw Water Pipeline Replacement Project. This project replaces the existing 6-inch-diameter raw water pipeline with a new pipeline. It would significantly improve the reliability of the District's surface water supply. The CEQA approval process for this project is in progress. The pipeline construction work is anticipated to start in late Spring – early Summer 2004.

Well Rehabilitation and Replacement Program. This program involves replacement and renewal of the existing wells and equipment to restore the wells to their original rated capacity and improve water supply reliability.

Distribution Main Replacement Program. This program includes replacing existing mains demonstrating the highest leakage rates and deficiencies with new distribution mains. The mains recommended for potential replacement to improve the system reliability and ability to provide fire flows may include but not limited to the following projects:

- Replace 8,220 feet of 1.5-inch, 2-inch, and 4-inch pipelines with 6-inch-diameter pipe.
- Replace 100 feet of 4-inch pipeline along Drake Street, near Rivera Road.
- Replace 400 feet of 4-inch pipeline along Audobon Avenue, between George Street and 5th Street, with 6-inch pipeline.
- Replace 240 feet of 6-inch pipeline along Audobon Avenue, between 6th Street and 7th Street, with 8-inch pipeline.
- Replace 120 feet of 6-inch pipeline along Edison Street, between Birch Street and Cedar Street, with 8-inch pipeline.

System Reliability and Safety Program. This proposed program includes but not limited to the following projects:

- Alta Vista Water Treatment Plant (WTP) Improvements
- Alta Vista Tank Access Improvements
- Pump Redundancy Study
- Pump Flow Testing Program
- Valve Exercise Program
- OSHA Improvements
- Leak Detection and Repair Program

6.1.2 Long-Term Implementation Plan

These projects are proposed to address the long-term demand projections though buildout in the year 2030.

Capital Projects –Renewal and Replacement

Storage Tank Rehabilitation Program. This program includes structural and other rehabilitation of all three existing District storage facilities. Since this program's completion requires the existing tanks' outage for an extended period of time, it cannot be completed until the second tank is constructed at each of the existing sites.

- **Alta Vista Tank** - this project would provide new inside and outside coatings for the tank. In addition, structural deficiencies of the 462,000-gallon tank will be addressed.
- **School House Tank –** this project includes complete replacement of the existing tank as its rehabilitation appears non-feasible at this time.
- **Portola Tank –** this project would include either a complete replacement or repair of the existing tank.

Distribution Main Replacement Program. This program continues replacing existing mains with new distribution mains. The mains recommended for potential replacement to improve the system reliability and ability to provide fire flows may include but not limited to the following:

- Replace 320 feet of 8-inch pipeline along Drake Street, between Cedar Street and Elm Street, with 10-inch pipeline.
- Replace 1,680 feet of 8-inch pipeline downstream from the Alta Vista Tank, along Alta Vista Road, with 10-inch pipeline.
- Replace 6,440 feet of pipeline in the Schoolhouse pressure zone, along Highway Route 1, South of Marine Boulevard and in the Airport area, with 12-inch pipeline.
- Replace 3,030 feet of pipeline within the Upper Moss Beach pressure zone with 10-inch pipeline.

Capital Projects - New Facilities

Additional New Storage Facilities: based on the further review of the demands and population projections and on the results of the Storage Siting Study, develop new storage facilities to address the system buildout requirements to the year 2030.

Distribution/Transmission System Improvements: based on the further review of the demands and population projections and on the results of the Storage Siting Study, develop new distribution and transmission main facilities to address the system buildout requirements to the year 2030.

Additional Water Supply Development: based on the further review of the demands and population projections and on the results of the Desalination Feasibility Study, develop new water supply to address the system buildout requirements to the year 2030.

6.2 Recommended Studies

As the District strives to ensure long-term water supply reliability and seeks the most cost-effective and energy-efficient solutions, the following studies are recommended for implementation in the near future:

- **Alta Vista Treatment Plant Improvements Feasibility Study**: this study would assess the feasibility of adding and/or modifying existing treatment processes to improve treatment efficiency and ensure all-season operation of the treatment plant.
- **Desalination Feasibility Study**: this study would provide an evaluation of the feasibility of the desalination system implementation regionally or by the District. Grant funding may potentially be procured for the work on this study.
- **Alternative Energy Sources Study**: to explore alternative power sources for the District facilities.
- **Tank Siting Study**: The District currently has an estimated water storage volume deficiency of 1.1 million gallons. Phase 1 near-term improvements include doubling existing storage tank capacity at each of the existing sites. Completion of the near-term improvements would reduce the deficit from 1.1 million to 450,000 gallons. Since the District is developing additional water supply, existing tank sites may or may not be the most beneficial for adding more storage. A siting study addressing the long-term District storage volume and location needs is recommended.

APPENDIX A

MWSD MONTHLY PRODUCTION DATA 2000-2003

Appendix A

Table A-1. Monthly Production Data

Month	Total Monthly Water Production (Gallons) for Year			
	2000	2001	2002	2003
January	10,764,320	10,820,260	10,092,170	11,507,410
February	9,622,050	9,299,690	9,389,600	10,940,630
March	10,768,870	11,074,490	11,108,820	11,888,430
April	11,703,440	11,877,000	11,681,730	10,547,290
May	12,824,790	14,239,320	12,966,820	11,325,160
June	13,234,470	14,148,520	12,917,230	12,930,600
July	13,144,110	13,233,550	13,383,220	13,341,720
August	13,579,610	12,490,700	13,261,280	13,472,360
September	10,224,840	11,126,900	13,275,760	13,318,500
October	11,871,310	11,444,270	12,982,280	12,542,620
November	10,114,590	10,790,560	10,669,090	9,724,690
December	10,963,940	10,063,180	10,343,040	9,609,490
Total Year	**138,816,340**	**140,608,440**	**142,071,040**	**141,148,900**
Avg. Daily Gallons	380,319	385,229	389,236	386,709
Avg. Daily gpm	264	268	270	269

APPENDIX B
MODEL DOCUMENTATION

Appendix B

Appendix B – Removed from Public Copy for security protection reasons.

APPENDIX C

CALIFORNIA WATERWORKS STANDARDS (CALIFORNIA CODE OF REGULATIONS, TITLE 22, CHAPTER 16, ARTICLE 2)

TITLE 22. Social Security
Division 4. Environmental Health
Chapter 16. California Waterworks Standards
Article 2. General Requirements

§64560. Basic Design.

(a) Additions to or changes in distribution systems shall be designed and constructed to:
(1) Be free of structural and sanitary hazards.
(2) Protect the quality of the water delivered to users at all times.
(3) Protect the distribution system against contamination by backflow.
(4) Provide adequate size and capacity to meet the requirements of Sections 64562 and 64566.
(5) Withstand, with ample safety factors, the physical stresses imposed during normal operation.
(6) Minimize the effects of events such as power supply, equipment, and structural failures, earthquakes, fires, floods and sabotage that are reasonably foreseeable.
(7) Protect against unauthorized entry and/or vandalism.
(8) Protect against adverse effects in areas subject to freezing weather.

NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

§64561. Reliability.

NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

HISTORY
1. Amendment filed 10-9-85; effective thirtieth day thereafter (Register 85, No. 42).

§64562. Quantity of Supply

(a) Sufficient water shall be available from the water sources and distribution reservoirs to supply adequately, dependably and safely the total requirements of all users under maximum demand conditions before agreement is made to permit additional service connections to a system.
(b) To ascertain this, first determine the total capacity of the existing source by procedures prescribed in Section 64563 and determine the total storage volume of the existing distribution reservoirs. Then determine the needed source capacity and the needed storage volume by procedures prescribed in Section 64564. The total available source capacity shall not be less than the needed source capacity.
(c) The requirements of this section shall apply to an entire public water system and to each pressure zone within a public water system.
(1) Requirements for an entire public water system shall be determined from the total source capacity, total storage volume and the total number of service connections.

(2) Requirements for a particular pressure zone shall be determined from the total water supply available from the water sources and interzonal transfers directly supplying the zone, from the total storage volume within the zone and from the number of service connections within the zone.

NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

HISTORY
1. Amendment filed 10-9-85; effective thirtieth day thereafter (Register 85, No. 42).

§64563. Procedures for Determining Source Capacity.

(a) The source capacity of a well shall be based on the sustained yield of the well or pump output, whichever is less.
(1) Sustained yield of a well shall be determined from a pump test or from historical records.
(2) The conditions of a pump test used to determine sustained yield of a well shall be acceptable to the Department and shall include:
(A) Constant rate of water discharge from the well during the pump test.
(B) Continuation of the pump test until at least four consecutive measurements of water level drawdown in the well and the elapsed time since the beginning of the pump test yield a straight line when the drawdown is plotted against the logarithm of the elapsed time.
(b) The source capacity of a surface water supply or a spring shall be the lowest anticipated daily yield, based on adequately supported and documented data.
(c) The source capacity of a purchased water connection between two public water systems shall be included in the total source capacity of the purchaser if the purchaser has sufficient storage or standby source capacity to meet user requirements during reasonably foreseeable shutdowns by the supplier.
(d) Where the capacity of a source varies seasonally, the source capacity shall be the capacity at the time of maximum day demand.

NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

§64564. Procedures for Determining Needed Source Capacity and Needed Storage Volume.

(a) Whenever possible, needed source capacity and needed storage volume shall be determined from existing water use records of the water system.

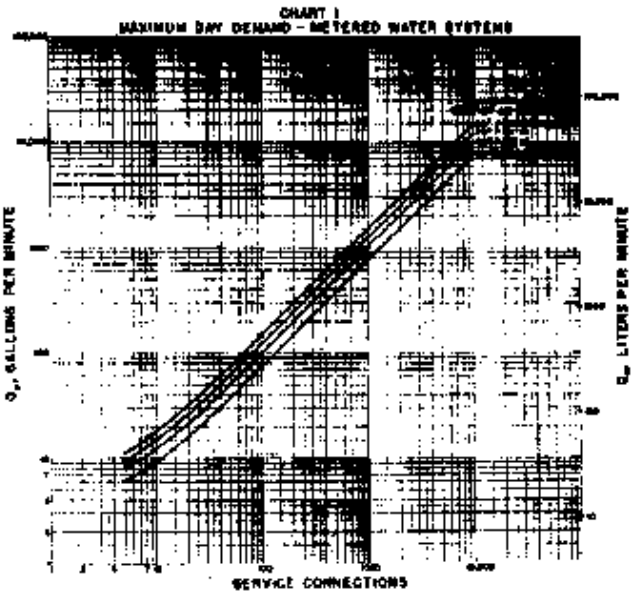
The records used shall clearly indicate total source capacity, total storage volume and maximum day demand of previous years.

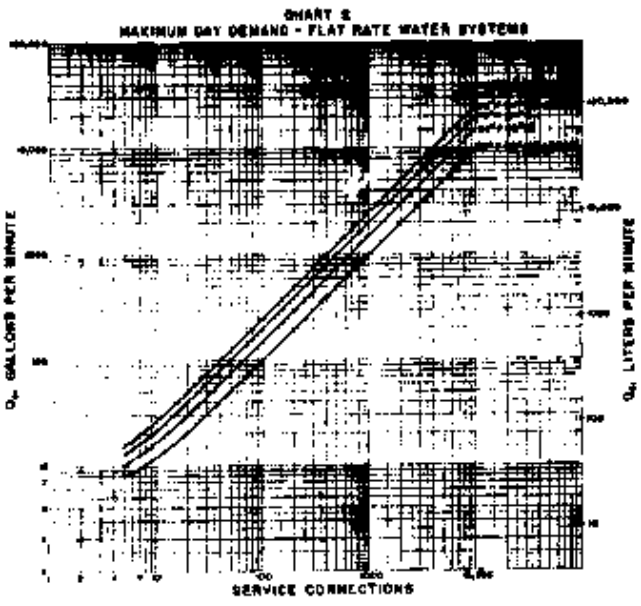
The existing records of the water system may be supplemented as needed by the records of a similar water system acceptable to either the Department or a qualified registered engineer.

(b) When the existing records of the water system are inadequate to determine these values and no records of a similar water system can be found to supplement the existing records, the maximum day demand, the needed source capacity and the needed storage volume for typical residential and general commercial areas (without provisions for fire flow) shall be determined as follows:

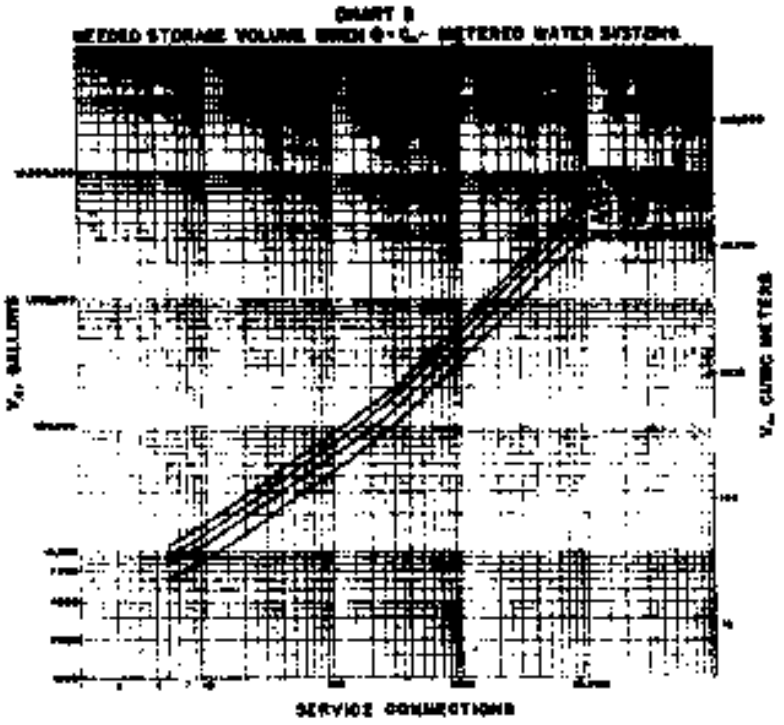
(1) Determine the maximum day demand (Qo) from Chart 1 or Chart 2.
(2) When the total capacity of the existing sources equals the maximum day demand (Qo), the needed storage volume (Vo) to meet peak demand during the day shall be determined from Chart 3 or Chart 4.
(3) When the total storage volume of the existing reservoirs (V) is less than the needed storage volume (Vo), the existing sources shall be supplemented so that the needed source capacity (Q) is met. For a metered water system, Q = Qo (2.5-1.5V/Vo) or for a flat rate water system, Q = Qo (2-V/Vo).
(c) The needed source capacity and needed storage volume determined under (b) may be modified, with the approval of the Department, to reflect local conditions such as climate, community type and kinds of users. Unless the Department's written approval is obtained, the needed source capacity shall not be less than the maximum day demand.
(d) The data used and the calculation made by the water supplier to determine whether sufficient water is available to accommodate additions to the systems must be kept and are subject to the Department review and approval at its discretion.

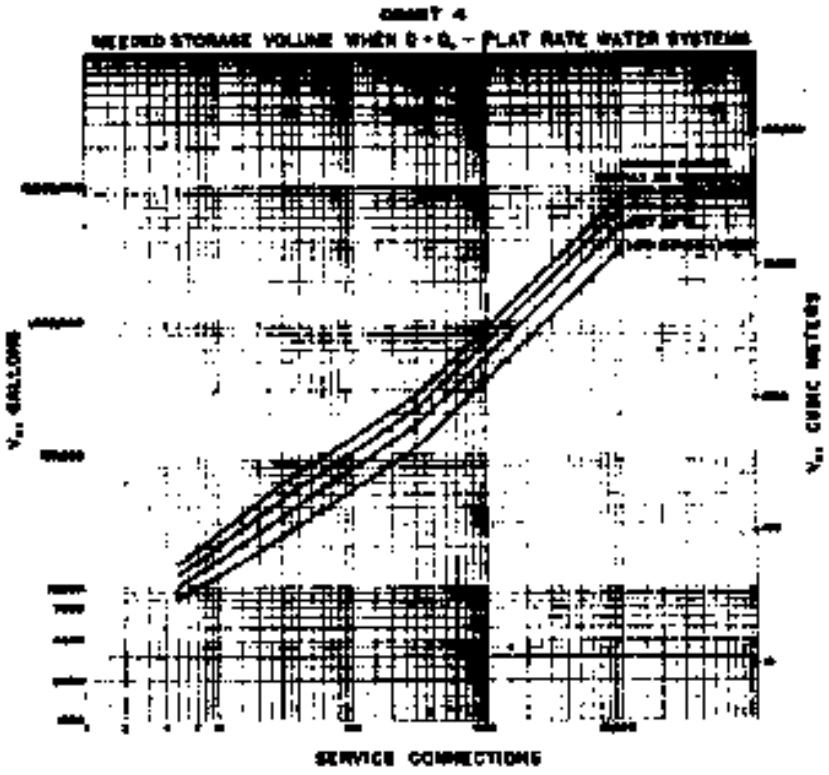
NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.





HISTORY
1. Amendment filed 10-9-85; effective thirtieth day thereafter (Register 85, No. 42).





§64565. Department Approval of Source and Storage Capacities.

NOTE

Authority cited: Sections 208, 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

HISTORY

1. Repealer filed 10-9-85; effective thirtieth day thereafter (Register 85, No. 42).

§64566. System Pressure.

(a) Changes in distribution systems shall be designed to maintain an operating pressure at all service connections of not less than 20 pounds per square inch gauge (psig) (140 kiloPascals gauge (kPag)) under the following demand conditions:
(1) User maximum hour demand.
(2) User average day demand plus design fire flow.
(b) In a public water system supplying users at widely varying elevations, a water supplier may furnish a service to a user which does not comply with (a) if the user is fully advised of the conditions under which minimum service may be expected and the user's agreement is secured in writing. This waiver shall be applicable only to individual service connections.
(c) Water mains shall be designed to have at least five psig (35 kPag) pressure throughout any buried length of the main except when the main is removed from service for repairs or maintenance. This requirement shall not apply to short lengths of water main near reservoir inlets and outlets provided:
(1) The water main is on premises owned, leased or controlled by the water supplier; or
(2) The prior review and written approval of the Department is obtained.

NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

§64568. Conditions for Adding Service Connections.

A new service connection may be added to a distribution system only if the water system will comply with Section 64562 after the new service connection is added and adding the new service connection will not cause pressure at an existing service connection to be reduced below the standards set in Section 64566.

NOTE

Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

§64570. Internal Combustion Engines.

(a) Where water cooling jackets for internal combustion engines are connected to water mains, the jacket shall be designed so that the water pressure inside the water main at the cooling jacket will at all times be greater than the engine coolant pressure.
(b) Backflow protection of the public water system shall be provided wherever makeup water is supplied to the cooling system of an internal combustion engine.

NOTE
Authority cited: Sections 208 and 4010.1 (h), Health and Safety Code. Reference: Sections 4010.1 (h), 4012, 4013 and 4019, Health and Safety Code.

HISTORY
1. Amendment filed 10-9-85; effective thirtieth day thereafter (Register 85, No. 42).

APPENDIX D

DECEMBER 18, 2003 MEMORANDUM: WATER SYSTEM MASTER PLAN DESIGN CRITERIA

MEMORANDUM

DATE: December 18, 2003

TO: George F. Irving, District Manager

FROM: Tanya Yurovsky, District Engineer

SUBJECT: Water System Master Plan Design Criteria - Engineer's Report

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SUMMARY

Based on the requirements stipulated in the Department of Health Services (DHS) permit and the CIP framework, the Board authorized a Water System Master Plan Update with the purpose of addressing the water supply issues in the water system. In order to develop a comprehensive Master Plan Update, standard operational and design criteria must be established and approved by the Board.

The purpose of this report is to propose the following for the Board's consideration:

- Draft water system operational and planning/design criteria,
- Basis for evaluating the existing water system, and
- Guidelines for planning and design of system improvements required to meet the CIP goals.

BACKGROUND

The Water System Capital Improvements Program (CIP) adopted by the Board on June 19, 2003, established the framework for capital improvements to the water system for the next three years. The CIP provided a view of the capital projects required over the next 3 years to ensure adequate water resources and meet the service needs of the District customers. The CIP approach provided an opportunity for the District to prioritize capital expenditures, manage cash flow, and project funding requirements. The CIP combines the short-term and long-term improvements thus allowing the District to address the goal of rehabilitating the Water System and bringing it up to the industry standards. A separate Board authorization is required to implement projects included in the CIP.

INTRODUCTION

To ensure adequate pressure, flow, redundancy, and reliability of the water system, standard operational and design criteria must be established. The design criteria will also be used to assess the capabilities of the existing system, evaluate alternative improvements, and develop a list of recommended projects with a detailed implementation schedule.

DISCUSSION

Water System CIP

The CIP is organized into three separate program areas, each representing a different function of the District's Water System. Organizing projects by function allows the CIP to be viewed as a series of programs for improvements in specific areas of District responsibility. A discussion of the three programs follows.

Water Resources Development. This program includes capital projects required for ensuring reliable water supply capacity for the District customers. The purpose of this program is to address the shortage of reliable supply currently estimated between 160 and 200 gallons per minute (gpm). In addition, this program will address the existing water quality issues as mandated by the State Department of Health Services (DHS).

Storage and Pumping Improvements. This program intends to address the existing water storage and fire flow deficiencies. Additional storage is required to address the Water System needs and meet the regulatory requirements.

Water Main Replacement Projects. The existing distribution system consists of pipelines of various ages and materials of construction, including 67 percent of asbestos cement pipe. The system demonstrates high water losses of over 11 percent. This program establishes a plan of replacing substandard water mains with recorded high emergency outages and repair rates.

Prioritization Criteria

Establishment of the prioritization criteria creates a foundation for the District decision-making process and ensures adequate funding for the improvements required. The criteria provide a method to rate the relative importance of a particular project based upon factors such as protection of public health, employee safety, legal and regulatory requirements, and funding constraints. These criteria establish which projects should be implemented in any given year and over the CIP planning horizon. The Prioritization Criteria are represented by three project levels listed from most to least critical for implementation.

- **Level 1, Mandatory Projects:** **"**Must do", highest priority. District has little or no control to defer. May include projects funded by others, if any.
    - Projects required by law/legislation, regulations;
    - Projects protecting health and safety of employees and the public;

Examples:

- Department of Health Services mandated projects to comply with drinking water regulations;
- Projects mandated by other regulatory agencies;
- Projects already under construction.

- **Level 2, Necessary Projects:** Must be done. District has moderate level of control over the timing of implementation.

Examples:

  - Projects required for providing adequate emergency storage and meeting fire flow requirements;
  - Projects reducing water system losses and reducing pipeline leaks.

- **Level 3, Discretionary Projects:** Should be done. District has significant level of control over the timing of implementation.

Examples:

  - Projects with implementation schedule beyond the current 3-year planning horizon;
  - Projects that are required but can be deferred to a later date.

Water System Planning and Design Criteria

The planning and design criteria proposed for the water system include minimum design requirements for the distribution pipelines and storage facilities. These include the demand factors, and storage facility and pipeline sizing and material selection. Table below provides a summary of the proposed criteria.

Recommended Water Facility Planning and Design Criteria

PLANNING	
Maximum Day Demand Factor (Number x Average Day Demand)	1.5
Peak Hour Demand Factor (Number x Maximum Day Demand)	1.75
Storage Facility Sizing • Emergency Storage • Operational Storage • Fire Storage	 2 maximum day 0.25 maximum day fire flow x duration
Pipeline Sizing • Minimum Diameter, inches • Friction Factor (Hazen Williams "C") o DIP o PVC Pipe	 6 120 130
DESIGN	
Average Demand Conditions • Pressure, psi • Headloss, ft/1,000 ft • Velocity, fps	 50 no higher than 3 no higher than 5
Maximum Day Demand Conditions • Pressure, psi • Headloss, ft/1,000 ft • Velocity, fps	 50 no higher than 5 no higher than 7
Peak Hour Demand Conditions • Pressure, psi • Headloss, ft/1,000 ft • Velocity, fps	 40 no higher than 7 no higher than 8
Fire Flow Demand Conditions • Pressure, psi • Headloss, ft/1,000 ft • Velocity, fps	 20 no higher than 10 no higher than 12
Storage Facilities • Construction • Type	 Steel Above Ground
Pipelines • Material • Depth of Cover, minimum, ft	 PVC or DIP 4

Notes:

1. PVC — Polyvinylchloride Pipe
2. DIP — Ductile Iron Pipe
3. psi — Pounds per Square Inch
4. fps — Feet per Second
5. ft/1,000 ft — Feet per 1,000 Feet

Storage Requirements

Storage requirements comprise from the following three major components:

- Operational Storage,
- Emergency Storage, and
- Fire Storage

Operational Storage. Water demands vary over the 24-hour period. Higher demands occur during the morning and evening hours declining to a nominal baseline during the day. Operational storage is the storage volume used to meet the daily demand variations. Typically, water supply sources such as treatment plants and groundwater wells operate at a constant rate during the 24-hour period. This constant flow is augmented by flow from storage reservoirs during peak demand periods, lowering the storage volume. The storage tanks are then refilled when the demands drop below the constant production rate. Typically, water systems are planned and designed to hold in reserve about 25 percent of the water used during a maximum day demand. With current maximum day demand of 475 gallons per minute (gpm) this amounts to an operational storage requirement of 171,000 gallons.

Emergency Storage. A reserve of potable water is required to meet demands during emergency outage periods when normal supply is interrupted due to a natural disaster (seismic event, floods), power failure, loss of supply, loss of treatment, or a scheduled outage for repair and maintenance. A storage volume equivalent to two maximum days is recommended for the water system. This storage volume amounts to 1,368,000 gallons.

Fire Storage. Fire fighting storage requirements are identified in the National Fire Code, the Insurance Service Office guidelines, and the local Fire Department. The storage requirements are based on the flow requirements and duration of the fire. The highest fire requirement for the District's service area includes fire flows of 2,000 gpm for two-hour duration, equating to a storage volume requirement of 240,000 gallons.

The total storage requirement under these criteria amounts to 1,779,000. With the existing storage of 662,000 gallons, additional 1,117,000 gallons are required.

NEXT STEPS

The following presents a summary of the next steps required for the Water System Master Plan Update:

- Present Draft Water System Criteria to the Board — December 18, 2003
- Present Draft Master Plan Update to the Board — January 15, 2004
- Present Master Plan Update to DHS — January 2004