SECTION 4

WATER USE

4-1 Historic Water Production

The City obtains its water supply through groundwater wells in the West Coast Basin and a connection that supplies imported water from Metropolitan Water District of Southern California (MWD). The City currently owns two wells in the West Coast Basin (Well 11A and Well 15).

The total annual water production from July 1995 to June 2009 is shown in Table 4-1 and on Figure 4-1. Figure 4-2 illustrates the historic water production by month. Over the last fourteen fiscal years, the annual production has averaged a total of 6,687 acre feet per year (AFY) {5.97 million gallons per day (mgd); 4,146 gallons per minute (gpm); 9.45 cubic feet per second (cfs)}. The average production from the West Coast Basin is 1,023 AFY. The City's adjudicated groundwater right is 1,131 AFY, which does not include any leased water or any surplus water from the previous years. The average amount of imported water purchased is 5,664 AFY.

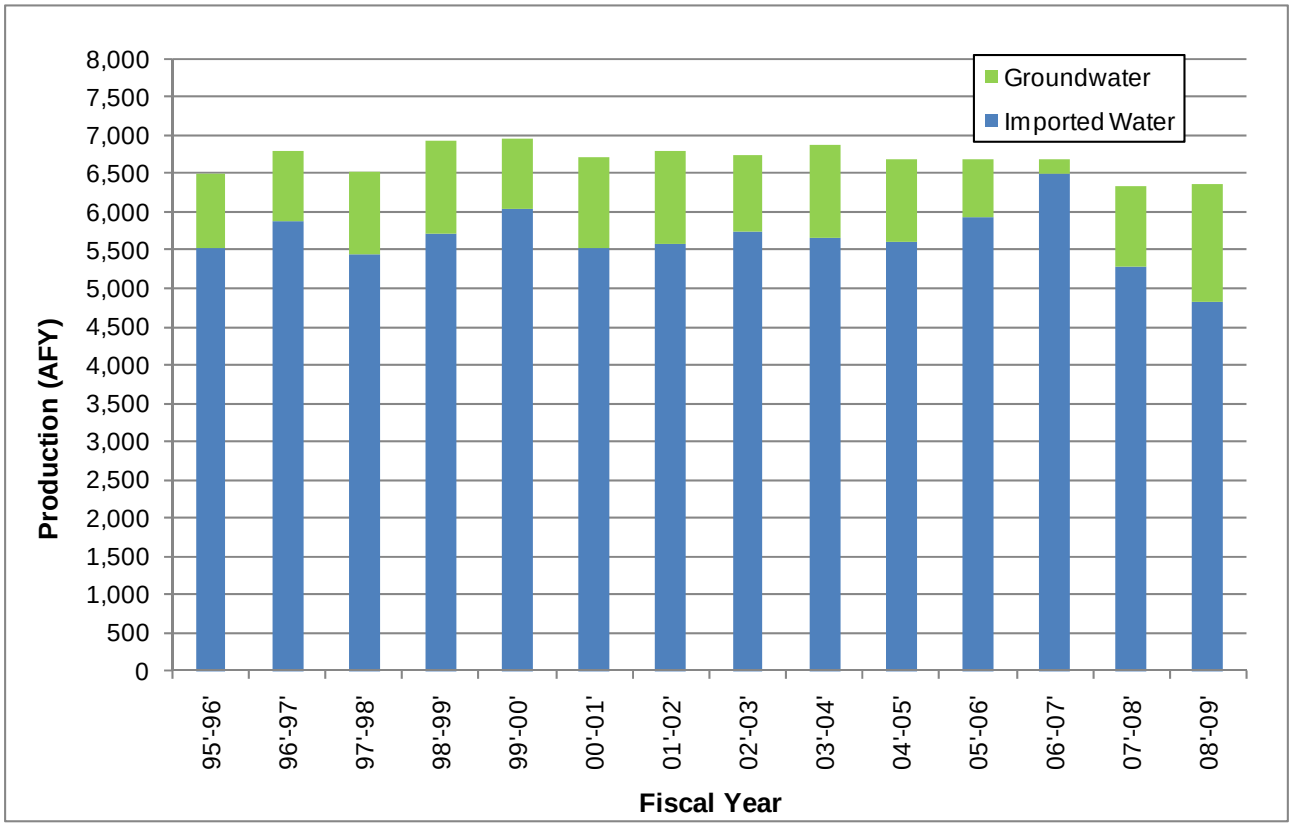
Generally, the total water use has been steady, with minor variations from year to year. Large annual variations are not expected because the service area has been mostly developed, and because of the mild climate resulting from the City's proximity to the Pacific Ocean. There has been a slight decrease in water use over the past two fiscal years. This may be attributed to a very conscientious water conservation effort by the public. Water conservation is discussed further in Section 4-10.

Table 4-1
Historic Water Production (Annual)

Fiscal Year	Imported Purchased (AFY)	Imported Purchased (mgd)	Imported % of Total	Groundwater Production (AFY)	Groundwater Production (mgd)	Groundwater % of Total	Total (AFY)
95'-96'	5,532	4.94	85	973	0.87	15	6,505
96'-97'	5,883	5.25	86	920	0.82	14	6,803
97'-98'	5,445	4.86	83	1,078	0.96	17	6,523
98'-99'	5,718	5.10	82	1,214	1.08	18	6,932
99'-00'	6,033	5.39	87	927	0.83	13	6,960
00'-01'	5,537	4.94	82	1,180	1.05	18	6,718
01'-02'	5,582	4.98	82	1,202	1.07	18	6,784
02'-03'	5,748	5.13	85	1,005	0.90	15	6,753
03'-04'	5,670	5.06	83	1,193	1.07	17	6,863
04'-05'	5,620	5.02	84	1,079	0.96	16	6,699
05'-06'	5,929	5.29	89	770	0.69	11	6,699
06'-07'	6,498	5.80	97	194	0.17	3	6,692
07'-08'	5,278	4.71	83	1,059	0.95	17	6,337
08'-09'	4,822	4.31	76	1,534	1.37	24	6,356
Average	**5,664**	**5.06**	**85**	**1,023**	**0.91**	**15**	**6,687**

** Data extracted from annual Department of Water Resources Public Water System Statistics Reports*

Figure 4-1
Historical Water Production (Annual)

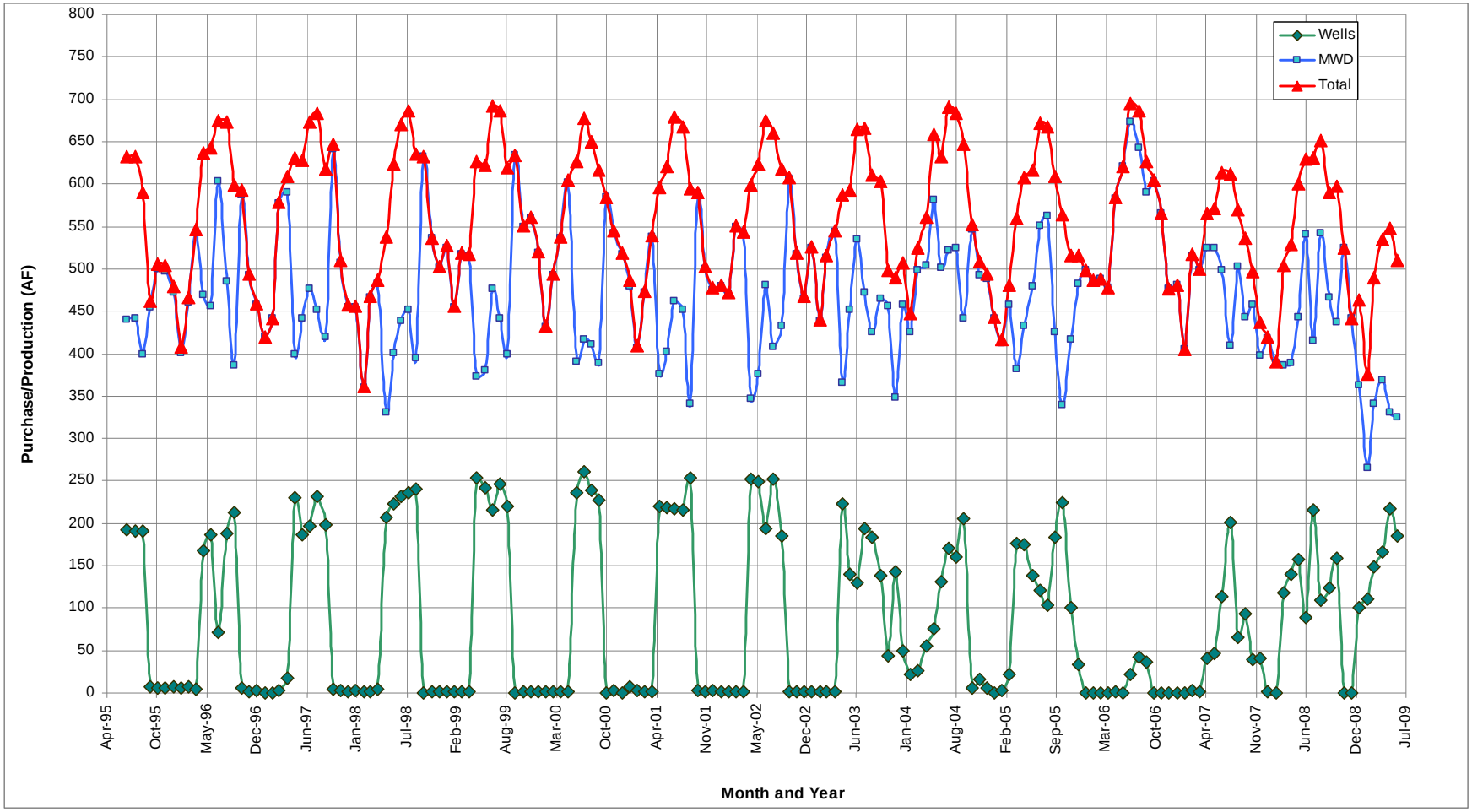


**Data extracted from annual Department of Water Resources Public Water System Statistics Reports*

4-2 Water Consumption versus Water Purchase/Production

The City typically purchases/produces more water than the quantity measured by the customer meters. Table 4-2 summarizes the difference between the measured consumption and production from FY 95-96 to FY 08-09. On average 96 percent of the water produced and purchased each year was used by consumers. Approximately 4 percent of the water supply is unaccounted for each year. The discrepancy is partly due to the differences in the accuracies of the few large meters which measure purchases and production, and the thousands of small customer meters which measure sales. Unaccounted for water can also be due to unmeasured uses such as water main flushing and other maintenance related tasks. The remainder may be due to leaks from the system. Although the unaccounted for water rate reached as high as 8.8 percent, the average unaccounted for water rate of 4.1 percent is well within the industry standard.

Figure 4-2
Historical Water Purchase/Production (Monthly)



**Data extracted from annual Department of Water Resources Public Water System Statistics Reports*

Table 4-2
Water Consumption versus Water Purchase/Production

Fiscal Year	Water Consumption (AFY)	Water Purchase/ Production (AFY)	Percent Unaccounted For Water	Population	Per Capita Consumption (GPD/Person)
95'-96'	6,040	6,505	7.1	32,063	168
96'-97'	6,478	6,803	4.8		
97'-98'	6,362	6,523	2.5		
98'-99'	6,371	6,932	8.1		
99'-00'	6,688	6,960	3.9		
00'-01'	6,447	6,719	4.1	33,852	170
01'-02'	6,358	6,784	6.3		
02'-03'	6,422	6,753	4.9		
03'-04'	6,258	6,863	8.8		
04'-05'	6,424	6,699	4.1		
05'-06'	6,733	6,699	-0.5		
06'-07'	6,611	6,692	1.2		
07'-08'	6,458	6,337	-1.9		
08'-09'	N.A.	6,358	N.A.	36,718	
Average	**6,435**	**6,688**	**4.1**		

4-3 Water Demand Variations

Demand variations through a year are influenced by seasonal effects such as temperature, humidity, and precipitation. Due to its proximity to the Pacific Ocean, such variations are quite moderate for the City.

System demand variations throughout a day are influenced by the customer base and the daily lifestyles of the customers. In a service area such as the City's, the peak demands within a day occur in the morning hours between 6:00 am and 9:00 am, when customers wake to begin their daily routine and significant landscape irrigation takes place. For this study, the variations are expressed as a ratio to the average demand, with the average demand being equal to one.

4-4 Monthly Demand Variations

Typical of most Southern California communities, the City's water consumption exhibits a distinct seasonal pattern. Peak and low monthly consumption occur during the dry summer months and wet winter months, respectively. Monthly demand totals for FY 95-96 to FY 08-09 are shown in Table 4-3. Peak demands typically occur in July and August. Low demands typically occur in January and February. The highest and lowest monthly demand factors seen in Table 4-3 are 1.26 and 0.66, respectively. A graph of the monthly demand factors (monthly demand/average monthly demand) by water year is illustrated on Figure 4-3.

Table 4-3
Monthly Water Demands (AF)

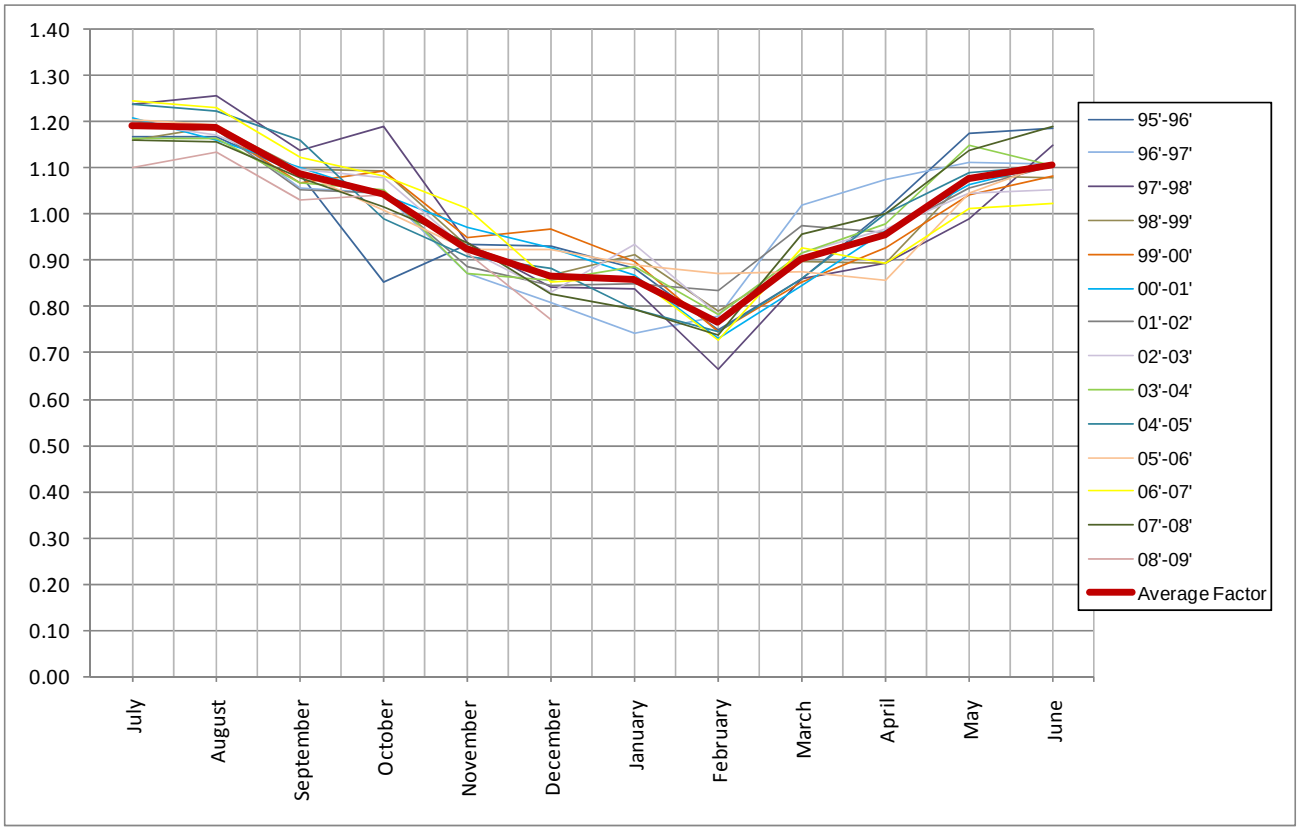
Month	95'-96'	Factor	96'-97'	Factor	97'-98'	Factor	98'-99'	Factor	99'-00'	Factor	00'-01'	Factor	01'-02'	Factor
July	632	1.17	675	1.19	673	1.24	670	1.16	692	1.19	677	1.21	679	1.20
August	633	1.17	674	1.19	684	1.26	687	1.19	687	1.18	650	1.16	668	1.18
September	590	1.09	599	1.06	619	1.14	635	1.10	619	1.07	616	1.10	595	1.05
October	462	0.85	593	1.05	646	1.19	633	1.10	634	1.09	584	1.04	590	1.04
November	506	0.93	494	0.87	510	0.94	537	0.93	551	0.95	544	0.97	502	0.89
December	504	0.93	460	0.81	457	0.84	503	0.87	561	0.97	519	0.93	478	0.85
January	479	0.88	420	0.74	456	0.84	527	0.91	520	0.90	487	0.87	481	0.85
February	407	0.75	442	0.78	361	0.66	456	0.79	433	0.75	410	0.73	472	0.83
March	467	0.86	579	1.02	468	0.86	519	0.90	495	0.85	474	0.85	551	0.98
April	546	1.01	609	1.07	487	0.90	517	0.90	538	0.93	540	0.96	544	0.96
May	636	1.17	630	1.11	538	0.99	626	1.08	604	1.04	596	1.06	598	1.06
June	643	1.19	628	1.11	624	1.15	622	1.08	627	1.08	621	1.11	624	1.10
Average	**542**		**567**		**544**		**578**		**580**		**560**		**565**	

Month	02'-03'	Factor	03'-04'	Factor	04'-05'	Factor	05'-06'	Factor	06'-07'	Factor	07'-08'	Factor	08'-09'	Factor	Average Factor
July	674	1.20	665	1.16	691	1.24	672	1.20	695	1.25	613	1.16	631	1.17	1.20
August	660	1.17	666	1.16	684	1.23	667	1.19	686	1.23	612	1.16	651	1.20	1.19
September	618	1.10	610	1.07	647	1.16	610	1.09	627	1.12	570	1.08	591	1.09	1.09
October	608	1.08	603	1.05	552	0.99	564	1.01	604	1.08	536	1.02	597	1.11	1.05
November	519	0.92	499	0.87	508	0.91	516	0.92	565	1.01	496	0.94	525	0.97	0.93
December	467	0.83	490	0.86	493	0.88	515	0.92	476	0.85	438	0.83	442	0.82	0.87
January	527	0.94	507	0.89	442	0.79	498	0.89	482	0.86	420	0.79	482	0.89	0.86
February	440	0.78	448	0.78	416	0.75	486	0.87	405	0.73	390	0.74	406	0.75	0.76
March	515	0.92	524	0.92	481	0.86	488	0.87	517	0.93	504	0.96	518	0.96	0.91
April	545	0.97	560	0.98	559	1.00	478	0.86	499	0.90	529	1.00	500	0.93	0.95
May	588	1.04	658	1.15	608	1.09	584	1.05	565	1.01	600	1.14	566	1.05	1.08
June	593	1.05	633	1.11	617	1.10	621	1.11	571	1.02	629	1.19	572	1.06	1.10
Average	**563**		**572**		**558**		**558**		**558**		**528**		**540**		

Notes: Peak factors are highlighted in red

Data extracted from annual Department of Water Resources Public Water System Statistics Reports

Figure 4-3
Monthly Demand Factors



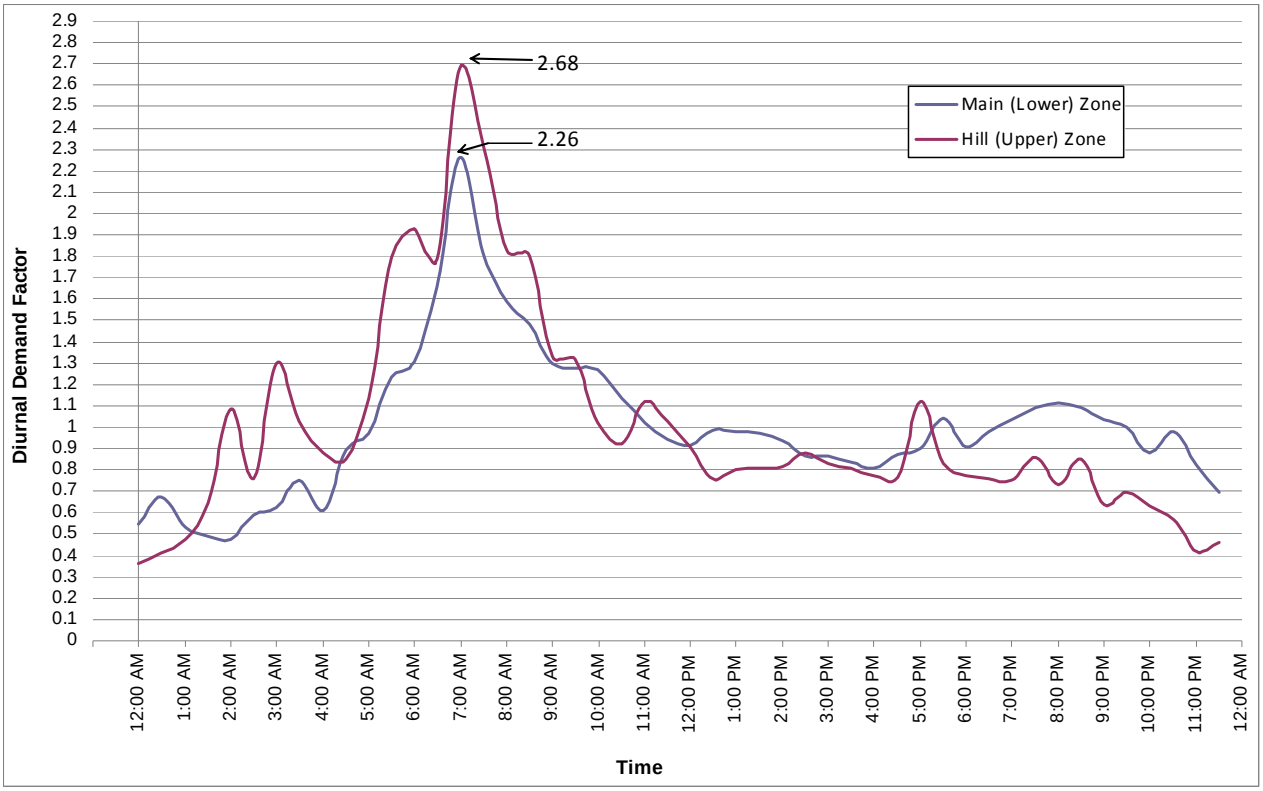
4-5 Hourly Demand Variations

Knowledge of accurate demand variations over a 24-hour period is essential for proper analysis of water systems. For this study, hourly demand variations were represented by the development of a diurnal demand curve for each pressure zone. The diurnal demand curves are employed in determining the adequacy of the sources of supply, pumping facilities, reservoirs, and the transmission/distribution facilities.

The hourly water usage in each zone was determined based upon data collected from the City's SCADA system on March 22, 2010. The facility flow meters, pump flows, and water levels in the reservoirs were utilized in calculating the total system demand in 30-minute increments over a 24-hour period. The diurnal demand curves developed are shown on Figure 4-4.

In the Main or Lower Zone, the peak hour demand is approximately 2.26 times the average demand and occurs in the morning hours around 7:00 am. In the Hill or Upper Zone, the peak hour demand is approximately 2.68 times the average demand and occurs in the morning hours around 7:00 am.

Figure 4-4
Diurnal Curves



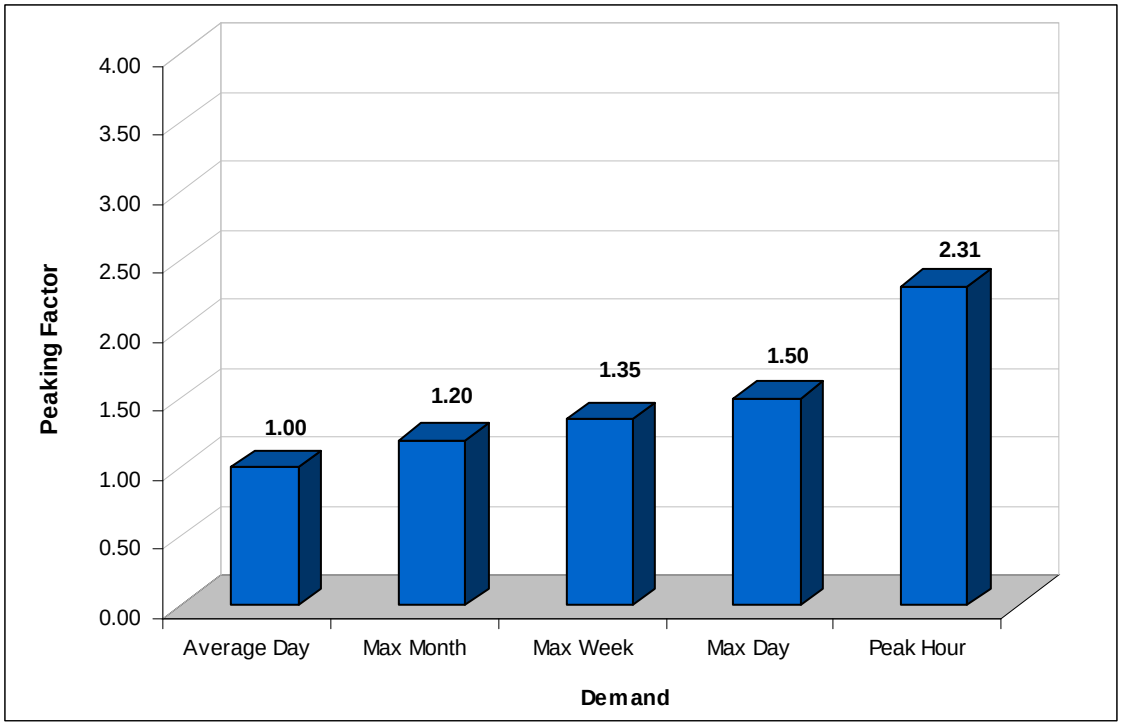
4-6 System Demands and Peaking Factors

It is important to evaluate a water system during various incremental peak demands. Typically, a water system is designed to meet the maximum demands placed on it. The system components must be designed to cope with these demands as they occur. Maximum month and maximum day demands are important factors in sizing a system's supply capability. Maximum day demands usually dictate the design criteria for both system transmission and storage needs. Peak hour criterion is a measure of the system's overall adequacy with respect to its transmission and distribution elements, as well as its operational storage capacity. The City of Manhattan Beach water system demands utilized in this study are shown in Table 4-4. The relationships between the peaking factors developed for this study with respect to the average day demand estimate are displayed graphically on Figure 4-5.

Table 4-4
Water System Demands and Peaking Factors

Demand Description	Existing Demand			Peaking Factor
	(gpm)	(mgd)	(AFY)	
Average Day	3,942	5.68	6,358	1.00
Max Month	4,731	6.81	7,630	1.20
Max Week	5,322	7.66	8,583	1.35
Max Day	5,913	8.52	9,537	1.50
Peak Hour	9,092	5.03	5,637	2.31

Figure 4-5
Water Demand Peaking Factors



Existing Demands

Average Day

The average day demand is based on the City of Manhattan Beach's average daily purchase/production records for FY 07'-08'. As shown in Table 4-2 and 4-4, the average day demand is approximately 3,942 gpm.

Maximum Month

The maximum month peaking factor was determined from the annual production and consumption records. Based on the historical records from FY 95'-96' to FY 08'-09', the maximum month usage is about 1.2 times the average month and typically occurs in July or August. The maximum month demand is estimated at approximately 4,731 gpm.

Maximum Week

The maximum week demands are estimated to be approximately 1.35 times the average day demand or 5,322 gpm.

Maximum Day

The maximum day demands are estimated to be approximately 1.5 times the average day demand or 5,913 gpm.

Peak Hour

The peak hour demands were based upon the diurnal demand curves illustrated on Figure 4-4. The overall peak hour system demand is estimated to be 2.31 times the average day demand or about 9,092 gpm. The

Main pressure zone has a slightly lower factor of 2.26. The Hill pressure zone has a slightly higher peak hour factor of 2.68. Estimates of the peak hour demands by zone are shown in Table 4-5.

Table 4-5
Water System Demands by Zone

Zone	Average (gpm)	Max Month (gpm)	Max Week (gpm)	Max Day (gpm)	Peak Hour (gpm)
Main or Low	3,688	4,426	4,979	5,532	8,335
Hill or High	252	302	340	378	675

Ultimate Demands

Because the City is nearly developed, a large increase in population and water demands is not expected. The total City population increased from 36,505 persons in 2008 to 36,718 persons in 2009 *(Ref: California Department of Finance Demographic Research Unit).* This is an increase of less than 0.6 percent. In addition, any incremental increase in water demands will most likely be offset by conservation efforts. As shown in Table 4-2, water consumption has been declining since FY 05'-06'. Therefore, the ultimate demands are expected to be similar to the existing demands for this study.

4-7 High Water Users

The City's high water users are listed in Table 4-6.

Table 4-6
High Water Users

Address	Account Number	Description	Meter Description	Water Meter Consumption Average (Gallons Per Day)
1831 MARINE AVE	94000101005	Northrup	10" WATER	168,600
1400 PARKVIEW AVE (fire)	94009425002	Manhattan Village Hotel	8" WATER	51,820
1500 ROSECRANS AVE	94050000104	Continental 1500 Rosecrans LLC	3" WATER	19,900
1330 PARKVIEW AVE	94009400100	Manhattan Village	2" WATER	19,850
479 33RD ST (city)	43069711008		2" LANDSCAPE	14,990
2414 SEPULVEDA BLVD	98056002203	Car Wash	2" WATER	14,610
2700 SEPULVEDA BLVD	94003400009	Manhattan Village Mall	2" WATER	14,190
3500 SEPULVEDA BLVD (fire)	94020211306	Manhattan Village Mass	2" LANDSCAPE	12,950
1230 ROSECRANS AVE	57038000106	HSOV Manhattan Towers	4" WATER	11,940
1550 ROSECRANS AVE #A	94061122000	Manhattan Village	2" WATER	11,170
1312 PACIFIC AVE	53074111000	School	4" WATER	10,900
1600 MEADOWS AVE	97009111009	School	3" WATER	10,700
VILLAGE CIR/CTR	10111500108	Home Owner Association	2" LANDSCAPE	10,290
1440 ROSECRANS AVE	94000160100	Hughes Aircraft	3" WATER	10,130
3280 SEPULVEDA BLVD	94020522000	Manhattan Village	2" WATER	10,100
1441 15TH ST	88030611007	School	3" WATER	9,495
300 S SEPULVEDA BLVD	89006201400	Pro Thro Enterprises	2" WATER	9,255
1138 HIGHLAND AVE	27001103003	Carey Zetoun 2004 Trust	1.5" WATER	8,763
80 S MORNINGSIDE DR	22046001002	School	3" WATER	8,618

Table 4-6
High Water Users (Continued)

Address	Account Number	Description	Meter Description	Water Meter Consumption Average (Gallons Per Day)
8 WESTPORT #1/2	10160000100	Home Owner Association	2" LANDSCAPE	8,615
101 MAN BCH BLVD	94003201005	Public Facility	2" WATER	8,069
225 26TH ST (city)	37042891002	Park	2" LANDSCAPE	7,785
3400 VALLEY DR	57031101102	High Density Residential	2" WATER	7,656
975 AVIATION BLVD	80098000109	Commercial	1" WATER	7,170
1500 SEPULVEDA BLVD	98049001108	Commercial	2" WATER	7,111
1501 POINSETTIA AVE	52067001002	School	2" LANDSCAPE	6,807
1800 ROSECRANS AVE	94001201001	1800 Rosecrans Partners, LLC	2" LANDSCAPE	6,798
3615 HIGHLAND AVE	38060501100	Abbjohn Inc.	1" WATER	6,415
1865 MAN BCH BLVD	90000102204	Commercial	2" WATER	6,355
1426 8TH ST (city)	84173001006	Public Facility	2" LANDSCAPE	6,336
2620 SEPULVEDA BLVD #B	94021950001	Manhattan Village	2" WATER	6,216
2610 SEPULVEDA BLVD	94021850100	Manhattan Village Mall	2" LANDSCAPE	6,016
12 VILLAGE CENTER DR	11010500201	Home Owner Association	2" LANDSCAPE	5,940
900 SEPULVEDA BLVD	85205901100	Hotel	2" WATER	5,933
3600 SEPULVEDA BLVD	57037602400	Commercial	2" WATER	5,862
1 PORTSMOUTH WAY	10000000108	Home Owner Association	2" LANDSCAPE	5,507
1144 PACIFIC AVE	53072701003	School	2" LANDSCAPE	5,375
3501 SEPULVEDA BLVD	94003251304	Hotel	4" WATER	5,368
1800 ROSECRANS AVE #F	94001806000	Manhattan Village	2" WATER	5,328
19 SAUSALITO CIR	11060170000	Home Owner Association	2" WATER	5,305
E SIDE GATEWAY DR	11010000206	Home Owner Association	2" LANDSCAPE	5,295
1150 TENNYSON ST	89044201205	Lane 4 Backstroker	2" WATER	5,082
30 SANTA CRUZ CT	10311450104	Home Owner Association	2" WATER	5,063
3621 BELL AVE	62009201001	Public Facility	2" WATER	4,775
4200 OCEAN DR (Co)	17125000005	LA County	2" WATER	4,730
2617 BELL AVE	66071611006	School	3" WATER	4,517
400 S SEPULVEDA BLVD	89002301101		2" WATER	4,373
1658 MAN BCH BLVD	83139901008		2" WATER	4,362
111 N SEPULVEDA BLVD	71063501308	SHEET METAL WORKERS PEN	3" WATER	4,314

4-8 Unit Flow Factors

The water system demands used in this study were based upon the City's annual production and purchase records as described in Section 4-2. Detailed water meter data was utilized to distribute the demands in the hydraulic model. This is the most accurate way to distribute the demands and inherently account for high water users.

Sometimes it is necessary to calculate water use based upon the number of dwelling units or by acreage, especially in new development or redevelopment areas. Although unit flow factors were not used in developing the hydraulic model for this Water Master Plan, they are presented in Table 4-7 for the City's use in developing future demand estimates for new projects. The unit flow factors are based upon the detailed water meter data provided for this study. It should be noted that the factors are based on the average water use for each customer class and have been adjusted for unaccounted water. In actuality, the water use varies from customer to customer. These factors should only be utilized in lieu of more detailed data.

Table 4-7
Unit Flow Factors

Land Use	Unit Flow Factor	Units
Low Density Residential	432	gpd/du
Medium Density Residential	280	gpd/du
High Density Residential	298	gpd/du
General Commercial	3,595	gpd/ac
Downtown Commercial	6,952	gpd/ac
Local Commercial	3,186	gpd/ac
Mixed-Use Commercial	1,266	gpd/ac
Manhattan Village Commercial	3,266	gpd/ac
North End Commercial	8,399	gpd/ac
Industrial	3,517	gpd/ac
Public Facilities	852	gpd/ac

4-9 Recycled Water

Currently, the City utilizes approximately 298 AFY of recycled water supplied by the WBMWD's recycled water system. The existing recycled water users are listed in Table 4-8. WBMWD is currently planning an additional 46 AFY recycled water supply for two users within the City or Manhattan Beach. These are the Marriot Golf Course (42 AFY) and Manhattan Heights Park (4 AFY).

Table 4-8
Existing Manhattan Beach Recycled Water Users

User Name	Existing/ Potential	Usage Type	Total Average (AFY)	User Name	Existing/ Potential	Usage Type	Total Average (AFY)
Mira Costa High School	Existing	Irrigation	38	Valley/Ardmore Greenbelt @ M.B.B.S.	Existing	Irrigation	7
Polliwog Park	Existing	Irrigation	33	Meadows Elementary School	Existing	Irrigation	6
Marine Avenue Park	Existing	Irrigation	19	Valley/Ardmore Greenbelt @ 8th St	Existing	Irrigation	5
Grandview Elementary / Ladera	Existing	Irrigation	18	Marine & Sepulveda Median	Existing	Irrigation	4
Pennekamp Elementary School	Existing	Irrigation	18	Marine Avenue Median	Existing	Irrigation	4
Sports Park	Existing	Irrigation	15	MB Fire & Police Landscape	Existing	Irrigation	4
Mar Brad Middle School - La Marina Field	Existing	Irrigation	14	Valley/Ardmore Greenbelt @ 15th St	Existing	Irrigation	3
Valley/Ardmore Greenbelt @ 19th St	Existing	Irrigation	14	Live Oak Park	Existing	Irrigation	2
Manhattan Studios	Existing	Irrigation	12	Marine & Herrin Median	Existing	Irrigation	2
MB Middle School (Bell Ave South of Park)	Existing	Irrigation	12	MB Unified School District Admin	Existing	Irrigation	2
Manhattan Village Park	Existing	Irrigation	10	Rosecrans Medians @ Pine	Existing	Irrigation	2
Marine Avenue Median	Existing	Irrigation	10	Marine Triangle Median	Existing	Irrigation	1
Valley/Ardmore Greenbelt @ 2nd	Existing	Irrigation	10	1508 Aviation	Existing	Irrigation	0.4
Valley/Ardmore Greenbelt @ Ardmore	Existing	Irrigation	9	2202 Aviation	Existing	Irrigation	0.5
Begg Elementary School	Existing	Irrigation	7	Dorsey Field	Existing	Irrigation	8.0
Robinson Elementary School	Existing	Irrigation	7	Voorhees Sump	Existing	Irrigation	0.6
						Total	**297.9**

4-10 Water Conservation

The Manhattan Beach City Council approved a Water Conservation Ordinance that became effective on July 2, 2009. Highlights of the new permanent requirements are as follows:

- Irrigation watering hours: Wednesday and Saturday only from 6 pm to 9 am for a maximum of 15 minutes per station
- No irrigation between 9 am and 6 pm
- No washing sidewalks, streets, walkways, patios, driveways, alleys or parking areas whether paved or unpaved, with a hose connected to a domestic water source
    - Exception: use of a water broom or pressure washer
- No vehicle washing
    - Exception: use of a hand-held bucket or a hose with a positive action quick release shutoff valve or nozzle
- No filling water features (i.e. fountain, pond, lake, water display)
    - Exception: unless water feature is constructed with a water recycling system
- No filling water recreation facilities (i.e. hot tub, spa, permanent swimming or wading pool)
    - Exception: unless constructed, installed or equipped with a cover to reduce water loss due to evaporation

The City itself has implemented water conservation efforts including the following:

- Installation of waterless urinals in some City facilities
- Modified irrigation systems at parks and in medians
- Upgraded some landscaping with native and more drought tolerant plants
- Constructed new fire facility to be able to capture and reuse water in its training exercises
- Promoting city-wide conservation programs on its website
- Conducting educational outreach at local events
- Implemented a tiered water rate structure to encourage water conservation

Water conservation will continue to be an important issue as California's water storage and supply remain at critically low levels and as legislative mandates for reduced water consumption become law. All urban water users will be required to achieve a 20 percent reduction in urban per capita water use in California on or before December 31, 2020. Incremental progress must be shown by reducing per capital water use by 10 percent on or before December 31, 2015.