

## 8.0 Water Demands

### 8.1 Historic and Projected Demand

Water use in the San Diego area is closely linked to the local economy, population, and weather. Over the last half century a prosperous local economy has stimulated population growth, which in turn has produced a relatively steady increase in water demand. However, fluctuating economic and weather conditions in the 1990s and lingering effects from the 1988-1992 drought resulted in deviations from historic demand patterns. By 1999, a new combination of natural population increase and job creation surfaced as the primary drivers of long-term water consumption increases.

Until FY 2000, the peak year water demand in the Authority's service area occurred in 1990, when member agency use crested at 646,645 AF. Fiscal year 2000 demands exceeded the 1990 historic peak and reached a total water use of 694,994.7 AF. Following the 1988-1992 drought, the Authority's service area experienced significant reductions in water use. This reduction in water use was attributable to several factors, including the economic recession, water conservation measures implemented by the Authority and its member agencies as a result of the 1988-92 drought, a loss of approximately 10,000 acres of avocados, and relatively plentiful rainfall. From 1996 to 1999, yearly water demand remained fairly constant at the low 600,000 AF range, (excluding the 1998 decrease, due to extreme El Niño weather conditions). **Table 8-1** shows the historic water demand within the Authority's service area. By 2020, water demands are projected to reach 813,000 AF, which is approximately a 15 percent increase above the 2000 demand of 694,995 AF.

**Table 8-1**

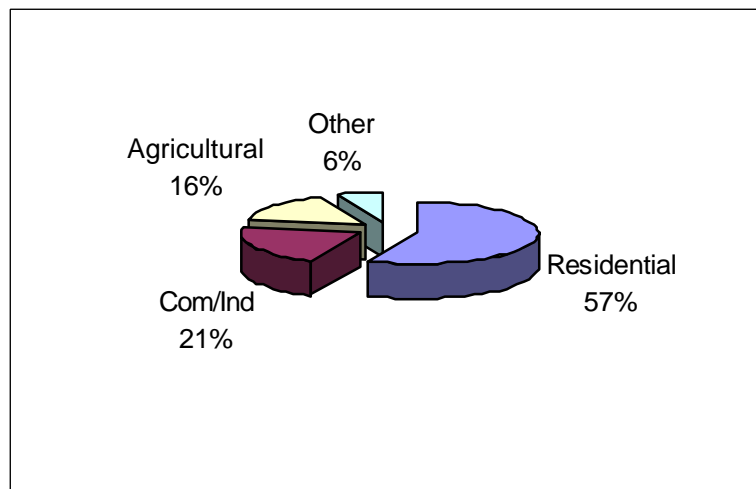
#### HISTORIC WATER DEMAND WITHIN AUTHORITY SERVICE AREA

YEAR	WATER USE (AF)
1990	646,645
1991	585,619
1992	503,210
1993	548,673
1994	536,907
1995	526,053
1996	615,900
1997	621,739
1998	562,225
1999	619,409
2000	694,995

Source: Authority Annual Reports

Demand for water in the Authority's service area is divided into two basic categories: municipal and industrial (M&I), and agricultural. M&I water is used in the residential, commercial and industrial sectors as well as agricultural customers receiving full service water. Combined, these sectors consume about 80 to 85 percent of water in the region. Depending on local rainfall, agricultural water accounts for about 15 to 20 percent of demand. The "Other" category includes water system maintenance and losses, including evaporation, meter losses ( $\pm$  errors), leaks, and seepage. **Figure 8-1** shows the relative percentages of various categories of water demand in FY 00.

**Figure 8-1**  
**FY 2000 Categories of Water Demand**



## 8.2 Municipal and Industrial Demand

M&I demand can be subdivided into residential demand (water used for human consumption in the home, domestic purposes, and residential landscaping) and water used for commercial, industrial and institutional purposes.

### 8.2.1 Residential Demand

Residential water consumption is composed of both indoor and outdoor uses. Indoor water use includes sanitation, bathing, laundry, cooking, and drinking. Residential surveys conducted in the region indicate that, depending upon the season, between 40 percent to 60 percent of all residential water is used on the landscape. Other minor outdoor uses include car washing, surface cleaning and similar activities.

Based on SANDAG data, the San Diego regional housing stock composition in 1999 was approximately 59 percent single-family homes, 36 percent multi-family homes, and 5 percent mobile homes. Single-family residences generally contain larger landscaped areas, predominantly planted in turf, and require more water for outdoor

application in comparison to other types of housing. The general characteristics of multi-family and mobile homes limit outdoor landscaping and water use, although condominium and apartment developments often contain green belt areas.

### 8.2.2 Commercial and Industrial Demand

Commercial water demand consists of incidental uses necessary for the operation of a business or institution, such as drinking, sanitation, and landscape irrigation. Major commercial water users include service industries, such as restaurants, car washes, laundries, hotels, and golf courses. Economic indicators developed by the Greater San Diego Chamber of Commerce indicate that almost half of San Diego's residents are employed in commercial (trade and service) industries.

Industrial water consumption consists of a wide range of uses, including product processing and small-scale equipment cooling, sanitation, and air conditioning. Water-intensive industrial uses in the City of San Diego, including kelp processing, electronics manufacturing, and aerospace manufacturing, typically require smaller amounts of water when compared to other water-intensive industries found elsewhere in Southern California, such as petroleum refineries, smelters, chemical processors, and canneries.

The tourism industry in San Diego County affects water usage within the Authority's service area by not only the number of visitors, but also through expansion of service industries and attractions, which tend to be larger outdoor water users. Tourism is primarily concentrated in the summer months and affects seasonal demands and peaking. SANDAG regional population forecasts do not specifically account for tourism, but tourism is reflected in the economic forecast and causes per capita use to increase.

### 8.3 Agricultural Demand

In recent years, agriculture has accounted for 15 to 20 percent of the Authority's total water demand. **Table 8-2** shows calculated irrigation water requirements by Authority member agency and by crop for FY 99, totaling 251,129 AF. This table was developed using the following information:

- Crop acres based on SANDAG and DWR data;
- Reference evapotranspiration rates used in to calculate water demand:
  - Oceanside CIMIS Station #49 - 48.1" per year
  - San Pasqual Valley CIMIS Station #170 – 65.7" per year
  - Areas in between used an average of the two stations - 52.4" per year;
- Crop coefficients of 70 percent for citrus and subtropical crops, 100 percent for fruits and vegetables, 65 percent for avocados, 100 percent for flowers and nurseries, 100 percent for field crops and 60 percent for pasture;
- A leaching factor of 10 percent; and
- An irrigation emission uniformity of 80 percent.

For the reader unfamiliar with agricultural technical terms, definitions are shown below:

- Reference evapotranspiration is the amount of water used by a well watered cool season grass or pasture plus the amount of water that evaporates from the surface of the soil.
- Crop coefficient is a conversion factor to account for the difference in the evapotranspiration represented by reference evapotranspiration and a particular crop.
- Leaching factor is a multiplier to determine how much extra irrigation water is needed to prevent the accumulation of salts in the soil.
- Emission uniformity is a measure of an irrigation system's ability to deliver the same amount of water to each tree.

By comparison, reported, agricultural, irrigation water use measured 135,047 AF in FY 99 as shown in **Table 8-3**. This table was developed using the following information:

- Reported irrigation water use was derived from member agency water billing and water production records, including agricultural customers receiving M&I water and recycled water.
- Private well water use was estimated from personal communications of agricultural, water industry and technical experts.
- Historic, effective rainfall was calculated using 66 percent of historic annual rainfall. Rainfall averages 10" in coastal areas, 16" in inland areas and 13" for areas in between. The location of agricultural acres within a district determined the level of rainfall used and might not be representative of the district as a whole.

With the addition of historic, effective rainfall, estimated total agricultural water use is 180,470 AF or only 72 percent of calculated, irrigation water requirement.

What accounts for this 70,656 AF or 28 percent difference?

- Irrigation practices vary widely among growers with some severely under irrigating while others over irrigate for economic and agronomic reasons.
- Water needs vary by crop type within the same crop category. As an example, many types of flowers use 100 percent of reference evapotranspiration, but there are some such as blue eucalyptus, proteas and foliage type plants that use considerably less.
- A year-round growing season with frequent changes of crops in a given field may increase the duration of lower demand when plants are small or ground is bare.
- Water use in greenhouses may vary considerably throughout the year and from year to year.

- Actual water use in a cooler and drier than normal year is compared to irrigation water requirement calculated on average, normal weather. It is difficult to predict grower response to such conditions.
- Some member agencies' billing records lack detailed information about accounts. Their billing systems exist to produce water bills and not necessarily to provide detailed information about their customers and their water use. Billing systems are becoming more sophisticated as water agencies realize the need to know their customers and their water use thoroughly in order to manage water to the best economic benefit of the district and customers.
- Figures for IAWP and reclaimed water are well documented. Local ag and M&I ag water use records are highly reliable in some member agency billing systems and are estimates in other agencies with less detailed systems.
- Private well water use presents a source of error, for which there is no near-term solution as well water is not required to be metered or reported. Well owners do not typically make available information about their well's production. Personal knowledge by water district staff, engineers, agricultural experts and hydrogeologists in the agricultural community is the only source of information.
- Misclassification of land use type is a concern. The close interface of agricultural and urban areas in San Diego County may cause some types of urban landscape and recreational land use to be misclassified as agriculture. Large, semi-rural residential plots are particularly difficult to classify.
- Acreage was derived from the percentages of each type of crop developed by DWR that were then applied to the total number of SANDAG acres, except for avocados which were taken from Avocado Commission data. The data from each source were carefully scrutinized and this combination was thought to yield the most reliable values when compared to self-reported information from the County Department of Agriculture, Weights and Measures and spot checks by Authority GIS staff. Future acre and crop estimates derived from multi-spectral, satellite or aerial imagery should provide more accurate information.



**Table 8-2  
1999 Calculated Irrigation Water Requirement  
In Acre Feet by Crop and Member Agency**

Member Agency	Citrus & Subtropical	Fruits & Vegetables	Avocados	Flowers & Nurseries	Field Crops	Pasture	Agency Total
CARLSBAD MWD	-	1,723	-	1,953	857	-	4,533
CITY OF ESCONDIDO	2,012	128	6,452	1,498	-	-	10,090
FALLBROOK PUD	3,441	228	13,097	1,786	-	139	18,691
HELIX WD	2	22	19	347	-	60	450
CITY OF OCEANSIDE	1,437	5,858	1,866	6,557	-	-	15,719
OLIVENHAIN MWD	2,528	510	299	1,307	-	880	5,524
OTAY WD	138	890	114	1,343	-	11	2,495
PADRE DAM MWD	107	169	1,615	558	-	940	3,389
PENDLETON MR	-	6,585	-	717	-	-	7,302
CITY OF POWAY	60	-	1,421	325	-	-	1,806
RAINBOW MWD	8,534	2,988	23,686	4,707	78	1,359	41,352
RAMONA MWD	1,665	321	8,604	1,897	-	1,015	13,502
RINCON DEL DIABLO	-	608	1,086	386	54	110	2,243
CITY OF SAN DIEGO	1,273	8,296	773	5,274	739	1,501	17,857
SAN DIEGUITO WD	-	55	26	4,253	-	-	4,334
SANTA FE ID	3,183	50	-	0	-	299	3,531
SWEETWATER	-	101	-	61	-	-	162
VALLECITOS WD	556	812	3,893	2,863	-	108	8,231
<b>VALLEY CENTER MWD</b>	<b>27,407</b>	<b>179</b>	<b>37,574</b>	<b>3,333</b>	<b>46</b>	<b>1,020</b>	<b>69,558</b>
VISTA ID	1,014	355	1,020	3,387	43	49	5,867
YUIMA MWD	3,783	472	7,642	2,359	-	234	14,490
<b>Total per Crop</b>	<b>57,141</b>	<b>30,350</b>	<b>109,186</b>	<b>44,912</b>	<b>1,817</b>	<b>7,724</b>	<b>251,129</b>

**TOTAL 251,129 AF**

Acreeage data taken from SANDAG and DWR information.

Excludes non-irrigated lands and abandoned agricultural groves

Includes irrigated lands classified as fallowed.

Crop Co-efficients: Citrus/Subtropicals-70%, Avocados-65%, Fruits/Vegetables-100%, Flowers/Nursery-100%, Corn/Field Crops-100%, Pasture-60%

Leaching requirement-10%, Emission Uniformity - 80%

**Table 8-3**

**FY 99 Reported Agricultural Water Use and Comparison to Calculated Irrigated Water Requirement**

All Units in Acre Feet

Member Agency	IAWP	Local Ag	Private Wells	Recycled Ag	M&I Ag	Reported Ag	Effective Rainfall	Total Ag	Calc. IWR	Difference AF	Percent Difference
CARLSBAD MWD	1,260	-		-	475	1,735	453	2,187	4,533	2,346	51.75
CITY OF ESCONDIDO	3,147	1,851	384	-	1,153	6,535	1,976	8,511	10,090	1,579	15.65
FALLBROOK PUD	6,678	-	3,948	480	1,666	12,772	3,742	16,514	18,691	2,177	11.65
HELIX WD	-	-		-	327	327	68	395	450	55	12.28
CITY OF OCEANSIDE	2,201	-	2,000	-	2,072	6,273	2,086	8,359	15,719	7,360	46.82
OLIVENHAIN MWD	963	-		85	408	1,456	887	2,343	5,524	3,181	57.59
OTAY WD	105	-		-	1,426	1,531	356	1,886	2,495	609	24.40
PADRE DAM MWD	807	323	949	-	0	2,079	672	2,752	3,389	637	18.81
PENDLETON MR	-	5,315	-	-	-	5,315	730	6,045	7,302	1,257	17.21
CITY OF POWAY	362	-		-	-	362	356	717	1,806	1,089	60.29
RAINBOW MWD	17,035	-	6,000	-	849	23,884	8,029	31,913	41,352	9,439	22.83
RAMONA MWD	2,977	-	2,742	626	3,046	9,391	2,672	12,062	13,502	1,440	10.66
RINCON DEL DIABLO	969	-	621	-	497	2,087	643	2,730	2,243	(487)	(21.71)
CITY OF SAN DIEGO	82	-	4,000	120	-	4,202	2,380	6,582	17,857	11,275	63.14
SAN DIEGUITO WD	-	296	907	-	1,330	2,533	435	2,968	4,334	1,367	31.53
SANTA FE ID	193	250		-	1,113	1,556	513	2,069	3,531	1,462	41.41
SWEETWATER	-	-		-	117	117	16	133	162	29	17.93
VALLECITOS WD	2,106	-		-	-	2,106	1,570	3,676	8,231	4,555	55.34
<b>VALLEY CENTER</b>	<b>31,204</b>	<b>-</b>	<b>9,794</b>	<b>-</b>	<b>330</b>	<b>41,328</b>	<b>14,222</b>	<b>55,549</b>	<b>69,558</b>	<b>14,009</b>	<b>20.14</b>
VISTA ID	403	30		-	-	433	829	1,263	5,867	4,604	78.48
YUIMA MWD	707	2,450	5,870	-	-	9,027	2,790	11,816	14,490	2,674	18.45
<b>TOTALS</b>	<b>71,197</b>	<b>10,515</b>	<b>37,215</b>	<b>1,311</b>	<b>14,809</b>	<b>135,047</b>	<b>45,423</b>	<b>180,470</b>	<b>251,126</b>	<b>70,656</b>	

**Agricultural water use is 28.14% less than calculated irrigation water requirement.**

IAWP-Interim Agricultural Water Program, Local Ag-Water produced by member agencies and sold to agricultural customers.

Reported Ag is the sum of IAWP, Private Wells, Reclaimed Ag and M&I Ag.

Effective rainfall is 66% of historic, average rainfall, ie. 6.6"-coastal, 10.5"-inland, 8.6"-in between.

Total Ag is the sum of Reported Ag and Effective Rainfall.

Calc. IWR is Calculated Irrigation Water Requirement.

