

CHAPTER 4. WATER DEMAND

The water consumption of EBMUD customers remained relatively level in recent years in spite of account growth. Although adequate in normal years, the reliable water supply is currently not sufficient to meet demand during drought. Increased requirements for releases from storage for the environment and increasing water demand by other water rights holders will result in a further reduction in the water supply for the District in the future. Projected available water supply for dry years indicate that the demand will not be met and the frequency of meeting the demand without rationing will decrease.

PAST AND CURRENT DEMAND

Prior to the early 70s, EBMUD's per capita water consumption was increasing causing EBMUD to begin conservation activities (Chapter 6). Since the implementation of the conservation activities and due to the impact of the 1976-77 drought, water consumption in the District's service area had been lower than the amount that would otherwise be anticipated. Figure 4-1 demonstrates the relative decrease in the rate of water consumption compared with an increase in the number of accounts or service connections. The largest reductions in use in the late 1970s and late 1980s reflect the impact of droughts in 1976-77 and 1987-92, respectively.

While much of the drought management efforts in 1977 were aimed at short-term demand reductions in response to the drought, long-term reductions were realized due to structural changes, such as industries modifying water-using equipment. EBMUD recognized this in reevaluating its demand reduction goals in 1989.

Figures 4-2 through 4-6 display the breakdown of metered water use by categories. Figures 4-2 and 4-5 show water use by single-family homes predominates in the district, followed by multi-family dwelling units, commercial, industrial, institutional and irrigation uses. Figure 4-5 also differentiates demand east and west of the Oakland-Berkeley hills for each category. Figures 4-3 and 4-4 show a further breakdown of the specific types of residential water use.

Metered consumption and total system demand are different quantities. Total system demand includes such quantities as leakage in the distribution system and water for fire fighting, which are not metered uses. The difference between water delivered into the distribution system at the filter plants and the total of all customer billed quantities is assumed at 8% of total system demand plus 1 MGD for District use consistent with the WSMP EIR. EBMUD is in the process of identifying and characterizing the components of the difference to account for such things as meter error, leakage, hydrant loss, District use, fire fighting use, etc.

PROJECTED WATER DEMAND

WATER SUPPLY MANAGEMENT PLAN (WSMP) DEMAND PROJECTIONS

The purpose of the 1993 updated WSMP was to provide an adequate water supply at the projected year 2020 level of development with rationing limited to 25% of normal water demand levels during a worst case drought.

EBMUD's water demand projections were based on population growth. In the WSMP, population was converted to demand using per capita usage in two residential and four non-residential categories. The WSMP includes extensive forecasting of Districtwide water demands using data from the Association of Bay Area Governments (ABAG), State Department of Finance and local government agencies to

FIGURE 4-1. ACCOUNTS VS. CONSUMPTION, 1961-1999

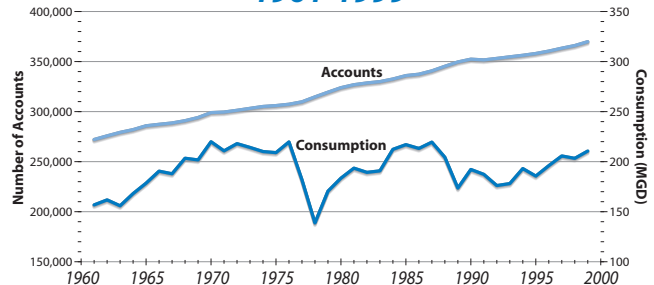


FIGURE 4-2. EAST-OF-HILLS AND WEST-OF-HILLS CONSUMPTION BY CATEGORY

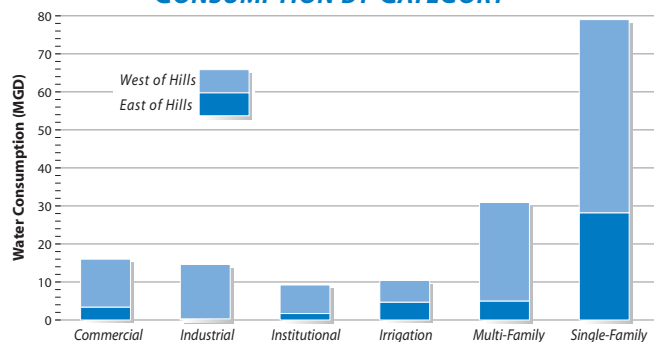


FIGURE 4-3. EBMUD WATER USE CHARACTERISTICS

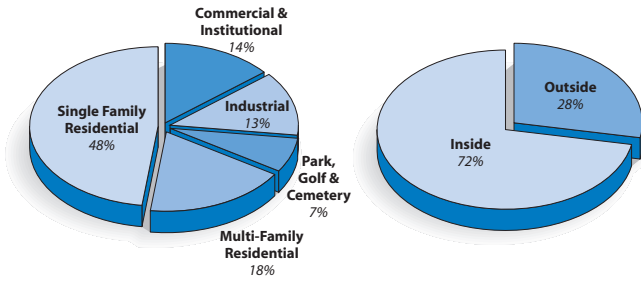


FIGURE 4-4. SINGLE-FAMILY RESIDENTIAL PER CAPITA WATER USE

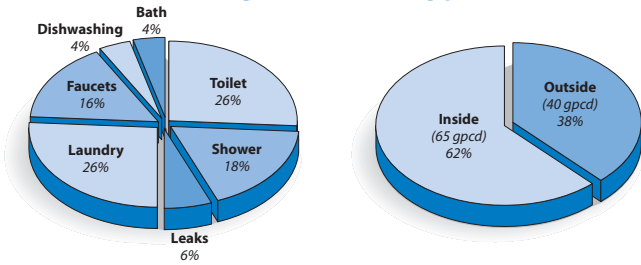


FIGURE 4-5. INDOOR AND OUTDOOR RESIDENTIAL WATER USE

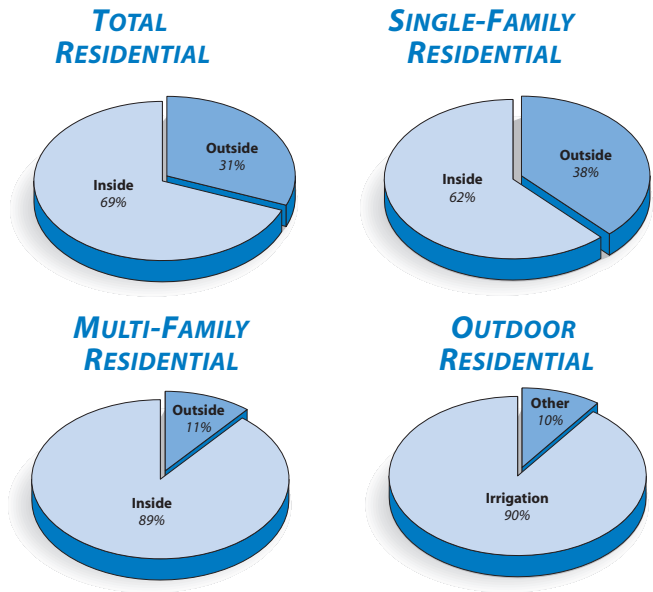
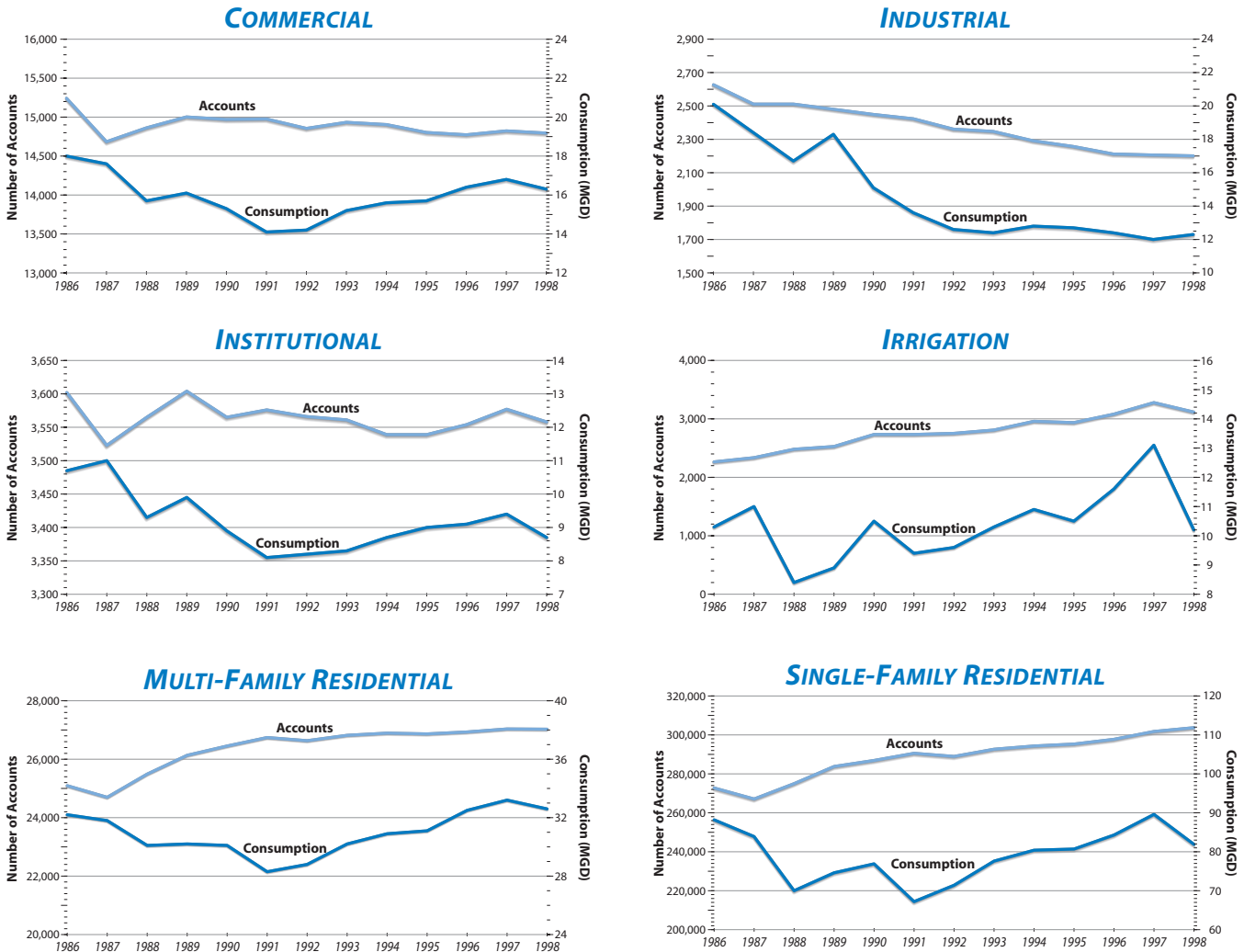


FIGURE 4-6. ACCOUNTS AND CONSUMPTION FROM 1986 TO 1998 FOR EACH CATEGORY



determine future population distributions. Future demands were then estimated from these population distributions. For the year 2020, the Water Supply Management Program adopted by EBMUD forecasts a District demand of 277 MGD without savings from water recycling or conservation and 228 MGD with successful water recycling and conservation programs in place.

2000 Demand Study Using Land Use Data

During 2000, the Districtwide Update of Water Demand Projections (2000 Demand Study) was completed. EBMUD developed a land use data management system and associated software tools to calculate future potable water demands up to the year 2030. The 2000 Demand Study was a significant improvement in EBMUD planning as it provided a methodology to prepare more detailed demand projections such as community-level area studies. The projections aid in water supply planning for each pressure zone. Pressure zones are 100-foot-elevation belts that have been defined in the service area due to the varying topography. Future water demands are calculated based on existing and future demands for various land use categories and future changes in land use as stated in the respective general plans of the service area communities.

The 2000 Demand Study projects demands based on 17 different land use categories - five residential and twelve non-residential. These land use categories are based on land use type and regional characteristics such as weather patterns, population densities, and landscaping patterns. The detailed breakdown of land use types in the 2000 Demand Study allows for a more detailed and potentially more accurate demand projection. The 2000 Demand Study also reflects the future land uses designated by adopted general and specific plans.

Adopted general plans and specific plans of all the cities and counties within EBMUD's service area were compiled in 1998. Meetings were held with the city and county planners to determine the location and type of each land use category for 1996 and future years. This led to the District developing a land use coverage by digitizing land use polygons over a 1996 aerial photograph of the service area.

The Demand Study forecasts a demand of 277 MGD which is adjusted to take into account projected savings to be achieved through the District's conservation and recycled water programs. Assuming the full projected savings of 34 MGD can be achieved through conservation and the full projected savings of 14 MGD can be achieved through recycled water by year 2020, the 2020 forecast (as adjusted by these factors) is 229 MGD. This projection is consistent with the projections done on a population growth basis as presented in the WSMP. For further details please refer to the ***Summary Report, Districtwide Update of Water Demand Projections.***

SUPPLY-DEMAND COMPARISONS

During non-drought years EBMUD currently supplies its customers with an annual average of about 220 MGD of

water. Approximately 95% of this supply is Mokelumne River water collected in Pardee Reservoir. EBMUD's ability to utilize its Mokelumne River entitlement of up to 325 MGD is limited by river hydrology, diversions by senior water rights holders, and reservoir releases to the lower Mokelumne River for instream and Bay-Delta resource needs.

In order to meet its customers' water needs now and in the future, EBMUD has to balance water supply and demand. Both supply and demand vary seasonally and become critical during drought periods which can span several years. At present, EBMUD's current supply is insufficient to meet customer needs in multiple year droughts despite water conservation and recycling programs. During the most recent 1987-1992 drought, the District's customers were subject to water use restrictions each year. Without additional supplies, water use restrictions will occur more frequently in the future.

PAST AND CURRENT SUPPLY-DEMAND

EBMUD experienced a rapid increase in water use from 1950 to 1970, with demand at 200-220 MGD in non-drought years after 1970. Sharp reductions in demand occurred as a result of cutbacks during the two most recent droughts in 1976-1977 and 1987-1992. Lower demand levels in wetter years immediately following these droughts reflected changes in customer water use and success in implementing conservation practices.

PROJECTED SUPPLY-DEMAND

Based on 1990 ABAG population projections, the WSMP projected rapid growth from 1990 to 2000 and a forecast of 228 MGD in year 2020 (after conservation and reclamation reductions). In 1995 in the UWMP, the projections were revised to reflect actual customer account growth to 1995. The current 2000 Demand Study projects rapid growth from 2000 to 2010 and a 2020 planning demand of 229 MGD (as adjusted by conservation and recycled water savings). In comparing the water demand projections in year 2020, the 228 MGD in the WSMP remains valid as a water supply planning criteria. The demand analysis performed in the WSMP can be found in Chapter 3 of the WSMP and further detailed in Technical Appendix A3.

Summary of EBMUD's Projections for normal, dry and multiple dry years

A summary of EBMUD's demand and supply projections in five-year increments is provided in Table 4-1. The data reflects new values obtained from the 2000 Demand Study (Chapter 4) and new recycled water projects (Chapter 5).

The increase in Districtwide demand between 2000 and 2010 reflects the compressed time frame during which many of the cities in the service area anticipate intense development activity. The continued but slower increase in demand beyond 2010 reflects a more built-out environment with land use changes resulting in higher densities of existing land uses.

TABLE 4-1. PROJECTED DEMAND AND AVAILABLE SUPPLY (MGD)

	2000	2005	2010	2015	2020
Customer Demand¹	230	242	257	267	277
Adjusted for Conservation ²	(8)	(14)	(20)	(27)	(34)
Adjusted for Recycled Water ³	(6)	(9)	(11)	(12)	(14)
Planning Level of Demand	216	219	226	228	229
Available Supply & Need for Supplemental Supply					
Normal Year	>216	>219	>226	>228	>229
Supplemental Supply Need	0	0	0	0	0
Single Dry Year (Multiple Dry Years – Year 1), Moderate Stage (~7% deficiency) ⁴	200	203	210	212	213
Supplemental Supply Need	0	0	0	0	0
Multiple Dry Years – Year 2 Severe Stage (25% deficiency) ⁴	162	164	169	171	172
Supplemental Supply Need	0	0	0	0	0
Multiple Dry Years – Year 3 Available Supply	125	114	95	84	77
Deficiency	42%	48%	58%	64%	67%
Supplemental Supply Need (to limit deficiency to 25%)⁵	87	102	128	142	154
<p>¹ Demand taken from the 2000 Demand Study.</p> <p>² Conservation water savings from the WCMP 1999 Annual Report. 2 MGD in 1999 and 34 MGD for year 2020. Linearly interpolated into five-year increments.</p> <p>³ Recycled water use was obtained from Staff in Office of Recycling and Chapter 5 of this Plan.</p> <p>Note: Conservation and Reclamation savings reported are those attributed to programs which are part of the 1993 WSMP. Refer to Chapter 6 of this Plan.</p> <p>⁴ Assumed drought conditions per Table 3-1.</p> <p>⁵ The supplemental supply need is calculated from modeling studies. The supplemental supply need is the amount of water needed to limit customer deficiency to 25% and to implement all provisions of the 1998 Joint Settlement Agreement.</p>					

EBMUD evaluates and forecasts water supply availability for any calendar year by evaluating the forecast runoff and the existing storage levels in the reservoirs. A “Normal” year is a year that EBMUD does not need to implement a Drought Management Program. In a Normal year, the April projection of the end of September total system storage would be 500 TAF or greater (see Table 3-1). In the normal year, EBMUD can meet the customer demands through the year 2020; therefore the available supply is considered as greater than or equal to the demand. It is important, however, to note that the frequency of Normal years will decrease in the future; and the years where rationing will need to be implemented will increase in frequency, as explained in Chapter 2.

In its evaluation of water supply availability, EBMUD accounts for the diversions of both upstream and downstream water right holders and fishery releases. Fishery releases are based on the requirements of a 1998 Joint

Settlement Agreement (JSA) between EBMUD, US Fish and Wildlife Service, and the California Department of Fish and Game. The Federal Energy Regulatory Commission incorporated the JSA into the EBMUD hydropower license in 1999. The California State Water Resources Control Board incorporated the flow provisions of the JSA into the EBMUD Mokelumne River water rights in 2000 through decision 1641.

The available supply shown in Table 4-1 in years 1, 2 and 3 of a multiple year drought was determined through EBMUDSIM (EBMUD’s hydrologic model) analyses with the following assumptions:

- EBMUD’s Drought Planning Sequence is used for 1976, 1977, and 1978
- Total system storage is depleted by the end of the third year of the drought
- The diversions by Amador and Calaveras counties upstream of Pardee Reservoir increase over time

- Releases are made to meet the requirements of senior downstream water right holders and fishery releases are made according to the Joint Settlement Agreement.

In Table 4-1, “Single Dry” year (or Year 1 of “Multiple Dry Years”) is determined as a year that EBMUD would implement Drought Management Program elements at the “moderate” stage with the goal of achieving between 0 to 15 percent reduction in customer demand (see Table 3-1). The April projection of the end of September total system storage would be between 500 TAF and 450 TAF.

Year 2 of Multiple Dry Years is determined as a year that EBMUD would implement Drought Management Program elements at the “severe” stage with the goal of achieving between 15 to 25 percent reduction in customer demand (see Table 3-1). The April projection of the end of September total system storage would be between 450 TAF and 300 TAF.

In Table 4-1, in Year 3 of the multiple year drought, deficiencies from about 48% in year 2005 to about 67% in year 2020 are forecast to occur. The supplemental supply needed is the additional amount of water that is necessary to limit customer deficiency to 25 percent in a multiple-year drought while continuing to meet the requirements of senior downstream water right holders and the provisions of the 1998 Joint Settlement Agreement. The supplemental supply can be met from the projects described in Chapter 2 under Water Supply Planning. Chapter 3 discusses how EBMUD would manage a water supply shortage.

There is a shortage of water which will only worsen in the future as the number of customers in the District’s service area increases, and senior water right holders on the lower Mokelumne River increase their diversions.