# SECTION 2
# ASSESSMENT OF PROJECT NEED AND PURPOSE

## 2.1 OVERVIEW OF NEEDS ASSESSMENT

In 1996, Metropolitan prepared an Integrated Resources Plan (IRP) which is a planning tool that outlines strategies to secure and manage water resources to meet Metropolitan's service area needs. Metropolitan has developed projects, programs and policies that are guided by the set of IRP recommendations.

The IRP determined that a mix of water resources and management tools is needed to provide reliable water supplies of acceptable quality and affordability. In order to develop and maintain such a mix, it is necessary to implement a wide variety of water programs and management tools.

In developing recommendations for a preferred mix of water resources to meet the needs of the service area, the primary objectives identified by the IRP are to:

- Ensure reliability of water supplies;
- Ensure affordability of reliable water supplies;
- Ensure water quality with particular attention to salinity in order to facilitate implementation of cost-effective local groundwater conjunctive use storage and water recycling projects;
- Maintain diversity of water resources in order to minimize the overall risks associated with the long-term water resources plan;
- Ensure flexibility to minimize the risk of stranded investments (costs which are incurred for facilities that are ultimately not needed due to changes in demands); and
- Incorporate institutional/environmental constraints in the development of a resource strategy; although imported supplies may appear to be lower in costs than some local resources, the success of imported resources development may be difficult to achieve without a strong commitment to utilize feasible local resources (conservation, water recycling, and groundwater) first.

The IRP made the following recommendations to guide Metropolitan's future water resources planning:

- Fully implement water conservation best management practices (BMPs) to achieve significant reductions in regional water demands;
- Make full use of economically feasible local water supplies, such as groundwater, reclaimed water, and desalinated water;
- Maximize the use of deliveries from the Colorado River Aqueduct;
- Maintain and fully utilize dependable flows in the State Water Project;
- Optimize the use of Central Valley water transfers; and
- Maximize storage within Metropolitan's service area.

Metropolitan's mission is to provide its service area with adequate and reliable supplies of high quality water. In fulfilling this mission, Metropolitan has analyzed a wide variety of water resources and management tools. One of Metropolitan's primary resources is water from the Colorado River brought to Southern California through the CRA. Metropolitan has established a goal of maximizing the efficiency of the CRA and use of Colorado River water. The Cadiz Project has been proposed to contribute to achievement of this goal.

Uncertainties regarding the availability of water supplies to serve Southern California's urban economy have traditionally focused on hydrologic shortages. Water has been stored for use during dry seasons and for periods of drought. Political and environmental regulatory issues have added new sources of uncertainty. Concerns of other Lower Colorado River Basin states with California's continued reliance on unused Colorado River waters has spurred the U.S. Department of Interior to require California to develop a plan to live within its Colorado River water apportionment. As a result, Metropolitan continues to diversify its sources of supply and to seek new and creative means to make more efficient use of available supplies. Metropolitan has a goal of maintaining a full CRA, and programs such as the Cadiz Project are essential to addressing the need for diversification of water supplies from the Colorado River. The three main goals of the Cadiz Project are to provide: 1) storage of Colorado River water and withdrawal of stored water, 2) transfer (extraction and delivery) of indigenous groundwater for use within Metropolitan's service area; and 3) management of all storage and transfer operations (including the extraction of indigenous groundwater) to ensure the protection of critical resources.

The need for continued full CRA deliveries is predicated on the simultaneous implementation of a high level of water conservation, recycling and reclamation. Without implementation of these water efficiency measures, shortages would not be averted even with continued full CRA deliveries. Further, because a number of variables affect availability of each water supply, large or small, only a balanced mix of water resources can provide sufficient flexibility to provide a reasonable assurance of reliability. The Cadiz Project is one option to address the IRP recommendation for a full CRA. Other parallel efforts have also been implemented or are under review to develop the mix of management tools and resources needed to provide a reliable water supply.

## 2.2 GENERAL APPROACH TO NEEDS ASSESSMENT

Metropolitan assesses the need for future water supplies through a systematic and regularly updated analysis of water demands throughout its service area compared to water supplies available from a wide variety of sources. To quantify the need for supplies, Metropolitan uses official population projections and historical demand data, which are adjusted to reflect projected reductions in per capita demand resulting from implementation of water conservation measures. These minimum demands constitute the overall water supply need for Metropolitan's service area, shown on Figure 2-1.

Once demands are determined, Metropolitan evaluates the potential supplies available from all sources or "resource areas." The six major resource options evaluated are:

1. Water recycling and groundwater recovery;
2. Storage within the service area;
3. Central Valley transfers and groundwater storage;
4. State Water Project;
5. Ocean water desalination; and
6. Colorado River.

Supply projections for the future are made based on historic data adjusted to reflect known trends. As an example, Metropolitan anticipates groundwater recovery and water recycling will yield about 500,000 acre-feet of supply in 2020. This projection is based on current levels of recycling, an analysis of yields from all currently proposed recycling projects, and an estimate of the potential yield from this resource area given general trends in the development of these programs.

This approach to analysis of supply leads to a general picture of future supplies, by type or resource area that includes three elements for each resource area:

a. Existing supplies;
b. Projected supplies from currently planned programs; and
c. Potential or "target" supplies from new programs.

Metropolitan then compares minimum demands to projected supplies from all areas. If this analysis shows a shortfall in supply, Metropolitan then determines how best to meet this need from the six resource areas listed earlier. In general, Metropolitan attempts to meet overall need in the most cost-effective manner feasible, by enhancing supplies from all feasible resource areas. The amount of supply that can be reasonably expected from each resource area is examined using a model which evaluates trends, potential programs and Metropolitan's ability to convey, distribute and blend supplies from each source to meet water supply and water quality objectives. Based on this analysis, Metropolitan defines a "target" or "need" for new projects in each supply area.

Metropolitan's approach to planning for regional water supply reliability during dry years is based on implementation of a diverse range of resource investments and conservation measures. This approach is essential because: (1) a diversified approach helps ensure supply reliability and operational flexibility if supplies from any one source are temporarily disrupted; (2) diversification helps prevent overloading of any one element of the water conveyance and distribution system; and (3) distribution system capacity is optimally used if supply is derived from a variety of regions and sources. Meeting dry-year demands through 2020 therefore requires a diversity of sources in Metropolitan's service area and in Metropolitan's two major imported water supply areas, the Sacramento-San Joaquin Valley and the Colorado River.

## 2.3 DRY-YEAR WATER SUPPLY NEEDS

### 2.3.1 GENERAL

The rationing of water during the recent drought (1987-1992) underscores the necessity to improve Metropolitan's supply reliability, particularly in dry years. Metropolitan's approach to achieving dry-year supply reliability, outlined in the following paragraphs, is:

- Determining total dry-year demand for Metropolitan's service area;
- Identifying and quantifying existing supplies from all local and regional sources;
- Determining the need for additional supply;
- Evaluating resource options for procurement of this supply from all resource areas to determine appropriate targets for each resource area; and
- Identifying specific needs and objectives within each resource area.

In determining need and evaluating options for meeting that need, Metropolitan has focused on the period from 2000 to 2020, for which reliable, official projections of population growth and other demographic changes are available. Within this planning period, the need for dry-year supply enhancement and for diverse options to meet dry-year supply needs is evaluated in an integrated resources model as outlined below. Storage plays a significant role in meeting dry-year needs.

### 2.3.2 THE ROLE OF STORAGE

The role of storage in a water delivery system is to optimize existing resources by managing supply deliveries in order to provide assured water service, even during adverse and emergency circumstances. California's climate is characterized by alternating periods of wet and dry, with two-year drought periods occurring approximately once every six to eight years and extended drought, such as the 1987-1992 drought, occurring on a less frequent basis. Water supplies vary significantly from year to year as a result, and it is, therefore, essential for water agencies to proactively manage available supplies. In short, water supplies vary from greater abundance during wet years to reduced availability during dry years which may extend over several years. By developing new storage facilities, it is possible to reduce or avoid the effects of these natural events and the need for operating contingencies.

Adequate storage during periods of abundance is also needed to prevent and offset overdraft of local groundwater basins and surface storage during droughts. Southern California's groundwater basins were overdrawn by approximately 1.5 million acre-feet (maf) during the recent 1987-1992 drought. Several local surface water reservoirs, which capture runoff from adjacent watersheds and are operated by member agencies, were drawn down to approximately 50 to 65 percent full. If the drought had extended into the following year, increasingly severe shortages would have occurred. Therefore, it is vital to prepare for the next drought by developing additional storage programs.

Water storage programs are essential to water supply reliability for virtually all California water agencies, which rely on water stored during wet years for supply during dry years. For example, approximately 50 percent of the runoff in California's Central Valley is captured and stored in a system of reservoirs owned and operated by local, state and federal government agencies. Reservoirs on the Colorado River store approximately 60 maf and are an essential element of water supply programs for Arizona, Nevada and Southern California.

Currently, storage available to Metropolitan is inadequate to meet water needs in times of drought or emergency. Metropolitan has, therefore, pursued a program to enhance groundwater and surface storage capacity both within and outside its service area.

Metropolitan's commitment to storage as an element of a prudent water management strategy includes enhancement of groundwater and surface storage in Southern California, development of water banking programs in the San Joaquin Valley and enhancement of conveyance facilities. Metropolitan and its member agencies are also cooperating to enhance storage of water in groundwater basins in Metropolitan's service area to meet normal demands and to provide additional yield during periods of drought.

Enhancing groundwater storage is a critical element of this strategy because groundwater storage, when compared to surface storage alternatives, is relatively inexpensive, has fewer potential environmental impacts, and results in significantly less evaporative losses. The use of groundwater storage reduces the need to draw on water supplies from environmentally sensitive areas such as the San Francisco Bay-Delta during drought periods. Metropolitan and its member agencies are actively pursuing the goal of enhancing groundwater storage throughout the Metropolitan service area, and local groundwater production capability in a dry year is anticipated to increase significantly as a result of these efforts. This enhanced yield will involve full use of virtually all useable groundwater storage capacity within the Metropolitan service area. Efforts to further enhance groundwater storage capacity must therefore be focused on areas outside the six-county Metropolitan service area, along the California Aqueduct in the San Joaquin Valley and/or the Colorado River Aqueduct between the Colorado River and the coastal plain of Southern California.

### 2.3.3 THE ROLE OF CONSERVATION

Conservation directly reduces per capita demand and thus reduces the need for dry-year supply enhancement. Metropolitan is implementing a comprehensive package of conservation and water management programs to ensure its ability to meet current and projected demand in its service area under a full range of hydrologic conditions. The program includes implementation of:

- Enhanced water conservation; and
- Enhancement of existing supply through recycling and groundwater recovery.

These two elements of Metropolitan's overall water management program have already contributed significantly to reducing demand in all years. Metropolitan has contributed over $140 million to conservation programs involving retrofitting more than four million residential plumbing fixtures. The result of these and other programs described below has been a permanent reduction in demand of 480,000 acre-feet of water per year. The programs implemented by Metropolitan and its member agencies account for more than half of the water savings due to conservation in California.

### 2.3.4 THE ROLE OF TRANSFERS

Water transfers are also a major component of California's overall strategy for better management of available supplies. Water transfers involve changing the use of supplies in response to changing conditions. For example, farmers may install water conservation and water storage facilities which allow them to transfer part of the supplies they currently use to other users. During droughts, commercial, industrial, residential and certain agricultural users may be willing purchasers of transferred supplies because the consequences of rationing are not economically acceptable for such users. Transfers in drought years thus benefit the transferor by providing a higher economic return than could be gained by traditional use of the water and benefit the receiving party by enhancing water supply reliability or preventing an economic catastrophe that may otherwise result during a period of drought.

## 2.4 PROJECTION OF DRY-YEAR DEMAND: 2000-2020

### 2.4.1 GENERAL

Metropolitan's overall dry-year supply needs have been evaluated continuously in a series of studies beginning in 1988. These studies provide a flexible framework for the evaluation of Metropolitan's water transmission, storage and distribution system needs. As projects to meet defined needs are implemented and new potential projects are identified, they are factored into the analysis and needs are adjusted. In this way, Metropolitan's analysis of water supply and water quality reliability is constantly updated to reflect current and projected circumstances.

Estimates of dry-year demand are based on projections of water demands and groundwater replenishment needs, availability of existing supplies, blending of water resources to meet water quality standards, and the integrated operations of surface reservoirs and groundwater basins.

These studies currently show that Metropolitan needs to enhance its dry-year supplies through water storage and water transfers. In addition, they note that rapid population and water demand increases occurred in the 1980s and 1990s, despite significant reductions in per capita demand as a result of conservation programs, demographic shifts and land use changes. The most recent (1999) projections of dry-year demand have identified a minimum dry-year demand for Metropolitan's service area

through 2020 of approximately 5.1 maf. The basis for this projection is detailed in the following sections.

### 2.4.2 SCAG, SANDAG AND DWR POPULATION PROJECTIONS

Metropolitan estimates its regional water demands based on the adopted population and growth plans of two regional government organizations: the Southern California Association of Governments (SCAG) and the San Diego Association of Governments (SANDAG). In addition, the California Department of Water Resources (DWR) projects statewide population and demographics as part of its process for projecting future water demands in California. Approximately every three years, SCAG and SANDAG convene elected officials from their respective areas and agree on population, housing, employment and land use (PHEL) objectives, along with a set of infrastructure plans needed to support those demographic objectives (SCAG 1997 and SANDAG 1997). The regional population, housing and jobs goals are allocated to various communities in such a way as to best meet jobs/housing balances, reduce vehicle miles traveled, and meet other social and resource goals. The SCAG and SANDAG adopted plans are used by virtually all regional agencies as the basis for regional planning for transportation, water and wastewater, compliance with federal air quality standards and related activities.

Metropolitan plans its water supply, storage, and delivery facilities to support the regional governments' adopted plans by matching its water demand forecasts to the SCAG and SANDAG goals. Since 1987, Metropolitan's water demand forecasting tool for this purpose has been the Institute for Water Resources-Municipal and Industrial Needs (IWR-MAIN) Water Use Forecasting System (United States Army Corps of Engineers (ACOE) 1987; Planning and Management Consultants, Ltd. 1990a, 1990b, 1990c and 1991a). Metropolitan has adapted this system for use in Southern California as the MWD-MAIN System. MWD-MAIN projects future demands in the residential, commercial, industrial, public and other sectors. In projecting long-term water demands, the resulting MWD-MAIN system accounts for a wide variety of economic, demographic and climatic factors. Residential water demands reflect population, housing mix, household occupancy, housing values, weather conditions, price for water services and the implementation of conservation practices. Other urban water uses (such as irrigation of public parks and rights-of-way, fire-line use and system losses) are included in the public/unaccounted sector (Planning and Management Consultants Ltd. 1991a).

The population and water demand projections presented for Metropolitan's service area in Tables 2-1 and 2-2 are keyed to Metropolitan’s member agencies shown on Figure 2-2. Table 2-1 shows the population projections for Metropolitan's service area. The greatest growth rates, in terms of percent increases, are projected to occur in San Bernardino and Riverside counties. The greatest numerical increases are projected to occur in developed areas such as Los Angeles and Orange counties.

The SCAG and SANDAG forecasts suggest that population in Metropolitan’s service area will continue to represent approximately one-half of the state's total population. The SCAG and SANDAG projections indicate that population in the Metropolitan service area is expected to increase from 16.4 million in 1998 to approximately 19.1 million by 2010; an average of nearly 225,000 people per year. Population in 2020 is estimated at 21.3 million, an increase of similar magnitude but reflecting a lower percentage growth. These projections are higher than the 200,000 people per year annual growth observed through the 1970s to mid-1980s, but significantly lower than the 300,000 to 350,000 people per year annual growth of the late 1980s.

**TABLE 2-1**
**PROJECTED POPULATION FOR THE METROPOLITAN SERVICE AREA**

| Agency | 2000 | 2010 | 2020 |
|---|---|---|---|
| Anaheim | 345,000 | 395,700 | 423,900 |
| Beverly Hills | 40,500 | 41,700 | 43,000 |
| Burbank | 102,100 | 110,500 | 124,500 |
| Calleguas | 488,800 | 531,500 | 603,400 |
| Central Basin | 1,524,100 | 1,601,500 | 1,721,200 |
| Compton | 87,900 | 92,300 | 99,100 |
| Eastern | 525,300 | 785,600 | 1,020,600 |
| Foothill | 100,200 | 113,500 | 135,800 |
| Fullerton | 124,100 | 130,900 | 134,800 |
| Glendale | 183,400 | 194,500 | 213,100 |
| Inland Empire | 694,300 | 862,600 | 1,045,900 |
| Las Virgenes | 65,300 | 76,000 | 87,900 |
| Long Beach | 453,300 | 481,500 | 525,400 |
| Los Angeles | 3,826,700 | 4,268,900 | 4,847,000 |
| MWDOC | 2,068,800 | 2,242,300 | 2,341,100 |
| Pasadena | 139,700 | 151,400 | 171,000 |
| San Diego | 2,743,900 | 3,195,100 | 3,641,200 |
| San Fernando | 23,800 | 25,300 | 27,200 |
| San Marino | 13,300 | 13,600 | 14,000 |
| Santa Ana | 323,700 | 335,900 | 342,900 |
| Santa Monica | 91,900 | 94,700 | 98,000 |
| Three Valleys | 524,600 | 566,200 | 617,500 |
| Torrance | 130,700 | 134,000 | 138,900 |
| Upper San Gabriel | 863,300 | 922,700 | 997,600 |
| West Basin | 830,300 | 866,400 | 917,300 |
| Western | 669,200 | 832,300 | 979,700 |
| **MWD TOTAL** | **16,984,200** | **19,066,600** | **21,312,000** |

**TABLE 2-2**
**PROJECTED DRY-YEAR RETAIL DEMAND IN METROPOLITAN'S SERVICE AREA (ACRE-FEET)**

| Agency | 2000 | 2010 | 2020 |
|---|---|---|---|
| Anaheim | 80,140 | 91,300 | 102,000 |
| Beverly Hills | 14,560 | 15,200 | 15,900 |
| Burbank | 25,930 | 30,400 | 33,600 |
| Calleguas | 135,900 | 149,300 | 168,900 |
| Central Basin | 271,160 | 288,200 | 309,500 |
| Compton | 10,490 | 11,400 | 12,600 |
| Eastern | 213,290 | 281,500 | 338,800 |
| Foothill | 20,090 | 23,000 | 26,500 |
| Fullerton | 33,990 | 35,300 | 36,500 |
| Glendale | 32,820 | 35,500 | 38,800 |
| Inland Empire | 232,030 | 282,000 | 335,200 |
| Las Virgenes | 27,920 | 33,200 | 37,600 |
| Long Beach | 77,500 | 83,900 | 91,100 |
| Los Angeles | 680,600 | 748,600 | 833,900 |
| MWDOC | 537,030 | 596,500 | 637,100 |
| Pasadena | 39,500 | 42,800 | 47,000 |
| San Diego | 688,000 | 767,700 | 839,200 |
| San Fernando | 3,800 | 4,100 | 4,500 |
| San Marino | 7,150 | 7,400 | 7,700 |
| Santa Ana | 53,600 | 56,400 | 60,800 |
| Santa Monica | 15,700 | 16,400 | 18,000 |
| Three Valleys | 150,100 | 161,000 | 175,500 |
| Torrance | 33,600 | 36,400 | 40,700 |
| Upper San Gabriel | 200,000 | 218,000 | 232,800 |
| West Basin | 203,700 | 229,700 | 248,800 |
| Western | 318,300 | 352,800 | 384,000 |
| **TOTAL** | **4,106,900** | **4,598,000** | **5,082,000** |

In addition to the SCAG and SANDAG demographic forecasts, the 1998 forecasts by DWR in its California Water Plan include population projections higher than the SCAG and SANDAG projections. Based on its higher population projections, DWR projects 2020 demand in excess of supply in both normal and drought years. The DWR projections for 2020 are several hundred thousand acre-feet higher than those used by Metropolitan.

The SCAG and SANDAG growth projections have historically under-estimated actual growth. In 1990, for example, SCAG and SANDAG projected average annual growth for the period from 1990 to 2010 at about 50,000 persons per year less than the actual growth so far. Forecasts of water demand and infrastructure requirements which are based on SCAG and SANDAG population projections have, therefore, historically also been conservative.

### 2.4.3 FORECASTS OF WATER DEMAND

Metropolitan forecasts water demand based on current and projected per capita water demand in Metropolitan's member agencies, each of which has different climate, demographic, economic and development characteristics. In general, per capita demand is significantly higher in hot inland valleys. In addition, water use is affected by:

**Trends in Household Characteristics**

SCAG and SANDAG project that the number of households in the Metropolitan service area will increase from 5,290,000 in 1997 to 7,072,000 by 2020. However, the average number of persons per household was 2.97 in 1997 and is expected to increase to 3.05 in 2005 before falling to 2.96 in 2020, reflecting changing trends in family size and composition. More recent projections confirm these trends.

**Industrial and Commercial Employment Projections**

The 1997 SCAG and SANDAG projections estimated industrial employment to increase from 1,279,000 to 1,328,000 between 1997 and 2020. Commercial and institutional (government and services) employment was projected to increase much more rapidly, from 5,890,000 to 9,145,000 during the same period. Employment increases will be greater in commercial sectors than in industrial, especially in restaurants, hotels and tourism; hospitals and health care services; and schools, colleges and educational providers.

**Geographic Growth Trends and Water Use within the Micro-Climates of Southern California**

Historically, water use per household has been higher in the hotter, drier inland areas than in the colder, wetter coastal areas. Average per capita residential use ranges from 97 gallons per person per day (gpcd) on the coastal fringe to 123 gpcd on the coastal plains to 164 gpcd in the inland areas. An increasing percentage of the region's single-family dwelling units is expected to occur in inland areas, due to the greater availability and affordability of land, compared to coastal locations.

**Type of Residence and Associated Trends in Indoor and Outdoor Uses**

There are differences in water use for single- and multi-family residences, with single-family per capita residential use generally involving more outdoor use than multi-family residential use. Per capita use for residents in multi-family units is typically lower. Both SCAG and SANDAG have projected an increase in the percent of families living in multi-family units by 2020.

**Seasonal Trends in Water Use**

On average, base level use accounts for about 70 percent of total annual municipal and industrial use of water in Metropolitan's service area. During the period from April through October, water use increases, primarily due to greater use of water for irrigation during the dry summer months. This use above base level accounts for the remaining 30 percent of total annual use.

**Water Pricing and Household Income**

Water price and household income interact in predictable ways and these relationships are factored into Metropolitan's calculations of water demand. Higher incomes increase demand because consumers with greater discretionary income tend to acquire water using appliances and larger housing lots, and increase irrigation of lawns and gardens. Recent (1999) projections suggest that real incomes will outpace growth in the price of water, resulting in an increase in per capita demand.

SCAG and SANDAG monitor trends in these factors, and they are incorporated into Metropolitan's water use forecasting model. The result is a water use projection that reflects projected changes in the key factors affecting municipal and industrial water use.

## 2.4.4 CURRENT AND PROJECTED CONSERVATION PROGRAMS

Metropolitan adjusts its demand projections to reflect existing and projected water savings. In addition to the water conservation programs described here, water recycling programs and other water conservation related programs are described in Section 2.5.4. A number of conservation programs are being aggressively pursued and implemented by Metropolitan and its member agencies. Several programs, including showerhead and toilet retrofitting, have been implemented region-wide since 1991. Metropolitan and its member agencies have contributed over $140 million to conservation programs which have involved retrofitting 1.6 million low-flow toilets and 2.9 million low-flow showerheads. The result of these and other programs described below has been a permanent reduction in demand of 480,000 acre-feet per year.

**Current Programs**

Long-term conservation efforts act to reduce or offset per capita water demand. Metropolitan promotes water conservation practices through pricing incentives that encourage efficient use of water in its service area; public information, education and major media campaigns; and financial incentives to retrofit residential and commercial buildings and industrial sites with water conserving fixtures and to promote efficient irrigation practices.

Conservation Credits Program

At present, the primary vehicle for implementing water conservation projects in the Metropolitan service area is the Conservation Credits Program. Under this program, Metropolitan provides a financial incentive to its member agencies for the implementation of cost-effective conservation projects that have a demonstrated ability to save water. Metropolitan's incentive is based on the lesser of $154 per acre-foot of water saved over the life of the program or one-half the cost of the proposed program, whichever is less.

Public Information and Education Program

The primary element of Metropolitan's public information and education programs focuses on two goals:

1. Educating consumers on the benefits of water conservation; and

2. Providing consumers with information on how to conserve water.

The program is divided into six specific areas of concentration including: written publications, education programs, efficient landscaping programs and mass media campaigns. In recent years, Metropolitan has made a substantial effort to enhance the effectiveness of public information campaigns promoting water conservation. Demonstrated results of these programs have allowed Metropolitan to further design and enhance mass media campaigns urging water conservation.

Research Program

Research efforts have focused on the best methods to implement residential water audits, residential leak detection, retrofit distribution and low-flow shower head surveys by examining the implementation modes of these programs, their cost effectiveness and consumer receptivity.

Projected Programs

Metropolitan has undertaken a number of studies regarding the effectiveness of additional conservation actions and has participated in the development of a statewide urban conservation plan, commonly referred to as Best Management Practices or BMPs. BMPs have served as the standard for water conservation throughout the state for almost 10 years and are nationally recognized. BMPs rely on the use of proven technologies to reduce water use, including an ambitious program to continue retrofitting residential, commercial, industrial and government facilities with water-saving devices for showers and toilets. The conservation plan also includes changes to the plumbing code to ensure that best available technology is applied to all new construction.

Under the BMP process, participating urban water agencies have implemented proven water conservation measures and developed and implemented new measures as they become feasible. In return for this commitment, environmental and public interest groups participating in the BMP process have generally agreed that BMP implementation provides the best available methods for water conservation implementation. It was also agreed that the State Water Resources Control Board should only use reliable estimates of conservation savings that have been developed through the BMP process. The primary vehicle for implementation of these practices is Metropolitan's Conservation Credits Program.

In addition to those BMPs already in implementation, there are a number of potential BMPs which must be shown to be technically and economically feasible, and socially acceptable, before a major commitment of resources for their implementation can be made. For those BMPs with limited performance data, Metropolitan has developed pilot programs which include technical and financial assistance to member agencies and sub-agencies, designed to evaluate and quantify performance characteristics for specific best management practices. The programs implemented to date have resulted in a net reduction in per capita demand of approximately 13 percent, compared to projected demand without their implementation.

Residential Retrofit Program

The indoor residential plumbing retrofit program is designed to reduce domestic water use. It involves replacing existing high-volume showerheads with more efficiently designed showerheads which limit the flow rate to less than 2.5 gallons per minute. It also involves retrofit of existing toilets with ultra-low flush toilets to further reduce the volume of water used inside the residence.

Home Audit Program

The home water audit program is an evaluation of a homeowner's outdoor and indoor water use by a trained professional. Empirical data indicate a certain fraction of households account for disproportionate amounts of total residential water use in a given community. The home water audit savings are achieved by installing indoor retrofit devices, finding and repairing leaks, and by educating homeowners on efficient interior water use and exterior irrigation practices.

Leak Detection Program

The distribution system audits and leak detection program involves a thorough examination of the accuracy of water agency records and distribution system flow control equipment including pipes, meters, valves, hydrants and other system elements. The result of the water audit is used to financially justify the development and implementation of a leak detection and repair plan. Unaccounted water use may include authorized unmetered uses such as fire fighting, sewer flushing and street cleaning, and unauthorized uses include leakage, major breaks, illegal connections and under-registration of meters.

Landscape Water Audit Program

The landscape water audit program involves careful evaluation of water requirements and actual water use on large landscaped areas, including commercial/ industrial sites, parks, cemeteries and golf courses. It is designed to assist landscape managers in making more efficient use of water by correcting problems with irrigation systems and devising efficient irrigation schedules. Metropolitan will develop financial incentives and provide training for member agencies. Landscape requirements for new commercial, industrial and multi-family complexes are designed to promote the appropriate use of plants and turf in the landscape where appropriate, and advanced irrigation control systems and methods of irrigation. It is estimated that it would take five years for all the cities and counties in the service area to adopt and implement landscape ordinances into their building permit approval processes. Metropolitan will provide staff assistance to local agencies that implement this practice and will work on legislation in support of landscaping ordinances.

Code Enforcement

Since 1992, California plumbing code has required that low-flow showerheads and 1.6 gallon-per-flush toilets be used in all new or remodeled buildings. Because water savings from this measure can be expected only if builders comply with the law, Metropolitan has assisted its member agencies and sub-agencies in providing adequate enforcement of this law. The goal of this BMP is to achieve 95 percent or higher compliance in new construction and industrial sites with water-conserving fixtures.

**Conservation Effectiveness**

In addition to existing conservation, Metropolitan projects 500,000 acre-feet in conservation savings from the projected programs by 2020. Other new programs will have to be developed to accomplish the remaining projected reduction. The extension of existing programs and the implementation of new programs will result in a reduction in average per capita water usage in Metropolitan's service area from 220 gpcd to 192 gpcd, a reduction of 13 percent. These results will be achieved despite a shift in population growth from the cooler coastal plain to hotter and drier inland valleys. Because rationing is not a permanent measure and can have significant economic and social costs and impacts, rationing is not a feature of Metropolitan's program of BMPs and would be implemented only in periods of extreme water shortages.

### 2.4.5 MUNICIPAL, INDUSTRIAL AND AGRICULTURAL DEMANDS

Because Metropolitan's demand projections are adjusted to reflect not only current water savings from conservation programs, but also to reflect projected savings from even more progressive programs in the future, demand calculations are considered to be minimum projections of demand.

To further define projected water demands, Metropolitan uses an adjusted water demand model developed by the ACOE Institute of Water Resources (ACOE-IWR). This econometric model was first developed in the early 1960s and was extensively updated for the ACOE in the 1980s (ACOE 1987). Metropolitan has adjusted this model by calibrating it to Metropolitan's service area.

In projecting long-term water demands, the resulting MWD-MAIN system accounts for a wide variety of economic, demographic and climatic factors. Residential water demands reflect population, housing mix, household occupancy, housing values, weather conditions, price for water services and the implementation of conservation practices. Other urban water uses (such as irrigation of public parks and rights-of-way, fire-line use and system losses) are included in the public/unaccounted sector (Planning and Management Consultants Ltd. 1991a).

Agricultural water use is a relatively small part of total water use in Metropolitan's service area. It currently accounts for about 10 percent of total service area demands, and is projected to decline over time as agricultural lands are converted to urban uses. The projections are based on Metropolitan studies of historic trends, discussions with member agencies, and detailed area studies in some regions.

### 2.4.6 TOTAL DRY-YEAR DEMAND IN THE METROPOLITAN SERVICE AREA

Based on these analyses, baseline dry-year retail demand projections for 2010 and 2020, adjusted to reflect projected conservation savings, are 4,598,000 acre-feet and 5,082,000 acre-feet respectively (Table 2-2). In addition, if supplies are available, there will be an additional wholesale demand for supplies to replenish in-service area groundwater supplies with imported water.

## 2.5 EXISTING DRY-YEAR SUPPLY FROM ALL SOURCES

### 2.5.1 GENERAL

The first step in determining the need for additional dry-year supplies is to identify and project supply from existing sources and programs. In determining the supply currently available to meet dry-year demands, Metropolitan projects dry-year supplies from all currently available sources, using historical data and data related to existing and projected law and regulation to estimate firm yield from each of the following sources:

1. Metropolitan's State Water Project contract entitlements from northern California, as permitted by the State Water Resources Control Board (SWRCB);
2. Metropolitan's Colorado River Compact allocation and other existing Colorado River programs; and
3. Other programs, including:

    a. Potential water transfers between agricultural water districts in the Colorado River Resource Area or the Central Valley Resource Area and Metropolitan;

b. Desalinated water from projects in Metropolitan's service area or from desalination of agricultural drainage water in the Central Valley Resource Area and/or the Colorado River Resource Area;
c. Storage in the service area; and
d. Water recycling and groundwater recovery.

### 2.5.2 METROPOLITAN'S EXISTING STATE WATER PROJECT CONTRACT ENTITLEMENTS

Metropolitan obtains imported water supplies from the California Aqueduct, a facility of the State Water Project operated by the Department of Water Resources. State Water Project entitlements, as well as agricultural transfer or exchange water, are conveyed to Metropolitan through the California Aqueduct.

For the State Water Project, dependable (or dry year) supply is defined as the average annual supply which could be expected if there were a recurrence of the hydrologic conditions that occurred during the critical seven-year drought from 1928 to 1934. Metropolitan's portion of the State Water Project's current dependable supply is about 1.14 maf per year. However, should a repeat of critical period drought occur, water supplies could be substantially less than the seven-year average; thus dependable supplies would be reduced. During the six-year drought from 1987 to 1992, dependable supplies were found to be lower than projected. As a result, the definition of the State Water Project dependable supply is being reevaluated.

In addition, the SWRCB, as a part of its hearings on the San Francisco Bay/Sacramento-San Joaquin Delta, is developing terms and conditions for the export of water from the Delta, which could change the present amount of water available to the State Water Project and other users of this resource.

Since 1987, when the SWRCB began hearings to review the existing standards and to adopt new standards protecting the beneficial uses of water from the Delta and San Francisco Bay, efforts to enhance water supply reliability, water quality (in-stream water quality and water supply water quality), ecosystem restoration and levee stability have been underway. This effort began under the SWRCB, and has continued under the State-Federal CALFED Bay-Delta Program. One significant result of the SWRCB process was the 1994 Bay-Delta Accord, an interim plan for protecting Bay-Delta resources and ensuring reliable water supplies and water quality. Metropolitan was a leader in this effort and in the establishment of the CALFED Bay-Delta process.

The outcome of the CALFED Bay-Delta Program and future regulatory requirements under state and/or federal endangered species laws and regulations is uncertain. To the extent that reduction in exports from the Delta area or increased reservoir releases are considered, new water rights decisions would be required from the SWRCB, which would reduce the amount of water for State Water Project contractors, including Metropolitan.

Although Metropolitan is looking forward to resolution of dry-year State Water Project water supply problems in the long term, current dry-year supplies available to Metropolitan from the State Water Project are projected to be 450,000 acre-feet per year.

### 2.5.3 EXISTING COLORADO RIVER CONTRACT ALLOCATIONS

Metropolitan's entitlement to water from the Colorado River is governed primarily by four factors:

1. A 1931 agreement establishing delivery priorities among various California water users;
2. Its 1930, 1931, 1946 and 1987 contracts with the United States for delivery of Colorado River Water;
3. 1964, 1979 and 1984 United States Supreme Court decrees (Arizona v. California); and

4. The United States Secretary of the Interior's criteria for coordinated long-range operation of Colorado River reservoirs (operating criteria).

Historically, Metropolitan's delivery contracts with the United States Department of the Interior have allowed diversion of 1.2 maf per year, and an additional 180,000 acre-feet per year of surplus water when available. With commencement of operation of the Central Arizona Project in 1985, Metropolitan's ability to divert water on a dependable (dry-year) basis was reduced to 550,000 acre-feet per year. Arizona and Nevada are also increasing their use of Colorado River water in all years, potentially resulting in a reduction in the amount of water available for use in California under all conditions. Metropolitan's delivery priority for supplies to California is also last, and is for 550,000 acre-feet.

In 1988, Metropolitan entered into a water conservation agreement with the Imperial Irrigation District (IID), another user of Colorado River water. Under this agreement, Metropolitan funds specified conservation projects in the IID service area in return for which Metropolitan is entitled to divert the water conserved. When the conservation projects are fully implemented, Metropolitan would be entitled to divert approximately 106,000 acre-feet per year. This would increase Metropolitan's dependable supplies from the Colorado River to 656,000 acre-feet per year.

In order to maximize the efficiency of the CRA and use of Colorado River water, Metropolitan and other California water agencies developed California's Colorado River Water Use Plan (California Plan). The Cadiz Project contributes to Metropolitan's ability to meet the objectives of the California Plan as well as addresses the recommendations of Metropolitan's IRP.

California is one of three states which are collectively authorized to divert and use 7.5 maf/year of water from the Lower Basin of the Colorado River system pursuant to the Colorado River Compact of 1922 and the Boulder Canyon Project Act of 1929. The United States Supreme Court has ruled that California is limited to 4.4 maf of this apportionment, plus fifty percent of any declared surplus (determined by the U. S. Secretary of the Interior). For the past several decades, California has exceeded its annual 4.4 maf diversions from the Colorado River through use of surplus water or the unused water apportioned to Arizona and Nevada. California's annual use of Colorado River water has varied over this period from 4.5 maf to 5.2 maf. Arizona is now fully using its annual apportionment and Nevada will soon reach full use of its annual apportionment. In years this occurs, California will be unable to rely on unused water apportioned to other States, and will be forced to rely solely on surplus water to exceed the 4.4 maf limitation. In anticipation of potential reductions in Colorado River water supplies, the Colorado River Board of the State of California began development of the California Plan. A draft of the California Plan was issued by the Colorado River Board for public review in May 2000. California's Colorado River water agencies are pursuing the programs and projects addressed in the California Plan.

An important goal of the California Plan is to establish baselines for water usage in agricultural areas, which will encourage conservation programs and voluntary water transfers from agricultural to urban agencies. Projects which would conserve agricultural water would allow maintenance of current agricultural production levels with less water. Along with projects such as the Cadiz Project, the voluntary transfer of conserved agricultural water to Metropolitan's service area will help Metropolitan keep the CRA operating at up to full capacity.

In addition, Metropolitan and others are participating in the development of a "Lower Colorado River Multi-Species Conservation Plan" (LCR-MSCP). The outcome of the LCR-MSCP and future regulatory requirements under state and/or federal endangered species laws and regulations is uncertain.

### 2.5.4 OTHER EXISTING PROGRAMS TO MEET WATER SUPPLY AND WATER QUALITY OBJECTIVES

In addition to yield from Metropolitan's contract allocations from the State Water Project and the Colorado River, dry-year demand is offset by a number of existing programs that provide reliable short-term supply during dry periods, but are not a part of normal-year supplies. They include water recycling, groundwater recovery, in-service area storage and Central Valley transfers and storage. As outlined below, these existing programs are projected to add about 840,000 acre-feet of firm supply by 2020.

**Water Recycling and Groundwater Recovery**

Recycled water has been used in Metropolitan's service area for decades, and over 50 percent of all water recycling in California occurs in Metropolitan's service area. Recycled water and groundwater recovery programs fall into three categories as described in the following sections.

Direct Use of Recycled (Treated) Water

This form of water recycling involves treating wastewater and conveying it in separate distribution systems for uses such as irrigation of golf courses and parkland, and industrial uses such as power plant cooling. At present, direct application of recycled water is limited to such non-potable uses by California Department of Health Services regulations.

Groundwater Replenishment

Recycled water can also be used to replenish groundwater basins and to control salt-water intrusion along Southern California's coastal plain. These uses enhance the overall water supply available during all years by increasing the availability of groundwater supplies.

Groundwater Desalination

Groundwater with high levels of total dissolved solids (TDS) is generally not suitable for domestic or agricultural use, and also has limited industrial applications. Groundwater with TDS levels in the range of 2,000 milligrams per liter (mg/L) can, however, be desalinated at a cost well below that of ocean-water, which has TDS levels of over 10,000 mg/L. Groundwater desalination is not currently a major component of water supply in Southern California, but it is anticipated to become a more important component in the future.

Combined, brackish groundwater desalination and water recycling have increased existing in-service area water production by 230,000 acre-feet per year. Water recycling and brackish groundwater desalination provide permanent benefits and help to meet demand in all year types.

**In-Service Area Surface Storage**

Under the Monterey Agreement, which governs use of State Water Project supplies and facilities, a portion of storage in the DWR reservoirs at Lake Castaic and Lake Perris is dedicated to meeting dry-year needs. Groundwater storage programs implemented cooperatively by Metropolitan and its member agencies supplement this surface storage. In addition, Metropolitan has existing storage at Lake Mathews and Lake Skinner. Total projected in-basin storage, shown on Table 2-3, is approximately 1,761,200 acre-feet. However, 400,000 acre-feet of Diamond Valley Lake storage is dedicated to emergency use, leaving 400,000 acre-feet of storage capacity dedicated to drought storage. Total in-service area drought

storage is, therefore, approximately 1,361,200 acre-feet. Assuming a three-year drought period and some loss of storage capacity due to evaporation during the drought period, annual dry-year yield from existing storage is approximately 390,000 acre-feet.

**TABLE 2-3**
**EXISTING IN-SERVICE AREA SURFACE STORAGE AVAILABLE TO METROPOLITAN AND MEMBER AGENCIES (acre-feet)**

| Reservoir | Total Storage | Dead Storage | Storage Allocated to Others | Storage Available |
|---|---|---|---|---|
| Pyramid | 171,200 | 4,800 | 5,300 | 161,100 |
| Castaic | 323,700 | 18,600 | 11,400 | 293,800 |
| Elderberry Forebay | 28,200 | 200 | 0 | 28,000 |
| Silverwood | 75,000 | 4,000 | 24,900 | 46,100 |
| Lake Perris | 124,000 | 3,500 | 0 | 120,000 |
| Lake Mathews | 182,000 | 3,500 | 0 | 178,500 |
| Lake Skinner | 44,000 | 200 | 0 | 43,800 |
| Diamond Valley Lake | 800,000 | 0 | 0 | 800,000 |
| SDCWA Reservoir | 90,000 | 0 | 0 | 90,000 |
| **Total** | **1,838,000** | **35,300** | **41,600** | **1,761,200** |

## Central Valley Transfers and Groundwater Storage

Metropolitan has actively pursued voluntary water transfer and storage programs in the Central Valley and has implemented two storage programs, the Semitropic and Arvin-Edison dry-year water banking programs. Under these programs, Metropolitan contributes to the development of groundwater banking facilities and conveys State Water Project and other available water supplies to these banking sites. As of 1999, total storage in these two groundwater banks was approximately 550,000 acre-feet, with an anticipated dry-year yield of 140,000 acre-feet.

## Existing Local Dry Year Supplies

Local water supplies consist of local groundwater, local surface water, recycled water, recovered groundwater and Department of Water and Power DWP water imported by the City of Los Angeles via the Los Angeles Aqueduct.

### Local Groundwater Supplies

Local groundwater production constitutes about 90 percent of the natural local water supply in Southern California. Groundwater basins are replenished through a combination of natural percolation, temporary retention in flood control reservoirs, and diversion into groundwater spreading basins. The major groundwater basins located in Metropolitan's service area are shown in Figure 2-3, and operated by local agencies. The dependability of supply from this source is affected by several factors, one of which is contamination of groundwater basins. Efforts to solve contamination problems in several large groundwater basins are underway and will result in enhanced supply reliability in the future. From 1980 to 1996, groundwater production in Metropolitan's service area varied from a low of 1.1 maf in 1993 to a high of 1.4 maf in 1996.

Metropolitan has an ongoing Groundwater Recovery Program that provides its member agencies with incentives to recover and treat contaminated groundwater. This program will expand dependable local water supplies by developing otherwise unusable contaminated supplies for use in conjunction with imported supplies.

As a result of enhanced groundwater management, reliable yield from local groundwater basins is projected to increase from 1.27 maf to about 1.31 maf by 2010 and 1.34 maf in 2020.

Local Surface Water Production

Local agencies in the Southern California coastal plain maintain a number of surface reservoirs in local watersheds. From 1980 to 1996, yield from these reservoirs ranged from a low of 75,000 acre-feet in 1990 to a high of 207,000 acre-feet in 1984 (following the 1983 El Niño year). Reliable dry-year supply is assumed to be approximately 76,500 acre-feet.

Los Angeles Aqueduct Supply

Since 1914, the DWP has imported water supplies from the watershed of the Eastern Sierra Nevada Mountains via the Los Angeles Aqueduct. From 1980 to 1996, the annual supply from this source ranged from 106,000 acre-feet to over 518,000 acre-feet.

Currently, reliable dry-year supply is estimated at about 215,000 acre-feet. This supply estimate reflects resolution of environmental disputes in the Mono Lake and Owens Valley areas, as well as the yield anticipated from a long term groundwater management program in the Owens Valley.

### 2.5.5 TOTAL PROJECTED 2020 DRY-YEAR SUPPLY FROM EXISTING PROGRAMS

As Table 2-4 shows, the projected total dry-year yield from all existing sources, based on full implementation of water management programs through the year 2020, is approximately 3,494,000 acre-feet.

**TABLE 2-4**
**EXISTING DRY-YEAR SUPPLIES IN 2020**
**(acre-feet)**

| Source | Yield |
|---|---|
| Metropolitan State Water Project | 450,000 |
| Metropolitan Colorado River Aqueduct | 656,000 |
| In-Service Area Storage | 390,000 |
| Groundwater Recovery | 230,000 |
| Central Valley Banking | 140,000 |
| Local Groundwater | 1,336,500 |
| Local Surface Water | 76,500 |
| Los Angeles Aqueduct | 215,000 |
| **Total Projected Supply** | **3,494,000** |

## 2.6 METROPOLITAN'S INTEGRATED PROGRAM TO MEET 2020 DRY-YEAR DEMANDS

In November 1997, Metropolitan initiated a process to secure supplemental water supplies and regional storage to meet dry-year demands. This process reflects the broad, statewide acceptance of the role of storage and transfers as a primary focus of water management programs to meet urban demands in dry years. The process involved establishment of overall targets for six resource areas:

1. Water recycling and groundwater recovery;
2. Storage within the service area;
3. Central Valley transfers and groundwater storage;
4. State Water Project;
5. Ocean Water Desalination; and
6. Colorado River.

As noted earlier, the targets for each resource area are based on an integrated model that takes into account:

1. Potential supplies;
2. Potential storage capacity; and
3. Available conveyance capacity for delivery of supplies to Metropolitan.

Potential supply sources in the six resource areas were identified independently by Metropolitan and through proposals from the public and private entities.

Based on the concurrent analysis of supply availability and storage and conveyance capacity, the integrated resource model provided data which allowed targets to be set for each major resource option. Once potential supply sources were identified and the qualifications of the potential providers were assured, each potential source was evaluated to determine: (1) regional need and economic value; (2) financial, legal and regulatory feasibility; and (3) potential for implementation.

Metropolitan then initiated a public review process to solicit and evaluate specific proposals for projects to meet resource procurement targets in each major resource option area. Proposals were received from both public and private entities. A committee composed of Metropolitan Board members and member agency General Managers conducted a series of publicly noticed and advertised meetings. A technical review panel of independent experts advised the committee as to the technical feasibility of individual proposals. The committee evaluated all proposals received and made advisory recommendations to the Metropolitan Board of Directors. Some proposals were determined to be infeasible because of costs or hydrologic, geotechnical or engineering issues, and were eliminated from further consideration. Proposals that were determined to be potentially feasible were carried forward for more detailed evaluation. At a future date, additional proposals may be solicited or developed if the potentially feasible options are inadequate to meet the target for each resource option area or are determined to be infeasible during detailed studies.

This integrated approach to resource procurement to meet current and future dry-year demand through 2020 has resulted in development of quantitative targets for each of the resource option areas and more detailed evaluation of specific projects in each area. The specific proposals received for each major resource option preliminarily indicate that it should be feasible to meet overall targets, and provide a basis for projections of the potential dry-year supply from each resource option area. It is important to note that each resource option area represents a distinct source of potential dry-year supply and that meeting the

overall quantitative targets for all resource option areas will be necessary to meet the current and projected dry-year demand through 2020.

### 2.6.1 PROJECTED DRY-YEAR YIELDS FOR NON-COLORADO RIVER RESOURCE AREAS

**Targets for Water Recycling and Groundwater Recovery**

Existing recycling and groundwater recovery programs are currently producing 230,000 acre-feet per year. Yield from these existing programs is expected to rise to 375,000 acre-feet per year by 2020. In 1998, Metropolitan executed a Request for Proposals under its Local Resources Program to develop 53,000 acre-feet of new project yield. Based on proposals submitted, Metropolitan anticipates that this objective could be met in the near future and that the yield from this program would be approximately 428,000 acre-feet by 2010. Metropolitan has established a target of 500,000 acre-feet from the program by 2020, or an additional yield of 125,000 acre-feet compared to projected yield from existing programs.

**Targets for Local Groundwater Storage**

In addition to the 390,000 acre-feet of annual yield from dry-year storage currently available, the North Las Posas Basin groundwater storage project is scheduled to be completed by 2005. This project will add 210,000 acre-feet in storage with an annual yield of 70,000 acre-feet. Finally, four projects are currently under study (Raymond Basin - in planning and development, Orange County Basin - specific proposals being studied, Chino Basin - in planning and development, Central/West Basin - studies underway), which in combination are anticipated to yield 450,000 acre-feet storage with an annual yield of 150,000 acre-feet.

The net effect of these programs is to add 660,000 acre-feet of dry-year storage to Metropolitan's current storage capacity. Prudent use of this storage would involve delivery over a three-year period, with an annual dry-year yield of about 220,000 acre-feet.

**Targets for Central Valley Transfers and Groundwater Storage**

For the first decade of the 21st century, Metropolitan has established a target of 180,000 acre-feet of new dry-year yield from Central Valley transfers and groundwater storage programs. The total of 180,000 acre-feet per year in new dry-year yield is projected to come from expansion of existing Central Valley storage and transfer programs. All these programs would, if implemented, occur south of the Delta, thus further enhancing their water supply reliability.

**Targets for State Water Project Programs**

In April 1992, the State of California outlined a comprehensive plan to meet the water needs of urban, agricultural and environmental interests. It was recognized that there was a need to implement several currently planned State Water Project programs, and complete the environmental documentation for selection of a comprehensive Delta solution, as well as provide for the reallocation of State Water Project supplies through voluntary transfers. Of the 1992 proposed programs, only one, the Kern Water Bank (KWB), has been implemented. The remaining programs (South Delta Water Management Program (SDWMP); off-stream storage facilities in either the Sacramento or San Joaquin Valleys; and a Delta conveyance facility) are under consideration as part of the CALFED Bay-Delta process. Off-stream storage and Delta conveyance are still in the preliminary stages of planning and were not assumed to be in place in analysis of reliable water supplies from the State Water Project.

By 2000, the final phase of the KWB Fan Element will be operational, providing significant additional water storage capacity south of the Delta. The projected schedule for construction and operation of other facilities is currently undefined.

In addition, existing state policy also calls for water marketing to play a more important role in meeting California water needs. The viability of using market forces to voluntarily reallocate water supplies was demonstrated in 1991 when the Governor's Water Bank (91-Bank) acquired a gross amount of 820,800 acre-feet for critical needs including those of urban areas and agriculture.

It is difficult to predict the net increase in supply available to Metropolitan that would result from implementation of many potential supply enhancement and management programs. For this needs analysis, it has been assumed that the programs described above would be implemented by 2020, with an increase in State Water Project yield of 200,000 acre-feet per year in a dry year.

**Targets for Ocean Water Desalination**

Ocean desalination is a potentially long term source of reliable water supply that would also enhance water quality in Metropolitan's service area, and it is under study at this time. Implementation of large-scale ocean desalination projects would depend on the cost of energy, the cost of facilities and development of appropriate methods for disposal of highly saline brine. Advances in desalination technology and efficiency are needed before large-scale desalination can be an economically viable alternative to other Metropolitan programs. There are significant environmental issues which must be addressed related to disposal of highly saline brine from the desalination process. Even assuming that technological issues could be resolved in the relatively near future, the planning, design and construction of desalination facilities will require considerable time. As a result, although desalination is currently under study, significant yield from ocean desalination is not anticipated until sometime following 2020.

**Summary of Demand Versus Non-Colorado River Resource Area Supplies**

In summary, if all non-Colorado River Resource Area supply reliability enhancement programs outlined above are successfully implemented by 2020, the net effect will be to increase dry-year supply in 2020 by approximately 870,000 acre-feet as shown in Table 2-5.

**TABLE 2-5**
**PROJECTED NEW 2020 DRY-YEAR SUPPLY PROGRAM**
**(acre-feet)**

| Resource Option | Dry-Year Supply |
|---|---|
| Water Recycling and Groundwater Recovery | 270,000 |
| In-Service Area Storage | 220,000 |
| Central Valley Transfers and Groundwater Storage | 180,000 |
| State Water Project Programs | 200,000 |
| Ocean Desalination | -- |
| **Projected Non-Colorado River Aqueduct Resource Area Supply** | **870,000** |

## 2.6.2 NEEDS ANALYSIS FOR THE COLORADO RIVER RESOURCE AREA

Metropolitan evaluated the need for additional Colorado River resources assuming that new supplies of 870,000 acre-feet would be obtained from other sources. As illustrated in Table 2-6, a residual need of 718,000 acre-feet remains for dry-year supplies in the Colorado River Resource Area.

**TABLE 2-6**
**PROJECTED COLORADO RIVER RESOURCE AREA 2020 DRY-YEAR SUPPLY NEEDS**
**(acre-feet)**

| Resource Option | Dry-Year Supply |
|---|---|
| Projected Dry-Year Demand (Table 2-2) | 5,082,000 |
| Existing Dry-Year Supplies (Table 2-4) | 3,494,000 |
| Projected Non-Colorado River Aqueduct Resource Area Dry-Year Supply (Table 2-5) | 870,000 |
| **Remaining Dry-Year Requirement** | **718,000** |

To evaluate the quantity of additional supplies to be provided from the Colorado River Resource area, an analysis of the Colorado River Aqueduct was undertaken. This analysis demonstrated that the annual conveyance capacity of the Colorado River Aqueduct is approximately 1.25 maf, and current and planned programs have a dry-year yield of 656,000 acre-feet. Therefore, there is significant unused dry-year conveyance capacity in the Colorado River Aqueduct. Because supply from the Colorado River is the lowest cost imported supply available to Metropolitan, it is also beneficial to utilize Colorado River Aqueduct supplies to the extent feasible.

Full utilization of the Colorado River Aqueduct during dry years would also meet Metropolitan's need for operational flexibility in use of other facilities. For example, it would ensure that maximum conveyance capacity would be available in the California Aqueduct to import supplies from the State Water Project, from transfers and from Central Valley banking.

Based on these considerations, Metropolitan established a target for the Colorado River Aqueduct of 594,000 acre-feet of additional dry-year yield, which would (1) minimize the capital and operational cost of new programs, and (2) reduce the need for, and impacts associated with, new facilities.

### Other Projects on the Colorado River Aqueduct

In 1997, Metropolitan initiated a planning process to identify potential projects which, collectively, might meet the 594,000 acre-foot per year target for dry-year supply on the Colorado River Aqueduct. Three projects are currently in various stages of implementation and are anticipated to be operational before 2020.

San Diego County Water Authority - Imperial Irrigation District Transfer

The San Diego County Water Authority (SDCWA), a Metropolitan member agency, has negotiated a water transfer which would provide to up 200,000 acre-feet per year of new yield to the service area.

All-American and Coachella Canals Lining Projects

Under this program, Metropolitan will fund a conservation program which will consist of constructing a 23-mile concrete-lined canal parallel to the existing earthen All-American Canal and Coachella Canal. This program will yield 74,000 acre-feet per year, water which is currently lost through seepage (52,600 acre-feet from lining the All-American Canal and 21,500 acre-feet from lining the Coachella Canal). Metropolitan will have rights to the conserved water for a period of 55 years with an option to renew the program for an additional 55 years.

Hayfield Groundwater Storage Program

The Hayfield Groundwater Storage Program involves delivery of approximately 150,000 acre-feet per year to this groundwater basin via the Colorado River Aqueduct, storage of up to 800,000 acre-feet in the basin, and recovery of approximately 150,000 acre-feet per year during dry years. Metropolitan owns a large part of this valley and competing uses of its resources are therefore minimal. Environmental documentation was completed for this site in early 1999 and the project is being implemented.

## 2.7 REMAINING COLORADO RIVER RESOURCE AREA DRY-YEAR NEED

If all the proposed Colorado River Resource Area supply reliability enhancement programs outlined above are successfully implemented by 2020, the net effect would be to increase dry-year supply in 2020 by 424,000 acre-feet leaving a residual need in the Colorado River Resource Area of 170,000 - 240,000 (prior to implementation of the Cadiz Project) acre-feet as shown in Table 2-7.

**TABLE 2-7**
**COLORADO RIVER RESOURCE AREA DRY-YEAR NEED[1]**
**(acre-feet)**

| | |
|---|---|
| Target for dry-year supply on the Colorado River Aqueduct | 594,000 |
| SDCWA-IID Transfer | 130,000 - 200,000 |
| All-American and Coachella canals lining projects | 74,000 |
| Hayfield Valley Water Storage Program | 150,000 |
| Cadiz Groundwater Storage and Dry-Year Supply Program | 150,000 |
| **Remaining Colorado River Resource Area Dry-Year Need[2]** | **20,000 – 90,000** |

[1]The potential need for any one project may increase depending on actual yield realized from these proposed programs.
[2]Remaining need may be met by one or a combination of other potential projects under various stages of study.

## 2.8 SUMMARY OF NEEDS ANALYSIS

In summary, the objective of the Cadiz Project is to allow Metropolitan to store Colorado River water during wet years when supplies are available and deliver this stored water to Metropolitan's service area during dry years. In addition, the Cadiz Project will involve the transfer of indigenous groundwater in the Cadiz-Fenner aquifer system to further supplement Metropolitan's dry-year supplies and improve water quality.

The need for the Cadiz Project is based on current and projected needs (regional population and demographic projections for Southern California made by SCAG, SANDAG and DWR). Based on these official projections and accounting for the effects of aggressive water conservation programs in Metropolitan's service area, Metropolitan has determined that dry-year water demand in 2020 will exceed supply by approximately 1.5 maf. Meeting this need will require programs in a number of resource areas, and Metropolitan has established a dry-year target of 594,000 acre-feet for the Colorado River Aqueduct resource area. Existing Colorado River projects are anticipated to meet all but 170,000 – 240,000 acre-feet of this target. The Cadiz Project meets 150,000 acre-feet of this deficit in the Colorado River resource area[1], leaving a deficit of approximately 20,000 - 90,000 acre-feet.

[1] The Cadiz Project is designed with a capability to transport 150,000 acre-feet of water over one year to or from groundwater storage. The actual operation would be subject to the Groundwater Monitoring and Management Plan.