MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

INFORMATION

- **Board of Directors**
  Water Planning, Quality and Resources Committee

October 14, 2003 Board Meeting

10-3

Subject

Review of Integrated Resources Plan Update draft report

Description

Background. In November 2001, the Board directed staff to complete an Integrated Resources Plan Update (IRP Update). Since that time, staff has conducted a series of technical evaluations, multiple presentations to the Board, coordination meetings with the member agencies, a board workshop on Jan. 29, 2003, and a Member Agency Managers workshop on Sep. 15, 2003. Based on analysis and input from this process, staff has completed a 2003 IRP Update draft report for review by the Board and member agencies (**Attachment 1**).

Goals of the IRP Update. The 1996 Integrated Resources Plan called for a review of the resource development targets on a periodic basis. The primary goals of the IRP Update were to: (1) review the goals and achievements of the 1996 IRP; (2) identify changed conditions for water resource development; and (3) to update the resource targets through 2025.

Recommendations. The 2003 IRP Update draft report contains refinements to regional supply development targets based on the identified changed conditions (see **Attachment 1**). These targets are to be achieved in five-year intervals through 2025, and will allow for compliance with current water code. The draft report also sets a regular five-year schedule for future updates, coincident with Metropolitan's filing of the Regional Urban Water Management Plan, as prescribed by the California Water Code. The IRP Update also establishes the use of a 10 percent water supply planning buffer. This buffer sets total resource development targets above forecasted water demands to compensate for non-hydrologic uncertainty in water demand, new water supply implementation, and loss of existing supply.

Policy Implications. The draft report identifies changes in the regional resource development targets due to changed conditions affecting the service area. The water supply planning buffer will require additional resource development. The draft Long Range Finance Plan Update includes estimates of water rates to support the resource investments incorporated in the IRP. The Long Range Finance Plan estimated that rates and charges would increase between 3.5 and 4.5 percent annually. Also, the updated resource targets will serve as input for an update of the System Overview Study to identify any changes in infrastructure requirements that would also be reflected in the Capital Investment Plan.

Next Steps. The draft report (**Attachment 1**) will serve as the basis for discussion and review with the member agencies and other parties as needed to seek input and answer questions concerning the report. Based on the input received, staff plans in November to present an IRP Update final report for consideration and adoption by the Board.

Policy

By Minute Item 41734, dated Jan. 9, 1996, Board adoption of the Integrated Resources Plan
By Minute Item 44696, dated Nov. 20, 2001, Board adoption of the Integrated Resources Plan Update workplan

Fiscal Impact

None

9/26/2003
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10/1/2003
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Attachment 1 – 2003 IRP Update Draft Report

BLA #2317

DRAFT FINAL

INTEGRATED WATER RESOURCES PLAN

2003 UPDATE

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September 2003

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EXECUTIVE SUMMARY

BACKGROUND

Reliability. Affordability. Water Quality. Diversity.
Flexibility. Environmental & Institutional Constraints

These six objectives were the drivers behind the 1996 Integrated Resources Plan (IRP) developed by Metropolitan Water District of Southern California (Metropolitan) in concert with its member public agencies. The purpose of the IRP was to establish regional targets for the development of water resources including conservation, local supplies, State Water Project supplies, Colorado River Aqueduct supplies and water drawn from regional storage and purchased through water transfers.

THE 1996 IRP PROCESS

Metropolitan's Board of Directors set the direction and vision for the 1996 IRP. The IRP process was a collaborative effort drawing input from many groups including Metropolitan's board, an IRP workgroup (comprised of Metropolitan staff, member agency and sub-agency managers, as well as groundwater basin managers), and representatives from the environmental, agricultural, business and civic communities. It was important that the IRP be a collaborative process because its viability was contingent on the success of local projects in achieving their individual target goals for resource management and development.

RESULTS OF THE 1996 IRP PROCESS

The outcome of the 1996 IRP was a "Preferred Resource Mix" which would ensure Metropolitan and its member agencies meet their full service retail demands without interruption through 2020. Metropolitan's Board of Directors formally adopted the IRP in January 1996. In December 2001, the IRP was the topic of discussion again. It was time for an update based on an analysis of changed conditions.

SCOPE OF THE 2003 IRP UPDATE

The Metropolitan Board of Directors requested an update of the 1996 IRP to focus on changed conditions, and extend the planning horizon in order to comply with new water planning legislation linking land use decisions to water supply availability. The IRP Update had three objectives:

1. To review the goals and achievements of the 1996 IRP
2. To identify changed conditions for water resource development
3. To update the resource targets through 2025

FINDINGS AND CONCLUSIONS

1. **Changed Conditions:** The most significant changed conditions are higher projected local supplies and conservation savings. Together these changes cause projected Metropolitan demands in 2020 to drop as much as 500,000 acre-feet in a dry year, compared to the 1996 IRP. Other major changed conditions include:

    1. Board-revised goals for the State Water Project
    2. Board-revised goals for the Colorado River Aqueduct
    3. More stringent water quality regulations
    4. Resource implementation risk

2. **Reliability:** The results of the IRP Update analysis demonstrate that the resource targets of the 1996 IRP, factored in with the changed conditions discussed in this report, provide for 100 percent reliability in 2020 and up to 2025.

3. **Buffer Supply:** Although current resource targets do not need to be modified, the IRP Update identified two new areas of concern: 1) increased water quality regulation, and 2) resource implementation risk surrounding the development of planned projects.

    The IRP Update recommends a 10 percent supply buffer to manage the two concerns and other uncertainties. The planning buffer calls for Metropolitan to add 500,000 acre-feet to existing water resource plans by 2025, equally split between local and imported sources.

4. **Updated Resource Targets**: With the recognition of changed conditions and the addition of the proposed buffer, the Region's resource targets have changed. Table ES - 1 summarizes the proposed new targets for each major resource, including the buffer supply of 500,000 acre-feet split between recycling, groundwater recovery and desalination and Central Valley / State Water Project storage and transfers.

IMPLEMENTATION APPROACH

There is no single cornerstone for regional supply reliability. That is why there is an integrated resource plan that depends on many sources of supply. Achieving the continued reliability forecasted by the IRP rests on the shoulders of member and local agencies, as well as Metropolitan. Together, through this IRP Update, Metropolitan, the member agencies, and numerous local agencies will be able to provide reliable water supplies through continued investment in the region's water supplies.

Metropolitan's implementation approach for achieving the goals of the IRP Update is summarized in Table ES - 1. Many of the programs and resources are in place or have been developed by Metropolitan and the member agencies. Additional programs have been identified for future development. A comprehensive description of Metropolitan's implementation approach is contained in the *2003 Report on Metropolitan's Water Supplies.*

Table ES - 1: 2003 IRP Update Report: Updated Resource Targets

	1996 IRP 2020	IRP Update 2020	Change	IRP Update 2025
Conservation	882,000	1,027,600	+145,600	1,107,000
• Recycling, • Groundwater Recovery • Desalination	500,000	750,000	+250,000 (buffer)	750,000
Colorado River Aqueduct *	1,200,000	1,250,000	+50,000	1,250,000
State Water Project	593,000	618,000	+25,000	618,000
Groundwater Conjunctive Use	300,000	300,000	0	300,000
CVP/SWP Storage and Transfer	300,000	550,000	+250,000 (buffer)	550,000
MWD Surface Storage **	620,000	620,000	0	620,000

* The 1,250,000 acre-feet supply from the Colorado River Aqueduct is a target for specific year types when needed. Metropolitan is not expecting a full aqueduct in every year.
** Target for Surface Storage is for total capacity, not dry year yield.

Table ES - 2: IRP Update Resource Status – 2020 to 2025

Target	Programs and Status
• **Conservation**	***Current*** - Conservation Credits Program - 1992 Plumbing Codes ***In Development or Identified*** - Innovative Conservation Program - Southern California Heritage Landscape Program - 2007 Washing Machine Plumbing Code
• **Recycling** • **GW Recovery** • **Desalination**	***Current*** - LRP Program ***In Development or Identified*** - Additional LRP Requests for Proposals - Seawater Desalination Program
• **SWP**	***Current*** - SWP Deliveries - San Luis Carryover Storage (Monterey Agreement) ***In Development or Identified*** - CALFED & Phase 8 Hearings - Napa Negotiations - Environmental Water Account

Table ES - 3: IRP Update Resource Status – 2020 to 2025

Target	Programs and Status
• **CVP/SWP Storage and Transfers** • **Spot Transfers and Options**	***Current*** - Arvin Edison Program - Semitropic Program - San Bernardino Valley MWD Program - Kern Delta Program - Desert Water / Coachella Valley Advanced Storage - Spot Market transfers and options ***In Development or Identified*** - San Bernardino Valley MWD Conjunctive Use Program - Mojave Storage Demonstration Project - North Kern Storage Program - Kern Water Banking Program - Other San Joaquin Valley Programs
• **In Region Groundwater Conjunctive Use**	***Current*** - North Las Posas - Cyclic Storage - Replenishment Deliveries - Proposition 13 Programs (short-listed) ***In Development or Identified*** - Raymond Basin GSP - Proposition 13 Programs (wait-listed) - Expanding existing programs - New groundwater storage programs
• **In Region Dry-Year Surface Water Storage**	***Current*** - DVL - SWP Terminal Reservoirs (Monterey Agreement)

PLANNING CYCLE

Metropolitan leads, participates in, and produces a number of planning studies and reporting functions on a regular basis. Table ES - 4 shows the approximate timetables for the major processes and the type of requirement, legal or internal, which drive the process.

The driving process for the other functions is the IRP. The 1996 IRP determined, through a comprehensive stakeholder process, what the principles should be for building a long-term water resource plan, and the development targets under that plan. The other planning processes build off of the resource development targets.

Table ES - 4: Metropolitan Planning and Reporting Cycles

Report	Requirement / Type	Year							
		1999	2000	2001	2002	2003	2004	2005	2006
Regional Urban Water Management Plan	State Law / Report		X					X	
Annual Report to the California State Legislature on Achievements in Conservation, Recycling, and Groundwater Recharge	State Law / Report		X	X	X	X	X	X	X
Report on Metropolitan's Water Supplies	Internal Policy / Report				X	X	X	X	X
IRP Report Card	Internal Policy / Report				X		X	X	
IRP Update	Internal Policy / Planning Process					X			X
System Overview Study	Internal Policy / Planning Process						X		
Water Surplus and Drought Management Plan	Internal Policy / Planning Process	X					X		
Salinity Management Study	Internal Policy / Planning Process	X							
Long-Range Financial Plan	Internal Policy / Planning Process						X		

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TABLE OF CONTENTS

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SECTION 1- INTRODUCTION

BACKGROUND

In the mid 1990s, Metropolitan faced growing demands and increasing competition for existing water supplies. Metropolitan and its member agencies responded to this challenge with an Integrated Resource Planning (IRP) Process that would develop a comprehensive water resources strategy to provide the region with a reliable and affordable water supply for the next 25 years. The IRP process addressed the threat of periodic shortages, and provided Metropolitan's service area with an essential building block in the foundation of a strong economy and a healthy quality of life. Metropolitan's Board of Directors formally adopted the IRP in January 1996.

The IRP is intended to be a dynamic process that allows for response to any changes in water supply or demand. In keeping with this approach, Metropolitan's Board initiated the IRP Update in December 2001.

THE 1996 IRP PROCESS

Metropolitan's IRP was developed as a two-phase process over a two and a half year period. Phase 1 included data gathering, analysis, and decision-making. Major accomplishments during this phase were: 1) defining resource management and business principles; 2) determining the reliability targets for the region; 3) projecting water demands; and 4) identifying resource options. Phase 2 focused on developing a Preferred Resource Mix and evaluating coordinated local water management efforts.

Metropolitan's Board of Directors set the direction and vision for the 1996 IRP. The IRP planning process was open and participatory involving Metropolitan, its member agencies, other water resource agencies, environmental interests, and the general public. Because of the diverse needs and interdependencies of the various entities in the region, the success of the IRP was contingent on a transparent and interactive decision-making process that involved the major stakeholders.

IRP Workgroup

During the IRP process, the IRP Workgroup provided much of the technical guidance and direction. The Workgroup consisted of Metropolitan staff, member agency and local retail agency managers, and the groundwater basin managers. This IRP Workgroup met more than 35 times and spent hundreds of hours evaluating the analyses developed by Metropolitan staff.

Regional Assemblies

Major milestones in the process were established by a series of three regional assemblies held in October 1993, June 1994, and March 1995. These

gatherings marked the first time that Metropolitan's senior management, board of directors, and member agency managers convened to discuss strategic direction and regional water solutions. Participants at these assemblies also included general managers from the groundwater providers, as well as invited public representatives. Each assembly produced a written Assembly Statement documenting areas of consensus and identifying areas where divergent views remained unresolved.

Public Forums and Member Agency Sponsored Workshops

In addition to the IRP Workgroup and three regional assemblies, six regional public forums and several member agency workshops were held to facilitate broader public input into the planning process. More than 450 people attended the public forums, representing business, environmental, community, agricultural, and water interests from throughout the state.

RESULTS OF THE 1996 IRP PROCESS

When Metropolitan's Board of Directors initiated the IRP Process they required that six main policy objectives be met: reliability, affordability, water quality, diversity, flexibility, and sensitivity to environmental and institutional constraints. Feasible resource options were identified, examined, and combined into various strategies or "mixes" which were measured against the IRP objectives. The eventual result of this process was the selection of the Preferred Resource Mix that balanced local and imported supplies.

The Preferred Resource Mix established regional targets for the development of water resources including Conservation, Local Supplies, State Water Project (SWP), Colorado River, Regional Storage and Central Valley transfers. It reflected the most comprehensive strategy on how the region should achieve an affordable level of water supply reliability, while establishing assurance that full-service demands at the retail level would be satisfied under all foreseeable hydrologic conditions through 2020. For the purposes of analysis, "foreseeable hydrologic conditions" was understood to mean "under historical hydrology".

The most important product of the IRP Process was a regional planning framework for making future decisions about resource development. This framework supports the ability of Metropolitan service area to plan for reduced risk through diversification, and remain flexible in response to uncertain future demands. The1996 IRP also recognized that the plan should be revisited and adjusted periodically to keep pace with uncertainty and changing conditions.

SCOPE OF THE 2003 IRP UPDATE

In December 2001, after Metropolitan's Strategic Plan, Rate Restructuring, and IRP Review were completed, the Metropolitan Board adopted a specific scope and action plan to update the 1996 IRP.

In addition to extending the planning horizon from 2020 to 2025, the IRP Update set out to accomplish three major objectives:

- Provide a review of the resource development goals and current implementation achievements of the 1996 IRP

- Identify significant changed conditions affecting water resource development since the adoption of the 1996 IRP

- Evaluate the reliability of the IRP Preferred Resource Mix through 2020, adjust targets as needed to reflect changed conditions, and extend resource targets through 2025

The IRP Update included significant agency and Board participation, including regular communication with member agency staff, and coordination on demand and supply projections. The IRP Update also included frequent briefings to member agency staff and management, local groundwater managers, the Metropolitan Board, and other stakeholder groups. The process of updating the report extended over one and a half years and included the release of two IRP Report cards. Appendix 2 contains an overview of participation in the IRP Update.

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SECTION 2 – ANALYTICAL METHODS

1996 IRP PREFERRED RESOURCE MIX

Background

The 1996 IRP produced a comprehensive water resource development strategy, referred to as the "Preferred Resource Mix," which provides the region with reliable and affordable water supplies through 2020. This strategy is documented in Volume 1 of *Southern California's Integrated Water Resources Plan*, Report Number 1107, March 1996.

Analytical Approach

Several steps were taken to develop this strategy with a great deal of technical modeling and discussion through the IRP workgroups and workshops.

Step One:
Determine the potential shortfall between retail demand and imported and local supply through 2020.

Step Two:
Identify feasible options to offset potential shortages. Options examined included the development of: conservation, water recycling, groundwater recovery, seawater desalination, groundwater storage, surface storage, and imported supplies.

Step Three:
Assemble the feasible resource options into different water resource mixes, and evaluate those mixes against the six objectives of reliability, affordability, reduced risk, water quality, and other factors.

These steps were taken during what was considered Phase 1 of the IRP process beginning in June 1993. Three broad resource mixes resulted from the Phase 1 analysis: 1) an *Emphasis Import Mix,* which relied heavily on the development of imported supplies and regional storage infrastructure to meet future demands; 2) an *Emphasis Local Mix*, which relied primarily on the development of water recycling, groundwater recovery, and seawater desalination to meet future demands; and 3) an *Intermediate Resource Mix*, which included balanced investments in both local and imported supply development.

Phase 2 began in June 1994 to develop Southern California's Preferred Resource Mix by building on the analysis of Phase 1. During Phase 2, the Intermediate Resource Mix was refined into the Preferred Resource Mix. The Preferred Resource Mix set regional targets for resource development designed

to yield approximately 5,800,000 acre-feet if a critical drought year were to occur in 2020. Regional retail water demand under that same condition was estimated to be 6,100,000 acre-feet. The 300,000 acre-foot gap between the targeted supply development and demand is expected to be met by spot and option water transfers.

In total, the Preferred Resource Mix was found to satisfy the1996 IRP stated water supply reliability objective of 100 percent full service water demands at the retail level, under foreseeable hydrologic conditions.

2003 IRP UPDATE RELIABILITY MODELING

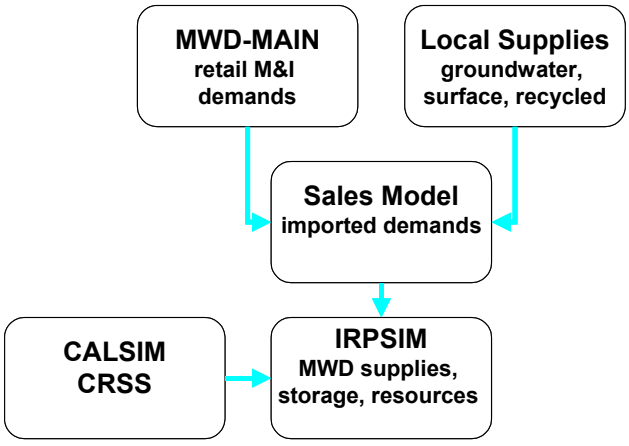
Background

The 1996 IRP evaluated reliability and resource options using a series of planning models. These basic models and related datasets improved and updated with current information, are used in the 2003 IRP Update to evaluate the 1996 IRP targets and changed conditions described in this report.

IRPSIM is Metropolitan's primary tool for evaluating regional reliability, storage operations, and resource opportunities, but a number of other models must be run before IRPSIM analysis can be performed. These models include:

MWD-MAIN:	Retail urban water demand projections
MWD Sales Model:	Local supply and imported demand projections
CALSIM/DWRSIM:	SWP imported supplies
CRSS:	Colorado River Aqueduct (CRA) imported supplies
IRPSIM:	Reliability and resource evaluation

In general, retail demand and conservation projections are developed for each member agency with MWD-MAIN. Metropolitan's Sales Model combines these retail demand projections with estimates of future local supplies to develop a forecast of Metropolitan and other imported demands. IRPSIM integrates projections of Metropolitan demands with projections of SWP supplies (CALSIM/DWRSIM) and CRA supplies (CRSS). The graphic shows how these models are interconnected.



Documentation on MWD-MAIN is contained in Appendix 1 of this report and in Metropolitan's *2000 Regional Urban Water Management Plan*. Detailed descriptions of the Sales Model, CALSIM, and CRSS are beyond the scope of this report but can be found in other Metropolitan, Department of Water Resources (DWR), and Bureau of Reclamation studies. The following is a brief description of IRPSIM.

IRPSIM Reliability Modeling

Metropolitan originally developed IRPSIM for evaluating the resource options in the 1996 IRP. IRPSIM uses a modeling method known as sequentially indexed monte-carlo simulation. In short, the model integrates projections of Metropolitan's demands and imported water supplies for each forecast year and adjusts each independent projection up or down, based on an assumed pattern of future weather drawn from the historic record. For instance, if Metropolitan expected the weather over the next 21 years (2004-2025) to be the same as the last 21 years (1982-2003), then IRPSIM would adjust the projected 2004 demands and supplies using the historical 1982 hydrology, and adjust the projected 2005 demands and supplies using the historical 1983 hydrology, and so on.

Metropolitan cannot predict the weather for any forecast year. Instead, IRPSIM cycles through all 77 years of hydrology to generate a probability distribution of reliability for each forecast year. In this way, Metropolitan can evaluate the probability of being in shortage or surplus for each forecast year, given the range in historical hydrology. This method of sequential analysis is effective in capturing the operation of storage resources that are drawn upon and refilled based on supplies and demands. Other agencies use identical or similar methods in their resource planning. Both DWR and the Bureau of Reclamation use historical weather for long-term planning.

2003 IRP Update Analysis

The reliability analysis for this report was performed in 2002 and captures most of the changed conditions since the 1996 IRP. The goal of the analysis was to evaluate Metropolitan's reliability with the existing IRP targets (or Board policy if more recent) under the changed conditions. As a result, the analysis is based on the best information available on demands, supplies, resources, and operating assumptions, as they existed in the spring of 2002. All aspects of Metropolitan's water resource portfolio are included in the analysis, such as groundwater storage operations, Diamond Valley Lake (DVL), Inland Feeder, and other existing and committed Metropolitan resources. For these runs, supplies and water transfers from a Quantification Settlement Agreement (QSA) are assumed to be in effect.

A note about the modeling: as stated previously, the objective of the modeling was to determine the impact and need of resources that are used to meet regional demands that remain after the use of traditional local supplies like groundwater, surface water, and Los Angeles Aqueduct supplies. All of these traditional local supplies, as well as the retail demand forecasts, have also had changes in assumptions since the 1996 IRP. These changes, listed in the appendices on retail demand and local supply, affect the need for supplemental resources, but were treated as assumptions and input for the purposes of modeling.

The following Resource Targets section discusses some of the resource assumptions embedded in IRPSIM. The results of the IRPSIM analysis are discussed in the Analysis and Findings section of this report.

Water Quality Assumptions

The water quality analysis of the IRP Update focused on meeting federal drinking water regulations at Metropolitan's treatment plants and meeting a maximum estimated salinity of 500 mg/L. Blend restrictions were used in IRPSIM to approximate the mix of SWP and CRA supplies needed to achieve these often-competing goals.

Most federal drinking water regulations for Metropolitan treated water deliveries are met through filtration and chemical treatment at Metropolitan's treatment plants. Metropolitan has five treatment plants: two that receive exclusively SWP water, and three that receive a blend of State Project and Colorado River water.

The SWP exclusive plants deliver water that meets federal regulations for disinfection by-products through regulation that called for a non-reversible commitment to institute an accepted treatment process to eliminate hazardous by-products. In December 2001, Metropolitan made that commitment to install ozonation at these two plants.

The blended plants, Skinner, Diemer, and Weymouth, meet federal guidelines through managing the blend of State Project and Colorado River water until treatment improvements are made. These blend restrictions limit the amount of State Project water as a percent of total treated water in the plant. Blend restrictions will ease based on the implementation of two treatment improvements, which are phase-in at each plant. Phase 1 calls for advance coagulation to be installed in 2005 for Skinner and 2006 for Diemer and Weymouth. Phase 2 calls for the installation of a treatment process equivalent to ozonation at Skinner, Diemer, and Weymouth in 2007, 2009, and 2009 respectively. The blend restriction for each of these dates and plants is given below. While Metropolitan's maximum capacity to manage State Project water at the blended treatments will be higher at time; low estimates of blend capabilities were used to assure compliance.

Table 2- 1: Assumed Blend Restrictions for Skinner, Diemer and Weymouth

	Maximum State Project Water Blend		
	30% Blend	**65% Blend**	**100% Blend**
Skinner	Until 2005	2005-2007	Beyond 2007
Diemer	Until 2006	2006-2009	Beyond 2009
Weymouth	Until 2006	2006-2009	Beyond 2009

The IRPSIM model used these blend restriction as rules that could not be violated, therefore all results of the reliability study reflect restricted water use due to water quality. The salinity goal was approximated in the study by restricting the minimum State Project blend to 25 percent.

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SECTION 3 – RESOURCE TARGETS

CONSERVATION

Background

Since the early 1990s, Metropolitan and its member agencies have earned national recognition as leaders in water conservation. This strong commitment to water conservation is reflected in the 1996 IRP, which considered conservation a "core" water supply and established initial targets for regional conservation savings.

Metropolitan's focus on water conservation stems from reliability issues linked to the 1987-1992 California drought. These concerns, coupled with technical advancements in water-efficient fixtures, fostered a heightened public and water agency awareness and acceptance of conservation, and provided an opportunity at Metropolitan for a new cost-effective option to bolster water supply reliability. Today, Metropolitan and its member agencies are pushing the envelope of water conservation technology with a portfolio of innovative conservation programs. Metropolitan and nearly all of its member agencies are signatories to the California Urban Water Conservation Council's Memorandum of Understanding Regarding Water Conservation in California, and have pledged to implement the Best Management Practices (BMP) for urban water conservation.

Issues

Unlike traditional water supplies, conservation reduces water demand in ways that are not easily measured or metered. Demand is reduced through changed consumer behaviors and savings from water-efficient fixtures like ultra-low-flow toilets and showerheads. In order to quantify conservation savings - as well as projections - estimates are made using specially designed models. These models were used for both the 1996 IRP targets and 2003 IRP Update projections.

Conservation savings are commonly estimated from a base-year water use profile. Metropolitan uses 1980 as the base year because California introduced a new plumbing code that promoted fixture-based (hardware) conservation in 1980. Between 1980 and 1990, an estimated 250,000 acre-feet was saved as the result of the 1980 plumbing code and water rate increases. These savings, known as pre-1990 savings, are included in the 1996 IRP target as well as the current estimate of achieved savings.

Reporting Conservation

Metropolitan differentiates conservation savings in four ways:

- Active: savings from Metropolitan and member agency-funded conservation programs, also known as BMP's
- Passive: savings from the Metropolitan-sponsored 1992 California plumbing code
- Price Effects: savings due to increases in retail water rates and conservation-oriented rate structures since 1990
- Pre-1990: savings from the 1980 California plumbing codes and price effects from the 1980 to 1990 price increases

A key issue with evaluating conservation savings is untangling the relationship between active and passive conservation. The distinction between what is an active versus passive conservation savings can be difficult to define, especially when there are active programs for fixtures that are reinforced by plumbing codes. For this report, active and passive conservation are reported together.

Metropolitan does not currently assign a savings value for public awareness campaigns and conservation education because changes in attitude are difficult to measure. It is generally accepted that these programs prompt people to install water saving fixtures, and therefore have a residual benefit increasing the effectiveness of companion conservation programs.

Changed Conditions

Metropolitan updated its 1996 IRP conservation projections with:

1. Updated water savings estimates for high-efficiency fixtures
2. Explicit handling of price-effect savings
3. An updated set of demographic projections affecting the savings rates
4. New projections of active conservation
5. The realization that active and passive savings are interrelated

The combined effect of these changes is an increase in the projections of total conservation from the 1996 IRP.

1996 IRP and 2003 IRP Update Targets

The 1996 IRP set conservation targets of 571,000 acre-feet in fiscal year (FY) 2002, 738,000 acre-feet in 2010, and 882,000 acre-feet by 2020. These targets were based on an estimate of regional BMP compliance and passive conservation. The 2003 IRP Update's projection of regional conservation is 653,000 acre-feet in FY 2003, 865,000 acre-feet by 2010 and 1,028,000 acre-feet by 2020. These projections include expected BMP compliance and represent a potential new "target" for total conservation.

Projections of 2020 conservation savings are 146,000 acre-feet higher (17 percent) than the original IRP target. In addition, the IRP Update includes a 2025 conservation projection of 1,107,000 acre-feet of savings. The following table (Table 3 - 1) shows the 1996 IRP conservation projection and the 2003 IRP Update:

Table 3 - 1: Conservation Targets (Acre-Feet)

Category	FY03	2010	2020	2025
2003 IRP Update	653,850	865,200	1,027,600	1,106,900
1996 IRP Target	571,000	738,000	882,000	N/A

Implementation Approach

Metropolitan's implementation approach for achieving the revised conservation target includes continuing to support the member agencies in developing cost-effective BMP-oriented active conservation programs, and developing new, innovative programs that address water use unique to the region. Metropolitan's stewardship charge within the rate structure will provide a continued funding mechanism for active programs. Metropolitan will continue to seek state and federal funding in conjunction with the Member agencies. Conservation implementation, including passive and price-effect savings, is contained in Table 3 - 2 below.

Table 3 - 2: Conservation Status (Acre-Feet)

Category	2020	Status
Active & Passive Savings	483,000	Current
Price Effect Savings	249,900	Current
Pre-1990 Savings	250,000	Current
System Losses/Other	44,700	Current
• 2007 Washing Machine Plumbing Code	NQ*	Identified
• S.C. Heritage Landscape	NQ*	Identified
• Innovative Conservation	NQ*	Identified
Total Conservation: 2020	**1,027,600**	

* Savings potential not quantified

Active Conservation – Conservation Credits Program

As a signatory to the California Urban Water Conservation Council's Memorandum of Understanding Regarding Water Conservation in California, Metropolitan has pledged to implement a prescribed set of urban water

conservation BMPs. In practice, many of Metropolitan's innovative conservation programs exceed BMP requirements. The region's commitment to conservation is represented by a $290 million investment by Metropolitan and its member agencies in conservation programs since 1990.

The cornerstone of Metropolitan's conservation program is the Conservation Credits Program. Under this program, Metropolitan contributes either one-half the program cost, or $154 per acre-foot of water conserved, whichever is less, to assist member agencies in exploring new program opportunities.

Passive Conservation from Plumbing Codes

Plumbing codes are among the most effective tools for reducing water use and have been critical to achieving the IRP goals. Plumbing codes reap long-term benefits. Each year, a percentage of existing non-conserving fixtures are replaced and new water-efficient housing units come on-line.

Metropolitan played a key role in supporting California's 1992 point-of-purchase plumbing code, which affects toilets (1.6 gallons per flush), showerheads (2.5 gallons per minute), urinals (1.0 gallons per flush) and faucets. Within Metropolitan's service area, the cities of Los Angeles, San Diego, and Santa Monica have passed retrofit-on-resale ordinances to accelerate fixture replacement beyond the plumbing codes. These code-like ordinances require that all non-conserving toilets and showerheads be replaced with water-efficient models when a property is sold. All three cities support their retrofit-on-resale ordinances with rebates.

There will be a new plumbing code for washing machines in 2007. Due to recent questions regarding the savings impact of the new code, it was not considered in the 2003 IRP Update for projections of passive conservation.

Price-Effect Conservation

Numerous demand studies have shown that retail water rates and rate structures can be effective in promoting water savings. Consumers respond to price increases by reducing discretionary water use and by installing water-conserving devices. As retail rates within the region increase, and as water agencies adopt conservation-oriented rate structures, Metropolitan expects discretionary household and commercial & industrial water use to decrease. This reduction was modeled and incorporated into the 2003 IRP Update as a source of conservation.

The resulting price effects savings for the region are estimated to be 155,000 acre-feet in FY 2003, and 250,000 acre-feet per year by 2020. Most of the savings are expected to come from reductions in outdoor irrigation, which is the major discretionary component of residential and commercial use.

Identified Programs

Metropolitan is implementing several new active conservation programs that are not included in the projected conservation savings estimates. These programs include a new outdoor landscape water use program and the Innovative Conservation Program.

Southern California Heritage Landscape Program

In 2002, Metropolitan launched a public outreach campaign targeting outdoor water use. The campaign, coordinated with participating member agencies, included funding for the promotion of efficient residential watering through irrigation controllers, a watering index to assist in estimating efficient watering times, and a native and California-friendly plant program. These programs were expanded in 2003 with an extensive media and outreach campaign and the launch of a consumer-oriented outdoor conservation savings website.

The landscape program is expected to reduce summer and fall outdoor water use. The actual savings rate will be measured, but are not included in the IRP Update's resource goals. Quantifying the potential savings is complicated because of possible overlaps with other programs – some of the outdoor savings may reduce the impact of price savings, or reduce the demand for recycled water. Further study is needed to investigate these issues.

Innovative Conservation Program

Metropolitan's Innovative Conservation Program (ICP) began in October 2001 with a request for proposals for new conservation technologies. The 2001 ICP identified two promising new technologies: X-ray machine recyclers and water brooms. Long-term penetration of these devices into the service area is unknown; therefore no savings have been incorporated at this time. In 2002, Metropolitan issued another ICP request for proposal, which is in the selection process. The new technologies identified by the ICP program are expected to generate significant additional savings, which will be quantified at a later date and are not included in this IRP Update report.

Many additional conservation programs and ideas receive Metropolitan funding in support of IRP goals but are not included in this report. A detailed description of these programs is contained in Metropolitan's *2000 Regional Urban Water Management Plan* and Metropolitan's *2003 Annual Report to the California State Legislature on Achievements in Conservation, Recycling and Groundwater Recharge.*

LOCAL RESOURCES - RECYCLING, GROUNDWATER RECOVERY, SEAWATER DESALINATION

Background

The 1996 IRP Preferred Mix called for a diverse portfolio of imported supplies and locally developed resources. To achieve a balanced mix, the IRP set targets and committed funding for member agency-developed wastewater recycling (recycling), and groundwater recovery supplies. The 1996 IRP recognized seawater desalination as a potential resource, but did not set targets for future development.

Metropolitan funds recycling and groundwater recovery projects through the Local Resources Program (LRP). The production-based incentive has been instrumental in helping the region implement the 1996 IRP local resource targets. Metropolitan has invested over $121 million in 53 recycling projects and 22 groundwater recovery projects. Independent of Metropolitan, member and sub-member agencies have also funded a significant number of local projects, many of which pre-date Metropolitan's LRP program.

Issues

An important issue uncovered in IRP Update meetings with member agencies is the significant amount of future recycling dedicated to replenishment and seawater barriers (non-consumptive or non-direct use). Metropolitan's original IRP recycling target was set for direct use (urban or agricultural) recycling. Many member agencies report recycled water for replenishment and seawater barrier as part of their groundwater production. This report follows that convention for those projects and therefore their production is not counted toward the target.

Changed Conditions

The status of locally planned recycling and groundwater recovery projects change from year to year. Metropolitan periodically surveys its member agencies for planned LRP-related projects in order to coordinate local supply projections with agency plans. Planned projects move on or off the books in response to changing long-term strategies, regulations, funding priorities, new opportunities, and a host of other reasons. The dynamic nature of local supply plans account for much of the change since the 1996 IRP.

Other changes since the 1996 IRP include the following:

- Decreases in the cost of seawater desalination
- Faster-than expected development of groundwater recovery supplies
- Recognition of member agency plans for a significant amount of recycling dedicated to non-direct use purposes such as groundwater replenishment and seawater barriers

1996 IRP and 2003 IRP Update Targets

The 1996 IRP targets for recycling and groundwater recovery projects were 300,000 acre-feet by 2000, 410,000 acre-feet by 2010, and 500,000 acre-feet by 2020. The recycling targets included pre-existing non-direct use supplies, but were intended to be for direct uses – consumptive urban and agricultural water supply. In FY 2002, recycling and groundwater recovery programs generated 251,000 acre-feet. While the target was narrowly missed for 2000, the region is expected to meet the 2010 and 2020 targets. Meeting the targets will require the region to produce 159,000 acre-feet of additional local project and/or seawater desalination supply by 2010 and 249,000 acre-feet by 2020. Overall, the region has developed about 50 percent of the 1996 IRP local resources target for 2020.

The 1996 IRP targets for direct use recycling, groundwater recovery, and desalination are shown in Table 3 - 3. These targets are still in effect for the 2003 Update analysis, even though the projections are higher.

Table 3 - 3: Recycling, Groundwater Recovery, and Desalination Targets (Acre-Feet)

Source	2005	2010	2020	2025
2003 IRP Update	355,000	410,000	500,000	500,000
1996 IRP Targets – Total	355,000	410,000	500,000	N/A
1996 IRP – Recycling	*310,000*	*360,000*	*450,000*	N/A
1996 IRP – GWR	*45,000*	*50,000*	*50,000*	N/A
1996 IRP – Desalination	*0*	*0*	*0*	N/A

Recycled Water Targets

The 1996 IRP recycling targets were 290,000 acre-feet in 2002, 360,000 acre-feet in 2010, and 450,000 acre-feet in 2020. In FY 2002, the region produced 201,000 acre-feet of recycled supplies, including both Metropolitan subsidized and agency self-funded projects. The production of these existing projects will continue to grow since the demand for recycled water takes time to develop, despite the fact that the infrastructure is already in place.

Of the 201,000 acre-feet of existing recycling production, about 31 percent is used for non-direct purposes and is represented in the 1996 IRP targets. Future non-direct use recycling supports local groundwater production through enhanced recharge or the generation of seawater barriers. The projected amount of non-direct use recycling is compared to direct use recycling in Table 3 - 4. Over time, recycling for replenishment and seawater barrier is projected to range from 40 percent to 33 percent of total recycling use.

Table 3 - 4: Projected Recycling Production – All Uses (Acre-Feet)

Source	2005	2010	2020	2025
Direct Use (Urban & Ag)	207,200	287,047	388,075	393,075
Replenishment	68,600	142,535	136,672	136,672
Seawater Barrier	17,500	45,500	53,500	53,500
Total Non-Direct	***86,100***	***188,035***	***190,172***	***190,172***
Total Recycling: All Uses	**293,300**	**475,082**	**578,247**	**583,247**

Groundwater Recovery Targets

The annual groundwater recovery production targets in the 1996 IRP targets were 40,000 acre-feet for 2000, and 50,000 acre-feet for 2010 and 2020. In FY 2002, the region produced 50,000 acre-feet of water from groundwater recovery facilities, of which 32,000 acre-feet came from Metropolitan-funded projects. Regional groundwater recovery supplies have developed faster than expected and are projected to exceed the 1996 IRP target by 45,000 acre-feet, representing a 90 percent increase.

Seawater Desalination

The 1996 IRP recognized seawater desalination as a potentially abundant resource for the region. Because of the then high cost estimates, environmental issues, and project site selection uncertainty, the IRP called for continued research into the technology, but did not set seawater desalination targets as part of the long-term resources plan.

Implementation Approach

Metropolitan's projection of the regional implementation of direct use recycling, groundwater recovery, and desalination exceed the 1996 IRP goals. Although the recycling for direct use target is missed by over 50,000 acre-feet in 2020, the difference is covered with increased groundwater recovery and seawater desalination (Table 3 - 5).

Table 3 - 5: Recycling, Groundwater Recovery, and Seawater Desalination Status in 2025 (Acre-Feet)

Source	Supply Range		Status
Recycling (Direct Use)	393,100	393,100	Current & Under Development
Groundwater Recovery	95,100	95,100	Current & Under Development
Seawater Desalination*	36,200	150,000	Under Development

*Metropolitan's current target for recycling, groundwater recovery, and desalination can accommodate 150,000 acre-feet of desalination. The desalination used for modeling 36,200, reflects known projects in Spring 2002.

Funding Mechanisms

Between 1986 and 1990, Metropolitan's contribution to local projects was $75 per acre-foot of production. In April 1990, Metropolitan's Board increased the contribution to $154 per acre-foot, and again in 1995 to a maximum of $250 per acre-foot.

In 1998, under a new innovative approach, Metropolitan issued a competitive Request for Proposals (RFP) for up to 53,000 acre-feet of new annual local project supplies. The goal of the RFP was to develop enough new recycling and groundwater recovery production to achieve the IRP targets and take advantage of competition to achieve regional cost savings. The RFP process assessed a number of different factors in selecting the optimal mix of local resources projects for funding. The weighted average cost of the selected projects under the competitive process was $110 per acre-foot of production.

Future targets for recycling production identified in the IRP Update will likely use a similar competitive process. Metropolitan has issued another RFP for 65,000 acre-feet of new supply in 2003/04 to meet the 2010 IRP goal for recycling and groundwater recovery production.

Seawater Desalination Implementation

Recent developments in technology and new siting strategies for plants have potentially reduced costs, and may make seawater desalination a viable supply option for the region earlier than anticipated. In 2001, Metropolitan issued a competitive RFP for seawater desalination projects with the goal of developing up to 50,000 acre-feet of annual supply. In light of the enthusiastic response to the proposals submitted under the RFP, this report includes a revised local resources target that can accommodate a seawater desalination goal of 150,000 acre-feet.

STATE WATER PROJECT

Background

The SWP consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants. This statewide water supply infrastructure was constructed and is operated by the DWR and provides water to 29 urban and agricultural agencies throughout California. The original State Water Contract called for an ultimate delivery capacity of 4,230,000 acre-feet, with Metropolitan holding a contract entitlement to 2,011,500 acre-feet.

More than two-thirds of California's drinking water, including all water supplied by the SWP, passes through the San Francisco-San Joaquin Bay-Delta (Bay-Delta). For decades, the Bay-Delta system has suffered water quality and supply reliability problems due to both variable hydrology and environmental standards that limit pumping operations in the Bay-Delta.

Issues

The 1996 IRP assumed that, without investments to improve conditions in the Bay-Delta, the amount of water available to Metropolitan as projected under State Water Resources Control Board (SWRCB) D-1630 would decrease due to additional environmental and fishery standards that would have to be imposed on water project operations. Without intervention, it was assumed that the decreases would lower Metropolitan's SWP yield to 171,000 acre-feet by 2005 under a repeat of a 1977 hydrologic condition, which is the driest single drought year on record for the SWP watershed area.

In 1995, the SWP began operations based on the new criteria agreed to under the historic 1995 Bay-Delta Accord (Accord). Under the Accord, the 1977 hydrologic scenario for SWP supply was improved to 418,000 acre-feet.

Changed Conditions

Metropolitan's strategy is to increase yield on the SWP in dry years while minimizing impacts to the Bay-Delta ecosystem. Maximizing deliveries to storage programs in wetter years will help achieve these goals.

Metropolitan's board set new goals for SWP supply with the adoption of CALFED Policy Principles in August 1999. In addition to committing Metropolitan to pursue water quality objectives, the principles called for the development of a 650,000 acre-foot minimum dry-year supply from the SWP by 2020. Metropolitan's policy objectives also include an average 1,500,000 acre-feet of supply to Metropolitan, exclusive of transfers and storage programs along the SWP.

In August 2000, CALFED reached a critical milestone when the Record of Decision (ROD) was approved. The ROD identifies implementation plans for Stage 1—the first seven years—of what is expected to be a 30-year improvement program in the Bay-Delta. The ROD included a provision for studying a diversion upstream of the Bay-Delta and a facility to convey water through the Delta, but it did not include plans for an isolated transfer facility. This represents a changed condition from the 1996 IRP, which set SWP targets in line with a full Bay-Delta fix that was assumed to be similar in cost and operation to an isolated transfer facility.

1996 IRP and 2003 IRP Update Targets

The following table shows the targets for the SWP through 2025.

Table 3 - 6: State Water Project Supply* Targets (Acre-Feet)

	2003	2010	2020	2025
2003 IRP Update	418,000	463,000	650,000	650,000
1996 IRP Target	283,000	593,000	593,000	N/A

* This table includes only SWP Entitlement Allocation and Improvements. It does not include San Luis Carryover Storage made available through the Monterey Amendment, or SWP water available from Desert Water Agency and Coachella Valley Water District as part of the DW/CV Advance Delivery Agreement.

Implementation Approach

Metropolitan's implementation approach for the SWP depends on the full usage of the current State Water Contract provisions (Table A basic contract amount, Article 21 interruptible supplies, Turnback Pool provisions, etc.) and the outcome of a number of negotiated agreements and their implementation. These include CALFED, the Phase 8 Settlement Agreement, The Monterey Amendment, and the Napa Negotiations. Each one of these stakeholder processes or agreements involves substantial Metropolitan and member agency staff involvement to represent regional interests. Metropolitan is committed to working collaboratively with DWR, SWP contractors, and other stakeholders to ensure the success of these extended negotiations and programs, summarized in Table 3 - 7.

Table 3 - 7: State Water Project Supplies Status: 2020 – 2025 Resources (Acre-Feet)

Program	Supply Range		Status
SWP Deliveries	418,000	1,741,000	Current
San Luis Reservoir Carryover	75,000	200,000	Current
Delta Improvements (CALFED & Phase 8)	200,000	200,000	Under Development
Napa Negotiations	N/A	N/A	Under Development

CALFED and Napa Negotiations

The CALFED ROD calls for improvements in the operations of the SWP pumping facilities. The first projects being implemented are focused on improved operations at the Banks Pumping Plant. In December 2002, a mediated stakeholder process identified a preferred alternative, and environmental documentation is proceeding. Project-wide estimates for increased pumping and wintertime benefits are 192,000 acre-feet per year and 150,000 acre-feet per year of summer and fall benefits. Supplies and capacity available to Metropolitan, based on estimated allocations among water users, would be 85,500 acre-feet per year. The implementation of this process has been improved by recent talks, known as the Napa Negotiations, between SWP and Central Valley Project agencies.

Phase 8 Settlement Agreement

Metropolitan also has been working to ensure that all Bay-Delta water users equitably share the burden of meeting flow requirements. In December 2002, all of the parties signed a settlement agreement known as, “The Sacramento Valley Water Management Agreement” or “Phase 8 Settlement Agreement.” The agreement, which resulted from the SWRCB Bay-Delta Water Rights Proceedings, includes work plans to develop and manage water resources to meet Sacramento Valley in-basin needs, environmental needs under the SWRCB’s Water Quality Control Plan, and export supply needs for water demands and water quality.

This agreement is comprised of about 60 water supply and system improvement projects by 16 entities in the Sacramento Valley. Approximately 185,000 acre-feet per year of yield are expected from conjunctive use projects in the Sacramento Valley. Approximately 45,000 acre-feet of this water would come to Metropolitan through its SWP allocation.

Based on the work plans for CALFED’s Bay-Delta Program and the Sacramento Valley Management Agreement, potential annual and dry-year supply capabilities are projected to be 45,000 acre-feet in 2010, and 200,000 acre-feet by 2015 and beyond. These projections do not reflect Metropolitan’s improved flexibility in managing SWP supplies for drought mitigation as a result of the Monterey Amendment provisions of the State Water Contract.

Monterey Amendment
The Monterey Amendment, executed by DWR and most of the State Water Contractors in 1995 and 1996, primarily addressed the allocation of SWP water in times of shortage and dealt with a number of other issues that facilitated more water management flexibility for Contractors. Although legal action challenging the validity of the Monterey Amendment has occurred, a settlement has been reached and a revised Environmental Impact Report is being prepared.

Environmental Water Account
Metropolitan also is a major contributor of water to the Environment Water Account (EWA), a key objective of the CALFED Stage 1 implementation. The EWA is a cooperative management program that provides protection to the fish of the Bay-Delta estuary through environmentally beneficial changes to the operations of the SWP and the federal Central Valley Project. With the EWA and its assurances in place, Metropolitan's SWP supplies are far more reliable and insulated against regulatory uncertainty than was assumed in the 1996 IRP.

Each of the above implementation approaches contributes to Metropolitan's long-term SWP strategy.

COLORADO RIVER AQUEDUCT

Background

Metropolitan was formed with a primary mission to secure and deliver Colorado River water to Southern California. In 1928, Metropolitan began to construct and, in 1941 to operate, the Colorado River Aqueduct (CRA) so that Colorado River Water could be delivered to Southern California.

One of Metropolitan's most valuable assets is an entitlement, through a contract with the federal government, to a basic apportionment of 550,000 acre-feet per year of Colorado River water. When the U.S. Secretary of the Interior declares that surplus water is available, Metropolitan also has a priority for an additional 662,000 acre-feet per year depending upon the availability of surplus supplies.

In 1988, Metropolitan entered into an agreement to fund water efficiency improvements to the service area of the Imperial Irrigation District (IID) in exchange for the right to divert the estimated amount of water conserved. This agreement, which is effective through 2033, provides up to 110,000 acre-feet per year to Metropolitan.

Issues

Water supplies from the Colorado River have been the topic of negotiation and intense debate over the past century; this debate continues today. By a 1964 U.S. Supreme Court decree (*Arizona v California and the Boulder Canyon Project Act*), California is required to limit its annual use to a 4.4 million acre-foot basic annual apportionment of Colorado River water plus any available surplus. Metropolitan will have to reduce its level of diversions in years when no surplus is available.

California water agencies have developed a plan that is acceptable to the U.S. Department of the Interior and other Colorado River basin states on how to reduce California's draw of Colorado River water. If an agreement (referred to as the QSA) is executed, California will be allowed continued access to special surplus water as available, through 2016.

Changed Conditions

The 1996 IRP recognized explicitly that program development along the CRA and in other Colorado River user service areas would play an important part in reaching the target of 1,200,000 acre-feet per year of deliveries when needed. The implementation approach addressed the specific areas of additional water conservation with California agricultural agencies; storing water out of state in Arizona; land management in the Palo Verde Irrigation District; storing water in vacant capacity of Lake Mead; using other entitlement holder's unused apportionments; and using surplus water as declared by the Secretary of the Interior. Subsequent to the 1996 IRP, the Metropolitan Board also adopted a policy that increased the annual target by 50,000 acre-feet to a total of 1,250,000 acre-feet, when needed for use by the region.

As of September 2003, the California agencies have reached a tentative agreement on the QSA, which Metropolitan's Board of Directors has approved. It is pending approval by the governing boards of the agencies, and by the U.S. Secretary of the Interior. The QSA supports Metropolitan's development plans for CRA deliveries. The QSA would allow for the agricultural conservation, land management, and potential surplus water availability management programs that were identified in the 1996 IRP. In addition, the QSA would clarify agency rights to water made available through agricultural to urban transfers, and the potential environmental liability cost for future transfers. The QSA also contains provisions that call for water transfers to the Coachella Valley Water District and recognizes the responsibility to uphold water rights that pre-date the Seven Party Agreement between the California agencies. These provisions impact Metropolitan's basic apportionment rights to Colorado River water.

1996 IRP and 2003 IRP Update Targets

The target for the CRA in the 1996 IRP was set at 1,200,000 acre-feet per year. The target for the CRA today is 1,250,000 acre-feet per year to meet regional demands when needed. Metropolitan also needs these supplies to manage regional storage conditions and water quality. Metropolitan recognizes that annual supplies will vary from year to year, even with the adoption of the QSA. The following table shows the targets for the CRA:

Table 3 - 8: Colorado River Aqueduct Targets* (Acre-Feet)

	2003	2010	2020	2025
2003 IRP Update	1,250,000	1,250,000	1,250,000	1,250,000
1996 IRP Target	1,200,000	1,200,000	1,200,000	N/A

* Metropolitan's target for the CRA is to have 1,250,000 acre-feet of supply from the Colorado River when needed. Metropolitan expects to receive less than a full aqueduct in normal years

Implementation Approach

At the time of this report, the four agencies involved in the QSA are on the verge of successfully concluding a "final" round of negotiations. Metropolitan's goal remains to produce 1,250,000 acre-feet of supply when needed, with or without the QSA. This section describes the current and identified resources (summarized in Table 3 - 9) that Metropolitan can develop to meet this goal.

Table 3 - 9: Colorado River Aqueduct Deliveries
Status: 2020-2025 Resources (Acre-Feet)

Program	Supply	Status
Base Apportionment	550,000	Current
IID/MWD Conservation Program	55,592	Current
Priority 5 Apportionment	-	Current
Coachella & All-American Canal Lining Projects	77,700	Current
Off-Aqueduct Storage • Hayfield Storage Program	150,000	Current
Interim Surplus Guidelines	-	Under Development
IID/MWD Conservation Program	49,538	Under Development
SDCWA/IID Transfer	200,000	Under Development
PVID Land Management Program	111,000	Under Development
Off-Aqueduct Storage • Lower Coachella Storage Program • Chuckwalla Storage Program • Central Arizona Banking	150,000 150,000	Under Development

In order to achieve the development targets for the CRA, Metropolitan has identified a number of programs. Four of the most promising currently in development are: the Coachella and All-American Canal Lining programs, the Palo Verde Land Management and Crop Rotation Program, the Hayfield Groundwater Storage Program, and the IID/San Diego County Water Authority/Metropolitan Water Transfer and Exchange Agreement. These programs could provide up to 538,700 acre-feet of dry year deliveries. The QSA would provide for a more straightforward implementation of these programs.

Other programs that could be developed by 2025 include groundwater storage programs in the Chuckwalla and Lower Coachella Valleys and a program with the state of Arizona to store surplus water along the Central Arizona Project. Together, these programs provide a potential for 450,000 acre-feet in dry years.

The QSA would provide for two additional sources of water supply for Metropolitan. Under the agreement, Metropolitan will have access to a total of 800,000 to 1,600,000 acre-feet of water through 2017. The QSA would also reinstate the Interim Surplus Guidelines (ISG), which were suspended when the original agreement deadline passed. Although Metropolitan's current plans for resource development do not rely upon surplus water from the ISG, the option to take the surplus water, should it become available, provides additional water management flexibility.

Metropolitan will continue to pursue the programs identified above to meet the target of 1,250,000 acre-feet per year when needed.

IN-REGION SURFACE WATER STORAGE

Background

With the completion and filling of Diamond Valley Lake (DVL) and the flexible storage provisions of the SWP Monterey Amendment, Metropolitan has exceeded the in-region dry-year storage capacity identified in the1996 IRP.

Storage at DVL significantly improves Metropolitan's ability to manage wet/dry year hydrologic cycles of imported supplies. In combination with the Inland Feeder, to be completed in 2007, DVL will allow Metropolitan to take full advantage of variable SWP allocations and to manage fluctuating Colorado River supplies.

Issues

An ongoing issue in comparing surface water storage between the 1996 IRP and 2003 Update relates to storage operation criteria. While the total reservoir

storage capacity is a straightforward comparison, how that storage is operated to generate dry-year yield is not. Metropolitan identified general long-term storage operation rules in the *1999 Water Surplus and Drought Management* (WSDM) study, but there is no official "rule curve" governing the operation of regional surface storage during a drought. Real-time decisions are based around the general WSDM rules, but are based more on issues such as water quality, actual hydrology, and SWP operations. Dry-year surface storage yields have been characterized in several ways by Metropolitan reports, including delivery capabilities over two and three-year dry periods. The IRP Update analysis assumes that dry-year surface storage can be used as needed and as available within the WSDM planning framework.

Changed Conditions

Based on an updated emergency storage calculation for 2020, there will be more surface water available in DVL for dry-year production as compared to the 1996 IRP. The updated calculation accounts for lower projected demands in 2020 and assumes that the emergency storage need is allocated to other regional reservoirs first, with the remainder allocated to DVL. As regional demands grow, the dedicated dry-year storage in DVL is expected to gradually decline to the 1996 IRP target of 400,000 acre-feet by 2030.

Another issue is the characterization of the flexible storage available in the SWP terminal reservoirs. The *2003 Report on Metropolitan's Water Supplies* assumes that roughly 50 percent of the available SWP flexible storage could be used in a dry year. In the IRP Update Report, dry-year surface production, including Monterey storage, is not limited in this way. Instead, Metropolitan's reliability modeling determines the availability of stored surface water supplies in each forecast year based on historical hydrology.

1996 IRP and 2003 IRP Update Targets

The 1996 IRP identified a 2020 in-region surface water target of 620,000 acre-feet of dry year storage - 400,000 acre-feet of dry year storage in DVL, and about 220,000 acre-feet available through the Monterey Amendment in the SWP terminal reservoirs (Castaic and Perris). This target remains the same for the 2003 IRP Update.

Table 3 - 10: In-Region Dry-Year Surface Storage Targets (Acre-Feet)*

	2010	2020	2025
2003 IRP Update Carryover Storage	620,000	620,000	620,000
1996 IRP Target	620,000	620,000	620,000

* Note: the table shows total capacity, not stored supply.

Implementation Approach

Metropolitan has met or exceeded the 1996 IRP target for dry-year surface storage. By 2025, Metropolitan will have between 454,300 and 866,000 acre-feet of dry year carryover storage capacity in DVL, Lake Mathews, and Lake Skinner, and between 110,000 and 219,000 acre-feet of capacity in the SWP terminal reservoirs (Table 3 - 11).

Table 3 - 11: In-Region Dry-Year Surface Storage Status in 2025 (Acre-Feet)

Program	Supply Range		Status
Metropolitan Surface Storage (DVL, Lake Mathews, Lake Skinner)	454,300	866,000	Current
SWP Flexible Storage	110,000	219,000	Current

IN-REGION GROUNDWATER STORAGE

Background

Groundwater basins within Metropolitan's service area are the foundation of the water supply system in Southern California. Conjunctive use is an important part of maintaining and enhancing the reliability of these basins. Local water management has included the conjunctive use of surface water and groundwater since the 1950's. Conjunctive use will be an even more important part of the region's supply reliability in the future. Currently, more than 70 recharge facilities are replenishing Southern California's water basins.

Issues

Metropolitan has found that a ratio of groundwater storage capacity to delivery capability of three to one generally allows for maximizing storage use, under historical hydrologic variation, while minimizing capital cost. In other words, for every 3,000 acre-feet of groundwater storage capacity, there should be 1,000 acre-feet of delivery capability. Most of Metropolitan's groundwater programs have this ratio as a goal while the programs are under development.

Changed Conditions

Major changed conditions since the 1996 IRP include the move from subsidy-based storage programs to contractual-based programs and the availability of bond funding for local groundwater storage projects. The advantage of contractual storage versus subsidy-based programs is the ability for Metropolitan to call upon the storage when needed, increasing the regional benefit of the stored water.

Since the 1996 IRP, additional groundwater funding mechanisms have become available. In 2000, Proposition 13 appropriated $45 million for groundwater conjunctive use projects in Metropolitan's service area. Another $200 million was made available based on a competitive bid process for additional local groundwater storage and recharge projects throughout California. In 2002, Chapters 7 and 8 of Proposition 50, also made available $76 million and $500 million respectively towards State water supply reliability and water management programs. Proposition 50 grants will be made available in a competitive-bid process similar to Proposition 13.

1996 IRP and 2003 IRP Update Targets

The 1996 IRP identified the need for about 200,000 acre-feet per year of dry-year yield from in-region groundwater storage by 2000, 275,000 acre-feet by 2010, and 300,000 acre-feet by 2020. These targets are still in effect.

Table 3 - 12: In-Region Groundwater Storage Targets (Acre-Feet)

Program	2010	2020	2025
2003 IRP Update	275,000	300,000	300,000
1996 IRP Target	275,000	300,000	

Implementation Approach

Moving forward, Metropolitan is developing contractual storage arrangements with groundwater basins throughout the region. During dry years, Metropolitan will be able call on participating agencies to draw upon previously stored supplies in place of imported deliveries. The imported water saved becomes available for other uses.

The development conjunctive use programs is often complicated by the demands of institutional, legal, environmental, and private stakeholders. Even so, Metropolitan has successfully implemented contractual conjunctive use programs in six groundwater basins in four counties. The lessons learned in these early successes will be invaluable in developing additional identified programs to meet the 1996 IRP Target. A summary of current and identified conjunctive use programs is contained in Table 3 - 13 below and in the following sections.

Table 3 - 13: In-Region Groundwater Storage Status 2020 & 2025 (Acre-Feet)

Program	Supply	Status
North Las Posas	70,000	Current
Long-term Seasonal Storage	100,000	Current
Proposition 13 Programs • City of Long Beach • Inland Empire • Orange County • Foothill • Three Valleys	61,000	Current
Proposition 13 Programs (in Progress) • San Diego County • Riverside County • Los Angeles County	~3,000	Under Development
Raymond Basin	25,000	Under Development
Additional Programs • Elsinore Valley GSP • San Gabriel Basin CUP • Expansion of existing programs & New Programs	111,000	Under Development

North Las Posas

The first contractual conjunctive use project developed by Metropolitan is the North Las Posas groundwater storage program. This program was developed in partnership with the Calleguas Municipal Water District, and will ultimately yield 70,000 acre-feet per year of dry year supply. By 2005, about 47,000 acre-feet of dry-year withdrawal capacity will be available with an additional 23,000 acre-feet of withdrawal capacity available.

Proposition 13 Projects

Metropolitan also is negotiating additional contractual conjunctive use agreements in Raymond Basin and for programs receiving partial funding through Proposition 13. These programs are expected to be in place by 2010, producing 25,000 acre-feet per year and 64,000 acre-feet per year of dry-year supply, respectively.

Metropolitan issued an RFP for the Proposition 13 programs and developed a short-listed set with an expected yield of 64,000 acre-feet per year. Several Proposition 13 projects have been signed, including programs with the City of Long Beach, Inland Empire Utilities Agency, Municipal Water District of Orange

County, Foothill Municipal Water District, and Three Valleys Municipal Water District. Together, these programs will ultimately yield over 61,000 acre-feet of dry year supply. Other programs are in the works in San Diego, Riverside, and Los Angeles counties.

Cyclic Storage

Metropolitan can currently draw upon 50,000 acre-feet per year of dry-year supply from cyclic storage accounts with several member agencies. Cyclic storage agreements allow Metropolitan to deliver replenishment water into a groundwater basin in advance of agency demands. Agencies can then take a paper transfer of the stored water when they incur a replenishment obligation to the basin. These types of agreements have been in place since the early 1970s but may be closed by 2020. Due to their uncertain status beyond 2010, they are not included in the implementation approach.

Interruptible Long-term Replenishment Program

Metropolitan's interruptible long-term replenishment program also provides a dry-year benefit. According to the provisions of Metropolitan's 1999 WSDM Plan, Metropolitan, during dry years, can cut replenishment deliveries an estimated 100,000 acre-feet for a minimum of two years while participating member agencies maintain normal groundwater withdrawals. After a dry period is over, these agencies buy extra replenishment water and restore their basins to pre-drought levels. Between cyclic and replenishment storage, Metropolitan can count on 150,000 acre-feet of reliable dry-year supplies from existing incentive rate programs. By 2020, this number may be reduced to 100,000 acre-feet after the cyclic accounts are closed.

Identified Programs

Additional programs have been identified for potential development in the future. These include two programs wait-listed in the Proposition 13 Conjunctive Use RFP:

- The Elsinore Valley Groundwater Water Storage Program with Elsinore Valley and Western Municipal Water District
- The San Gabriel Basin Conjunctive Use Project with Three Valleys Municipal Water District

Metropolitan also may consider expanding the existing programs at some time in the future. Beyond 2010, Metropolitan has the potential to develop additional dry-year storage programs with the issuance of additional RFPs.

CENTRAL VALLEY/STATE WATER PROJECT TRANSFERS AND STORAGE

Background

A major goal of the 1996 IRP was to develop additional supply reliability through the California Aqueduct by entering into flexible storage and transfer agreements with Central Valley Project (CVP) and SWP contractors. Metropolitan's strategy has been to focus on voluntary programs designed to improve regional reliability while benefiting those selling the water or providing storage. This strategy, along with a coordinated focus on developing programs, has enabled Metropolitan to exceed its 2010 CVP/SWP storage and transfer target in 2003.

Issues

Reporting the benefits of many of the storage and transfer programs is an issue because delivery capabilities are often tied to SWP allocation. For instance, the transfer component of the San Bernardino Valley program varies from 20,000 acre-feet to 80,000 acre-feet depending on the SWP allocation. While these programs can be represented exactly in Metropolitan models, assumptions must be made to simplify reporting.

Changed Conditions

Metropolitan's success in developing dry-year storage and transfer agreements is the result of changes since the IRP. These changes include:

- Dedicating Metropolitan staff to identifying and developing transfer and storage programs
- A recognition by some Central Valley agriculture interests that participation in transfer programs is a good business practice
- More cooperation between Metropolitan and DWR in facilitating spot transfers and options
- More cooperation between Metropolitan and the Federal government in facilitating spot transfers and options

1996 IRP and 2003 IRP Update Targets

The 1996 IRP target for CVP/SWP transfer and storage programs is 300,000 acre-feet per year of dry-year supply by 2010. This target is preserved for the 2003 IRP Update analysis, and the resources needed to achieve it are under development.

Table 3 - 14: Central Valley and State Water Project Storage and Transfer Targets (Acre-Feet)

	2010	2020	2025
2003 IRP Update Target	300,000	300,000	300,000
IRP Target	300,000	300,000	

Implementation Approach

Metropolitan has five major storage and transfer programs available for meeting dry-year needs. Additional programs are in development as demonstration projects. Metropolitan can meet the remainder of its CVP/SWP target through spot transfers and options, as projected in the IRP. The following sections describe Metropolitan's implementation approach of the CVP/SWP programs:

Table 3 - 15: CVP/SWP Storage and Transfer Programs Status: 2020 & 2025 Resources (Acre-Feet)

Program	Dry Year Supply	Status
Semitropic	107,000	Current
Arvin-Edison	90,000	Current
San Bernardino Valley MWD Transfer and Storage	70,000	Current
Kern Delta WD	50,000	Current
Desert Water WA & Coachella Valley WD	12,300	Current
Market Transfer Options	Variable	Current
Additional Storage/Transfers • Mojave Storage Program • North Kern Storage Program • Kern Water Banking Program • San Bernardino Valley MWD Conjunctive Use Program • Other San Joaquin Valley Programs	190,000	Under Development

<u>Semitropic and Arvin-Edison</u>

Metropolitan has developed programs with the Semitropic and Arvin-Edison Water Storage Districts with a combined storage capacity of about 700,000 acre-feet. When fully developed, they are expected to deliver 197,000 acre-feet per year assuming a 10-month delivery schedule.

San Bernardino Valley Transfer and Storage Program

In 2001, Metropolitan developed a combined transfer and storage program with the San Bernardino Valley Municipal Water District (San Bernardino). The San Bernardino transfer program has a delivery capability ranging from 20,000 acre-feet to 80,000 acre-feet depending on the hydrological conditions. In addition, the agreement allows Metropolitan to store up to 50,000 acre-feet of transfer water for use in dry years. In wet years, the San Bernardino transfer and storage programs can produce up to 130,000 acre-feet.

Kern-Delta Water District

Metropolitan has also developed a program with the Kern-Delta Water District for 250,000 acre-feet of storage, producing 50,000 acre-feet of dry-year yield. The program was approved in November 2002 with a program term of 25 years.

Desert Water /Coachella Valley Advanced Delivery Program

Another program available to Metropolitan is an advanced delivery program with the Desert Water Agency (DWA) and Coachella Valley Water District (CVWD). Under existing agreements, Colorado River supplies are delivered to DWA and CVWD in exchange for their SWP entitlements. Metropolitan has the option of delivering additional supplies in advance with a yield of up to 18,000 acre-feet in dry years.

Spot Transfers and Options

In addition to the storage and transfer programs described, Metropolitan expects to meet the remainder of its target through additional dry-year transfers and spot market purchases. Metropolitan demonstrated this capability in 2003 by purchasing about 120,000 acre-feet of CVP and SWP supplies through spot transfers and calling upon options.

Additional Storage/Transfer Programs

Metropolitan has identified several other transfer opportunities. Two of these, the Mojave Storage Program and the North Kern Storage Program, are in a pilot stage. Additional program opportunities exist with the San Bernardino and other agencies in the San Joaquin Valley. While the number and scope of these programs is still being worked out, they have the potential of producing up to 190,000 acre-feet by 2020.

In total, Metropolitan has the potential for exceeding the 300,000 acre-feet dry-year yield target with contractual storage and transfer programs alone. With the added capabilities of spot market transfers and options, Metropolitan will exceed the 1996 IRP Targets for CVP/SWP transfer supplies.

RESOURCE TARGET SUMMARY

The 1996 IRP set supply targets that have guided the region's resource development. Together, Metropolitan and the member agencies are successfully implementing the Preferred Resource Mix. This is evident in the number of programs that have been developed or are in progress. Still more programs have been identified by both Metropolitan and the member agencies to meet the IRP targets. A summary of the programs Metropolitan has developed or are in development / identified for implementation is in Table 3 - 16.

Table 3 - 16: IRP Update Resource Status - 2020 to 2025

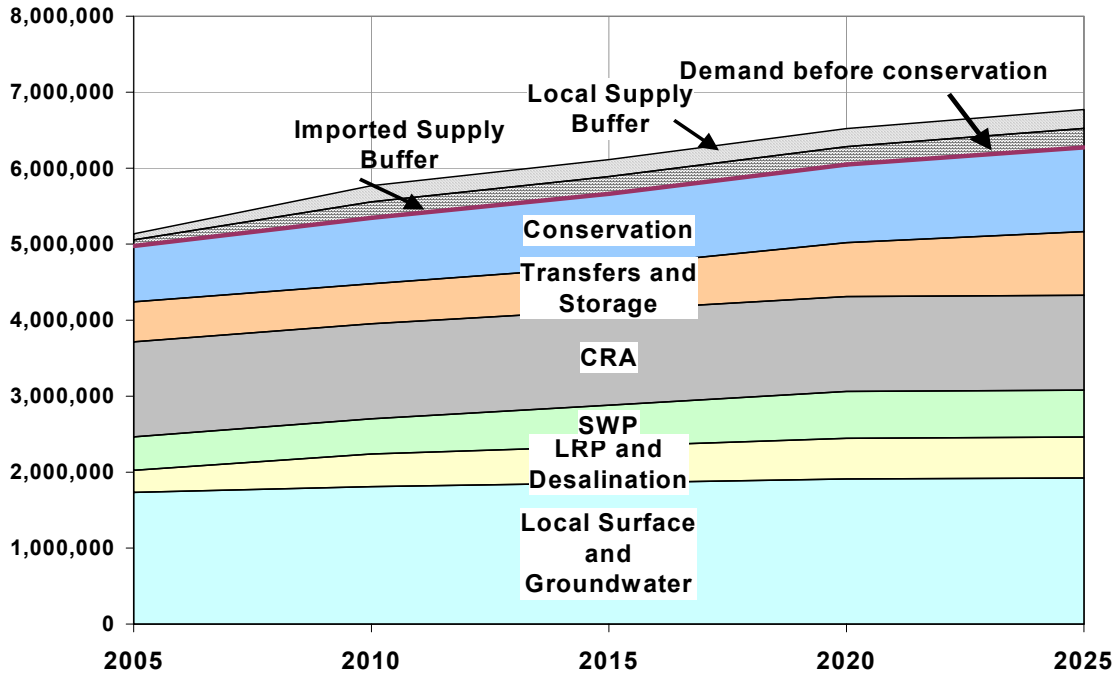
Resource	Programs and Status
• **Conservation**	***Current*** - Conservation Credits Program - 1992 Plumbing Codes ***In Development or Identified*** - Innovative Conservation Program - Southern California Heritage Landscape Program - 2007 Washing Machine Plumbing Code
• **Recycling** • **GW Recovery** • **Desalination**	***Current*** - LRP Program ***In Development or Identified*** - Additional LRP Requests for Proposals - Seawater Desalination Program
• **SWP**	***Current*** - SWP Deliveries - San Luis Carryover Storage (Monterey Agreement:) ***In Development or Identified*** - CALFED & Phase 8 Hearings - Napa Negotiations - Environmental Water Account

Resource	Programs and Status
• **CRA**	***Current*** - Base Apportionment - IID/MWD Conservation Program ***In Development or Identified*** - Coachella and All American Canal Lining Programs - PVID Land Management Program - Hayfield Storage Program - Lower Coachella Storage Program - Chuckwalla Storage Program - Central Arizona Banking Program - QSA Programs - Interim Surplus Guidelines
• **CVP/SWP Storage and Transfers** • **Spot Transfers and Options**	***Current*** - Arvin Edison Program - Semitropic Program - San Bernardino Valley MWD Program - Kern Delta Program - Desert Water / Coachella Valley Advanced Storage - Spot Market transfers and options ***In Development or Identified*** - San Bernardino Valley MWD Conjunctive Use Program - Mojave Storage Project - North Kern Storage Program - Kern Water Banking Program - Other San Joaquin Valley Programs
• **In Region Groundwater Conjunctive Use**	***Current*** - North Las Posas - Cyclic Storage - Replenishment Deliveries - Proposition 13 Programs (short-listed) ***In Development or Identified*** - Raymond Basin GSP - Proposition 13 Programs (wait-listed) - Expanding existing programs - New groundwater storage programs
• **In Region Dry-Year Surface Water Storage**	***Current*** - DVL - SWP Terminal Reservoirs (Monterey Agreement)

Dry-Year Resource Mix

With the 1996 IRP and Board-revised resource targets discussed in this section, Metropolitan's service area is reliable through 2025. Figure 3 – 1 shows how the Region's current resources and the IRP targets meet dry-year demands through 2025. Metropolitan and the member agencies have agreed that a buffer supply is necessary to insure the region against resource implementation uncertainty. The buffer supply and reliability tests performed for the 2003 IRP Update are discussed in the next section.

Figure 3 - 1: 2003 IRP Update – Dry-Year Demand and Supplies with Buffer



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SECTION 4 – RESULTS AND ANALYSIS

RELIABILITY STUDIES

Overview

A major finding of the IRP Update is that Metropolitan is reliable through 2025 given the existing IRP Targets, planned resources, and changed conditions described in this report.

The reliability through 2025 was demonstrated with two methods:

- Assessing the need for dry-year transfers on the Colorado River, CVP/SWP storage and transfers, and spot transfers with the projected resource mix
- Evaluating how many additional years of reliability are provided by the projected resource mix in: 2005, 2010, 2015, 2020, and 2025 with and without the 500,000 acre-feet planning buffer supply

Assumptions

The reliability analysis for the IRP Update was performed using Metropolitan's IRPSIM. Details of this modeling are found in the Analytical Methods section of this report. The analysis assumes that all goals of the 1996 IRP and subsequent board policies are implemented and that local supplies are available in the timelines indicated by the member agencies.

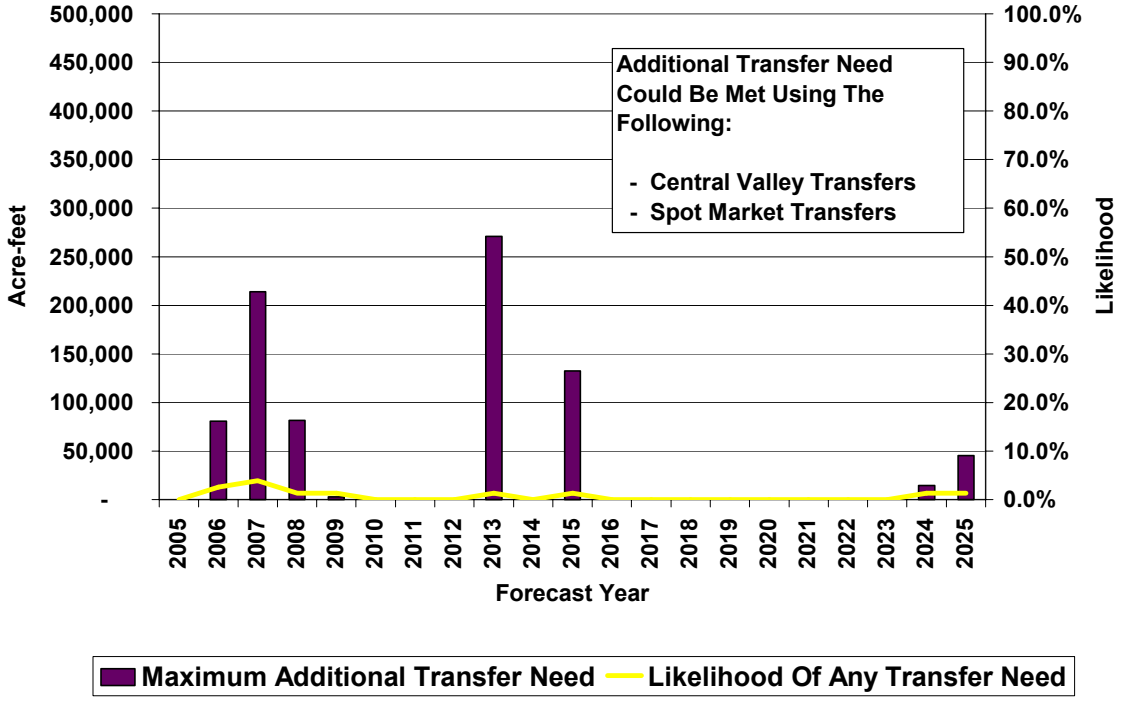
CRA transfers and storage are limited to two additional programs totaling 300,000 acre-feet (approximately 150,000 acre-feet per program) above current investments. This brings modeled dry-year supply from the CRA up to 1,250,000 acre-feet. CVP/SWP storage and transfers are limited to 300,000 acre-feet total (represented by a 90,000 acre-feet cap in the analysis). Spot transfers are unconstrained.

Transfer Needs Analysis

Under this scenario, the Metropolitan service area remains reliable through 2025 with varying needs for supplemental supply filled by spot market purchases

Figure 4 - 1 indicates the probability of need and the amount of transfers above current levels of development for CRA and CVP/SWP storage and transfer programs, but within the 1996 IRP Targets. Metropolitan would have a maximum forecasted annual transfer need of 271,000 acre-feet through 2025. The analysis shows that the peak need for transfers occurs during a 1977 hydrology.

Figure 4 - 1: Total Additional Transfers Needed To Ensure Reliability

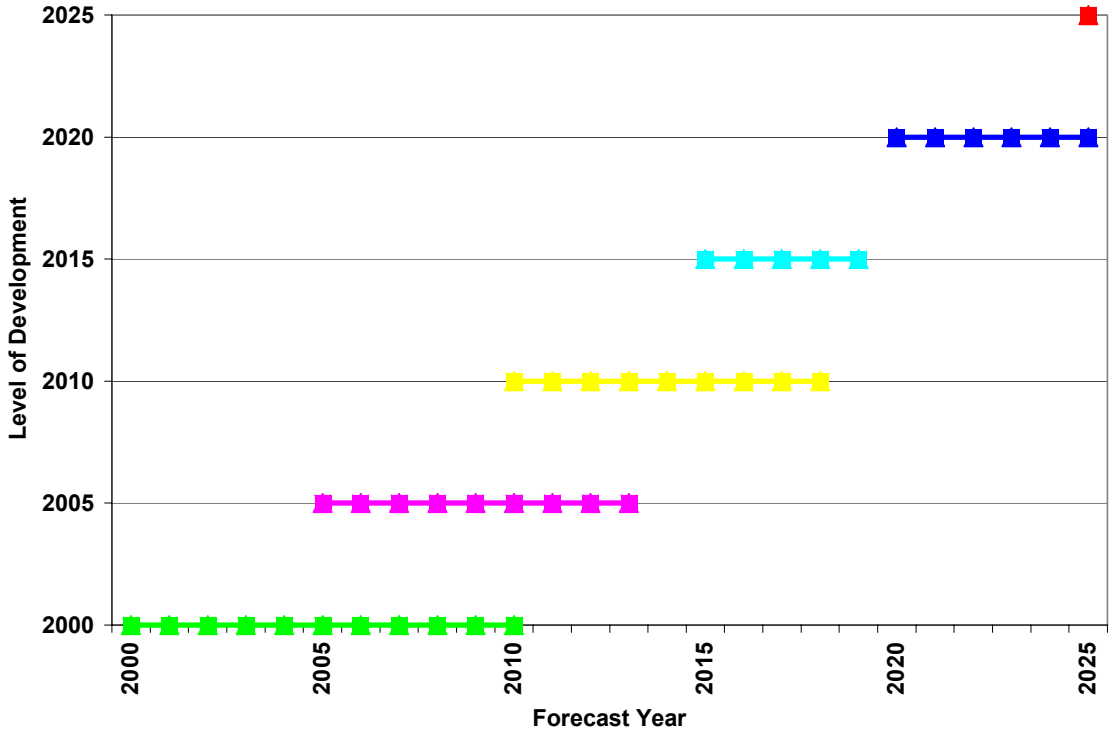


Additional Years of Reliability with 1996 IRP Targets

The 1996 IRP Resource Targets for 2020 provide just enough resources to carry the region through 2025.

This analysis tested how many additional years of reliability Metropolitan would have if a resource mix in a future year – 2010 for example – is fixed (Figure 4 - 2). This test was performed for 2005, 2010, 2015, and 2020 using the projected resource mix and 1996 IRP Targets as described above.

Figure 4 - 2: Additional Years of Reliability with Current Targets and Changed Conditions



Summary of Reliability Findings

The IRP Update reliability analysis shows that no changes to the 1996 IRP resource targets are necessary to extend the IRP through 2025, other than those targets that have been revisited by Metropolitan's Board. A significant contributor to this result is the increased projection of local supplies provided by the member agencies.

RISK AND THE SUPPLY BUFFER

Although reliability analysis showed that the 1996 IRP targets were sufficient through 2025, the IRP Update did identify two new areas of concern: (1) increased water quality regulation, and (2) resource implementation risk.

The analysis of increased water quality regulation emphasizes the periodic need for Colorado River water or storage to offset the total organic carbon and bromide levels in State Water supplies through blending. This means that Southern California will depend on varying amounts of these supplies to meet water quality goals as well as to meet demand, depending on the water quality of the SWP

Planning for water supply reliability is complicated by risk and uncertainty. Water supply reliability in the Metropolitan service area through 2025 and beyond depends on many factors including the successful implementation of local and imported water supply projects described in previous sections of this report. Inevitably, some projects envisioned for the region will be delayed or not completed. Uncertain regional growth and water demand projections are additional factors that must also be considered.

Because of these uncertainties, the concept of developing a buffer supply was introduced during the IRP Update Process. The final resource targets for the IRP Update include the buffer supply, and specify an increase of 500,000 acre-feet of resource development. The buffer will help to manage uncertainties inherent in the planning process.

The size of the planning buffer is a consensus-based number derived from three independent methodologies:

- Metropolitan's 1999 WSDM Plan showed that Metropolitan had developed supplies 10 years in advance of expected demands

- The planning and construction period for supply project development, which includes potential legal challenges, is approximately 10 years

- Analysis of plans for new and replacement supplies suggests that a 500,000 acre-foot buffer, which is approximately 10 percent of water demand with conservation in 2025, covers implementation risks

Metropolitan's Preferred Resource Mix will now include a buffer of 500,000 acre-feet, which will be drawn from equal increases in local resource targets and Central Valley transfers. To boost local supply development, Metropolitan will increase its recycling, groundwater recovery, and desalination goals by 250,000 acre-feet. The program will have an updated 2025 target of 750,000 acre-feet for recycling, groundwater recovery, and seawater desalination.

The updated target for Central Valley transfers will increase 250,000 acre-feet for a 2025 target of 550,000 acre-feet. The split between local project supplies and imported water from Central Valley transfers will be restricted to no less than 40 percent and no more than 60 percent from any one category.

SECTION 5 – CONCLUSIONS

SUMMARY OF 2003 IRP UPDATE AND CHANGED CONDITIONS

Objectives

The IRP Update had three objectives:

1. To review the goals and achievements of the 1996 IRP
2. To identify changed conditions for water resource development
3. To update the resource targets through 2025

Changed Conditions

The dynamic nature of water supply planning has already been discussed. Projections of demand and supply change over time as new information and technology becomes available, and as resource plans and priorities change.

Since the IRP Update was initiated in 2001, three sales forecasts have been completed, two in-depth local supply surveys have been performed, and numerous resource programs have been completed or identified while some have been abandoned. The long-term status of the Colorado River supplies has been a critical uncertainty throughout the development of the IRP Update.

Changed conditions since the 1996 IRP include:

1. Lower projected retail water demands
2. Higher projected local water resource development
3. Lower projected dry-year Metropolitan demands
4. Board-revised targets for the SWP and CRA
5. More stringent water quality regulations, and recognition of implementation risks

A major changed condition in the IRP Update is lower Metropolitan demands compared to the 1996 IRP. The drop in projected Metropolitan demands in 2020 is caused by lower retail demands coupled with higher local supplies, and is one of the primary reasons the current targets provide reliability through 2025.

<u>IRP Targets</u>
Changes in resource targets since the 1996 IRP are summarized in Table 5 - 1. The recommended buffer supply is shown through increases in the target for local supplies to 750,000 acre-feet and CVP/SWP storage and transfers to 550,000 acre-feet. The changes in the CRA and SWP are related to Board directives.

Table 5 - 1: Changed IRP Targets (Acre-Feet)

	1996 IRP 2020	2003 Update 2020	Change	2003 Update 2025
Conservation	882,000	1,027,600	+145,600	1,107,000
• Recycling • Groundwater Recovery • Desalination	500,000	750,000	+250,000	750,000
Colorado River Aqueduct*	1,200,000	1,250,000	+50,000	1,250,000
State Water Project	593,000	618,000	+25,000	618,000
Groundwater Conjunctive Use	300,000	300,000	0	300,000
CVP/SWP Storage and Transfer w/Buffer	300,000	550,000	+250,000	550,000
MWD Surface Storage **	620,000	620,000	0	620,000

* The 1,250,000 acre-feet supply from the Colorado River Aqueduct is a target for specific year types when needed. Metropolitan is not expecting a full aqueduct in every year.

** Target for Surface Storage is for total capacity, not dry year yield.

Reliability

The results of the IRP Update analysis show that the current resource targets, coupled with the changed conditions discussed in this report are sufficient for Metropolitan to be 100 percent reliable in 2020. The reliability test also shows that the current resource targets are sufficient to attain supply reliability out to 2025. This is possible because of the changed targets and conditions, including lower Metropolitan demands. As a result, the current resource goals are sufficient to extend the IRP through 2025.

This finding is demonstrated by the additional years of reliability for projected levels of resource development, as shown in Table 5 - 2. For instance, if the region developed its planned resources out to 2010 and then held them fixed, the region would be reliable until 2018.

Table 5 - 2: Additional Years of Reliability with Current Targets and Changed Conditions

Projection Year	2000	2005	2010	2015	2020	2025
Years of Reliability	10	8	8	4	5	1

Planning Supply Buffer

Although the current targets do not require updating, the IRP Update did identify two new areas of concern: (1) increased water quality regulation, and (2) resource implementation risk.

Water Quality Risk
The analysis of increased water quality regulation emphasizes the periodic need for Colorado River water or storage to offset the total organic carbon and bromide levels in State Water supplies through blending. This means that Southern California will be depending on varying amounts of these supplies to meet water quality goals as well as to meet demand depending on the water quality of the SWP (see Appendix A for analysis).

Implementation Risk
Metropolitan and the member agencies have agreed in principle that a planning buffer supply is necessary to hedge against resource implementation risks and demand uncertainty. The size of the buffer supply, 500,000 acre-feet, was derived using three independent methodologies. The 500,000 acre-feet buffer is equal to approximately 10 percent of projected retail water demand in 2025. Metropolitan's recommends that the 500,000 acre-feet buffer be split between imported and local supplies.

On the local side, there is approximately 250,000 acre-feet of risk in local supply projections based on the cost of local supplies that would not be regionally funded under the original goals of the 1996 IRP. Therefore, Metropolitan recommends increasing the recycling, groundwater recovery, and desalination target from 500,000 acre-feet to 750,000 acre-feet in 2025. Metropolitan also recommends increasing the 1996 IRP target for CVP/SWP storage and transfers from 300,000 acre-feet to 550,000 acre-feet to develop the imported portion of the buffer.

PLANNING AND REPORTING CYCLES

Metropolitan leads, participates in, and produces a number of planning studies and reporting functions on a regular basis. Table 5-3 shows the approximate timetables for the major processes and the requirement, legal or internal, which drive the process.

The 1996 IRP determined, through a comprehensive stakeholder process, the principles for building a long-term water resource plan, and the development targets under that plan. Other planning processes use the resource development targets identified by the IRP. For example, the *System Overview Study* determines the distribution system requirements needed to deliver water under the resource development targets from the IRP. The reports that are issued periodically are generally reporting the targets and the progress. For example, the *Report on Metropolitan's Water Supplies*, issued annually, shows the maximum supply capability of the resources implemented as a result of the IRP in a manner that can be used to assist agencies in complying with growth legislation. In the future, some of the planning processes and reporting functions should be consolidated for efficiency, but they will continue to be closely tied to the long-term resources plan.

Table 5 - 3: Metropolitan Planning and Reporting Cycles

Report	Requirement / Type	Year							
		1999	2000	2001	2002	2003	2004	2005	2006
Regional Urban Water Management Plan	State Law / Report		X					X	
Annual Report to the California State Legislature on Achievements in Conservation, Recycling, and Groundwater Recharge	State Law / Report		X	X	X	X	X	X	X
Report on Metropolitan's Water Supplies	Internal Policy / Report				X	X	X	X	X
IRP Report Card	Internal Policy / Report				X		X	X	
IRP Update	Internal Policy / Planning Process					X			X
System Overview Study	Internal Policy / Planning Process						X		
Water Surplus and Drought Management Plan	Internal Policy / Planning Process	X					X		
Salinity Management Study	Internal Policy / Planning Process	X							
Long-Range Financial Plan	Internal Policy / Planning Process						X		

NEXT STEPS

The 2003 IRP Update process showed a need for additional study, as well as improvements in reporting and monitoring the implementation progress. The following is a list of areas that Metropolitan intends to improve on and implement over the coming years. Improvements in these areas will help to prepare Metropolitan and the region for the next look at updating the IRP.

- Growth projections and demand changes
- Local supply targets for groundwater, surface, and Los Angeles Aqueduct supplies
- Reporting process for IRP target implementation
- Coordination and verification of local supply production and plans
- Risk analysis technique for buffer supply assessment
- Extended hydrologic impacts

Metropolitan and its member agencies are set to collaborate on the process needed to comply with the *California Urban Water Management Planning Act*. The Act requires a report to be submitted to the State of California by December 2005. Although this process is not Metropolitan's guiding planning process, Metropolitan will take steps to improve data exchange and verification with its members and their retail agencies. At the same time, Metropolitan staff intends to research and improve modeling and assessment techniques in the areas of variability and risk to supply development.

An issue that also needs to be resolved in the next IRP Update concerns the estimates of retail water demand, groundwater, surface, and Los Angeles Aqueduct supplies. In both the 1996 and in the 2003 IRP Update, these estimates did not have associated targets. However, they did contribute to the changed conditions. Retail demand estimates have decreased since the 1996 IRP, largely due to changes in the region's official growth forecast. Groundwater, surface, and Los Angeles Aqueduct supplies have also changed since the 1996 IRP. Those changes were captured and accounted for in the reliability analysis performed in this process, but these supplies are not measured against a target. Future updates need to address this in order to maintain the validity of all of the resource development targets.

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APPENDIX 1 - WATER DEMAND PROJECTIONS

Retail Water Demand

Water demand in the Metropolitan service area has experienced several discernable trends in the past ten years. Southern California emerged from a severe economic recession in the mid-1990s. Despite a sustained recovery that has lead to a robust economy, the intense development of long-term conservation programs and increases in pricing have succeeded in suppressing growth in normal year per capita water demands. Metropolitan projects that aggregate water demand will continue along this trend; per capita water demand will not return to its pre-drought levels.

MWD-MAIN

To forecast urban retail water demands, Metropolitan uses the MWD-MAIN Water Use Forecasting System. MWD-MAIN is a model combining statistical and end-use methods that has been adapted to conditions in Southern California. The statistical portion of the model incorporates projections of demographic and economic variables from regional planning agencies (the Southern California Association of Governments, or SCAG, and the San Diego Association of Governments, or SANDAG) into statistically estimated water demand models to produce forecasts of water demand. The end-use component of the model derives estimates of conservation by adding additional information on how that water is used- the end uses.

MWD-MAIN features a separate unique model for each sector. In the residential sector, the forecasts of water demand per dwelling unit are ultimately combined with the forecasts of dwelling units from the regional planning agencies to yield an estimate of total sector water demand. Similarly, in the nonresidential sector, water use per employee is combined with forecasts of employment to yield an estimate of total non-residential water demand.

Regional Growth Projections

The SCAG and SANDAG demographic projections used in the retail demand forecast are developed primarily for transportation planning, air quality management, and other regional planning purposes. The SCAG and SANDAG forecasts provide a linkage to local development and land use plans through the inclusion of sub-regional general plans, and through extensive input and feedback from cities and counties. Final plans adopted by SCAG and SANDAG are supported by environmental documentation.

The SCAG and SANDAG projections currently used by Metropolitan extend to 2020. Metropolitan contracted with the Center for Continuing Study of the California Economy (CCSCE) and SCAG to extend these projections to 2050. CCSCE developed unofficial projections for the six counties served by Metropolitan from national projections produced by the US Census Bureau. Member agency demographics for 2050 were then derived using SCAG's Geographic Information System based allocation models.

Demographics for interim years such as 2025 were interpolated from the 2020 SCAG/SANDAG projections and the 2050 estimates developed by CCSCE.

Conservation

In addition to accounting for future demographic trends, Metropolitan's water demand forecasts incorporate current and future water demand management (conservation) efforts. In 1991, Metropolitan signed a Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). The MOU commits Metropolitan to implement a number of long-term water conservation measures referred to as Best Management Practices (BMPs).

The MWD-MAIN model embeds a detailed accounting of water conservation, distinguishing between:

Passive Conservation - Water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. This form of conservation would occur without any water agency action.

Active Conservation - Water saved directly as a result of conservation programs by water agencies (including implementation of Best Management Practices). This form of conservation is unlikely to occur without agency action.

Price-effect Conservation - Water saved by retail customers attributable to the effect of changes in the real (inflation-adjusted) price of water. There may be some overlap between this form of conservation and the previous two. For example, increased water prices might induce a consumer to take part in one of the active conservation programs run by the providing agency.

Metropolitan's demand projections account for the effects of the conservation BMPs, including projected changes in the price of water. The forecast is based on expected BMP participation. Some of the region's retail agencies are not BMP signatories and some BMPs are not cost effective in Metropolitan's service area.

Metropolitan Water Demands

Forecasting retail demand is the first step in projecting Metropolitan demands (the need for imported water). As a regional water wholesaler, Metropolitan must also consider the development of local supplies within the service area in order to forecast imported demands.

One of the major changed conditions identified in the IRP Update analysis is a lower projection of Metropolitan demands in 2020 compared to the 1996 IRP. The drop in demand is caused by updated projections of retail demands and local supplies. These changed projections include:

- Lower retail demands
- Higher conservation savings
- Higher direct use recycling, groundwater recovery and desalination production
- Higher groundwater production

Table A1-1 contains a summary of the changes to the retail demands and local supplies. The largest changes occurred in the projections of Local supplies and conservation. Retail demands before conservation change as the result of lower growth projections from SCAG. Local supplies projections have increased due to a better accounting of local projects drawn from member agency 2000 UWMPs and close coordination with member agency staff. After accounting for these changes, direct use Metropolitan demands drops by over 500,000 acre-feet compared to the 1996 IRP.

Table A1-1: Metropolitan Dry-Year Demand Changes - 1996 IRP vs. 2003 Update

Category	1996 IRP	2003 Update	Change
Retail Demand - Before Conservation	*6,083,978*	*6,046,510*	*-37,468*
Conservation	*882,000*	*1,027,600*	*145,600*
Total Retail Demands with Conservation	**5,201,978**	**5,018,910**	**-183,068**
Direct Use LRP and Desalination	*500,000*	*533,156*	*33,156*
Local Surface and Groundwater	*1,618,571*	*1,911,193*	*292,622*
Total Local Supply – Direct Use	**2,118,571**	**2,444,349**	**325,778**
Total MWD Direct Use Demand	**3,083,407**	**2,574,561**	***-508,846***

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APPENDIX 2 - IRP UPDATE PROCESS AND STAKEHOLDER PARTICIPATION

IRP Update Process

In November 2001, Metropolitan's Board directed staff to produce an update of the 1996 IRP to examine any changed conditions since the original report, and to recommend specific modifications as warranted. In the past year and a half, Metropolitan staff has presented its interim findings to the Water Planning, Quality, and Resources Board Committee through eight reports. In January 2003, a workshop also was held for Metropolitan's Board to discuss final IRP recommendations and policy questions.

Table A2 - 1: Metropolitan's Water Planning, Quality, and Resources Board Committee/ Board Workshop

Year	Month	Meeting
2001	November	MWD Board directs staff to produce IRP Update work-plan
2002	January	***Oral Report to Board Committee***: IRP Report Card
	February	***Oral Report to Board Committee****:* Qualitative Changed Conditions
	March	***Oral Report to Board Committee****:* Quantitative Changed Conditions and Introduction of Buffer
	April	***Oral Report to Board Committee****:* Analytic Method, Quantitative Buffer, and adjusted scope
	May	***Oral Report to Board Committee****:* Status on the IRP Update
	June	***Oral Report to Board Committee****:* Stating preliminary conclusion of reliability through 2025 and requesting time with Member Agencies to resolve buffer issue
	November	***Oral Report to Board Committee****:* Updated IRP targets with buffer
2003	January	• ***Oral Report to Board Committee***: Final IRP Recommendation with policy question • ***Board Workshop***: Final IRP Recommendation with policy question

Stakeholder Participation

In keeping with the open, participatory process established with the 1996 IRP, the IRP Update relies upon the valuable input from a diverse group including member agency managers, local retail agency managers, groundwater basin managers, and individuals. In addition, coordination meetings were held with the Santa Ana Watershed Project Authority (SAWPA), an agency including representation comprised of Inland Empire Utilities Agency, Eastern Municipal Water District, San Bernardino Valley Municipal Water District, Western Municipal Water District, and Orange County Water Agency. Meetings were also held with the Northern Group of member agency managers and the Central / West Basin Caucus, a group of board members and staff from the Central / West Basin sub-agencies. Valuable input and guidance was gleaned from these meetings, which allowed for an open forum to discuss and evaluate the IRP Update. This process also has directly involved

Metropolitan's member agency managers and their staff through numerous IRP meetings and status reports at both member agency managers meetings and member agency meetings held throughout the last year and a half. In addition, Metropolitan sent out two IRP Report Cards tracking the update progress, solicited member agency input and verification on Local Supply Information, and also encouraged and incorporated comments to draft versions of this 2003 IRP Update Report.

Table A2 - 2: Stakeholder Participation

Year	Month	Meeting
2001	November December	***SAWPA Meeting:*** Review and discuss IRP Update process ***Northern Caucus Meeting***: Review and discuss IRP Update process
2002	January	• ***Member Agency Managers Meeting***: Review and discuss Jan. Board Report • Sent out **IRP Report Card #1** • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	February	• ***Member Agency Managers Meeting***: Review and discuss Feb. Board Report • Request member agency input / verification on Local Supply Information • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	March	• ***Member Agency Managers Meeting:*** Review and discuss March Board Report • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	April	• ***Member Agency Meeting:*** Reviewed initial conclusions of IRP and Buffer • ***SAWPA Meeting:*** Review and discuss IRP Update progress • ***Central /West Basin Caucus Meeting:*** Review and discuss IRP Update progress • ***Southern California Water Dialogue:*** Review and discuss IRP Update progress
	May	• ***Member Agency Managers Meeting:*** Review and discuss May Board Report • ***SAWPA Meeting:*** Review and discuss IRP Update progress
	September	• ***Member Agency Technical Review Meeting***: Reviewed Resource Assumptions • Sent out **IRP Report Card #2**
	October	• ***Member Agency Managers Meeting:*** Review and discuss local data and buffer scenario
	November	• ***Member Agency Managers Meeting:*** Review and discuss Nov. Board Report • ***Member Agency Advisory Meeting:*** Reaching consensus on buffer
2003	January	***Member Agency Managers Meeting***: Review Final IRP Recommendation with policy question
	August	Sent out draft 2003 IRP Update Report for member agency review/comment.
	September	• ***Member Agency Managers Meeting***: Review Draft IRP Update Report • ***Member Agency Workshop:*** Review Draft IRP Update Report

APPENDIX 3 – LOCAL SUPPLY ASSUMPTION

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Table A3 - 1: Total Local Supply for Consumptive Uses – Dry Year
(Excludes non-consumptive recycling; includes groundwater recovery)

Member Agency	2003**	2010	2020	2025	2003-2025
Anaheim	60,442	64,587	73,080	74,846	14,404
Beverly Hills	2,800	2,800	2,800	2,800	0
Burbank	20,536	20,536	20,536	20,536	0
Calleguas	28,973	45,148	46,680	46,680	17,707
Central Basin	179,387	184,225	187,000	187,000	7,613
Compton	6,100	6,100	6,100	6,100	0
Eastern	168,388	178,535	184,639	184,639	16,251
Foothill	8,140	8,140	8,140	8,140	0
Fullerton	24,602	25,028	25,955	26,698	2,096
Glendale	8,447	11,935	11,975	11,975	3,528
Inland Empire	172,492	197,843	237,970	237,970	65,478
Las Virgenes	5,740	8,000	9,600	9,600	3,860
Long Beach	29,875	32,819	37,025	37,025	7,150
Los Angeles	281,056	317,593	329,165	330,373	49,317
MWDOC	281,747	334,539	361,948	373,457	91,710
Pasadena	13,700	15,200	15,300	15,300	1,600
San Diego*	95,370	112,553	183,255	183,255	87,885
San Fernando	3,600	3,600	3,600	3,600	0
San Marino	6,150	6,150	6,150	6,150	0
Santa Ana	39,564	41,178	45,196	46,385	6,821
Santa Monica	3,455	3,615	3,615	3,615	160
Three Valleys	68,990	71,300	74,600	74,600	5,610
Torrance	9,500	9,500	9,500	9,500	0
Upper San Gabriel	176,375	181,450	188,700	188,700	12,325
West Basin	73,750	86,000	92,500	92,500	18,750
Western	204,336	233,220	265,520	265,520	61,184
Total of All Agencies	**1,973,514**	**2,201,594**	**2,430,549**	**2,446,964**	**473,450**

** 2003 represents model estimate

Table A3 - 2: Total Groundwater Production (Consumptive) – Dry Year
(Includes groundwater recovery supplies)

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	60,442	64,587	73,080	74,846	14,404
Beverly Hills	2,800	2,800	2,800	2,800	0
Burbank	13,836	13,836	13,836	13,836	0
Calleguas	20,165	23,088	22,120	22,120	1,955
Central Basin	174,000	174,000	174,000	174,000	0
Compton	6,100	6,100	6,100	6,100	0
Eastern	144,138	149,035	143,639	143,639	-499
Foothill	7,670	7,670	7,670	7,670	0
Fullerton	24,602	25,028	25,955	26,698	2,096
Glendale	6,657	9,925	9,925	9,925	3,268
Inland Empire	146,667	158,333	175,000	175,000	28,333
Las Virgenes	0	0	0	0	0
Long Beach	24,000	24,000	24,000	24,000	0
Los Angeles	131,250	138,250	138,250	138,250	7,000
MWDOC	243,746	271,539	293,948	299,457	55,711
Pasadena	13,700	15,200	15,300	15,300	1,600
San Diego	16,762	34,360	59,500	59,500	42,738
San Fernando	3,600	3,600	3,600	3,600	0
San Marino	6,150	6,150	6,150	6,150	0
Santa Ana	39,092	40,678	44,656	45,845	6,753
Santa Monica	3,175	3,335	3,335	3,335	160
Three Valleys	52,700	52,700	52,700	52,700	0
Torrance	2,000	2,000	2,000	2,000	0
Upper San Gabriel	152,630	154,100	156,200	156,200	3,570
West Basin	55,000	55,000	55,000	55,000	0
Western	199,660	227,800	260,100	260,100	60,440
Total of All Agencies	**1,550,543**	**1,663,114**	**1,768,864**	**1,778,071**	**227,528**

* 2003 represents model estimate

Table A3 - 3: Total Surface Water (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	2,000	2,000	2,000	2,000	0
Foothill	350	350	350	350	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	18,870	18,870	18,870	18,870	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	0	0	0	0	0
MWDOC	7,000	9,000	7,000	8,000	1,000
Pasadena	0	0	0	0	0
San Diego*	60,832	46,025	46,025	46,025	-14,807
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	5,900	5,900	5,900	5,900	0
Torrance	0	0	0	0	0
Upper San Gabriel	15,000	15,000	15,000	15,000	0
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**109,952**	**97,145**	**95,145**	**96,145**	**-13,807**

* 2003 represents model estimate

Table A3 - 4: Los Angeles Aqueduct (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	0	0	0	0	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	144,912	143,088	142,265	143,473	-1,439
MWDOC	0	0	0	0	0
Pasadena	0	0	0	0	0
San Diego	0	0	0	0	0
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	0	0	0	0	0
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**144,912**	**143,088**	**142,265**	**143,473**	**-1,439**

* 2003 represents model estimate

Table A3 - 5: Recycling M & I (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	6,700	6,700	6,700	6,700	0
Calleguas	8,808	22,060	24,560	24,560	15,752
Central Basin	5,387	10,225	13,000	13,000	7,613
Compton	0	0	0	0	0
Eastern	22,250	27,500	39,000	39,000	16,750
Foothill	120	120	120	120	0
Fullerton	0	0	0	0	0
Glendale	1,790	2,010	2,050	2,050	260
Inland Empire	6,955	20,640	44,100	44,100	37,145
Las Virgenes	5,740	8,000	9,600	9,600	3,860
Long Beach	5,875	8,819	13,025	13,025	7,150
Los Angeles	4,894	25,055	37,450	37,450	32,556
MWDOC	31,000	54,000	61,000	66,000	35,000
Pasadena	0	0	0	0	0
San Diego	17,775	32,168	52,730	52,730	34,955
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	472	500	540	540	68
Santa Monica	280	280	280	280	0
Three Valleys	10,390	12,700	16,000	16,000	5,610
Torrance	7,500	7,500	7,500	7,500	0
Upper San Gabriel	8,745	12,350	17,500	17,500	8,755
West Basin	18,750	31,000	37,500	37,500	18,750
Western	4,676	5,420	5,420	5,420	744
Total of All Agencies	**168,107**	**287,047**	**388,075**	**393,075**	**224,968**

* 2003 represents model estimate

Table A3 - 6: Seawater Desalination (Consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	0	0	0	0	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	0	11,200	11,200	11,200	11,200
MWDOC	0	0	0	0	0
Pasadena	0	0	0	0	0
San Diego	0	0	25,000	25,000	25,000
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	0	0	0	0	0
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**0**	**11,200**	**36,200**	**36,200**	**36,200**

* 2003 represents model estimate

Note: The desalination totals shown here were based on the best available information in April 2002. Since then, the member agencies have submitted proposals for 132,000 acre-feet potential of desalination

Table A3 - 7: Groundwater Recovery – Dry Year
(Already incorporated into groundwater)

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	2,600	2,600	2,600	2,600	0
Burbank	10,500	10,500	10,500	10,500	0
Calleguas	0	0	0	0	0
Central Basin	900	900	900	900	0
Compton	0	0	0	0	0
Eastern	3,360	3,360	3,360	3,360	0
Foothill	350	900	1,600	1,600	1,250
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	3,755	4,000	4,000	4,000	245
Las Virgenes	750	750	750	750	0
Long Beach	0	0	0	0	0
Los Angeles	0	0	0	0	0
MWDOC	12,221	29,971	29,971	29,971	17,750
Pasadena	0	0	0	0	0
San Diego	7,700	10,100	10,100	10,100	2,400
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	1,800	1,800	1,800	1,800	0
Three Valleys	3,600	3,600	3,600	3,600	0
Torrance	2,000	2,400	2,400	2,400	400
Upper San Gabriel	0	0	0	0	0
West Basin	2,200	3,400	3,400	3,400	1,200
Western	16,755	20,100	20,100	20,100	3,345
Total of All Agencies	**68,492**	**94,381**	**95,081**	**95,081**	**26,589**

* 2003 represents model estimate

Table A3 - 8: Recycling Groundwater Replenishment (Non-consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	45,000	45,000	45,000	45,000	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	500	28,000	28,000	28,000	27,500
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	2,500	10,000	10,000	10,000	7,500
MWDOC	5,000	45,000	37,000	37,000	32,000
Pasadena	0	0	0	0	0
San Diego	600	4,000	6,000	6,000	5,400
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	440	535	672	672	232
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	2,500	10,000	10,000	10,000	7,500
West Basin	0	0	0	0	0
Western	0	0	0	0	0
Total of All Agencies	**56,540**	**142,535**	**136,672**	**136,672**	**80,132**

* 2003 represents model estimate

Table A3 - 9: Recycling for Seawater Barrier (Non-consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	0	0	0	0	0
Beverly Hills	0	0	0	0	0
Burbank	0	0	0	0	0
Calleguas	0	0	0	0	0
Central Basin	0	0	0	0	0
Compton	0	0	0	0	0
Eastern	0	0	0	0	0
Foothill	0	0	0	0	0
Fullerton	0	0	0	0	0
Glendale	0	0	0	0	0
Inland Empire	0	0	0	0	0
Las Virgenes	0	0	0	0	0
Long Beach	0	0	0	0	0
Los Angeles	0	0	0	0	0
MWDOC	5,000	28,000	36,000	36,000	31,000
Pasadena	0	0	0	0	0
San Diego	0	0	0	0	0
San Fernando	0	0	0	0	0
San Marino	0	0	0	0	0
Santa Ana	0	0	0	0	0
Santa Monica	0	0	0	0	0
Three Valleys	0	0	0	0	0
Torrance	0	0	0	0	0
Upper San Gabriel	0	0	0	0	0
West Basin	12,500	17,500	17,500	17,500	5,000
Western	0	0	0	0	0
Total of All Agencies	**17,500**	**45,500**	**53,500**	**53,500**	**36,000**

* 2003 represents model estimate

Table A3 - 10: Total Local Supply (Consumptive and Non-consumptive) – Dry Year

Member Agency	2003*	2010	2020	2025	2003-2025
Anaheim	60,442	64,587	73,080	74,846	14,404
Beverly Hills	2,800	2,800	2,800	2,800	0
Burbank	20,536	20,536	20,536	20,536	0
Calleguas	28,973	45,148	46,680	46,680	17,707
Central Basin	224,387	229,225	232,000	232,000	7,613
Compton	6,100	6,100	6,100	6,100	0
Eastern	168,388	178,535	184,639	184,639	16,251
Foothill	8,140	8,140	8,140	8,140	0
Fullerton	24,602	25,028	25,955	26,698	2,096
Glendale	8,447	11,935	11,975	11,975	3,528
Inland Empire	172,992	225,843	265,970	265,970	92,978
Las Virgenes	5,740	8,000	9,600	9,600	3,860
Long Beach	29,875	32,819	37,025	37,025	7,150
Los Angeles	283,556	327,593	339,165	340,373	56,817
MWDOC	291,747	407,539	434,948	446,457	154,710
Pasadena	13,700	15,200	15,300	15,300	1,600
San Diego	95,970	116,553	189,255	189,255	93,285
San Fernando	3,600	3,600	3,600	3,600	0
San Marino	6,150	6,150	6,150	6,150	0
Santa Ana	40,004	41,713	45,868	47,057	7,053
Santa Monica	3,455	3,615	3,615	3,615	160
Three Valleys	68,990	71,300	74,600	74,600	5,610
Torrance	9,500	9,500	9,500	9,500	0
Upper San Gabriel	178,875	191,450	198,700	198,700	19,825
West Basin	86,250	103,500	110,000	110,000	23,750
Western	204,336	233,220	265,520	265,520	61,184
Total of All Agencies	**2,047,554**	**2,389,629**	**2,620,721**	**2,637,136**	**589,582**

* 2003 represents model estimate

Table A3 - 11: Summary of MWD Funded Local Resource Programs

Member Agency	Number of Funded Projects	Total Contract Yield
Beverly Hills	1	2,600
Burbank	2	3,594
Calleguas MWD	2	15,300
Central Basin MWD	6	15,124
Eastern MWD	4	15,890
Foothill MWD	1	1,600
Glendale	3	2,825
Inland Empire	2	17,500
Las Virgenes MWD	3	3,550
Long Beach	2	4,450
Los Angeles	3	8,510
MWDOC	17	68,474
Santa Ana	1	800
Santa Monica	2	2,080
SDCWA	20	57,261
Three Valleys MWD	2	1,016
Torrance	1	2,400
West Basin MWD	3	73,924
Western MWD	3	20,100
Total of All Agencies	**78**	**316,998**

Table A3 - 12: Existing and Committed Local Resource Programs

Member Agency	Project Name	Project Type	Contract Yield	Funding
Beverly Hills	Beverly Hills Desalter	Groundwater Recovery	2,600	GRP
Burbank	Burbank Lake Street GAC Plant	Groundwater Recovery	2,744	GRP
Burbank	Burbank Reclaimed Water System Expansion Project	Recycled Water	850	LRP
Burbank	Burbank/Lockheed Valley Plant	Groundwater Recovery	0	Unfunded
Burbank	Caltrans	Recycled Water	0	Unfunded
Burbank	Media City Center	Recycled Water	0	Unfunded
Burbank	PSD Power Plant	Recycled Water	0	Unfunded
Calleguas MWD	Conejo Creek Diversion Project	Recycled Water	14,000	LPP
Calleguas MWD	Oak Park/North Ranch Water Reclamation Project	Recycled Water	1,300	LPP
Central Basin MWD	Alamitos Barrier Reclaimed Water Project	Recycled Water	3,024	LRP
Central Basin MWD	Bellflower Reclamation Project	Recycled Water	0	Unfunded
Central Basin MWD	Century Reclamation Program [3]	Recycled Water	10,500	LRP
Central Basin MWD	Cerritos Reclaimed Water Expansion Project	Recycled Water	260	LPP
Central Basin MWD	Cerritos Reclamation Project	Recycled Water	0	Unfunded
Central Basin MWD	Juan Well Filter Facility	Groundwater Recovery	900	LRP
Central Basin MWD	Lakewood Water Reclamation Project	Recycled Water	440	LPP
Central Basin MWD	Montebello Forebay	Recycled Water	0	Unfunded
Central Basin MWD	Rio Hondo Water Reclamation Program [3]	Recycled Water	0	LRP
Eastern MWD	Eastern Regional Reclaimed Water System	Recycled Water	4,830	LPP Projects
Eastern MWD	EMWD Reach I Phase II	Recycled Water	1,700	LPP Projects
Eastern MWD	Hemet/SJ Regional Reclamation - Direct	Recycled Water	0	Unfunded
Eastern MWD	Lake Elsinor Make Up Water	Recycled Water	0	Unfunded
Eastern MWD	Menifee Basin Desalter	Groundwater Recovery	3,360	GRP
Eastern MWD	Moreno Valley Regional Reclamation	Recycled Water	0	Unfunded
Eastern MWD	Perris Valley Regional Reclamation	Recycled Water	0	Unfunded
Eastern MWD	Rancho California Reclamation (Existing non-LPP)	Recycled Water	0	Unfunded
Eastern MWD	Rancho California Reclamation Expansion	Recycled Water	6,000	LPP Projects
Eastern MWD	Temecula Valley Regional Reclamation	Recycled Water	0	Unfunded
Foothill MWD	Glenwood Nitrate	Groundwater Recovery	1,600	LPP
Foothill MWD	La Canada-Flintridge Country Club	Recycled Water	0	Unfunded
Glendale	Glendale Brand Park Reclaimed Water Project [4]	Recycled Water	0	LRP

Member Agency	Project Name	Project Type	Contract Yield	Funding
Glendale	Glendale Verdugo-Scholl Canyon Reclaimed Water Project [4]	Recycled Water	2,225	LRP
Glendale	Glendale Water Reclamation Expansion Project	Recycled Water	600	LPP
Glendale	Power Plant Project	Recycled Water	0	Unfunded
Inland Empire	California Institution for Men	Recycled Water	0	Unfunded
Inland Empire	Carbon Canyon Reclamation Project	Recycled Water	13,500	LPP
Inland Empire	Chino Basin Desalter No. 1 - IEUA	Groundwater Recovery	4,000	GRP
Inland Empire	El Prado Park and Golf Course	Recycled Water	0	Unfunded
Inland Empire	Ontario Golf Course and Westwind Park	Recycled Water	0	Unfunded
Inland Empire	Upland Hills Country Club	Recycled Water	0	Unfunded
Inland Empire	Western Hills Country Club	Recycled Water	0	Unfunded
Las Virgenes MWD	Calabasas Reclaimed Water System Expansion	Recycled Water	700	LPP
Las Virgenes MWD	Calabasas System	Recycled Water	0	Unfunded
Las Virgenes MWD	Las Virgenes Reclamation Project	Recycled Water	2,700	LPP
Las Virgenes MWD	Las Virgenes Valley System	Recycled Water	0	Unfunded
Las Virgenes MWD	Two Wells in Westlake	Groundwater Recovery	0	Unfunded
Las Virgenes MWD	Westlake Wells - Tapia WRF Intertie	Groundwater Recovery	150	LRP
Long Beach	Long Beach Reclamation Expansion Phase I	Recycled Water	2,750	LPP
Long Beach	Long Beach Reclamation Project	Recycled Water	1,700	LPP
Long Beach	Long Beach Reclamation Project	Recycled Water	0	Unfunded
Long Beach	THUMS	Recycled Water	0	Unfunded
Los Angeles	Cal Trans (5 & 134 Fwys)	Recycled Water	0	Unfunded
Los Angeles	East Valley - Phase I	Recycled Water	0	Unfunded
Los Angeles	Griffith Park	Recycled Water	0	Unfunded
Los Angeles	Hansen Area Water Recycling Project	Recycled Water	0	Unfunded
Los Angeles	Harbor Water Recycling Project	Recycled Water	5,000	LRP
Los Angeles	Los Angeles Greenbelt Project	Recycled Water	1,610	LPP
Los Angeles	Los Angeles Greenbelt Project - MCA	Recycled Water	0	Unfunded
Los Angeles	MGM/SONY Building	Recycled Water	0	Unfunded
Los Angeles	Sepulveda Basin Water Reclamation Project	Recycled Water	1,900	LPP
MWDOC	Capistrano Beach Desalter	Groundwater Recovery	1,300	GRP
MWDOC	Capistrano Valley Non-Domestic Water System Expansion	Recycled Water	2,895	LRP
MWDOC	Development of Non-Domestic Water System Expansion Ladera	Recycled Water	2,772	LRP

Member Agency	Project Name	Project Type	Contract Yield	Funding
MWDOC	El Toro Existing	Recycled Water	0	Unfunded
MWDOC	Green Acres Reclamation Project - Coastal	Recycled Water	800	LRP
MWDOC	Green Acres Reclamation Project - MWDOC	Recycled Water	5,400	LRP
MWDOC	Irvine Desalter	Groundwater Recovery	6,700	GRP
MWDOC	Irvine Ranch Michelson Expansion	Recycled Water	0	Unfunded
MWDOC	Irvine Ranch Part 1 Expansion	Recycled Water	0	Unfunded
MWDOC	Irvine Ranch Reclamation Project	Recycled Water	10,000	LPP
MWDOC	IRWD Reclaimed Well 78	Groundwater Recovery	0	Unfunded
MWDOC	Los Alisos WD	Recycled Water	0	Unfunded
MWDOC	Mesa Consolidated Colored Water Treatment Facility	Groundwater Recovery	11,300	LRP
MWDOC	Moulton Niguel Phase 4 Reclamation System Expansion	Recycled Water	1,276	LRP
MWDOC	Moulton Niguel Reclamation Project	Recycled Water	8,000	LPP
MWDOC	Moulton Niguel WD Existing	Recycled Water	0	Unfunded
MWDOC	OCWD Groundwater System - recharge	Recycled Water	0	Unfunded
MWDOC	OCWD Groundwater System - seawater barrier	Recycled Water	0	Unfunded
MWDOC	OCWD WF21 Above 12-yr. Average	Recycled Water	0	Unfunded
MWDOC	San Clemente Water Reclamation Project	Recycled Water	4,000	LPP
MWDOC	San Juan Desalter	Groundwater Recovery	4,800	GRP
MWDOC	Santa Margarita Reclamation Expansion Project	Recycled Water	3,600	LPP
MWDOC	Santa Margarita WD - Oso	Recycled Water	0	Unfunded
MWDOC	South Laguna Reclamation Expansion Project	Recycled Water	700	LPP
MWDOC	South Laguna Reclamation Project	Recycled Water	860	LPP
MWDOC	Trabuco Canyon Reclamation Expansion Project	Recycled Water	800	LPP
MWDOC	Trabuco Canyon Reclamation Project (Existing)	Recycled Water	0	Unfunded
MWDOC	Tustin Desalter	Groundwater Recovery	3,271	GRP
MWDOC	Water Factory 21 Blend	Groundwater Recovery	0	Unfunded
Santa Ana	Green Acres Reclamation Project - Santa Ana	Recycled Water	800	LRP
Santa Monica	Dry Weather Runoff Reclamation Facility	Recycled Water	280	LRP
Santa Monica	Santa Monica GW Treatment Plant	Groundwater Recovery	1,800	GRP
Santa Monica	Santa Monica Water Gardens	Recycled Water	0	Unfunded
SDCWA	Camp Pendleton	Recycled Water	0	Unfunded
SDCWA	Encina Basin Water Reclamation. Project - Phases I and II [5]	Recycled Water	5,000	LRP

Member Agency	Project Name	Project Type	Contract Yield	Funding
SDCWA	Encina Basin Water Reclamation Project Phase I [5]	Recycled Water	0	LRP
SDCWA	Encina Water Pollution Control Facility Reclamation Project [2]	Recycled Water	165	LPP
SDCWA	Escondido Regional Reclaimed Water Project	Recycled Water	2,800	LRP
SDCWA	Fairbanks Ranch	Recycled Water	0	Unfunded
SDCWA	Fallbrook Reclamation Project	Recycled Water	1,200	LRP
SDCWA	Lower Sweetwater Desalter Phase I	Groundwater Recovery	3,600	GRP
SDCWA	North City Water Reclamation Project	Recycled Water	17,500	LRP
SDCWA	Oceanside Desalter Phase I [1]	Groundwater Recovery	2,000	GRP
SDCWA	Oceanside Desalter Phase I and II [1]	Groundwater Recovery	6,500	GRP
SDCWA	Oceanside Water Reclamation Project	Recycled Water	300	LPP
SDCWA	Olivenhain Recycled Project - SE Quadrant	Recycled Water	1,788	LRP
SDCWA	Otay Recycled Distribution Expansion Project	Recycled Water	8,515	LRP
SDCWA	Otay Water Reclamation Project	Recycled Water	1,500	LRP
SDCWA	Padre Dam Reclaimed Water System Phase I	Recycled Water	850	LRP
SDCWA	Ramona/Santa Maria Water Reclamation Project	Recycled Water	1,600	LPP
SDCWA	Rancho Santa Fe (Existing)	Recycled Water	0	Unfunded
SDCWA	Rancho Santa Fe Reclaimed Water System	Recycled Water	220	LPP
SDCWA	RDDMWD Recycled Water Program	Recycled Water	648	LRP
SDCWA	San Elijo Water Reclamation System	Recycled Water	1,600	LRP
SDCWA	San Pasqual Reclamation Project	Recycled Water	1,100	LRP
SDCWA	San Vincente	Recycled Water	0	Unfunded
SDCWA	Santa Maria - Phase A	Recycled Water	0	Unfunded
SDCWA	Santee - Phase A	Recycled Water	0	Unfunded
SDCWA	Shadowridge Reclaimed Water System	Recycled Water	375	LPP
SDCWA	South Bay Water Reclamation Project (excluding Otay)	Recycled Water	0	Unfunded
SDCWA	Valley Center - Phase A	Recycled Water	0	Unfunded
SDCWA	Whispering Palms	Recycled Water	0	Unfunded
Three Valleys MWD	City of Industry Reclaimed System - Phase A	Recycled Water	0	Unfunded
Three Valleys MWD	Pomona Nitrate	Groundwater Recovery	0	Unfunded
Three Valleys MWD	Pomona Reclamation Project	Recycled Water	0	Unfunded
Three Valleys MWD	Rowland GW Treatment Project	Groundwater Recovery	516	GRP
Three Valleys MWD	Walnut Valley Reclamation Expansion Project [2]	Recycled Water	500	LPP

Member Agency	Project Name	Project Type	Contract Yield	Funding
Three Valleys MWD	Walnut Valley Reclamation Project	Recycled Water	0	Unfunded
Torrance	Madrona Desalter (Goldsworthy)	Groundwater Recovery	2,400	GRP
Upper SGVMWD	California Country Club	Recycled Water	0	Unfunded
Upper SGVMWD	Puente Hills/Rose Hills	Recycled Water	0	Unfunded
Upper SGVMWD	San Gabriel Valley Recycled Water Demonstration Project	Recycled Water	0	Unfunded
West Basin MWD	Sepulveda Desalter	Groundwater Recovery	2,400	GRP
West Basin MWD	West Basin Desalter No. 1	Groundwater Recovery	1,524	GRP
West Basin MWD	West Basin Water Reclamation Program	Recycled Water	70,000	LPP
Western MWD	Arlington Desalter	Groundwater Recovery	6,100	LPP
Western MWD	Chino Basin Desalter No. 1 - Western	Groundwater Recovery	4,000	GRP
Western MWD	Ellsinore Valley/Horse Thief Reclamation	Recycled Water	0	Unfunded
Western MWD	Ellsinore Valley/Railroad Canyon Reclamation	Recycled Water	0	Unfunded
Western MWD	Indian Hills Reclamation Project	Recycled Water	0	Unfunded
Western MWD	March AFB Reclamation Project	Recycled Water	0	Unfunded
Western MWD	Santa Rosa Water Reclamation Facility	Recycled Water	0	Unfunded
Western MWD	Temescal Basin Desalting Facility	Groundwater Recovery	10,000	LRP
Total of All Agencies			**316,998**	

(1) Oceanside Phase I agreement will be combined with Oceanside II agreement.

(2) The LPP agreement for these projects has terminated.

(3) On July 1, 1999, the Rio Hondo project was combined with Century Reclamation Program.

(4) On July 1, 1999, the Glendale Brand Park project was combined with Glendale Verdugo-scholl project.

(5) On July 1, 2000, the LRP agreement for Encina Basin Phase I was combined with New LRP agreement for Encina Basin Phase 2.

APPENDIX 4 – IRPSIM OUTPUT

Table A4 - 1: IRPSIM Output - Drought Reliability Test
1924 – 1934

Forecast Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Hydrology Year	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Hydrologic Conditions											
Southern California Year Type	Dry	Dry	Wet	Wet	Dry	Dry	Normal	Wet	Normal	Wet	Normal
Sacramento River Index D1630 Year Type*	Dry	Dry	Dry	Wet	Normal	Dry	Dry	Dry	Dry	Dry	Dry
Demands											
Retail Demand	4,613,044	4,651,232	4,543,626	4,578,290	4,858,417	4,832,610	4,834,923	4,859,995	4,854,491	4,963,965	5,054,591
Long-term/Replenishment Demand	284,736	286,064	288,540	291,220	294,111	296,800	296,699	296,573	296,748	296,577	296,664
Total Demand	4,897,780	4,937,296	4,832,166	4,869,510	5,152,528	5,129,410	5,131,622	5,156,568	5,151,239	5,260,542	5,351,255
Local Supplies											
Goundwater Production	1,622,783	1,633,514	1,582,984	1,593,704	1,667,892	1,673,419	1,646,939	1,623,115	1,648,707	1,626,065	1,658,028
L. A. Aqueduct Production	115,808	214,542	237,809	394,445	195,964	155,548	151,882	118,202	360,049	172,752	136,610
Advanced Technology Production	632,551	642,364	651,178	660,992	670,804	709,528	710,528	711,528	712,528	713,528	714,528
Surface Production	90,729	78,574	112,723	148,872	143,803	107,785	97,408	129,701	138,697	145,921	143,718
Total Local Supply	2,461,871	2,568,994	2,584,694	2,798,013	2,678,463	2,646,280	2,606,757	2,582,546	2,859,981	2,658,266	2,652,884
Total MWD Demand	2,435,910	2,368,301	2,247,472	2,071,497	2,474,066	2,483,131	2,524,865	2,574,020	2,291,258	2,602,277	2,698,371
MWD Supply Sources											
Colorado River Supplies											
Base Supply Programs	1,094,348	1,094,561	636,074	694,292	732,050	782,009	1,152,504	831,634	820,997	827,546	825,812
Hayfield & DWCV Programs (Net Operations)	-124	58,439	-58,451	-3,201	-320	177,991	-177,991	173,366	175,258	172,454	174,188
PVID	97,000	97,000	97,000	25,000	25,000	111,300	25,000	111,300	25,000	111,300	111,300
Additional CRA Programs	0	0	0	0	0	0	0	0	0	0	0
Net Colorado River Supply	1,191,224	1,250,000	674,623	716,091	756,730	1,071,300	999,513	1,116,300	1,021,255	1,111,300	1,111,300
State Water Project Supplies											
Base Supply Programs	1,032,752	1,039,539	1,578,026	1,886,708	1,809,950	1,147,991	1,571,496	991,366	1,250,003	960,454	1,019,188
Carryover (Takes)	200,000	0	0	0	200,000	200,000	0	0	0	0	0
Carryover (Puts To Program)	0	0	0	-200,000	-200,000	0	0	0	0	0	0
Net State Water Project Supply	1,232,752	1,039,539	1,578,026	1,686,708	1,809,950	1,347,991	1,571,496	991,366	1,250,003	960,454	1,019,188
Additional Water Surplus And Drought Management Actions (Storage Programs Show Net Operations)											
SWP Transfer Programs	20,000	20,000	20,000	20,000	20,000	20,000	20,000	42,908	20,000	42,013	43,714
Diamond Valley Lake	-8,066	58,762	-25,176	-105,519	-20,000	43,840	-66,144	150,315	0	88,155	57,075
SWP Storage Programs	0	0	0	-507	-50	0	0	219,513	0	168,704	160,241
Long-term Demand Cuts	0	0	0	0	0	0	0	53,618	0	66,000	66,000
In-Region Contractual Groundwater	0	0	0	0	0	0	0	0	0	165,651	234,000
DWR Reservoirs	0	0	0	0	0	0	0	0	0	0	6,854
Agricultural Demand Cuts	0	0	0	0	0	0	0	0	0	0	0
Remaining Targeted Central Valley Transfer Produ	0	0	0	0	0	0	0	0	0	0	0
Remaining Spot Water Needed	0	0	0	0	0	0	0	0	0	0	0
Total Additional WSDM Actions	11,934	78,762	-5,176	-86,026	-50	63,840	-46,144	466,354	20,000	530,523	567,884
Remaining Shortage	0	0	0	0	0	0	0	0	0	0	0
Remaining Surplus	0	0	0	245,276	92,564	0	0	0	0	0	0

Figure A4 - 1: IRPSIM Output - Total Storage
2015 – 2025 Forecast: 1924 – 1934 Hydrologic Sequence

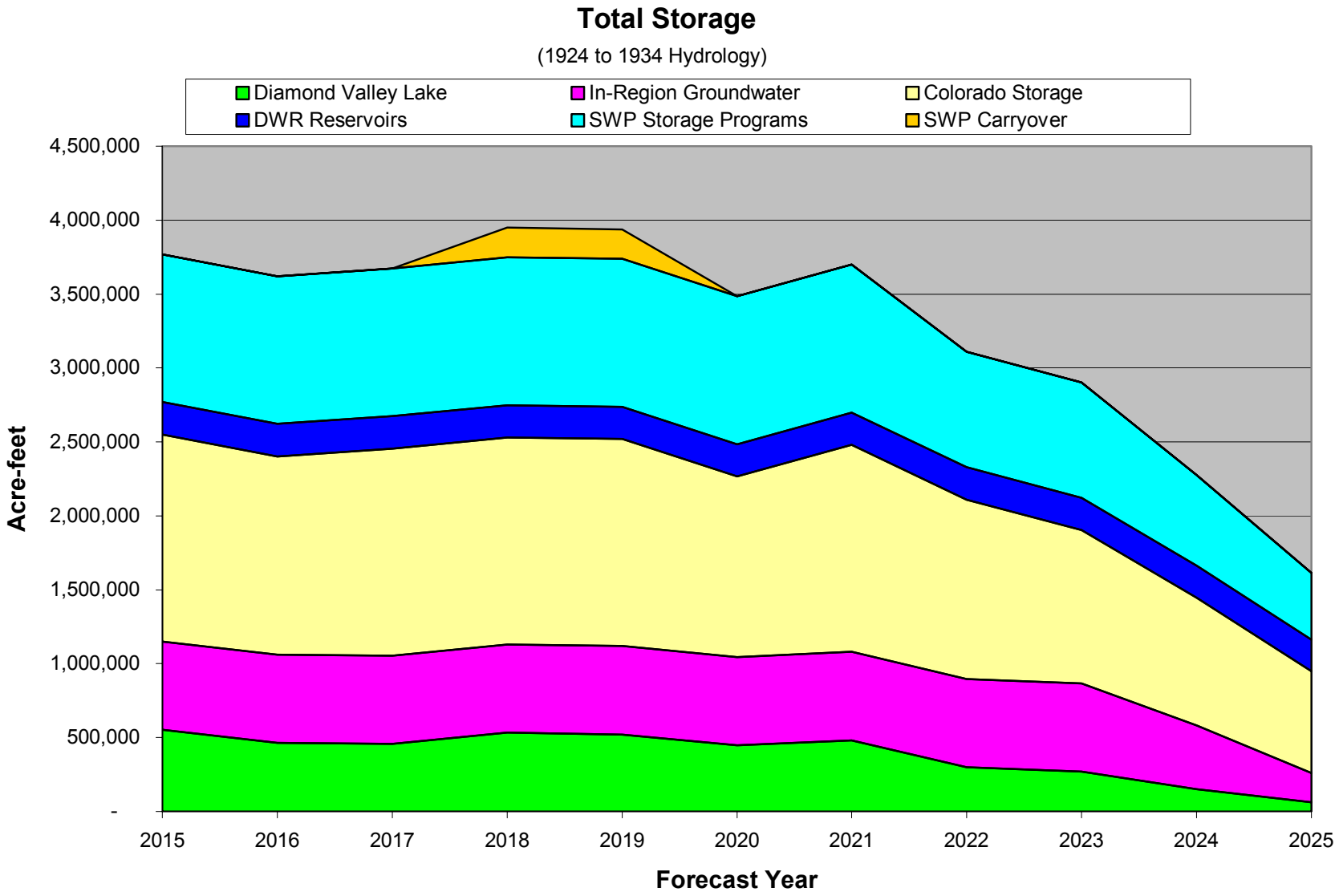

Table A4 - 2: IRPSIM Output - Drought Reliability Test
2015 – 2025 Forecast: 1981 – 1991 Hydrologic Sequence

Forecast Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Hydrology Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Hydrologic Conditions											
Southern California Year Type	Normal	Normal	Wet	Dry	Dry	Wet	Normal	Normal	Dry	Dry	Normal
Sacramento River Index D1630 Year Type*	Dry	Wet	Wet	Wet	Dry	Wet	Dry	Dry	Dry	Dry	Dry
Demands											
Retail Demand	4,661,720	4,437,698	4,219,166	4,909,935	4,850,993	4,768,078	4,890,914	4,983,574	5,147,630	5,237,478	5,068,636
Long-term/Replenishment Demand	284,676	285,948	288,208	291,427	294,106	296,593	296,783	296,729	296,880	296,839	296,645
Total Demand	4,946,396	4,723,646	4,507,374	5,201,362	5,145,099	5,064,671	5,187,697	5,280,303	5,444,510	5,534,317	5,365,281
Local Supplies											
Goundwater Production	1,600,991	1,601,597	1,567,064	1,666,752	1,665,839	1,617,869	1,651,420	1,653,447	1,687,600	1,693,077	1,657,732
L. A. Aqueduct Production	283,499	500,000	500,000	438,645	368,294	472,569	182,088	154,173	156,559	110,555	167,736
Advanced Technology Production	632,551	642,364	651,178	660,992	670,804	709,528	710,528	711,528	712,528	713,528	714,528
Surface Production	173,619	150,652	182,117	189,513	146,377	112,932	121,251	118,046	86,460	72,733	88,478
Total Local Supply	2,690,660	2,894,613	2,900,359	2,955,902	2,851,314	2,912,898	2,665,287	2,637,194	2,643,147	2,589,893	2,628,474
Total MWD Demand	2,255,735	1,829,033	1,607,014	2,245,461	2,293,786	2,151,775	2,522,409	2,643,111	2,801,363	2,944,425	2,736,807
MWD Supply Sources											
Colorado River Supplies											
Base Supply Programs	629,928	621,257	195,800	695,843	727,030	1,144,350	1,149,553	830,934	807,458	818,328	832,779
Hayfield & DWCV Programs (Net Operations)	-518	-52	-5	-1	0	0	0	174,066	194,542	181,672	167,221
PVID	97,000	97,000	97,000	25,000	25,000	25,000	25,000	111,300	70,821	111,300	111,300
Additional CRA Programs	0	0	0	0	0	0	0	0	0	0	0
Net Colorado River Supply	726,410	718,205	292,795	720,842	752,030	1,169,350	1,174,553	1,116,300	1,072,821	1,111,300	1,111,300
State Water Project Supplies											
Base Supply Programs	1,758,172	1,921,743	2,072,700	1,834,157	1,979,970	1,647,650	1,671,447	1,015,066	1,708,542	1,272,672	783,221
Carryover (Takes)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	183,967	0	0	0
Carryover (Puts To Program)	-200,000	-200,000	-200,000	-200,000	-200,000	-200,000	-183,967	0	0	0	0
Net State Water Project Supply	1,758,172	1,921,743	2,072,700	1,834,157	1,979,970	1,647,650	1,687,480	1,199,033	1,708,542	1,272,672	783,221
Additional Water Surplus And Drought Management Actions (Storage Programs Show Net Operations)											
SWP Transfer Programs	20,000	20,000	20,000	20,000	20,000	20,000	20,000	43,594	20,000	51,051	36,883
Diamond Valley Lake	-20,000	-20,000	-20,000	-20,000	-20,000	-20,000	-20,000	156,213	0	94,053	62,973
SWP Storage Programs	-191	-20	-3	0	0	0	0	127,970	0	219,039	154,065
Long-term Demand Cuts	0	0	0	0	0	0	0	0	0	66,000	66,000
In-Region Contractual Groundwater	0	0	0	0	0	-56,000	-19,000	0	0	130,309	234,000
DWR Reservoirs	0	0	0	0	0	0	0	0	0	0	219,000
Agricultural Demand Cuts	0	0	0	0	0	0	0	0	0	0	24,135
Remaining Targeted Central Valley Transfer Produ	0	0	0	0	0	0	0	0	0	0	45,231
Remaining Spot Water Needed	0	0	0	0	0	0	0	0	0	0	0
Total Additional WSDM Actions	-191	-20	-3	0	0	-56,000	-19,000	327,777	20,000	560,452	842,287
Remaining Shortage	0	0	0	0	0	0	0	0	0	0	0
Remaining Surplus	228,656	810,895	758,478	309,538	438,214	609,225	320,624	0	0	0	0

Figure A4 - 2: IRPSIM Output - Drought Reliability Test
1981 – 1991