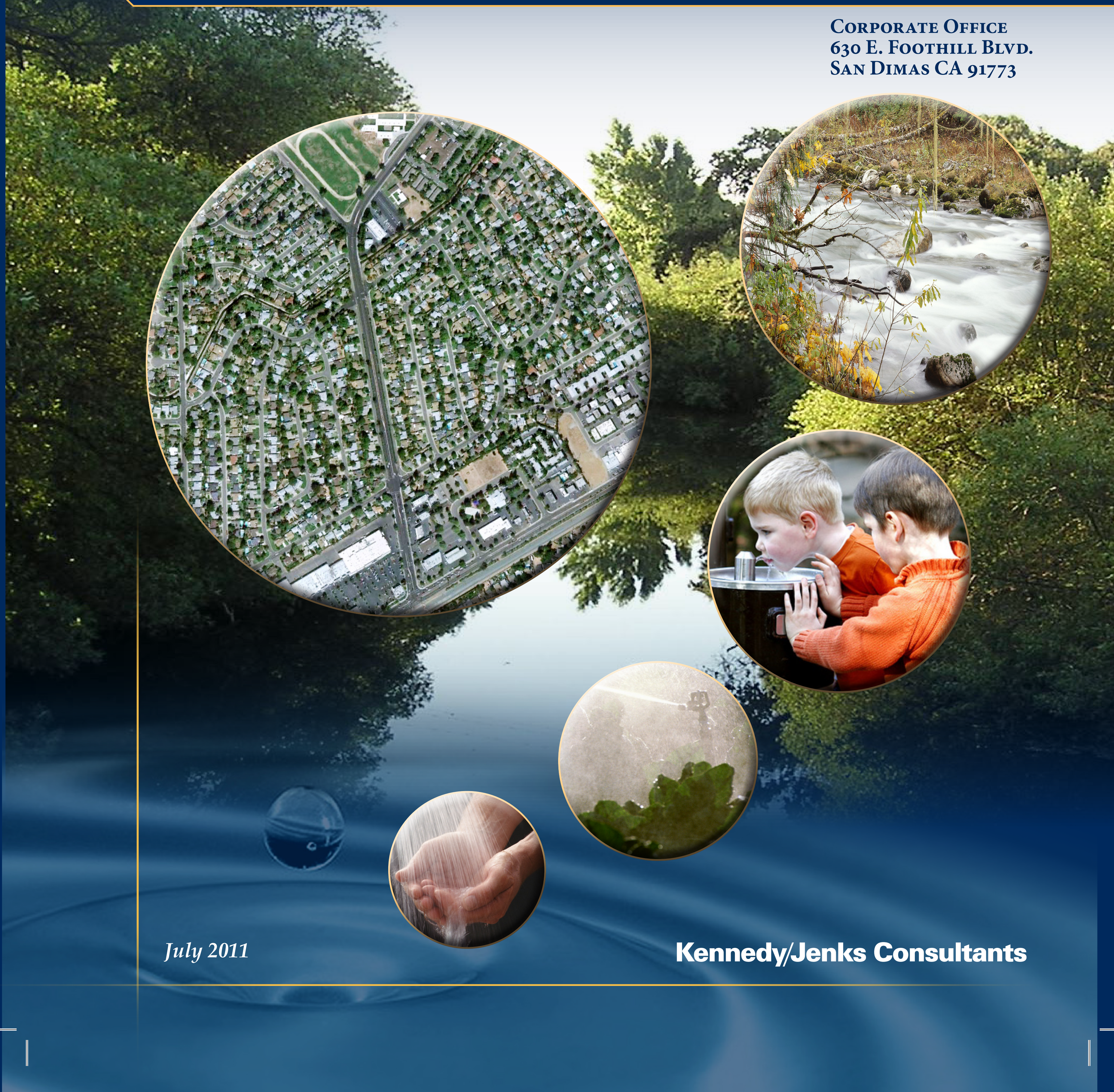
Golden State Water Company

A Subsidiary of American States Water Company

Final Report

2010 Urban Water Management Plan

Barstow



Corporate Office
630 E. Foothill Blvd.
San Dimas CA 91773

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Kennedy/Jenks Consultants

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Notice of Adoption

A meeting to solicit public comments on the 2010 Urban Water Management Plan for the Golden State Water Company Barstow System was held on June 9, 2011 at 4 p.m. at the Golden State Water Company Customer Service Office in Barstow, California. Notice of this meeting was published in accordance with Section 6066 of the Government Code in the Desert-Dispatch on April 5, 2011.

Copies of the Urban Water Management Plan were made available to the public at the Golden State Water Company Customer Service Office in Barstow, California at least one week prior to the public hearing.

Golden State Water Company, hereby, adopts the 2010 Urban Water Management Plan for the Barstow System.

William C Gedney

William C. Gedney
Vice President, Asset Management
Golden State Water Company

July 1, 2011

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Abbreviations

μg/L	micrograms per liter
ac-ft	acre-feet
ac-ft/yr	acre-feet per year
Act	Urban Water Management Planning Act
AMR	Automatic Meter Reading
AWAC	Alliance for Water Awareness and Conservation
AWWA	American Water Works Association
BAP	Base Annual Production
Basin	Mojave River Groundwater Basin
BMPs	best management practices
Cal EMA	California Emergency Management Agency
ccf	hundred cubic feet
CDPH	California Department of Public Health
cfs	cubic feet per second
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
COG	Council of Governments
Council or CUWCC	California Urban Water Conservation Council
CPUC	California Public Utilities Commission
DMM	Demand Management Measure
DWF	dry weather flow
DWR	Department of Water Resources (California)
DWR Guidebook	Guidebook to Assist Water Suppliers in the Preparation of a 2010 Urban Water Management Plan

ERP	emergency response plan
ETo	evapotranspiration
FPA	Free Production Allocation
GAC	Granulated Activated Carbon
gpcd	gallons per capita day
gpd	gallons per day
gpm	U.S. gallons per minute
GSWC	Golden State Water Company
GWMP	Groundwater Management Plan
HCD	Housing and Community Development
HECW	high efficiency clothes washers
HET	high efficiency toilets
ILI	infrastructure leakage index
MCL	maximum contaminant level
MF	multifamily
mg/L	milligrams per liter
mgd	million gallons per day
MOU	Memorandum of Understanding (Regarding Urban Water Conservation in California)
MTBE	methyl-t-butyl ether
MWA	Mojave Water Agency
N/A	not available, not applicable
NAICS	North American Industry Classification System
O&M	operation and maintenance
pCi/L	picoCuries per liter
PID	Public Improvement District
ppb	parts per billion

PTA	Packed Tower Aeration
R^3	Regional Recharge and Recovery Project
RHNA	Regional Housing Needs Allocation
RTP	regional transportation plan
RWMP	Regional Water Management Plan
SBX7-7	Senate Bill 7X-7, The Water Conservation Act of 2009
SCAG	Southern California Association of Governments
SF	single family
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
USMC	United States Marine Corps
UWMP	Urban Water Management Plan
VOC	volatile organic compound
WAP	Water Action Plan
WLCD	Water Loss Control Department
WRCC	Western Regional Climate Center
WSS	WaterSense Specification
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant
WY	water year

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Definitions

Chapter 2, Part 2.6, Division 6 of the California Water Code provides definitions for the construction of the Urban Water Management Plans. Appendix A contains the full text of the Urban Water Management Planning Act.

CHAPTER 2. DEFINITIONS

Section 10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

Section 10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

Section 10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

Section 10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

Section 10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

Section 10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, and reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

Section 10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

Section 10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

Section 10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

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Chapter 1: Plan Preparation

1.1 Background

This Urban Water Management Plan (UWMP) has been prepared for the Golden State Water Company (GSWC) Barstow System in compliance with Division 6, Part 2.6, of the California Water Code, Sections 10608 through 10657 as last amended by Senate Bill No. 7 (SBX7-7), the Water Conservation Act of 2009. The original bill requiring preparation of an UWMP was enacted in 1983. SBX7-7, which became law in November 2009, requires increased emphasis on water demand management and requires the state to achieve a 20 percent reduction in urban per capita water use by December 31, 2020.

Urban water suppliers having more than 3,000 service connections or supplying more than 3,000 acre-feet per year (ac-ft/yr) for retail or wholesale uses are required to submit a UWMP every 5 years to the California Department of Water Resources (DWR). The UWMP typically must be submitted by December 31 of years ending in 0 and 5, however SBX7-7 extended the UWMP deadline to July 1, 2011 to provide for development by DWR of required evaluation methodologies for determining water demand reduction targets. GSWC prepared an UWMP for the Barstow System in 1985, 1990, 1995, 2000, and 2005. This 2010 UWMP is an update to the 2005 plan.

GSWC water use targets for the Barstow System were developed based on Compliance Method 1 as described by SBX7-7 and supplemental guidance from DWR.

The portion of the Urban Water Management Planning Act (Act) that describes the purpose and intent of the UWMP states and declares the following:

Section 10610.2.

(a) The Legislature finds and declares all of the following:

- *(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.*
- *(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.*
- *(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.*
- *(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.*
- *(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.*
- *(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.*
- *(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.*
- *(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.*
- *(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.*

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

Section 10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

1.2 System Overview

GSWC is an investor-owned public utility company which owns 38 water systems throughout California regulated by the California Public Utilities Commission (CPUC). This UWMP has been prepared for the Barstow System.

Located in San Bernardino County, the Barstow System serves the City of Barstow and the surrounding unincorporated areas. The service area is primarily characterized by residential land use, with some commercial and industrial land use. Figure 1-1 illustrates the location of the Barstow System.

1.3 Notice of Document Use

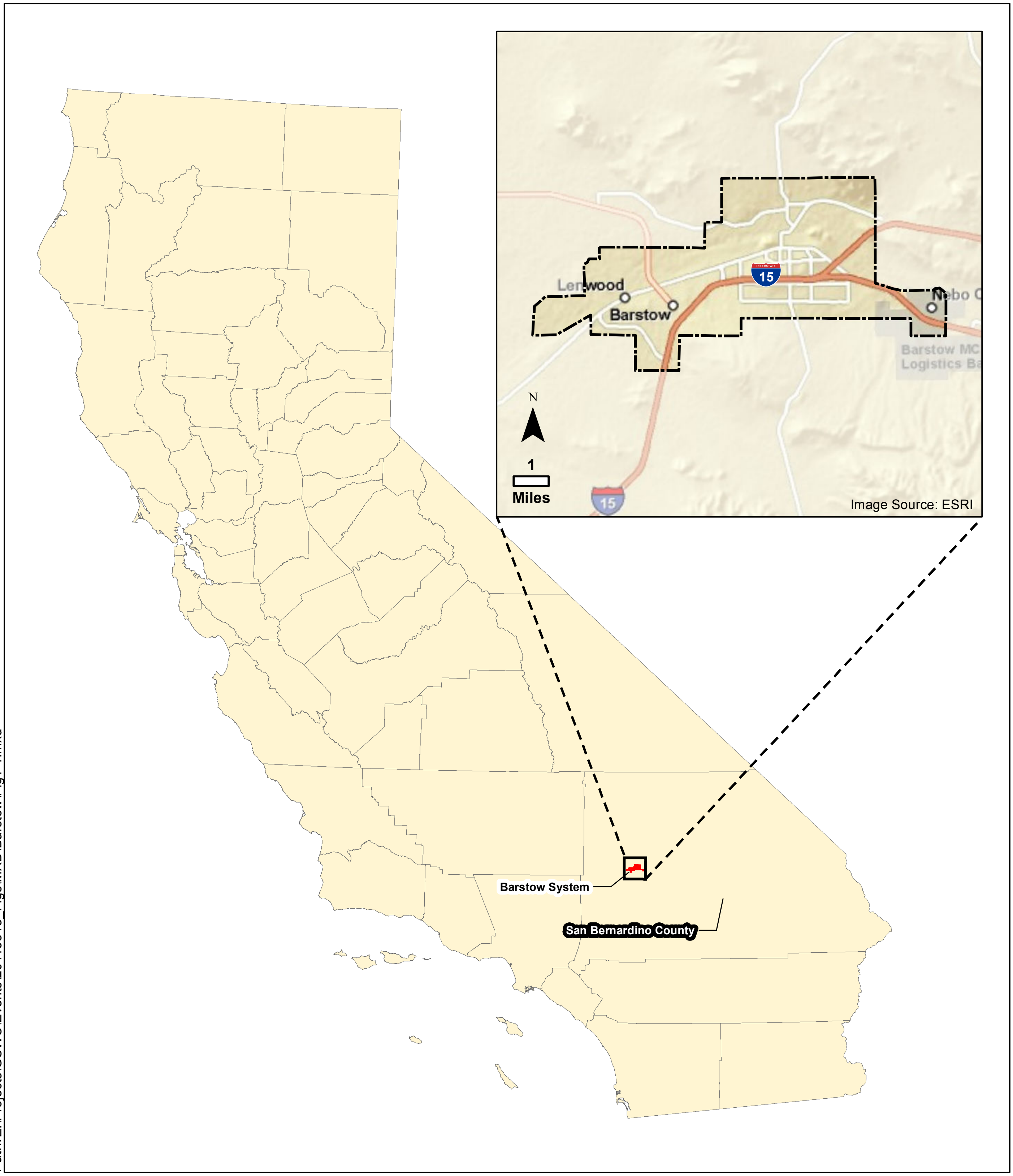
GSWC is committed to implementation of the projects, plans, and discussions provided within this document. However, it is important to note that execution of the plan is contingent upon the regulatory limitations and approval of the CPUC and other state agencies. Additionally, this document merely presents the water supply, reliability, and conservation programs known and in effect at the time of adoption of this plan.

1.4 Public Utility Commission 2010 Water Action Plan

The CPUC adopted the 2005 Water Action Plan (WAP) in December 2005 and an updated 2010 WAP in October 2010. The WAP is a general policy document, and specific implementation of policies and programs, along with modifications to CPUC ratemaking policies, and other programs including conservation, long-term planning, water quality and drought management programs are ongoing.

The purpose of the 2010 WAP update was to establish renewed focus on the following elements:

1. Maintain the highest standards of water quality;
2. Promote water infrastructure investment;
3. Strengthen water conservation programs to a level comparable to those of energy utilities;
4. Streamline CPUC regulatory decision-making;
5. Set rates that balance investment, conservation, and affordability; and
6. Assist low-income ratepayers.



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Barstow CSA

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Golden State Water Company
2010 Urban Water Management Plan

Barstow System
Location Map

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Figure 1-1

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GSWC has been actively involved with the CPUC in suggesting optimal approaches to the WAP. In particular, the GSWC has suggested specific implementation measures and modifications to certain CPUC rate setting practices so that regulated utilities are able as a practical matter to achieve the policy objectives of the WAP. These efforts are intended to include further investment in local resource optimization, reduced reliance on imported supplies, enhanced conservation, and intensification of company-wide efforts to optimize water resource mix, including planned water supply projects and programs to meet the long-term water supply needs of GSWC's customers.

1.5 Agency Coordination

The 2010 UWMP requirements for agency coordination include specific timetables and requirements as presented in this chapter. The required elements of the Act are as follows:

Section 10620.

(d) (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

Section 10621.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

Section 10635.

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

Section 10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

Table 1-1 lists the agencies with which coordination occurred while preparing this 2010 UWMP. The initial coordination began in July 2010, which included the distribution of letter notifications and requests for information. Each notification letter was followed up with a telephone call as necessary to obtain supporting data and coordinate preparation of the UWMP. Table 1-1 also provides a list of agencies that were provided public hearing notifications and access to the draft UWMP.

Table 1-1: Coordination with Agencies							
Agency	**Contacted for Assistance**	**Participated in UWMP Development**	**Commented on the Draft**	**Attended Public Meetings**	**Received Copy of the Draft**	**Sent Notice of Intent to Adopt**	**Not Involved/ No Information**
Southern California Association of Governments	✓						
City of Barstow	✓					✓	
County of San Bernardino	✓					✓	
Mojave Water Agency	✓	✓			✓	✓	

Note:
This table is based on DWR's *Guidebook to Assist Water Suppliers in the Preparation of a 2010 Urban Water Management Plan* (DWR Guidebook) Table 1.

1.6 Plan Adoption and Submittal

Public participation and plan adoption and submittal requirements are detailed in the following sections of the Act:

Section 10621.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640)

Section 10642. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

Section 10644.

(a) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

Section 10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

A public hearing to review the 2010 Barstow System UWMP was held on June 9, 2011 at the GSWC's Barstow Customer Service Area office in Barstow, California. This public session was held for review and comment on the draft UWMP before approval by GSWC. Legal public notices for the public hearing and availability of the plan for review and comment were published in advance in the local newspapers in accordance with Government Code Section 6066. Notifications were also posted to GSWC's website (www.gswater.com).

In addition, notifications of preparation of the plan were provided to cities and counties within which GSWC provides water at least 60 days in advance of the public hearing as required by the Act. Copies of the draft plan were available to the public for review at GSWC's Barstow office and posted on GSWC's website. Appendix B contains the following:

- Copy of the public hearing notice from the local newspaper,
- Screen capture of website posting of public hearing notice,
- Notifications and follow-up correspondence provided to cities and counties, and
- Meeting minutes from the public hearing pertaining to the UWMP.

The final UWMP, as adopted by GSWC, will be submitted to DWR, the California State Library, and cities and counties within which GSWC provides water within 30 days of adoption. Likewise, copies of any amendments or changes to the plan will be provided to the aforementioned entities within 30 days. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning). Adopted copies of this plan will be made available to the public at GSWC's Barstow Customer Service Office no later than 30 days after submitting the final UWMP to DWR.

1.7 UWMP Preparation

GSWC prepared this UWMP with the assistance of its consultant, Kennedy/Jenks Consultants, as permitted by the following section of the Act:

> *Section 10620.*
> *(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.*

During the preparation of the UWMP, documents that have been prepared over the years by GSWC and other entities were reviewed and information from those documents incorporated, as applicable, into this UWMP. The list of references is provided in Chapter 9.

The adopted plan is available for public review at GSWC's Barstow Office as required by Section 10645. Copies of the plan were submitted to DWR, cities and counties within the service area, the State Library, and other applicable institutions within 30 days of adoption as required by Section 10644. Appendix H includes copies of the transmittals included with the adopted plan as supporting documentation.

1.8 UWMP Implementation

> *Section 10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.*

GSWC is committed to the implementation of this UWMP concurrent with the scheduled activities identified herein as required by Section 10643 of the Act. Each system is managed through GSWC District offices and is afforded staff with appropriate regulatory approval to properly plan and implement responses identified in this document and other key planning efforts to proactively address water supply reliability challenges. Furthermore, each region of GSWC has a conservation coordinator that oversees the implementation of Demand Management Measures (DMMs) through GSWC participation in the California Urban Water Conservation Council's (Council or CUWCC) Memorandum of Understanding (MOU).

1.9 Content of the UWMP

This UWMP addresses all subjects required by Section 10631 of the Act as defined by Section 10630, which permits "levels of water management planning commensurate with the numbers of customers served and the volume of water supplied." All applicable sections of the Act are discussed in this UWMP, with chapters of the UWMP and DWR Guidebook Checklist cross-referenced against the corresponding provision of the Act in Table 1-2. Additionally, a completed copy of the 2010 Urban Water Management Plan Checklist organized by subject is included as Appendix J.

Table 1-2: Summary of UWMP Chapters and Corresponding Provisions of the California Water Code

Chapter	Corresponding Provisions of the Water Code		DWR Guidebook Checklist No.
Chapter 1: Plan Preparation	10642	Public participation	55 and 56
	10643	Plan implementation	58
	10644	Plan filing	59
	10645	Public review availability	60
	10620 (a)–(e)	Coordination with other agencies; document preparation	4
	10621 (a)–(c)	City and county notification; due date; review	6 and 54
	10621 (c)	UWMP adoption	7 and 57
	10620 (f)	Resource optimization	5
Chapter 2: System Description	10631 (a)	Area, demographics, population, and climate	8-12

Table 1-2: Summary of UWMP Chapters and Corresponding Provisions of the California Water Code			
Chapter	**Corresponding Provisions of the Water Code**		**DWR Guidebook Checklist No.**
Chapter 3: Water Use	10608	Urban water use targets	1
	10631 (e), (k)	Water use, data sharing	25 and 34
	10631 (k)	Data to wholesaler	33
Chapter 4: Water Supply	10631 (b)–(d), (h), (k)	Water sources, reliability of supply, transfers and exchanges, supply projects, data sharing	13-21, 24, 30, 33
	10631 (i)	Desalination	31
	10633	Recycled water	44-51
Chapter 5: Water Quality	10634	Water quality impacts on reliability	52
Chapter 6: Water Supply Reliability	10631 (c) (1)	Water supply reliability and vulnerability to seasonal or climatic shortage	22
	10631 (c) (2)	Factors resulting in inconsistency of supply	23
	10635 (a)	Reliability during normal, dry, and multiple-dry years	53
Chapter 7: Conservation Program and Demand Management Measures	10631 (f)–(g), (j), 10631.5, 10608.26 (a), 10608.36	Conservation Program, DMMs, and SBX7-7 water use reduction plan	2, 26-29, 32
Chapter 8: Water Shortage Contingency Plan	10632	Water shortage contingency plan	35-43

1.10 Resource Optimization

Section 10620(f) of the Act asks urban water suppliers to evaluate water management tools and options to maximize water resources and minimize the need for imported water from other regions. GSWC understands the limited nature of water supply in California and is committed to optimizing its available water resources. This commitment is demonstrated through GSWC's use of water management tools throughout the company to promote the efficient use of water supplies from local sources, wherever feasible. Additionally, GSWC takes efforts to procure local reliable water supplies wherever feasible and cost effective. GSWC is a regular participant in regional water resources planning efforts, and has developed internal company water resource plans and robust water conservation programs.

GSWC has implemented a water conservation program, deployed through each region of the company. In an effort to expand the breadth of offered programs, GSWC partners with wholesale suppliers, energy utilities, and other agencies that support water conservation programs.

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Chapter 2: System Description

Chapter 2 summarizes the Barstow System's service area and presents an analysis of available demographics, population growth projections, and climate data to provide the basis for estimating future water requirements.

The water system description requirements are detailed in the following section of the Act:

Section 10631.
(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

2.1 Area

The Barstow System is located in the County of San Bernardino and serves the City of Barstow and surrounding unincorporated areas. The system is located in the Mojave Desert. Elevations range from 2,073 feet to 2,760 feet above mean sea level. The Mojave River flows from west to east through the system. Figure 2-1 illustrates the customer service area of the Barstow System. The service area is primarily characterized by residential land use, with some commercial and industrial land use.

2.2 Demographics

The City of Barstow was chosen as demographically representative of the Barstow System. According to 2000 U.S. Census Data, the median age of Barstow's residents is 32 years. Barstow has an average household size of 2.71 and a median household income of approximately $35,069 in 1999 dollars, or $45,800 in 2010 dollars.

According to the Barstow General Plan (General Plan, 1997), the community will continue to grow over the next 20 years at rates consistent with the historic trends since the 1960s. Barstow will grow at a rate of approximately 3 percent per year between 1996 and 2020 and it assumes a dramatic increase in persons from west of the San Gabriel and San Bernardino mountains moving easterly into the desert. According to general plan land use category, vacant land is not a growth limiting factor. The single most tangible factor limiting growth will be the availability of water. The general plan also indicates that in the future Barstow's growth may occur due to new construction and redevelopment projects in residential, industrial and commercial areas that will be potentially implemented within the Barstow service area.

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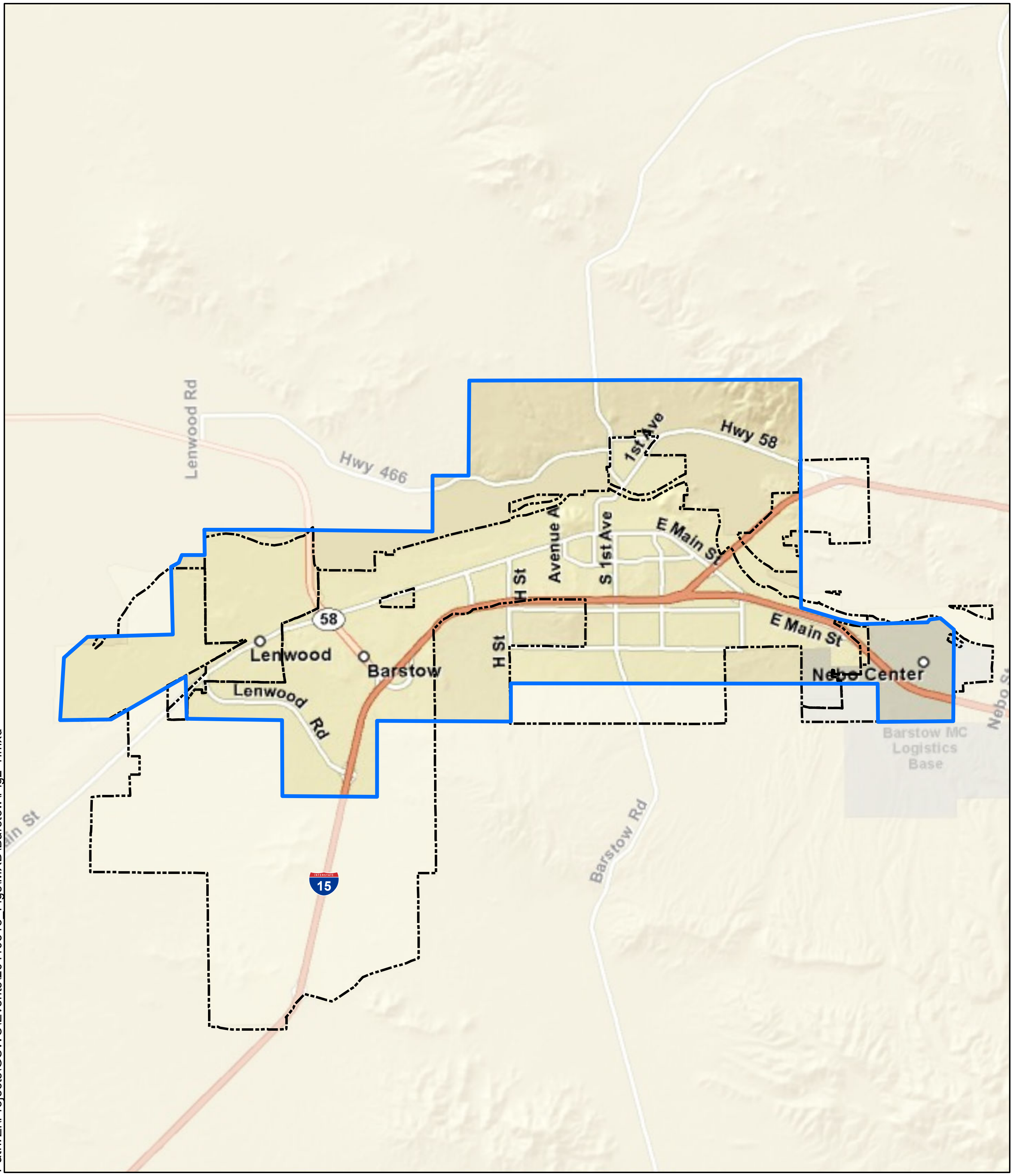

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Barstow System Boundary

City Boundary

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2010 Urban Water Management Plan

Barstow System Service Area

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Figure 2-1

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2.3 Historical and Projected Population

Population projections for the Barstow System were initially developed using the Southern California Association of Governments (SCAG) adopted 2008 “Integrated Growth Forecasting” process used in the 2008 Regional Transportation Plan (2008 RTP). However in March 2011, the Barstow system’s wholesaler and Watermaster, Mojave Water Agency (MWA), provided revised population projections for each of its retail agencies based upon SCAG’s preliminary 2012 Regional Transportation Plan (2012 RTP) which utilizes a new population projection model established upon 2010 Census data. Although the projections are not final, MWA considered the 2012 RTP projections to be a more realistic projection compared to the 2008 RTP, which contained robust projected growth rate assumptions predicated on a few large development proposals at the time which have since been cancelled. The 2008 RTP projected a growth rate of approximately 110 percent while the preliminary 2012 RTP projects a growth rate of 61 percent.

After considering the different projection models, GSWC elected to utilize the preliminary 2012 RTP population projections for the Barstow System as provided by MWA in order to align future growth and projected water use for both agencies. For a description of the population projection methodology development, refer to Section 2 of MWA’s Draft 2010 UWMP dated April 2011 found in Appendix G.

Annual estimates of historical population between 1997 and 2010 required for SBX7-7 are provided in Table 2-1. The population estimates were developed following DWR *Technical Methodology 2: Service Area Population*. GSWC is considered a Category 2 water supplier because they obtained population estimates from the wholesale water supplier. Since population estimates were provided for the years 2005 and 2010 by MWA the annual growth rate of 0.28 percent was calculated based on those years and applied to the years 1997 through 2010.

Table 2-1: Barstow System Historical Population

Year	Service Area Population
1997	29,506
1998	29,591
1999	29,677
2000	29,762[(1)]
2001	29,847
2002	29,933
2003	30,018
2004	30,104
2005	30,189
2006	30,274
2007	30,360
2008	30,445
2009	30,531
2010	30,616

Note:

1. Population for year 2000 from 2005 UWMP.

The Barstow System had an estimated population of 30,616 in 2010 and is expected to reach 49,350 by 2035 (MWA, 2011). A summary of historic and projected population within the Barstow System is presented in Table 2-2 and illustrated in Figure 2-2.

In summary, from 2005 and 2010, the Barstow population increased 1.4 percent, which is a growth rate of approximately 0.3 percent per year. By 2035, population is expected to increase by a total of 61 percent, from 30,616 in 2010 to 49,350 in 2035, which is a 2.5 percent growth rate per year. In contrast, the number of households, developed using SCAG's 2008 RTP, were expected to grow 134 percent during the same period, which equates to an annual household growth rate of 5.4 percent. Employment, also based on SCAG's 2008 RTP is expected to grow 91 percent during the same period, which equates to an annual employment growth rate of 3.6 percent. Areas with the highest projected growth increases are also the areas that will see the largest increase in water use.

The Barstow System has significant amount of land area available for future growth within the service area boundary; however the availability of water supply to support growth may be a limiting factor in determining the total growth that can occur.

Table 2-2: Barstow System Historical and Projected Population		
Year	Service Area Population	Data Source
2005	30,189	MWA
2010	30,616	MWA
2015	34,289	MWA
2020	37,962	MWA
2025	41,758	MWA
2030	45,554	MWA
2035	49,350	MWA

Notes:

1. This table is based on the DWR Guidebook Table 2.
2. Dashed line represents division between historic and projected data.
3. Growth rates for population is based on SCAG 2012 RTP preliminary growth rate data.

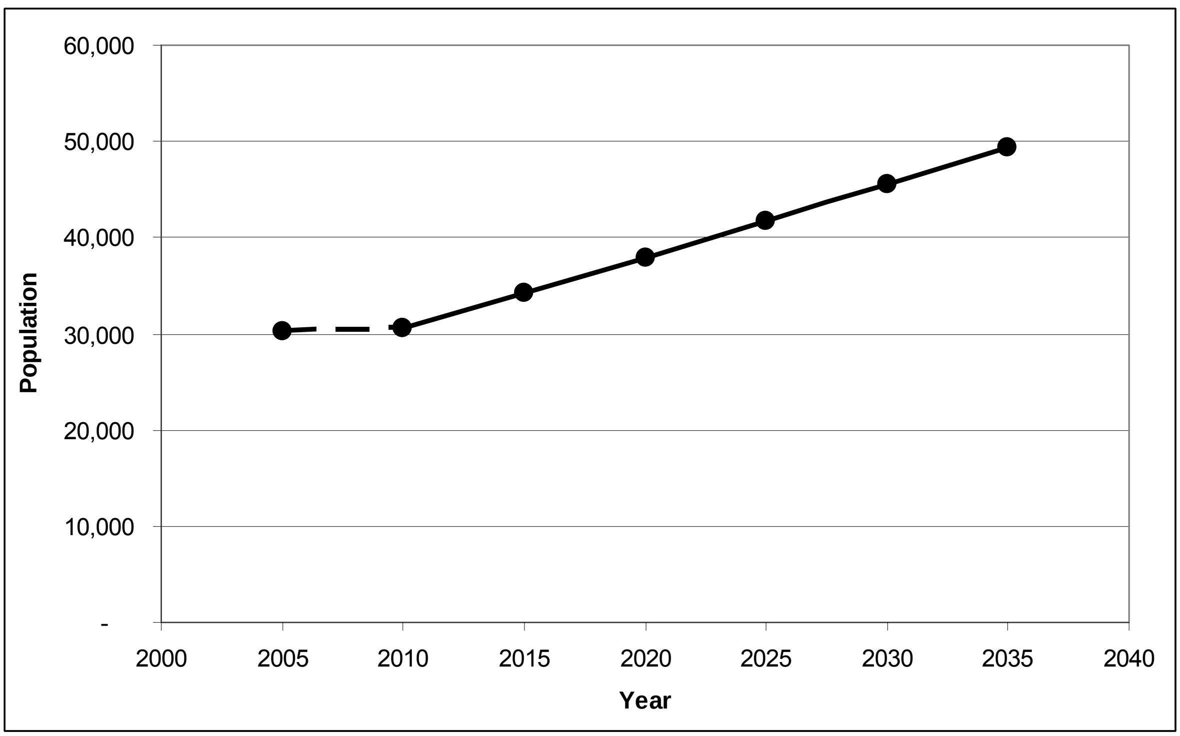

Figure 2-2: Historical and Projected Population Growth within the Barstow System

2.4 Climate

In keeping with its desert location, Barstow System service area has cool winters, and hot and dry summers. The Western Regional Climate Center (WRCC) website (www.wrcc.dri.edu) maintains historical climate records for the past 30 years for Barstow. Table 2-3 presents the monthly average climate summary based on historical data for Barstow. In winter, the lowest average monthly temperature is approximately 33 degrees Fahrenheit while the highest average monthly temperature reaches approximately 102 degrees in the summer. Figure 2-3 presents the monthly average precipitation based on 30-year historical data. The rainy season is from November to March. Monthly precipitation during the winter months ranges from 0.56 to 0.93 inches. Low humidity occurs in the summer months from June to October. The hot and dry weather during the summer months results in moderately high water demand.

Similar to the WRCC in the Barstow area, the California Irrigation Management Information System (CIMIS) website (http://www.cimis.water.ca.gov) tracks and maintains records of evapotranspiration (ETo) for few cities. ETo statistics used for this system also come from Barstow station. ETo is a standard measurement of environmental parameters that affect the water use of plants. ETo is given in inches per day, month, or year and is an estimate of the ETo from a large field of well-watered, cool-season grass that is 4- to 7-inches tall. The monthly average ETo is presented in inches in Table 2-3. As the table indicates, a greater quantity of water is evaporated during May, June and July in correlation to high temperatures and low humidity, which may result in high water demand.

Table 2-3: Monthly Average Climate Data Summary for Barstow System

Month	Standard Monthly Average ETo(1) (inches)	Average Total Rainfall (inches)	Average Temperature (degrees Fahrenheit)	
			Max	Min
January	2.2	0.79	60.6	34.5
February	2.9	0.93	64.6	37.9
March	5.3	0.64	70.9	42.6
April	7.0	0.21	78.3	48.3
May	9.1	0.09	86.8	55.4
June	10.0	0.06	96.4	63.0
July	9.9	0.33	102.1	69.2
August	8.9	0.24	100.8	67.9
September	6.8	0.29	93.8	61.3
October	4.9	0.28	82.0	51.1
November	2.8	0.45	68.7	40.8
December	2.0	0.56	59.0	33.4

Note:
1. Evapotranspiration (ETo) from http://www.cimis.water.ca.gov/cimis/welcom.jsp.

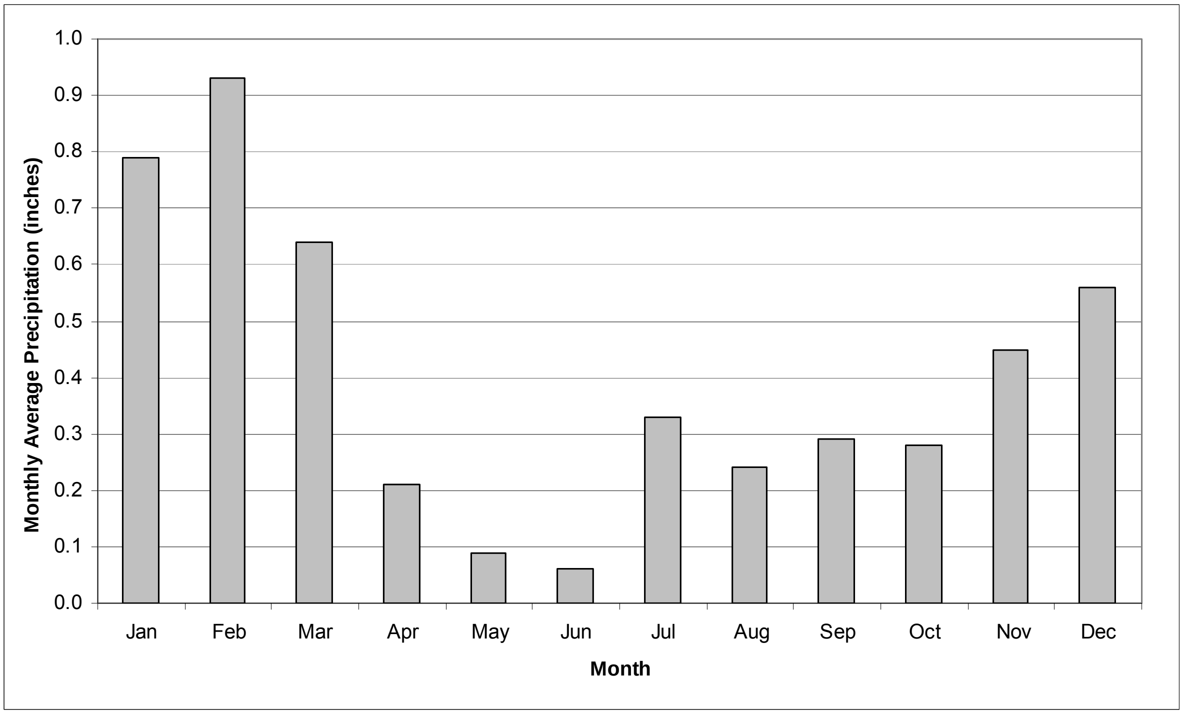

Figure 2-3: Monthly Average Precipitation in Barstow System Based on 30-Year Historical Data

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Chapter 3: Water Use

Section 10631(e) of the Act requires that an evaluation of water use be performed for the Barstow System. The Act states the following:

Section 10631.

(e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water-use sectors including, but not necessarily limited to, all of the following uses:

- *(A) Single-family residential*
- *(B) Multifamily*
- *(C) Commercial*
- *(D) Industrial*
- *(E) Institutional and governmental*
- *(F) Landscape*
- *(G) Sales to other agencies*
- *(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof*
- *(I) Agricultural.*

(2) The water-use projections shall be in the same five-year increments described in subdivision (a).

In addition, Section 10631(k) directs urban water suppliers to provide existing and projected water-use information to wholesale agencies from which water deliveries are obtained. The Act states the following:

Section 10631.

(k) Urban water suppliers that rely upon a wholesale agency for a source of water, shall provide the wholesale agency with water-use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).

In conjunction with projecting total water demand, each urban water retail supplier must develop urban water use targets and an interim urban water use target in accordance with SBX7-7. SBX7-7 amends the Act and requires statewide urban demand reduction of 20 percent by the year 2020. The bill sets specific methods for calculating both the baseline water usage and water use targets in gallons per capita day (gpcd).

Section 10608.20(e) states the following:

Section 10608.20.

(e) An urban retail water supplier shall include in its urban water management plan required pursuant to Part 2.6 (commencing with Section 10610) due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

This chapter presents an analysis of water use data with the resulting projections for future water needs and water use targets in accordance with SBX7-7 for the Barstow System.

3.1 Historical Water Use

Historical water use data from 1994 to 2010 were analyzed in order to provide an overview of historical water usage for the Barstow System. Figure 3-1 shows the historical number of metered service connections and water use for the Barstow System from 1994 through 2010.

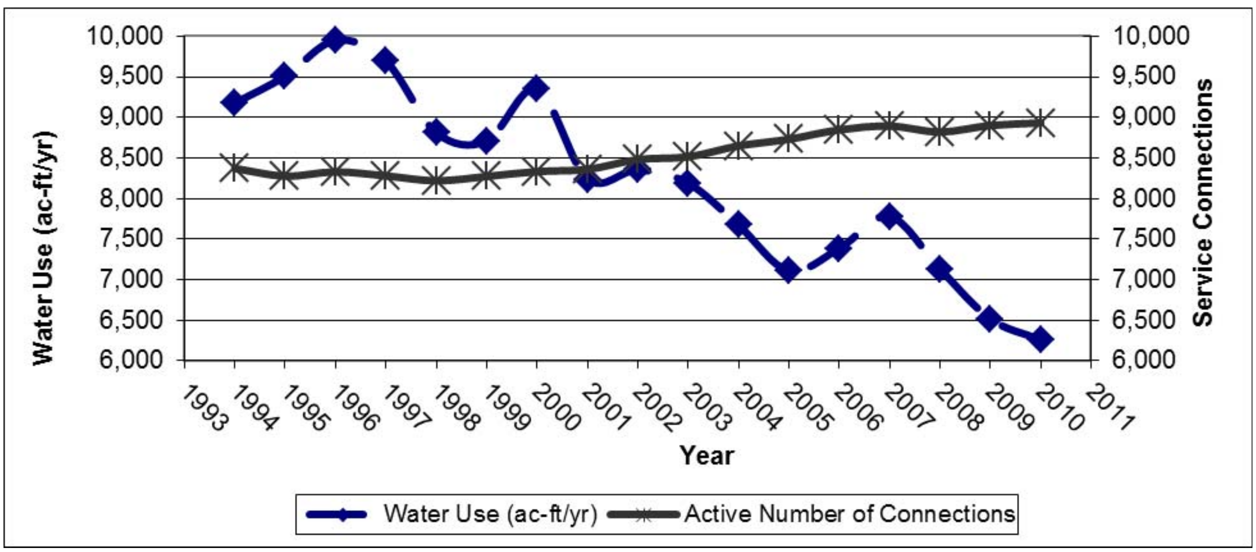

Figure 3-1: Historical Number of Metered Service Connections and Water Use

Figure 3-1 shows a decline in water use beginning in 2007 with an approximate 13 percent decline from 2008 to 2010. Review of similar data from other systems suggests the decline in water use has been widespread and is not isolated to the Barstow System. The recent decline in water use is not yet fully understood, but may be a result of several factors including: several years of cool summers, a statewide drought that forced mandatory water reductions and conservation in many areas, and an economic downturn that has caused many businesses to close and increased housing vacancies.

The customer billing data for the system consists of annual water sales data. The water sales data was sorted by customer type using the assigned North American Industry Classification (NAICS) codes. Then, the sorted water sales data were further grouped into the following seven categories: single-family, multi-family, industrial, commercial, institutional/government, landscape, and other. Table 3-1 shows the historical water use by customer type.

Table 3-1: Historical Water Use (ac-ft/yr) by Customer Type

YEAR	Single-Family	Multi-Family	Commercial	Industrial	Institutional/ Government	Landscape	Other	Total
1994	5,289	475	1,420	25	1,711	256	2	9,178
1995	5,226	539	1,567	27	1,899	251	0	9,509
1996	5,392	568	1,742	31	1,928	291	0	9,952
1997	5,269	598	1,657	28	1,841	299	0	9,692
1998	4,534	734	1,646	23	1,593	281	0	8,811
1999	4,421	815	1,657	26	1,482	310	0	8,711
2000	4,407	880	2,010	27	1,719	305	0	9,348
2001	3,931	792	1,825	35	1,378	271	7	8,239
2002	3,929	820	1,990	34	1,287	292	1	8,353
2003	3,777	803	1,990	36	1,255	326	1	8,188
2004	3,628	814	1,774	40	1,093	320	3	7,672
2005	3,324	788	1,671	40	962	313	11	7,109
2006	3,525	848	1,691	40	948	314	19	7,385
2007	3,517	855	1,829	51	1,119	378	30	7,779
2008	3,185	862	1,648	36	985	382	33	7,131
2009	2,896	785	1,605	30	827	345	29	6,517
2010	2,711	731	1,656	24	771	340	24	6,257

3.2 Water Use Targets

This section includes documentation of the water use targets commensurate with enactment of SBX7-7. The 2010 UWMP update is the first in which such targets have been required to be documented. The projected water use for each urban retail supplier is required to be reduced by a total of up to 20 percent by the year 2020 from a calculated baseline gpcd as required by SBX7-7. The steps described throughout this section follow the guideline methodologies developed by DWR over the past year, as documented in Section D of the *Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan* (DWR Guidebook) issued March 2011. The three overall steps to determine the 2020 water use target are as follows:

- Step 1 – Calculate the baseline per capita water use, using the required methodologies.
- Step 2 – Calculate the per capita reduction using at least one of the four methodologies (including the minimum reduction target – which is a provision included to ensure all agencies achieve a minimum level of water savings).
- Step 3 – Select the target reduction methodology and set interim (2015) and compliance (2020) water use targets. The chosen methodology is an option of the water supplier and may be changed in 2015.

The Act now stipulates that the state shall review the progress made towards reaching the statewide water savings targets as reported in the 2015 UWMP updates. Currently, no single urban water supplier is required to conserve more than 20 percent, however there are provisions in the law that could require additional conservation after 2015 if it is found that the program is not on track to reach 20 percent statewide water savings by 2020.

3.2.1 Baseline Per Capita Water Use

The first step in the process of determining the water use target is calculation of the baseline per capita water use (baseline gpcd). In order to calculate the baseline gpcd, service area population within the Barstow System was estimated and compared to actual water use records. The following three baseline gpcd calculations identified in SBX7-7 were evaluated for the Barstow System:

1. Baseline Method 1 – Average water use over a continuous 10-year period ending no earlier than December 31, 2004 and no later than December 31, 2010.
2. Baseline Method 2 – For retailers with at least 10 percent of 2008 demand served by recycled water (either retail-or wholesale-provided), this calculation may be extended to include an additional 5 years ending no earlier than December 31, 2004 and no later than December 31, 2010.
3. Baseline Method 3 – Estimate of average gross water use reported in gpcd and calculated over a continuous 5-year period ending no earlier than December 31, 2007 and no later than December 31, 2010.

The Baseline Methods 1 and 3 were calculated using GSWC supply data for the years ending December 31, 1997 through December 31, 2010. The base water use was calculated for each year commencing with 1997 as this was the first year with production data records available. The Barstow system does not currently receive recycled water; therefore Baseline Method 2 is not applicable. Table 3-2 below presents the base period ranges, total water deliveries and the volume of recycled water delivered in 2008; in order to determine the number of years that can be included in the base period range. Also shown are the actual start and end years for the selected base period range.

Table 3-2: Base Period Ranges			
Base	**Parameter**	**Value**	**Units**
10-year base period	2008 total water deliveries	8,419	Ac-ft
	2008 total volume of delivered recycled water	0	Ac-ft
	2008 recycled water as a percent of total deliveries	0	Percent
	Number of years in base period	10	Years
	Year beginning base period range	1997	
	Year ending base period range	2006	
5-year base period	Number of years in base period	5	Years
	Year beginning base period range	2003	
	Year ending base period range	2007	

Note:
Table format based on DWR Guidebook Table 13.

The average annual daily per capita water use in gpcd from 1997 through 2010 is provided in Table 3-3. The gallons per day calculation includes potable water entering the distribution system.

Table 3-3: 1997-2010 Base Daily Use Calculation			
Calendar Year	**Distribution System Population**	**Gallons/Day**	**Annual Daily per Capita Water Use, gpcd**
1997	29,506	9,966,549	338
1998	29,591	8,574,455	290
1999	29,677	8,800,353	297
2000	29,762	9,282,703	312
2001	29,847	8,296,662	278
2002	29,933	8,451,484	282
2003	30,018	8,472,364	282
2004	30,104	8,146,603	271
2005	30,189	7,729,463	256
2006	30,274	7,977,916	264
2007	30,360	8,158,489	269

Table 3-3: 1997-2010 Base Daily Use Calculation			
Calendar Year	Distribution System Population	Gallons/Day	Annual Daily per Capita Water Use, gpcd
2008	30,445	7,515,929	247
2009	30,531	7,025,982	230
2010	30,616	6,512,557	213

Note:
Table format based on DWR Guidebook Tables 14 and 15.

The 10-year averages available for GSWC to select are presented in Table 3-4; and the 5-year averages are shown in Table 3-5. The 1997-2006 10-year and 2003-2007 5-year average base daily usages of 287 and 268 gpcd, respectively, were selected.

Table 3-4: 10-Year Average Base Daily Per Capita Water Use	
10-Year Period	Average Base Daily Per Capita Water Use (gpcd)
1997-2006	287
1998-2007	280
1999-2008	276
2000-2009	269
2001-2010	259

Table 3-5: 5-Year Average Base Daily Per Capita Water Use	
5-Year Period	Average Base Daily Per Capita Water Use (gpcd)
2003-2007	268
2004-2008	261
2005-2009	253
2006-2010	244

3.2.2 Urban Water Use Targets

Retail suppliers must identify their urban water use reduction targets by utilizing one of four compliance methods identified in the SBX7-7. The four urban water use target development methods are as follows:

- Compliance Method 1 – 80 percent of baseline gpcd water use.
- Compliance Method 2 – The sum of the following performance standards: indoor residential use (provisional standard set at 55 gpcd); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (70 percent of reference ETo; plus 10 percent reduction in baseline commercial, industrial, and institutional (CII) water use by 2020.
- Compliance Method 3 – 95 percent of the applicable state hydrologic region target as identified in the 2020 Conservation Plan (DWR, 2010).
- Compliance Method 4 – A provisional method identified and developed by DWR through a public process released February 16, 2011, which aims to achieve a cumulative statewide 20 percent reduction. This method assumes water savings will be obtained through metering of unmetered water connections and achieving water conservation measures in three water use categories: (1) indoor residential, (2) landscape, water loss and other water uses and (3) CII.

GSWC elected to evaluate Compliance Methods 1 and 3 for selecting urban water use targets for the 2010 plan. The following section provides an explanation of the target calculations and a summary of the interim and compliance water use targets.

Compliance Method 1 Calculation Summary

The Compliance Method 1 2020 water use target was calculated by multiplying the base daily gpcd by 80 percent. A 20 percent reduction in baseline water use would require a reduction of 58 gpcd by 2020 (Table 3-6). The 2015 interim target would be 258 gpcd with a 2020 water use target of 229 gpcd.

Table 3-6: 2020 Water Use Target Method 1 Calculation Summary

Description	Baseline	2015 Interim Target	2020 Compliance Target
Per Capita Water Use (gpcd)	287	258	229
Percent Reduction	N/A	10%	20%

Compliance Method 3 Calculation Summary

The Compliance Method 3 2020 water use target was calculated by multiplying the respective hydrologic region target by 95 percent. The Barstow System is located in the South Lohontan region (Region 9), which has a hydrologic region target of 170 gpcd and a baseline water use of 237 gpcd. Ninety-five (95) percent of the Region 9 hydrologic region target results in a 2020 water use target of 162 gpcd. Since the baseline of 287 gpcd is greater than 95 percent of the hydrologic regional target of 162 gpcd, a review of the minimum reduction target is not triggered per the DWR methodologies.

Table 3-7 presents the results of the Method 3 calculation:

Table 3-7: 2020 Water Use Target Method 3 Calculation Summary

Description	Baseline	2015 Interim Target	2020 Compliance Target
Per Capita Water Use (gpcd)	287	224	162
Percent Reduction	N/A	22%	44%

Minimum Compliance Reduction Target

Systems with a 5-year baseline per capita water use of greater than 100 gpcd must calculate a minimum water use reduction, which the 2020 water use target cannot exceed. The minimum water use reduction compliance target is 95 percent of the 5-year average base daily per capita water use (ending no earlier than December 31, 2007, and no later than December 31, 2010). By this method, the minimum 2020 water use target for the Barstow System is 255 gpcd as presented in Table 3-8 below:

Table 3-8: Minimum 2020 Reduction

Description	5-Yr Average	2015 Interim Target	2020 Compliance Target
Minimum Allowable 2020 Target (gpcd)	268	262	255

3.2.3 Interim and Compliance Water Use Targets

The interim and compliance water use targets are provided per Section 10608.20(e) of the Act. Since both the Methods 1 and 3 compliance targets are less than the minimum reduction; Compliance Method 1 was selected by GSWC for the Barstow System. As a result, Table 3-9 shows the 2020 SBX7-7 compliance target for the Barstow System is 229 gpcd and the 2015 interim water use target is 258 gpcd. The implementation plan for achieving these targets is described in Section 4.8, Recycled Water and Chapter 7, Demand Management Measures.

Table 3-9: SBX7-7 Water Use Reduction Targets (gpcd)

Baseline	2015 Interim Target	2020 Compliance Target
287	258	229

3.3 Projected Water Use

Growth projections for the number of service connections and volume of water use were calculated for the years 2015 through 2035, in 5-year increments. Future water demands were estimated using a population-based approach. Additionally, demand projections are provided showing a scenario where the Barstow System fully meets water use target reductions by 2020 for comparison to current per capita water use trends. Detailed descriptions of how the population-based projections were calculated are provided below.

Figure 3-2 shows the historical and projected number of metered service connections for the Barstow System from 1994 through 2035. Figure 3-3 shows the historical and projected water use for the Barstow System from 1994 until 2035.

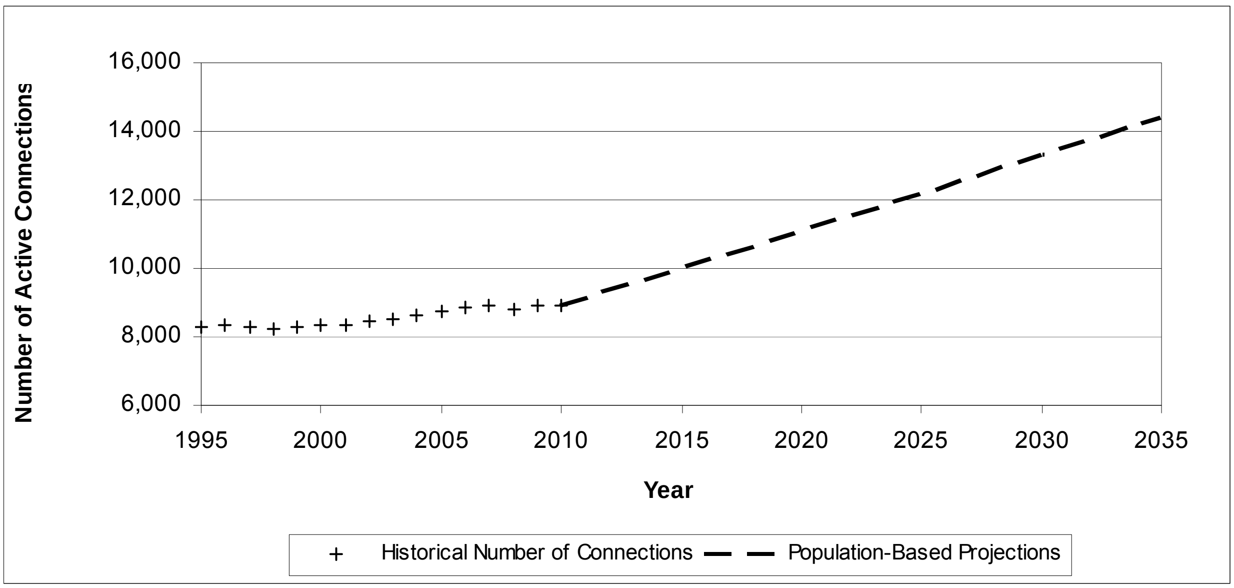

Figure 3-2: Historical and Projected Number of Metered Service Connections

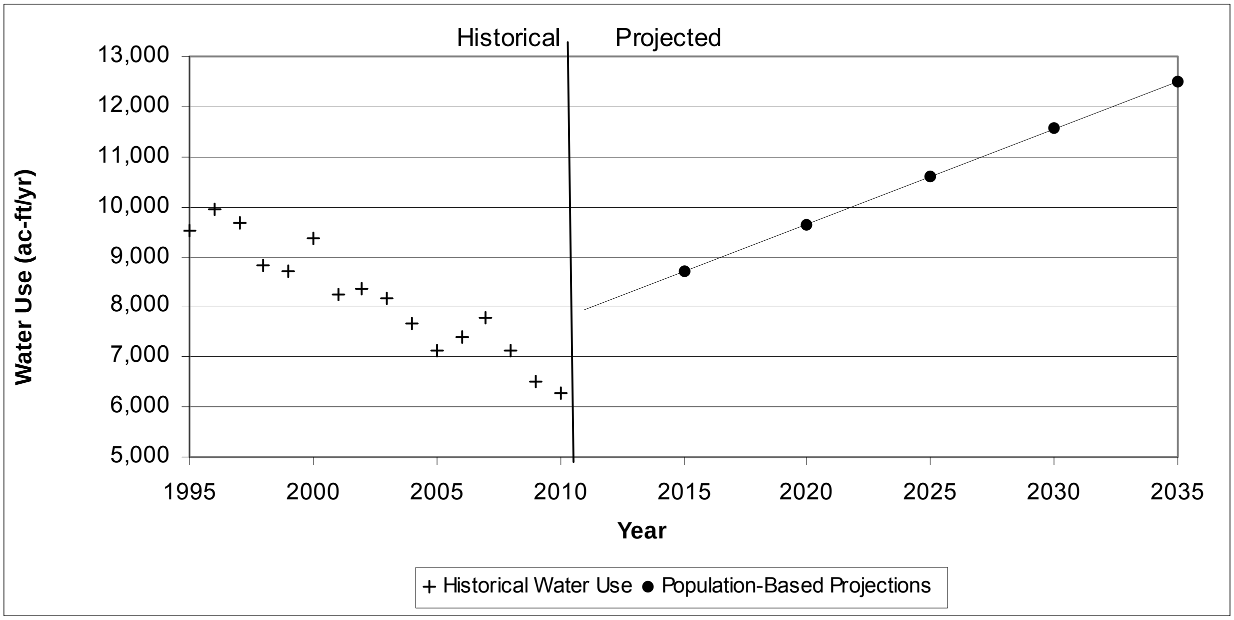

Figure 3-3: Historical Water Use and Future Water Use Projections

Historical water use records from 2000 through 2010 were analyzed to generate estimates of future water demands. Water use factors were then developed for the projection of future water use. A water use factor was calculated for each category in order to quantify the average water used per metered connection. For a given customer type, the unit water use factor is calculated as the total water sales for the category divided by the number of active service connections for that category. The unit water use factors for each customer type were averaged over the data range from 2000 through 2010 in order to obtain a representative water use factor that can be used for determining water demand projections by customer type. Table 3-10 presents the water use factors calculated for each customer category.

Table 3-10: Water Use Factors for the Barstow System

	Account Category							
	Single-Family	Multi-Family	Commercial	Industrial	Institutional/ Government	Landscape	Agriculture	Other[2]
Water Use Factor[1]	0.48	2.21	2.98	2.21	7.50	5.33	0.11	0.28

Notes:
1. Based on customer water use data for calendar years 1994-2009.
2. Other accounts for any service connections not included in any other category, including idle or inactive connections.

The population projections described in Chapter 2 were used to determine the growth in service connections for the eight account categories for the years 2015, 2020, 2025, 2030, and 2035. For example, the percent growth rate between the population from the year 2010 and the year 2015 was multiplied by the number of service connections in 2010 to obtain a projection of the number of connections in the year 2015. The projected water use was then calculated by multiplying the number of projected active service connections for each customer category by the corresponding customer average water use factor calculated above.

Figure 3-4 shows the water use projections by customer type. The projected number of service connections, and the resulting water demand, are provided in Table 3-11.

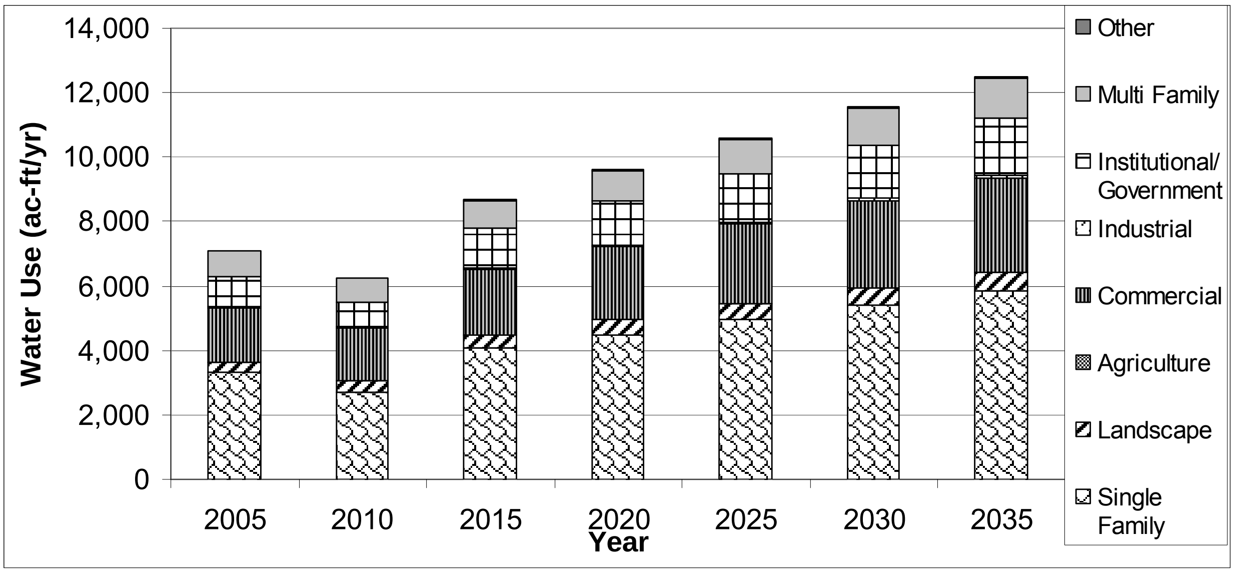

Figure 3-4: Projected Water Use by Customer Type

Table 3-11: Projections of the Number of Metered Service Connections and Water Use for the Barstow System

Year	Projection Type	Accounts by Type: Single-Family	Multi-Family	Commercial	Industrial	Institutional/ Government	Landscape	Agriculture	Other(3)	Total
2005(2)	*No. of Accounts*	7,492	339	604	16	155	60	1	64	8,731
	Water Use (ac-ft)	3,324	788	1,671	40	962	313	0.07	11	7,109
2010	*No. of Accounts*	7,625	348	607	19	148	70	1	115	8,933
	Water Use (ac-ft)	2,711	731	1,656	24	771	340	0.00	24	6,257
2015	*No. of Accounts*	8,540	390	680	22	166	79	2	129	10,008
	Water Use (ac-ft)	4,060	861	2,025	49	1,245	421	0.22	36	8,697
2020	*No. of Accounts*	9,455	432	753	24	184	87	2	143	11,080
	Water Use (ac-ft)	4,496	954	2,242	53	1,380	463	0.22	40	9,628
2025	*No. of Accounts*	10,400	475	828	26	202	96	2	157	12,186
	Water Use (ac-ft)	4,945	1,049	2,466	57	1,515	511	0.22	44	10,587
2030	*No. of Accounts*	11,346	518	904	29	221	105	2	172	13,297
	Water Use (ac-ft)	5,394	1,144	2,692	64	1,658	559	0.22	48	11,559
2035	*No. of Accounts*	12,291	561	979	31	239	113	2	186	14,402
	Water Use (ac-ft)	5,843	1,239	2,915	68	1,793	602	0.22	52	12,512

Notes:

1. This table is based on the DWR Guidebook Tables 3 through 7.
2. Based on calendar year.
3. Other accounts for any service connections not included in any other category, including idle or inactive connections.
4. All connections are metered.

3.4 Sales to Other Agencies

There are no anticipated sales to other agencies for the Barstow System; therefore, Table 3-12 has intentionally been left blank.

Table 3-12: Sales to Other Agencies in ac-ft/yr

Water Distributed	2005(2)	2010	2015	2020	2025	2030	2035
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

1. This table is based on the DWR Guidebook Table 9.
2. Based on calendar year.

3.5 Other Water Uses and System Losses

In order to estimate total water demand, other water uses, as well as any water lost during conveyance, must be added to the customer demand. California regulation requires water suppliers to quantify any additional water uses not included as a part of water use by customer type. There are no other water uses in addition to those already reported in the Barstow System.

System losses must be incorporated when projecting total water demand. System losses (also known as non-revenue water) are defined as the difference between annual water production and annual sales. Included are system losses due to leaks, reservoir overflows, or inaccurate meters, and other water used in operations such as system flushing and filter backwashing. GSWC does not tabulate system losses separately from other water uses such as operations. In the Barstow System, from 1997 through 2010, system water losses have averaged 13.8 percent of the total production; therefore, this rate was incorporated into water demand projections. Table 3-13 provides a summary of projected system losses in the Barstow System.

Table 3-13: Additional Water Uses and Losses in ac-ft/yr

Water-Use Type	2005(2)	2010	2015	2020	2025	2030	2035
Other Water Uses	N/A	N/A	N/A	N/A	N/A	N/A	N/A
System Losses(3)	1,549	1,038	1,198	1,326	1,458	1,592	1,723
Total	1,549	1,038	1,198	1,326	1,458	1,592	1,723

Notes:

1. This table is based on the DWR Guidebook Table 10.
2. Based on calendar year.
3. Includes system losses due to leaks, reservoir overflows, and inaccurate meters, as well as water used in operations.

3.6 Total Water Demand

As described above, other water uses, as well as any water lost during conveyance, must be added to the customer demand in order to project total water demand for the Barstow System. Although there are no other water uses contributing to the total water demand in the Barstow System, other water uses and system water losses must be incorporated into the total water demand. Table 3-14 summarizes the projections of water sales, other water uses and system losses, and total water demand through the year 2035.

The projected water sales and system losses were added to estimate the total baseline water demand shown in Table 3-14. The baseline demand projections below do not include water use reductions due to additional implementation of future DMMs or other conservation activities.

Projected water demands assuming full compliance with the interim and compliance water use reduction targets identified in this chapter is also provided in the Table 3-14 and Figure 3-5 for reference purpose. Water demands with SBX7-7 compliance are used for supply reliability evaluation purposes throughout this UWMP in order to align water demands with MWA supply projections. Figure 3-5 shows the projected total water demand through 2035.

Table 3-14: Projected Total Water Demand and SBX7-7 Compliance Projections in ac-ft/yr

Year(2)	Projected Water Sales	Other Water Uses and System Losses	Total Baseline Water Demand	SBX7-7 Compliance Projection	
				Water Savings	Total Water Demand with Savings
2005	7,109	1,549	8,658	0	N/A
2010	6,257	1,038	7,295	0	N/A
2015	8,697	1,198	9,894	0	9,909
2020	9,628	1,326	10,954	1,216	9,738
2025	10,587	1,458	12,044	1,333	10,711
2030	11,559	1,592	13,151	1,465	11,685
2035	12,512	1,723	14,235	1,576	12,659

Notes:
1. This table is based on the DWR Guidebook Table 11.
2. Based on calendar year.

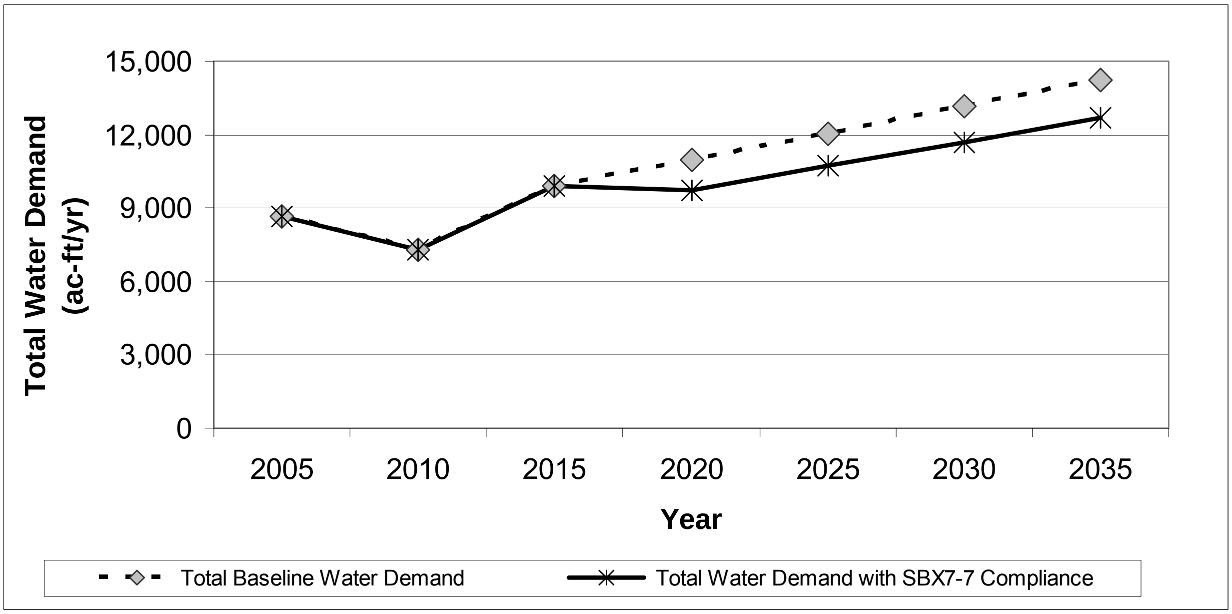

Figure 3-5: Total Water Demand

3.7 Data Provided to Wholesale Agency

GSWC does not currently obtain water from a wholesale agency for the Barstow System; however since they obtain water through the adjudicated Mojave River Groundwater Basin's (Basin) Centro Subarea where MWA is the Watermaster, preliminary water use projections were provided in late 2010 to MWA as summarized in Table 3-15. Since the preliminary projections were refined through coordination with MWA by integrating actual 2010 water use and supply data. As a result, the projections shown in Table 3-15 below do not agree with the demands presented in other chapters of this UWMP. As required per Section 10631(k) the supporting documentation providing the water use projections to the wholesale agency is included in Appendix I.

Table 3-15: Summary of Barstow System Data Provided to MWA in ac-ft/yr

Watermaster	Contracted Volume(2)	2010	2015	2020	2025	2030	2035
MWA	14,479	12,902	16,254	19,055	21,898	24,673	27,822

Notes:

1. This table is based on the DWR Guidebook Table 12.
2. Free Production Allocation. See Chapter 4 for more details.

3.8 Disadvantaged Community Water Use Projections

Section 10631.1 (a). Include projected water use for single-family and multi-family residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

Senate Bill 1087 requires that water use projections of a UWMP include the projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county in the service area of the supplier.

Housing elements rely on the Regional Housing Needs Allocation (RHNA) generated by the State Department of Housing and Community Development (HCD) to allocate the regional need for housing to the regional Council of Governments (COG) (or a HCD for cities and counties not covered by a COG) for incorporation into housing element updates. Before the housing element is due, the HCD determines the total regional housing need for the next planning period for each region in the state and allocates that need. The COGs then allocate to each local jurisdiction its “fair share” of the RHNA, broken down by income categories; very low, low, moderate, and above moderate, over the housing element’s planning period.

The County of San Bernardino last updated its housing element on April 12, 2007. A lower income house is defined as 80 percent of median income, adjusted for family size. The County’s housing element identifies the target number of low-income households from 2006 to 2013 as 16 percent of the population and very low-income as 22 percent. However, it is unknown what percentage of the low-income and very low-income households are within GSWC’s Barstow’s service area. For this reason, it is not possible to project water use for lower income households separately from overall residential demand. However, to remain consistent with the intent of the SB-1087 legislation and to comply with the UWMP Act, an effort has been made to identify those water use projections for future single and multi-family households based on the aggregate percentage of both the low-income and very low-income category. 38 percent was used to estimate the lower income demand projections as shown in Table 3-16 below.

Table 3-16: Low-Income Projected Water Demands in ac-ft/yr

	2015	2020	2025	2030	2035
Single-Family Residence	513	678	849	1,020	1,190
Multi-Family Residence	49	85	121	157	193
Total	562	763	969	1,176	1,383

Note:
This table is based on the DWR Guidebook Table 8.

GSWC will not deny or conditionally approve water services, or reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one of the following occurs:

- GSWC specifically finds that it does not have sufficient water supply.
- GSWC is subject to a compliance order issued by the State Department of Public Health that prohibits new water connections.
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

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Chapter 4: Water Supply

A detailed evaluation of water supply is required by the Act. Sections 10631 (b) through (d) and (h) of the Act state the following:

> *Section 10631.*
>
> *(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:*
>
> *(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.*
>
> *(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.*
>
> *(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.*
>
> *(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.*
>
> *(c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:*
>
> *(A) An average water year.*
>
> *(B) A single dry water year.*
>
> *(C) Multiple dry water years.*
>
> *(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.*
>
> *(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.*
>
> *(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single dry, and multiple dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.*

This chapter addresses the water supply sources of the Barstow System. The following chapter provides details in response to those requirements of this portion of the Act.

4.1 Water Sources

GSWC currently obtains all of its water supply for the Barstow System from local groundwater. GSWC operates several groundwater wells within the Basin's Centro Subarea. The Watermaster for the Basin is MWA. The amount of groundwater pumped from the Basin is regulated by the terms of the judgment entered by the Mojave Basin. Adjudication (Judgment), *City of Barstow, et al. vs. City of Adelanto, et al.* (Riverside Superior Court, Case No. 208568, Appendix F.a). The terms of the Judgment are discussed in greater detail below. GSWC has groundwater production rights arising from the Judgment as well as historic licenses issued by the State Water Resources Control Board to pump groundwater within the Barstow System.

Under the Judgment's terms, GSWC may produce as much groundwater as is needed to satisfy its customer demands within the Barstow Service Area. The Barstow System is located in the Centro Subarea Groundwater Basin, which is one of the five sub basins established by MWA through the adjudication process. GSWC has been assigned Base Annual Production (BAP) rights of 14,407 ac-ft/yr, which is based on historical production during the period 1986-1990. Parties to the Judgment, including GSWC are assigned a variable Free Production Allowance (FPA) by the Watermaster, which is a percentage of BAP set for each subarea for each year. GSWC may extract in excess of the FPA, however, as defined in the Judgment, this will cause GSWC to incur a replenishment assessment. Revenue from this assessment funds the importation of surface water supplies to replenish the Basin in a quantity equivalent to the production in excess of the FPA.

The current and planned water supplies needed by GSWC for the Barstow System are summarized in Table 4-1. The water supply from the Centro Subarea Groundwater Basin is estimated through 2035, in accordance with GSWC's long-term water supply planning projections.

Table 4-1: Current and Planned Water Supplies for the Barstow System in ac-ft/yr

Source	2010	2015	2020	2025	2030	2035
Production in Excess of FPA for the Centro Subarea (Payment of Replenishment Assessment or Carry Over Right)	0	0	0	0	159	1,133
Groundwater[(1)]	7,295	9,909	9,738	10,711	11,526	11,526
Recycled water	0	0	0	0	0	0
Total	7,295	9,909	9,738	10,711	11,685	12,659

Notes:

1. Based on projected use in the Mojave River Groundwater Basin Centro Subarea.
2. 2010 water supplies are based on actual production records.
3. Table format based on DWR Guidebook Table 16.

The City of Barstow and GSWC's Barstow System are located within the Centro Subarea and have a projected FPA of 80 percent of the BAP (11,526 ac-ft/yr) from 2010 to 2035. This water supply summary is based on information provided by MWA and the terms of the Judgment. In the near term, groundwater is expected to be the Barstow System's exclusive water supply.

There is presently no use of recycled water in the Barstow System. Use of recycled water to satisfy non-potable demands may be implemented by GSWC in the future, particularly to satisfy the non-potable demands of new developments. Future decisions concerning recycled water projects will be based upon a cost/benefit analysis and comparing the advantages of recycled water programs to alternative supplemental water projects. For more information on recycled water please see Chapter 4.7.

4.1.1 Imported Water Supply

The Barstow System does not have the ability to directly import and treat surface water at this time. However, it is possible that GSWC may pursue a surface water treatment plant as a future water supply option depending upon future cost/benefit analysis and subject to funding approval by the CPUC.

MWA presently uses imported surface water from the State Water project (SWP) to replenish the groundwater basin. SWP water originates within the Feather River watershed, is captured in Lake Oroville, and flows via the Sacramento-San Joaquin Delta, and the California Aqueduct to MWA's distribution system. Imported water supplies available to MWA consist primarily of the SWP supplies. According to the water supply contract between DWR and MWA revised on October 12, 2009, MWA's maximum annual entitlement from the SWP ("Table A") is 82,800 ac-ft/yr from 2010 to 2014; 85,800 ac-ft/yr from 2015 to 2019; and 89,800 ac-ft/yr from 2020 to 2035.

4.2 Groundwater

The Barstow System consists of 23 wells in the Middle Mojave River Valley Groundwater Basin (Middle Mojave Basin) (MWA, 2011), which is a hydrologic basin delineated by DWR that is included within the adjudicated Basin. These wells have a current total active capacity of 31,047 ac-ft/yr. Actual pumping for these wells averaged 8,387 ac-ft/yr between 2005 and 2010. The MWA is responsible for monitoring groundwater pumping in portions of the Basin. Following establishment of the MWA, the Basin was separated into smaller hydrologic subareas as defined in the Judgment for purposes of groundwater management. MWA's 2004 Regional Water Management Plan (RWMP), adopted on February 24, 2005 by Resolution 798-05, also serves as the Groundwater Management Plan (GWMP) for MWA as it contains all the relevant components related to Groundwater Management Plans in California Water Code Sections 10750-10753.10., as well as the components recommended by DWR in California's Groundwater, Bulletin 118 (DWR, 2003). The 2004 RWMP (refer to Appendix F.b) both complements and formalizes a number of existing water supply and water resource planning and management activities in the MWA service area that overlies several groundwater basins, as defined by DWR in Bulletin 118.

In addition to the Judgment, GSWC has three groundwater licenses from the State Water Resources Control Board (SWRCB) that, prior to the Judgment, allowed the extraction of percolating groundwater that is considered underflow of the Mojave River from the Mojave Basin. These licenses allowed GSWC to pump up to a total 20.0 cubic feet per second (cfs) (14,407 ac-ft/yr) from the underflow of the Mojave River for the Barstow System. Rights to pump groundwater are now established solely by GSWC being a stipulating party to the Judgment. GSWC may still report annual groundwater extractions to the SWRCB pursuant to the terms of these licenses.

4.2.1 Mojave River Groundwater Basin Area (as defined by Mojave Water Agency)

The Basin covers an area of approximately 3,400 square miles. The adjudicated portion of the Basin is generally bound by the San Bernardino and San Gabriel mountains to the south, Afton Canyon to the northeast, just beyond Lucerne Valley in the east, and the Antelope Valley to the north and west. The Basin is crossed by the Mojave River, which flows from the south out of the San Bernardino Mountains (Lake Arrowhead) and then in a northeasterly direction in the area near the Barstow System. The Basin is divided into five subareas: Este, Oeste, Centro, Baja, and Alto. The Barstow System pumps its water from the Centro Subarea.

The two primary interconnected water-bearing units in the Mojave Basin from youngest to oldest include:

- The Floodplain Aquifer that consists of Pleistocene and younger river channels and floodplain deposits of sand, gravel, and silt. The predominantly unconfined aquifer extends to an average depth of 200 feet, and is restricted to within approximately 1 mile of the active Mojave River channel. Specific yield of the aquifer averages approximately 22 percent, and wells yield up to 4,000 gallons per minute (gpm) (DWR, 2003 and MWA, 2004).

- The Regional Aquifer that consists of two formations including the middle Pleistocene aged unconsolidated alluvial deposits of fluvial sands, gravels, and silts deposited by the ancestral Mojave River, and the regional Late Tertiary and the younger unconsolidated to partially consolidated alluvial fan deposits of poorly sorted sands, gravels, silts, and clays. The aquifer can reach to a thickness of 2,000 feet. The permeability decreases with depth and the estimated effective thickness is approximately 300 feet.

Recharge within the Basin is from direct precipitation, ephemeral stream-flow, and infrequent surface flow and underflow of the Mojave River. Recharge also occurs from treated wastewater effluent, septic tank, and irrigation waters. There is estimated to be approximately 1,790,100 ac-ft of dewatered storage space in the Mojave Basin's five subareas with a total water storage capacity of nearly 5,000,000 ac-ft (DWR, 2003 and MWA, 2011).

Groundwater levels within the Floodplain Aquifer vary with rainfall and runoff, whereas the levels in the Regional Aquifer are not significantly influenced by changes in local rainfall. The groundwater flow direction is towards the active Mojave River channel and follows its course across the Basin. Within the Centro Subarea, the groundwater flow direction is to the north and northwest towards Harper Lake on the western side of Iron Mountain and to the east on the eastern side (DWR, 2003 and MWA, 2004). Water levels in Centro have been relatively stable with seasonal fluctuations and declines during dry years followed by recovery during wet periods. Water levels in the Harper Lake area indicate a slow recovery due primarily to reduced pumping during the past several years. Declines in water levels in wells in the vicinity of Hinkley (away from the river) show the effects of pumping and limited recharge, primarily due to agriculture. (MWA, 2011)

4.2.2 Mojave River Groundwater Basin Adjudication

In 1996, the Mojave Basin was adjudicated in the case *City of Barstow, et al. vs. City of Adelanto, et al.* (Riverside Superior Court, Case no. 208568, Appendix F.a). Due to the magnitude and complexity of the case, the numerous water Producers named in the lawsuit generated a settlement in the form of a Stipulated Judgment (Judgment).

MWA is the court-appointed Watermaster to assist the Court in ensuring compliance with the Judgment's terms. The Watermaster monitors and verifies water use, collects assessments, conducts studies, prepares an annual report of its findings and activities, and records water transfers and changes in ownership of groundwater rights to the Court.

The Judgment establishes a "Physical Solution" to correct the Basin's historic overdraft problems and to ensure adequate water supplies for the communities overlying the Basin. The Physical Solution is designed to allow all Producers to pump as much groundwater as needed while simultaneously protecting the Basin. This is accomplished through the establishment of the FPA for each Producer. All water produced in excess of any Producer's FPA must be replaced by the Producer, either by payment to the Watermaster (MWA) of funds sufficient to purchase replacement water through a "replenishment assessment, "or by the transfer of unused FPA from another Producer. Thus, the Judgment allows each Producer to produce as much water as they need annually to meet their water demand requirements so long as the Producer purchases the requisite replacement water or additional FPA necessary to offset its production above its established FPA so that the Basin is perpetually protected.

Each Producer's percentage share of FPA in a subarea was determined based upon the Producer's maximum annual water production (termed Base Annual Production or "BAP") during the 5-year Base Period (1986-90). Each Producer's FPA is equivalent to a percentage of its BAP, as determined for each subarea. All allocations of FPA among Producers are of equal priority.

The Court may review and adjust the FPA percentage within each subarea, as it deems necessary to protect the groundwater supplies within that subarea. The FPA for water year (WY) 2005-2010 for the Centro Subarea, from which GSWC produces water for the Barstow System, was set at 80 percent for all Producers. MWA has predicted that the FPA will be maintained at 80 percent of BAP in the Centro Subarea, at least in the near-term, because it appears that this percentage is adequate to prevent groundwater levels within the Centro Subarea from declining (MWA, 2011).

The BAP for groundwater extraction from the Mojave Basin, Centro Subarea is 56,269 ac-ft/yr (Table 4-2). GSWC's Barstow System has a BAP of 14,407 ac-ft and an FPA (based on the current 80 percent reduction) for WY 2005-2010 of 11,526 ac-ft within the Centro Subarea, as shown in Table 4-2.

Table 4-2: Groundwater Pumping Rights

Basin Name	BAP (ac-ft/yr)	Barstow System BAP (ac-ft/yr)	Barstow System 2005 – 2010 FPA (ac-ft/yr)
Centro Subarea	56,269	14,407	11,526

Notes:

1. BAP – Base Annual Production (adjudicated amount less than the historic licenses).
2. FPA – Free Production Allocation (currently 80 percent of BAP).

The groundwater wells along with the well capacity for the Barstow System are listed in Table 4-3. GSWC's Barstow System has a total active normal year well capacity of 18,650 gpm (31,047 ac-ft/yr).

Table 4-3: Well Name and Capacity

Well Name	Current Well Capacity (gpm)[1]	Current Well Capacity (ac-ft/yr)
Agate No. 3	550	887
Agate No. 4	1,000	1,613
Agate No. 5	600	968
Agate No. 6	400	640
Arrowhead No. 2	600	968
Arrowhead No. 3	0	0
Arrowhead No. 4	0	0
Bradshaw No. 1	800	1,290
Bradshaw No. 2	850	1,371
Bradshaw No. 3	0	0
Bradshaw No. 4	1,050	1,694
Bradshaw No. 5	1,200	1,936
Bradshaw No. 6	850	1,371
Bradshaw No. 7	1,000	1,613
Bradshaw No. 10	1,000	1,613
Bradshaw No. 11	1,000	1,613
Bradshaw No. 12	1,100	1,774
Bradshaw No. 13	850	1,371
Bradshaw No. 14	1,000	1,613
Crooks No. 1	1,200	1,936
Glen Road No. 1	1,500	2,420
Glen Road No. 2	1,200	1,936
Soapmine No. 2	900	1,452
Total Capacity	**18,650**	**31,047**

Note:

1. Estimated annual average current well production capacity is provided; actual and design instantaneous pumping capacity may be greater for each well.

The annual volumes of groundwater produced in the Barstow System from 2005 to 2010 is summarized in Table 4-4. This table shows that each year, the Barstow System used less than the FPA of 11,526 ac-ft/yr.

Table 4-4: Groundwater Pumping History by the Barstow System (2005 to 2010) in ac-ft

Basin Name	Metered or Unmetered	2005	2006	2007	2008	2009	2010
Mojave Basin: Centro Subarea	Metered	8,659	8,937	9,139	8,419	7,871	7,295
Percent total water supply		100%	100%	100%	100%	100%	100%

Notes:

1. Table format based on DWR Guidebook Table 18.
2. Years are reported in calendar years (January 1 – December 31).

The projected groundwater pumping volumes for the Barstow System through 2035 are summarized in Table 4-5. It is projected the Barstow System will continue to have an 80 percent FPA of 11,526 ac-ft/yr until 2035. This projection is based on the recent Centro Subarea FPA between 2005 and 2010 and information provided by MWA (MWA, 2011). During that time, the FPA was at 80 percent. Because the Judgment allows for transfers of groundwater rights, GSWC may increase its BAP (and corresponding FPA) by purchasing or leasing additional BAP from willing Producers within the Centro Subarea. GSWC also has the Judgment's Carry Over Right. This right allows a Producer to carry over unused FPA from one year to the next. Thus, any quantity of FPA not used by GSWC in a particular year may be carried over to the following year. The Carry Over Right is technically limited to one year. However, production in any particular year is first credited against any Carry Over Right then possessed by the Producer. Because the production of Carry Over Right can result in an equivalent reduction in production of FPA, Carry Over Rights can result in the effective carrying over of unused FPA in perpetuity up to the amount of a Producer's FPA. GSWC's current Carry Over Right amount is the equivalent of their FPA or 11,526 ac-ft.

The Judgment permits a Producer to pump more than their FPA provided that they pay a replenishment fee for each ac-ft of production in excess of their FPA. Accordingly, GSWC can rely upon additional groundwater production from its Barstow System wells, accompanied by payment of a replenishment assessment, to meet increased demand. This ability to produce in excess of FPA provides GSWC a means to satisfy new demands within the Barstow System for many years ahead.

Table 4-5: Projected Groundwater Pumping by the Barstow System to 2035 in ac-ft						
Basin Name	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Mojave Basin: Centro Subarea (FPA)	7,295	9,909	9,738	10,711	11,685	12,659
Mojave Basin: Centro Subarea (Excess of FPA)	0	0	0	0	159	1,133
Percent total water supply	100%	100%	100%	100%	100%	100%

Notes:

1. Table format based on DWR Guidebook Table 19.
2. Groundwater supply is based projected FPA of 80 percent for the Centro Subarea through 2035.
3. Years are reported in calendar years (January 1 – December 31).

4.3 Transfers and Exchanges

There are currently no specifically identified transfer and/or exchange opportunities in the Barstow System at this time; therefore, Table 4-6 has been left blank.

Table 4-6: Transfer and Exchange Opportunities					
Source Transfer Agency	**Transfer or Exchange**	**Short Term**	**Proposed Quantities**	**Long-Term**	**Proposed Quantities**
GSWC	N/A	N/A	N/A	N/A	N/A

Note:

Table format based on DWR Guidebook Table 20.

4.4 Planned Water Supply Projects and Programs

As discussed above, GSWC intends to pursue multiple strategies to ensure its long-term ability to reliably supply future water demands within its Barstow system. While most of the strategies are currently in the conceptual stages without specific plans for new water supply projects, one of the strategies that is being implemented by MWA is the Regional Recharge and Recovery Project (R^3).

The Regional Recharge and Recovery Project is a conjunctive use project currently under construction by MWA that will store SWP water underground in the local aquifer and later recover and distribute to local retail water purveyors. R^3 is part of a comprehensive solution developed by the MWA and the region's stakeholders to ensure a sustainable water supply for the region. R^3 is an integral part of the Regional Water Management portfolio identified in MWA's 2004 Regional Water Management Plan. The project will deliver SWP water from an SWP turnout in Hesperia to a recharge site in the floodplain aquifer along the Mojave River in Hesperia and southern Apple Valley. MWA-owned production wells on either side of the Mojave River located immediately downstream of the recharge site will then recover and deliver the stored water through pipelines directly to retail water agencies. (MWA, 2011)

This project will provide a new source of supply for major water providers in the Mojave Basin and offset their need to continue excessive pumping within the declining regional aquifer system. Water providers that benefit from the R^3 Project could include the Apple Valley Ranchos Water Company, City of Adelanto, City of Hesperia, GSWC, San Bernardino County Service Area 64 and the Victorville Water District. Phase 1 of the project (15,000 ac-ft/yr of supply) has an estimated completion date of 2012. Phase 2 is planned to be completed after 2015. (MWA, 2011) Phase 1 of the R^3 project will not be supplying water to the Barstow System; however it will provide an indirect benefit by expanding the region's supply source portfolio.

As part of a long-term planning effort if groundwater supplies become depleted or unreliable, GSWC may construct a surface water treatment plant to treat imported water from MWA's Mojave River Pipeline. GSWC has purchased property for a future surface water treatment plant site, and is evaluating participating in MWA's Integrated Regional Water Management Plan which will include additional details regarding the size and purpose of the proposed future facility. The construction of any future facilities is subject to CPUC approval. Additionally, as part of its normal maintenance and operations, GSWC will construct replacement wells, pipelines, and treatment systems as needed as a part of its ongoing Capital Improvement Program to maintain its supply and meet distribution system requirements.

Table 4-7 has intentionally been left blank as the R^3 project will not provide water to the Barstow System. Also; there is insufficient information available to determine the capacity of a future GSWC surface water treatment plant at this time.

Table 4-7: Future Water Supply Projects in ac-ft

Project Name	Normal Year	Single-Dry Year	Multiple-Dry Years		
			Year 1	Year 2	Year 3
N/A	N/A	N/A	N/A	N/A	N/A

Note:
This table is based on the DWR Guidebook Table 26.

4.5 Wholesale Agency Supply Data

There are no direct deliveries of imported water supply for the Barstow System. However, the Barstow System will rely on water imported by MWA through the SWP to replenish the local groundwater. MWA's existing and planned water sources available to the Barstow System under normal years is currently undetermined, therefore Table 4-8 has been intentionally left blank.

Table 4-8: Existing and Planned Wholesale Water Sources in ac-ft/yr

Wholesaler Sources	Contracted Volume	2010	2015	2020	2025	2030	2035
MWA	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note:
This table is based on DWR Guidebook Table 17.

Table 4-9 demonstrates the reliability of wholesale water supply for the Barstow System for 2035. The table includes a single-dry year and multiple-dry year supplies for 2035. The reliability of the wholesale supply has been supplied by MWA and DWR (MWA, 2011).

Table 4-9: Reliability of Wholesale Supply for Year 2035 in ac-ft/yr					
			Multiple-Dry Water Years		
Wholesaler	**Average / Normal Water Year Supply**	**Single-Dry**	**Year 1**	**Year 2**	**Year 3**
MWA	12,659	12,659	12,659	12,659	12,659
Percent Normal	100	100	100	100	100

Note:
Table format based on DWR Guidebook Table 31.

Table 4-10 presents the factors affecting wholesale supply for the Barstow System. The factors affecting the reliability of the imported water through the State Water Project are environmental in nature. Legal factors concerning the adjudication of the groundwater basin limit pumping quantities and water quality issues may limit the area where wells can pump are related to GSWC's groundwater supply which is not a wholesale supply. Further discussion of water quality is presented in Chapter 5 and legal issues for pumping are presented in Chapter 6.

Table 4-10: Factors Affecting Wholesale Supply				
Name of Supply	**Legal**	**Environmental**	**Water Quality**	**Climatic**
Centro Subarea Groundwater	N/A for wholesale supply	SWP Deliveries to MWA are affected by several environmental factors that limit pumping capacity in the Sacramento-San Joaquin Bay Delta area	N/A for wholesale supply	N/A

Note:
Table format based on DWR Guidebook Table 29.

4.6 Desalination

Section 10631(i) of the Act requires an evaluation of desalination opportunities within the Barstow System. The Act states the following:

Section 10631
(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

Per requirements of California Water Code Section 10631(i), this chapter presents opportunities to use desalinated water as a future water supply source for the Barstow System.

The groundwater supplies in the GSWC service area are not considered brackish in nature, and desalination is not required. There are brackish supplies near the dry lakes but it is not practical to pump, treat and potentially induce migration of better quality water to the dry lake areas and potentially cause subsidence. Additionally, because the Barstow service area is not in a coastal area, it is neither practical nor economically feasible for GSWC or MWA to implement a seawater desalination program. However, MWA, GSWC and the other retail water purveyors could partner with other SWP contractors and provide financial assistance in construction of other regional groundwater desalination facilities in exchange for SWP supplies. The desalinated water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to MWA from the SWP contractor. A list summarizing the groundwater desalination plans of other SWP contractors is not available; however, it is anticipated that MWA would begin this planning effort should the need arise. (MWA, 2011)

In addition, should an opportunity emerge with a local agency other than an SWP contractor, an exchange of SWP deliveries would most likely involve a third party, such as Metropolitan Water District. Most local groundwater desalination facilities would be projects implemented by retailers of SWP contractors and, if an exchange program was implemented, would involve coordination and wheeling of water through the contractor's facilities to MWA (MWA, 2011).

There are no opportunities identified for using desalinated water as a source of water supply for the Barstow System by GSWC or the wholesale supplier Mojave Water Agency (MWA). MWA does not identify any desalination opportunities that are practical or economically feasible (MWA, 2011). Therefore, Table 4-11, has been left blank.

Table 4-11: Summary of Opportunities for Water Desalination

Source of Water	Yield (ac-ft/yr)	Start Date	Type of Use	Other
None	N/A	N/A	N/A	N/A

4.7 Recycled Water

This chapter covers Section 10633 which details the requirements of the Recycled Water Plan that are included in the Act. The Act states the following:

Section 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(c) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(d) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(e)	*A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre feet of, recycled water used per year.*
(f)	*A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.*

4.7.1 Coordination

Table 4-12 summarizes the role of the agencies that participate in the development of recycled water plans that affect the Barstow System of GSWC.

Table 4-12: Role of Participating Agencies in the Development of the Recycled Water Plan

Participating Agencies	Role in Plan Development
Water agencies	GSWC works closely with the Mojave Water Agency and Barstow Regional Wastewater Treatment Facility in planning a potential recycled water distribution system and identifying potential recycled water customers. The Barstow Regional Wastewater Treatment Facility, acting as the recycled water wholesaler, would lead the way in implementing the recycled water plan and distribution network.
Wastewater agencies	The Barstow Regional Wastewater Treatment Facility, operated by the City of Barstow provides a steady supply of treated effluent that does not meet California recycled water quality standards. Options are being evaluated to treat water to Title 22 standards.
Groundwater agencies	Mojave Water Agency supplies groundwater in the region. However, groundwater recharge is not a proposed use of recycled water at this time.
Planning agencies	The City of Barstow, as owner and operator of the Barstow Regional Wastewater Treatment Facility, plays a key role in conducting data and customer assessments, analyzing community impacts and economic impacts.

4.7.2 Wastewater Quantity, Quality, and Current Uses

GSWC's service area in Barstow is somewhat larger than the City of Barstow's municipal sewer system. Approximately 64 percent of the wastewater generated within the GSWC Barstow System is collected by gravity sewers and transported to the Barstow Regional Wastewater Treatment Facility (WWTF), owned and operated by the City of Barstow. The remaining 36 percent of wastewater is treated through private septic systems. The Barstow Regional WWTF provides primary and secondary treatment for an average dry weather flow (DWF) of 2.8 million gallons of wastewater per day (mgd); the design capacity for the Barstow Regional WWTF is 4.5 mgd. Currently, Barstow Regional WWTF discharges the majority of the effluent into percolation ponds. The remaining effluent is used to irrigate animal feed crops at the sludge disposal site (City of Barstow, 2009).

As noted above, the percentage of GSWC customers that are connected to the Barstow sanitary sewer system is estimated at 64 percent. This fraction is used to predict the total volume of wastewater that will be collected and treated through the year 2035. A per capita wastewater generation factor was used to estimate the volume of wastewater generated by the population connected to the sewer system. In their 2009 Draft Sewer Master Plan, the City of Barstow provided a per capita wastewater generation factor of 100 gallons per day (gpd) per person (City of Barstow, 2009). Table 4-13 summarizes the estimates of the existing and projected volumes of wastewater collected and treated in the Barstow System.

Currently, the Barstow Regional WWTF does not treat any of the effluent to meet recycled water standards set forth in Title 22 of the California Code of Regulations. However, the City of Barstow's *2009 Draft Sewer Master Plan* recommends that the existing Wastewater Treatment Plant (WWTP) will require an expansion of 1.0 mgd when the projects within the Public Improvement District (PID) Scenario approach build-out. Expanding the existing WWTF could maximize the capacity of the existing interceptor sewer system. To address this limitation, the City of Barstow plans to construct a new 2.2 mgd West Side WWTP by the year 2020. The City plans to further expand the West Side WWTP to handle 4.6 mgd by the year 2030. This new facility would consist of secondary and tertiary treatment processes with the tertiary reclaimed water being treated to Title 22 standards and produced for local reuse.

The Sun Valley Golf Course is identified as the primary potential user of recycled water. Although this golf course is not located within GSWC's service area, a distribution system for recycled water would need to be constructed as part of the planned developments, and this system could facilitate future connections for GSWC customers.

The *2009 Draft Sewer Master Plan* estimates funding requirements for the planned WWTP Capital Improvements at $158.8M. This figure includes estimated construction costs plus 40 percent for Professional Services and Contingencies.

Table 4-13 assumes that 2.2 mgd of wastewater would be treated to meet recycled water standards starting in the year 2020 when the proposed West Side WWTP would come on-line. As noted above, the percentage of GSWC customers that are currently connected to the Barstow sanitary sewer system is estimated at 64 percent. Although this fraction will likely change with the construction of the new plant and collection system, it is used here to predict the total volume of wastewater that will be collected and treated to recycled water standards for the GSWC Barstow system. Therefore, the volume of water generated within the GSWC Barstow System expected to be treated to recycled water standards is calculated as 2.2 x 0.64 = 1.41 mgd. The remaining effluent is assumed to be discharged into the percolation ponds or at the sludge disposal site, see Table 4-14. Until 2020, however, 100 percent of the wastewater collected and treated at the Barstow Regional WWTF will be discharged into the percolation ponds or at the sludge disposal site. Table 4-15 was intentionally left blank as there is no existing use of recycled water by the GSWC customers in the Barstow System.

Table 4-13: Estimates of Existing and Projected Wastewater Collection and Treatment in ac-ft/yr (mgd) for the Barstow System							
	2005(3)	**2010(3)**	**2015**	**2020**	**2025**	**2030**	**2035**
Projected population in service area(2)	30,189	30,616	34,289	37,962	41,758	45,554	49,350
Wastewater collected & treated in service area(4)	2,164 (1.93)	2,195 (1.96)	2,458 (2.19)	2,721 (2.43)	2,994 (2.67)	3,266 (2.92)	3,538 (3.16)
Quantity that meets recycled water standard	0	0	0	1,577 (1.41)	1,577 (1.41)	1,577 (1.41)	1,577 (1.41)

Notes:

1. This table is based on the DWR Guidebook Table 21.
2. For population projections see Section 2.3.
3. Based on actual year.
4. Volumes of wastewater collected and treated are estimated based on the per capita generation factor and percent served by the municipal sewer system. WW = population x 100 gal/day *0.64.

Table 4-14: Estimates of Existing and Projected Disposal of Non-Recycled Wastewater In ac-ft/yr (mgd) for the Barstow System								
Method of Disposal	**Treatment Level**	**2005(2)**	**2010(2)**	**2015**	**2020**	**2025**	**2030**	**2035**
Discharged into percolation ponds or at the sludge disposal site	Secondary	2,164 (1.93)	2,195 (1.96)	2,458 (2.19)	1,144 (1.02)	1,416 (1.26)	1,689 (1.51)	1,961 (1.75)

Notes:

1. This table is based on the DWR Guidebook Table 22.
2. Based on actual year.
3. Volumes of effluent discharged are estimated based on the total volume of wastewater collected minus the volume treated to recycled water standards. See Table 4-13.

Table 4-15: Existing Recycled Water Use in the Barstow System		
Type of Use	**Treatment Level**	**2009 Use (ac-ft/yr)**
None	N/A	N/A

4.7.3 Potential and Projected Use

The City of Barstow's *Sewer Master Plan* from May of 2000 identified several potential uses for recycled water, including irrigation of parks, green belts, athletic fields, agricultural crops, and other types of landscaped property. In the *2009 Draft Sewer Master Plan*, the City names the Sun Valley Golf Course as the primary potential user for recycled water, but does not estimate a usage rate. Furthermore, since the Sun Valley Golf Course is not within the GSWC service area, and no other potential users for recycled water are identified, Table 4-16 and Table 4-17, representing potential and projected recycled water use, are intentionally blank. Projections will be updated in the 2015 UWMP for the Barstow System if the City has finalized its plans. Where feasible, GSWC will support a recycled water project in the Barstow System by encouraging recycled water use among its customers. Table 4-18 was intentionally left blank, because there is no projected recycled water use for 2010.

Table 4-16: Potential Future Recycled Water Uses in ac-ft/yr

Type of Use	Treatment Level	Description	Feasibility	2010[2]	2015	2020	2025	2030	2035
Landscape Irrigation	Tertiary	Potential Customers	Potential	0	0	0	0	0	0
			Total	0	0	0	0	0	0

Notes:
1. This table is based on the DWR Guidebook Table 23.
2. Based on actual year.

Table 4-17: Projected Future Recycled Water Use in Barstow System in ac-ft/yr

Type of Use	2010	2015	2020	2025	2030	2035
None	0	0	0	0	0	0

Table 4-18: Comparison of Recycled Water Uses—Year 2005 Projections versus 2010 Actual

Type of Use	2005 Projection for 2010	2010 Actual Use
None	0	0

Note:
This table is based on the DWR Guidebook Table 24.

4.7.4 Optimization and Incentives for Recycled Water Use

As the owner and operator of the Barstow Regional WWTF, the City of Barstow is responsible for determining the technical and economic feasibility of supplying recycled water to the Barstow System. Because the City of Barstow is still in the initial planning stages, there are no actions in place at this time by which GSWC is encouraging the use of recycled water in the Barstow System. Therefore, Table 4-19 is not applicable for this system and has been intentionally left blank.

Table 4-19: Methods to Encourage Recycled Water Use and the Resulting Projected Use in ac-ft/yr

Actions	2010	2015	2020	2025	2030
N/A	N/A	N/A	N/A	N/A	N/A

Note:
This table is based on the DWR Guidebook Table 25.

Chapter 5: Water Quality

Section 10634 of the Act requires an analysis of water quality issues and their impact to supply reliability. The Act states as follows:

> *Section 10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631 and the manner in which water quality affects water management strategies and supply reliability.*

5.1 GSWC Measures for Water Quality Regulation Compliance

To facilitate full compliance with water quality laws and regulations, GSWC maintains an Environmental Quality Department that has independent lines of reporting authority within the organization. The Environmental Quality Department is headed by a company officer specifically assigned to oversee and manage the company's environmental and water quality programs. The Vice President of Environmental Quality has a staff of three managers, including two Water Quality Managers. The Water Quality Managers, in turn, manage a staff of Water Quality Engineers and Technicians that are assigned to district offices. Each district office is assigned one Water Quality Engineer and at least one Water Quality Technician to provide direct support to the local drinking water systems within the district.

The District Water Quality Engineer is the main point of contact for the California Department of Public Health (CDPH) as well as other regulatory agencies. The Water Quality Engineer also is responsible for coordinating compliance measures through scheduling required sample collection, preparing water quality related plans, maintaining a water quality database, providing training to operations, maintaining a cross connection control program, and preparing and submitting monitoring reports, permit applications and other regulatory related correspondence.

As a whole, the Environmental Quality Department monitors and participates in the implementation of new water quality related laws and regulations. Through routine department meetings and training, the District Water Quality Engineers are kept up to date with changing water quality regulations and related technology. These efforts contribute towards maintaining a pool of trained water quality professionals that can be utilized throughout the company. This provides the company the ability to respond to a wide variety of water quality issues or emergencies.

5.2 Water Quality Issues

5.2.1 Surface Water Quality

No surface water is used in the Barstow System, therefore this section is not applicable.

5.2.2 Groundwater Quality

The active groundwater wells in the Barstow System meet all current California Title 22 drinking water standards. Table 5-1 summarizes water quality issues and recommendations for wells within the Barstow System. The following discussion relates to contaminants with maximum contaminant levels (MCLs) that are either existing or have been proposed by the United States Environmental Protection Agency (USEPA) and/or CDPH. Drinking water regulations pertaining to emerging contaminants of concern, such as chromium (VI), nitrosamines, and volatile organic compounds (VOCs), and potential revisions to existing regulations are closely monitored by GSWC's Environmental Quality Department. The appropriate sampling and action will be taken on any affected water supply sources as monitoring requirements, new or revised MCLs are promulgated by the USEPA or CDPH. Besides radon and arsenic, methyl-t-butyl ether (MTBE) may become a water quality concern because of ground contamination from old gas stations in the Barstow area. So far, MTBE has not been detected in any Barstow well.

Perchlorate. Ammonium perchlorate is used as a main component in solid rocket propellant, and can be found in some types of ammunitions and fireworks. CDPH adopted a new perchlorate drinking water standard of 6 micrograms per liter (µg/L), effective October 18, 2007.

On November 18, 2010, GSWC was notified by personnel at the United States Marine Corps (USMC) Nebo Supply Base that samples taken from the base water distribution system showed levels of perchlorate above the MCL of 6 parts per billion (ppb). GSWC immediately sampled water from the distribution system outside the base on November 18, 2010.

The test results from the samples collected on November 18, 2010, which were received by GSWC on November 19th, indicated the level of perchlorate was above the MCL. On November 19, 2010, GSWC issued a Water Alert in its Barstow customer service area. GSWC also collected well samples and found three wells exceeded the MCL for perchlorate: Soapmine Well No. 2, Arrowhead Well No. 2, and Crooks Well No. 1 (only one, Soapmine Well No. 2, of which was pumping to the system at the time). The three wells were removed from service and the Soapmine Well No. 2 placed in inactive status with CDPH. The wells will not be available as supply sources until authorized by CDPH. GSWC is currently assessing the perchlorate plume's potential impact upon Arrowhead Well No. 2 and Crooks Well No. 1.

While the causes and extent of the contamination are currently being investigated by GSWC and CDPH, it is not currently anticipated that additional wells will be impacted by the recently discovered perchlorate plume in the aquifer underlying the Barstow System. GSWC is implementing a number of measures to ensure the affected portion of the Barstow System will continue to receive reliable drinking water supplies and that the source(s) of contamination are being properly identified, characterized, and monitored. Should treatment be required in the future, it is anticipated it would take approximately 2 to 5 years to implement a perchlorate wellhead treatment system such as ion exchange. Consideration will also be included for alternative water quality management strategies such as blending or supply replacement.

Manganese. On occasion, the Crooks Well No. 1 has exceeded the Secondary MCL of 50 µg/L for manganese which is mitigated with wellhead treatment (oxidation and filtration).

Nitrate. The Crooks Well No. 1 has exceeded the primary MCL of 45 mg/L for nitrate in addition to manganese. The source is blended with system water to lower the nitrate concentration and quarterly monitoring is conducted to ensure levels remain stable.

While nitrate treatment is not expected to exceed the MCL within other sources in the Barstow system, should treatment be required, it is anticipated it would take approximately 2 to 5 years to implement a nitrate wellhead treatment system such as ion exchange. Consideration will also be included for alternative water quality management strategies such as blending or supply replacement.

Radon. Radon levels in the groundwater supply have been reported in the range of 286 to 622 pCi/L, with all but one source over 300 pCi/L. In 1999, the USEPA proposed a radon MCL at 300 pCi/L, with an alternative standard of 4,000 pCi/L if the state has an approved Multimedia Mitigation program to reduce the indoor radon risk from soil and rocks underneath homes and buildings. While the proposed radon rule has not proceeded to promulgation, the effect of the proposed radon MCL would be widespread in groundwater wells throughout California.

All groundwater production from wells in this system will be impacted if the radon MCL is set at 300 pCi/L. Best available technologies for radon removal include Packed Tower Aeration (PTA) and Granular Activated Carbon (GAC). Due to some critical operation concerns with the use of GAC, PTA is the most common and effective method for radon removal. Installation of treatment facilities at some of the well sites in this system may be problematic due to lack of available space for treatment equipment. It is expected the state will develop an approved Multimedia Mitigation program thus allowing the alternative MCL standard.

Table 5-1: Summary of Water Quality Assessment

Well	Current Well Capacity (gpm)(1)	Status	Water Quality Issue/Concern	Existing Treatment	Recommendations
Agate No. 3	550	Stand-By	Radon	None	Continue Monitoring; Future Multimedia Mitigation (radon)
Agate No. 4	1,000	Active	Radon	None	Continue Monitoring; Future Multimedia Mitigation (radon)
Agate No. 5	600	Active	Radon	None	Future Multimedia Mitigation (radon)
Agate No. 6	400	Active	Radon	None	Continue Monitoring; Future Multimedia Mitigation (radon)
Arrowhead No. 2	600	Inactive	Nitrate, Radon, Perchlorate	None	Install wellhead treatment or show compliance with perchlorate MCL; Future Multimedia Mitigation (radon)
Arrowhead No. 3	0	Inactive			
Arrowhead No. 4	0	Inactive			
Bradshaw No. 1	800	Active		None	
Bradshaw No. 2	850	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 3	0	Inactive			
Bradshaw No. 4	1,050	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 5	1,200	Active	Radon	None	Future Multimedia Mitigation (radon)

Table 5-1: Summary of Water Quality Assessment

Well	Current Well Capacity (gpm)(1)	Status	Water Quality Issue/Concern	Existing Treatment	Recommendations
Bradshaw No. 6	850	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 7	1,000	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 10	1,000	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 11	1,000	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 12	1,100	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 13	850	Active	Radon	None	Future Multimedia Mitigation (radon)
Bradshaw No. 14	1,000	Active	Nitrate, Radon		Continue Monitoring; Future Multimedia Mitigation (radon)
Crooks No. 1	1,200	Active	Perchlorate, Nitrate, Radon, Manganese, TDS, Boron	Fe/Mn Removal, Blending	Replace supply, Install wellhead treatment, or show compliance with perchlorate MCL; Future Multimedia Mitigation (radon)
Glen Road No. 1	1,500	Active	Radon	None	Future Multimedia Mitigation (radon)
Glen Road No. 2	1,200	Active	Radon	None	Future Multimedia Mitigation (radon)
Soapmine No. 2	900	Active	Perchlorate, Radon	None	Replace supply, install wellhead treatment or show compliance with perchlorate MCL; Future Multimedia Mitigation (radon)

Note:

1. Estimated annual average current well production capacity is provided; actual and design instantaneous pumping capacity may be greater for each well.

5.2.3 Distribution System Water Quality

Distribution system monitoring is performed for several water quality parameters in the Barstow System, including general physical properties, presence of coliform bacteria, disinfectant and disinfection by-product levels, and corrosivity of the water by monitoring lead and copper levels at customers' water taps. All monitoring parameters and levels currently meet drinking water standards and it is expected that these standards will continue to be met in the future.

GSWC utilizes an approved Sample Siting Plan for the collection, recording, and reporting of all bacteriological analyses. GSWC has also established an aggressive cross-connection control program to reduce the hazard associated with backflow and back-siphonage. These programs are required to comply with CDPH regulations on Waterworks Standards and Cross Connection Control.

5.3 Projected Water Quality Impacts

Projected water quality impacts to water supply reliability within the Barstow System through 2035 as shown in Table 5-2. The three wells removed from service due to perchlorate detections are not expected to reduce the overall ability of GSWC to meet projected water demands. However, replacement wells, wellhead treatment, or other supply sources may be constructed to offset current capacity reductions.

Table 5-2: Summary of Projected Water Supply Impacts Due to Water Quality in ac-ft/yr

Water Source	2010	2015	2020	2025	2030	2035
Agate Well No. 3	0	0	0	0	0	0
Agate Well No. 4	0	0	0	0	0	0
Agate Well No. 5	0	0	0	0	0	0
Agate Well No. 6	0	0	0	0	0	0
Arrowhead Well No. 2	0	(968)	(968)	(968)	(968)	(968)
Arrowhead Well No. 3	0	0	0	0	0	0
Arrowhead Well No. 4	0	0	0	0	0	0
Bradshaw Well No. 1	0	0	0	0	0	0
Bradshaw Well No. 2	0	0	0	0	0	0
Bradshaw Well No. 3	0	0	0	0	0	0
Bradshaw Well No. 4	0	0	0	0	0	0
Bradshaw Well No. 5	0	0	0	0	0	0
Bradshaw Well No. 6	0	0	0	0	0	0
Bradshaw Well No. 7	0	0	0	0	0	0
Bradshaw Well No. 10	0	0	0	0	0	0
Bradshaw Well No. 11	0	0	0	0	0	0
Bradshaw Well No. 12	0	0	0	0	0	0

Table 5-2: Summary of Projected Water Supply Impacts Due to Water Quality in ac-ft/yr						
Water Source	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Bradshaw Well No. 13	0	0	0	0	0	0
Bradshaw Well No. 14	0	0	0	0	0	0
Crooks Well No. 1	0	(1,936)	(1,936)	(1,936)	(1,936)	(1,936)
Glen Road Well No. 1	0	0	0	0	0	0
Glen Road Well No. 2	0	0	0	0	0	0
Soapmine Well No. 2	0	(1,452)	(1,452)	(1,452)	(1,452)	(1,452)

Note:
Table format based on DWR Guidebook Table 30.

Chapter 6: Water Supply Reliability

Sections 10631 and 10635 of the Act require that an assessment of water supply reliability for various climatic conditions be undertaken. The Act states:

Section 10631.

(c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.

(B) A single dry water year.

(C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

Section 10635.

(a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

6.1 Reliability of Supply

The Barstow System presently receives all of its water supply from groundwater from the Centro Subarea, which is replenished with natural infiltration from the Mojave River and imported SWP water delivered by MWA. The following discussion summarizes the reliability of GSWC's water supply sources.

Groundwater reliability is based on GSWC's share of the projected Mojave Basin's annual FPA and the numerous current and planned projects in the Mojave Basin designed to increase the reliability of the groundwater supply. GSWC's groundwater supply may be augmented by future supplemental water projects, including potential surface water treatment and water reclamation. The following is a summary of the imported surface water and groundwater supply reliability.

6.1.1 Wholesale Water Supply Reliability

MWA is not only the Watermaster for the Basin but also the sole importer of water to the area from the State Water Project. This section presents a summary of the reliability of MWA's SWP supplies.

The SWP supply for MWA that is applicable to GSWC is the amount of SWP water used for aquifer recharge. MWA has purchased rights for up to 82,800 ac-ft/yr of SWP water for 2010 and 89,800 ac-ft/yr by 2020. Currently the SWP average water delivery is 60 percent of the contracted amount. The single-dry year and multiple-dry year scenarios have significant curtailments of SWP delivery. Tables 6-5 thru 6-7 present the average, single-dry, and multiple-dry year supply reliability of the SWP deliveries to MWA.

Table 6-1: Reliability of SWP Supplies			
Source	**Average Year**	**Single-Dry Year**	**Multiple-Dry Year**
2010 Percent Available	60%	7%	34%
2010 SWP Deliveries (ac-ft/yr)	49,680	5,796	28,152
2030 Percent Available	61%	11%	35%
2030 SWP Deliveries (ac-ft/yr)	54,778	9,878	31,430

The effect of curtailed SWP supplies could have a direct effect on the ability of water retailers to purchase extra water above their current FPA allotment. If GSWC pumps more than their FPA they pay MWA to import water via the SWP to replenish the aquifer the excess amount of groundwater pumped. This scenario does not take into account GSWC's existing Carry Over Right (described below) equivalent to one year FPA. The Carry Over Right will ensure GSWC's reliability for water rights not needing replenishment far into the future. Nevertheless, MWA's groundwater reliability cornerstone is the ability to offset excess groundwater pumping through SWP supplied water groundwater recharge.

6.1.2 Groundwater Supply Reliability

Supply reliability for the Barstow System depends upon the reliability of local groundwater and imported surface water supplies used to replenish those supplies.

GSWC may engage additional strategies to ensure its long-term ability to reliably serve future water demands within its Barstow system including implementing a recycled water project to supply non-potable demands and potential purchases or leases of additional FPA from willing sellers within the Centro Subarea. These options will similarly be evaluated based upon a cost/benefit analysis and opportunity availability.

GSWC may further augment its groundwater reliability through the operation of the Judgment's Carry Over Right. This right allows a Producer to carry over unused FPA from one year to the next. Thus, any quantity of FPA not used by GSWC in a particular year may be carried over to the following year. The Carry Over Right is technically limited to one year. However, production in any particular year is first credited against any Carry Over Right then possessed by the Producer. Because the production of Carry Over Right can result in an equivalent reduction in production of FPA, Carry Over Rights can result in the effective carrying over of unused FPA in perpetuity up to the amount of a Producer's FPA. Currently GSWC's Carry Over Right is equivalent to one year unused FPA or 11,526 ac-ft.

As noted above, the Court has the authority to adjust the FPA of the Centro Subarea annually, depending on groundwater conditions within the Subarea. If necessary, the Court can reduce the FPA, by no more than 5 percent annually, to help groundwater levels in the Subarea recover. Reductions of FPA by the Court have historically been initiated pursuant to recommended reductions by MWA. MWA has projected that FPA will remain at 80 percent within the Centro Subarea through 2035 (MWA, 2011). Moreover, the MWA has stated that although many of the sources that recharge the groundwater basin have high annual variability, including flows from the Mojave River and imported water from the SWP, the groundwater basins within the MWA service area are sufficiently large enough to allow for continued water use during dry periods with only a temporary decline in water levels (MWA, 2011).

The Mojave Water Agency has developed numerous water supply projects and management actions designed to increase reliability of groundwater within the MWA service area. These programs fall under two categories:

- Supply Enhancement projects, either involving groundwater recharge or an increase in groundwater efficiency, and
- Management actions involving conservation, storage agreements, and water transfers and water banking.

The supply enhancement projects include a total of five recharge projects, three projects for the Alto Subarea, and one project each for the Ames Valley and Copper Mountain/Joshua Tree Subarea. These projects will total approximately 28,500 ac-ft of additional recharge into the aquifers below the recharge areas. There are currently no projects specified for the Centro Subarea by MWA. For further detail on MWA's water supply projects and management options please refer to MWA's Draft 2010 UWMP included as Appendix G.

Table 6-2 presents water supply projections for groundwater sources during a normal year, single-dry year, and multiple-dry years for the Barstow System. The normal-year supply represents the expected supply under average hydrologic conditions, the dry-year supply represents the expected supply under the single driest hydrologic year, and the multiple-dry year supply represents the expected supply during a period of three consecutive dry years. During dry years, MWA may not receive the full contracted amount of SWP water for groundwater replenishment. In this case, the Mojave Basin has available storage to act as a buffer during times of short or extended dry water years. Additionally, MWA has stated that water supply deficits in single-dry and multiple-dry years will be met through demand management measures and increased reliance on stored groundwater during normal and wet years (MWA, 2011).

Currently MWA does not project any basin-wide water supply deficits for projections through 2035. The main factor for long-term reliability of the Basin is the reliability of the SWP deliveries and their ability to replenish the groundwater basin after dry years when the groundwater basin recharge is reduced. As Table 6-2 shows, by 2035, GSWC will have a small portion of their supply needing to be made up by leasing additional groundwater or making replenishments to MWA. This does not take into account the fact that GSWC currently has 11,526 ac-ft of Carry Over Right to use if needed.

Table 6-2: Supply Reliability for the Barstow System for Year 2035 in ac-ft/yr

Source	Normal Water Year	Single-Dry Water Year	Multiple-Dry Water Years		
			Year 1	Year 2	Year 3
Production in Excess of FPA	1,133	1,133	1,133	1,133	1,133
Groundwater FPA	11,526	11,526	11,526	11,526	11,526
Total	12,659	12,659	12,659	12,659	12,659
Percent of Normal		100%	100%	100%	100%

Note:
Table format based on DWR Guidebook Table 28.

Table 6-3 provides the basis of estimates of water-year data for groundwater supplies for single-dry year and multiple-dry year periods estimates.

For the groundwater reliability analysis, MWA evaluated the long-term hydrologic conditions in the Mojave Basin (MWA, 2011). MWA analyzed water supply data for the period 1931 to 2009, which include numerous single-year and multiple-year wet and dry periods, to calculate the average annual water supply for 2035. MWA's projections for the single-dry year and multiple-dry year water supplies were based on the data provided in the 2009 State Water Project Reliability Report (DWR, 2009). According to the Reliability Report, DWR indicates that in an extremely single-dry year, like 1977, the amount of available water will be reduced below normal. In addition, DWR selected the period 1987 to 1992 as a multiple-dry year period. MWA provided the average annual projected deficits for the Mojave Basin in 2035 using the analysis presented by DWR (MWA, 2011). As discussed above, deficits in the available water supply during times of short or extended periods may be met with groundwater storage capacity of the Mojave Basin.

The Barstow System has pumped between 7,295 ac-ft/yr and 9,139 ac-ft/yr for the past 5 years. It is projected the Barstow System will pump annual amounts ranging from 7,295 ac-ft/yr to 12,659 ac-ft/yr between 2010 and 2035.

Table 6-3: Basis of Water Year Data

Water Year Type	Base Year(s)	Historical Sequence
Purchased Water[1]		
Normal Water Year	N/A	
Single-Dry Water Year	N/A	
Multiple-Dry Water Years	N/A	
Groundwater[2]		
Normal Water Year[3]	Average	1923 – 2003
Single-Dry Water Year	1977	--
Multiple-Dry Water Years	1931 – 1934	--

Notes:

1. MWA 2010 Draft UWMP.
2. Table format based on DWR Guidebook Table 27.

6.1.3 Factors Resulting in Inconsistency of Supply

As discussed above, the Mojave Basin can be relied upon as a source of water throughout drought periods. Because of the size and character of the Mojave Basin, the Basin can sustain production quantities in excess of recharge for multiple years without material changes in water levels so long as long-term recharge quantities offset historical outflows from the Basin. The Physical Solution set forth in the Judgment is designed to ensure that adequate replacement water is available to the Basin over the long-term to replenish production in excess of the naturally occurring recharge. Thus, the primary factor that could result in inconsistency of supply is long-term deficiencies in necessary replacement water.

Legal: Although, the Judgment does not restrict GSWC's ability to produce groundwater in excess of the FPA in any particular year, there is the potential that the Judgment could be amended pursuant to the Court's reserved jurisdiction to restrict production quantities in the future should there be inadequate supplemental water supplies to replace production from the Basin in excess of FPA. It is for this reason that GSWC intends to coordinate with MWA to ensure that adequate supplemental water supplies are available on a long-term basis to satisfy all water demands in excess of the naturally available Basin yield for all water constituents overlying the Basin.

Environmental: SWP deliveries to MWA are affected by several environmental factors that limit pumping capacity in the Sacramento-San Joaquin Bay Delta area. For further discussion of this issue please refer to MWA's 2010 UWMP. As already discussed the SWP deliveries are critical for aquifer recharge. At this time the curtailment of SWP deliveries is not affecting the aquifer FPA and is not projected to affect the FPA amount for the 25 year projection period.

Water Quality:

Contaminated groundwater could cause existing wells to become unusable without treatment or the installation of new wells. On November 18, 2010, GSWC was notified by personnel at the USMC Nebo Supply Base that samples taken from the base water distribution system showed levels of perchlorate above the MCL of 6 parts per billion. GSWC immediately sampled water from the distribution system outside the base on November 18, 2010.

The test results from the samples collected on November 18, 2010, which were received by GSWC on November 19th, indicated the level of perchlorate was above the MCL. On November 19, 2010, GSWC issued a Water Alert in its Barstow customer service area. GSWC also collected well samples and found three wells exceeded the MCL for perchlorate: Soapmine Well No. 2, Arrowhead Well No. 2, and Crooks Well No. 1 (only one, Soapmine Well No. 2, of which was pumping to the system at the time). As a result, the wells were removed from service, and the Soapmine Well No. 2 placed in inactive status with CDPH. The wells will not be available as a supply source until authorized by CDPH. While the causes and extent of the contamination are currently being investigated by GSWC and CDPH, it is not currently anticipated that additional wells will be impacted by the newly discovered perchlorate contaminant plume in the aquifer underlying the Barstow System. GSWC is implementing a number of measures to ensure the affected portion of the Barstow System will continue to receive reliable drinking water supplies and that the source(s) of contamination are being properly identified, characterized, and monitored.

Table 6-4 presents a summary of the factors discussed that could potentially result in inconsistency of supply for the Barstow System.

Table 6-4: Factors Resulting in Inconsistency of Supply				
Name of Supply	**Legal**	**Environmental**	**Water Quality**	**Climatic**
Groundwater, Mojave River Groundwater Basin, Centro Subarea	Adjudicated basin sets pumping limits to 80% of total allocation	SWP Deliveries to MWA are affected by several environmental factors that limit pumping capacity in the Sacramento-San Joaquin Bay Delta area	Contaminated Groundwater could cause existing wells to become unusable without treatment or the installation of new wells.	N/A

Notes:
1. Table format based on DWR Guidebook Table 29.
2. N/A – Not Applicable.

6.2 Normal Water Year Analysis

As discussed above, the Judgment authorizes GSWC to produce in excess of its FPA to meet increased demands within the Barstow Service Area. Table 6-5 summarizes the service reliability assessment for a normal water year based on water supply and water demand projections.

Table 6-5: Comparison of Projected Normal Year Supply and Demand					
	2015	**2020**	**2025**	**2030**	**2035**
Water Supply Total (ac-ft/yr)	9,909	9,738	10,711	11,685	12,659
Water Demand Total (ac-ft/yr)	9,909	9,738	10,711	11,685	12,659
Difference (supply minus demand)	0	0	0	0	0
Difference as Percent of Supply	0%	0%	0%	0%	0%
Difference as Percent of Demand	0%	0%	0%	0%	0%

Note:
Table format based on DWR Guidebook Table 32.

6.3 Single-Dry Year Analysis

Table 6-6 demonstrates the reliability of water supplies to meet projected annual water demands for the Barstow System in a single-dry year. It is assumed that the single-dry year demands are the same as those water demands projected for the normal years. MWA has stated that water supply deficits in single-dry and multiple-dry years will be met through demand management measures and increased reliance on stored groundwater during normal and wet years (MWA, 2011).

Table 6-6: Comparison of Projected Supply and Demand for Single-Dry Year

	2015	2020	2025	2030	2035
Supply Total (ac-ft/yr)	9,909	9,738	10,711	11,685	12,659
Demand Total (ac-ft/yr)	9,909	9,738	10,711	11,685	12,659
Difference (supply minus demand)	0	0	0	0	0
Difference as Percent of Supply	0%	0%	0%	0%	0%
Difference as Percent of Demand	0%	0%	0%	0%	0%

Note:

Table format based on DWR Guidebook Table 33.

6.4 Multiple-Dry Year Analysis

Table 6-7 presents the projected multiple-dry year water supply and demand assessment. The water demands in the multiple-dry years are assumed to be the same as the water demands in normal years. For the demand projections, the third year of the multiple-dry year water supply projection represents the end of each 3-year multiple-dry year period as required for the multiple-dry year analysis.

As described above, the water supply for the Barstow System of GSWC is comprised of local groundwater and imported water used to replenish the groundwater basin. Accordingly, as long as sufficient imported water supplies are available to replenish overproduction from the Basin, GSWC can rely upon groundwater production, including production in excess of its FPA, to satisfy all demands during drought periods. Therefore, the total groundwater supply available to the Barstow System is expected to continue to be 100 percent reliable under all hydrologic conditions. Also, MWA has stated that water supply deficits in single-dry and multiple-dry years will be met through demand management measures and increased reliance on stored groundwater during normal and wet years (MWA, 2011).

Table 6-7: Projected Multiple-Dry Year Water Supply and Demand Assessment					
Year	**Supply (ac-ft/yr)**	**Demand (ac-ft/yr)**	**Difference**	**Difference as Percent of Supply**	**Difference as Percent of Demand**
2011					
2012					
2013	8,863	8,863	0	0%	0%
2014	9,386	9,386	0	0%	0%
2015	9,909	9,909	0	0%	0%
2016					
2017					
2018	9,806	9,806	0	0%	0%
2019	9,772	9,772	0	0%	0%
2020	9,738	9,738	0	0%	0%
2021					
2022					
2023	10,322	10,322	0	0%	0%
2024	10,516	10,516	0	0%	0%
2025	10,711	10,711	0	0%	0%
2026					
2027					
2028	11,295	11,295	0	0%	0%
2029	11,490	11,490	0	0%	0%
2030	11,685	11,685	0	0%	0%
2031					
2032					
2033	12,269	12,269	0	0%	0%
2034	12,464	12,464	0	0%	0%
2035	12,659	12,659	0	0%	0%

Notes:

1. This assessment is based on the 3-year multiple-dry year period ending in 2015, 2020, 2025, 2030, and 2035.
2. Table format based on DWR Guidebook Table 34.

Chapter 7: Conservation Program and Demand Management Measures

This Chapter addresses the water conservation requirements of the Act for the Barstow System and includes a summary of current and planned DMM implementation and an overview of the proposed program for compliance with SBX7-7 which requires 20 percent statewide reduction in urban water use by 2020. The DMM portions of the Act state the following:

Section 10631.

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.

(K) Conservation pricing.

(L) Water conservation coordinator.

(M) Water waste prohibition.

(N) Residential ultra-low-flush (ULF) toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(j) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivisions (f) and (g) by

complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum.

7.1 Conservation Program Background

In 1991, GSWC became a signatory to the MOU regarding water conservation in California and a member of the CUWCC, establishing a firm commitment to the implementation of the Best Management Practices (BMPs) or DMMs. The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, GSWC committed to implement a specific set of locally cost-effective conservation practices in its service areas. In order to facilitate efficient BMP reporting for GSWC across service areas spread throughout California, several BMP "Reporting Units" were established. The Barstow BMP Reporting Unit is equivalent to the Barstow System.

As an investor-owned utility, GSWC's ability to obtain funding and implement conservation programs is contingent on approval of the General Rate Case by the CPUC. GSWC is currently in the process of reviewing and revising its existing conservation program as follows:

- In 2011, GSWC will be submitting a General Rate Case with the CPUC which will facilitate further development of cost-effective conservation programs, including compliance with SBX7-7.

- Subject to funding approval for each rate-making area, GSWC will conduct a baseline water use efficiency assessment of each of its districts to identify opportunities for cost-effective conservation. Results of the baseline assessment will be available by 2013, and will enable GSWC to define programs that target water savings in specific areas and meet DMM requirements. To the extent practicable, a companywide conservation program will then be implemented. Varying levels of program implementation will be scaled as appropriate for each district depending on funding availability, local wholesaler and regional participation levels, and SBX7-7 targets.

The MOU and associated BMPs were revised by the CUWCC in 2008, which is equated to the DMMs per Section 10631(j) of the Act. The revised BMPs now contain a category of "Foundational BMPs" that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs). The remaining BMPs are generally quantifiable (the water savings achieved from implementation can be directly calculated) and are called "Programmatic BMPs." Programmatic BMPs are divided into Residential, Large Landscape, and CII categories. These revisions are reflected in the CUWCC's BMP reporting database starting with reporting year 2009. The revised BMP organization is also reflected in the 2010 UWMP's DMM compliance requirements. A summary of the DMMs described in the Act and the current CUWCC BMP organization is presented in Table 7-1 for reference.

Table 7-1: CUWCC BMP and UWMP DMMs Organization and Names					
CUWCC BMP Organization and Names (2009 MOU)				**UWMP DMMs**	
Type	Category	BMP #	BMP name	DMM #	DMM name
Foundational	Operations Practices	1.1.1	Conservation Coordinator	L	Water conservation coordinator
		1.1.2	Water Waste Prevention	M	Water waste prohibition
		1.1.3	Wholesale Agency Assistance Programs	J	Wholesale agency programs
		1.2	Water Loss Control	C	System water audits, leak detection, and repair
		1.3	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	D	Metering with commodity rates for all new connections and retrofit of existing connections
		1.4	Retail Conservation Pricing	K	Conservation pricing
	Education Programs	2.1	Public Information Programs	G	Public information programs
		2.2	School Education Programs	H	School education programs
Programmatic	Residential	3.1	Residential assistance program	A	Water survey programs for single-family residential and multi-family residential customers(1)
				B	Residential plumbing retrofit
		3.2	Landscape water survey	A	Water survey programs for single-family residential and multi-family residential customers(1)
		3.3	High-Efficiency Clothes Washing Machine Financial Incentive Programs	F	High-efficiency washing machine rebate programs
		3.4	WaterSense Specification (WSS) toilets	N	Residential ultra-low-flush toilet replacement programs
	Commercial, Industrial, and Institutional	4	Commercial, Industrial, and Institutional	I	Conservation programs for commercial, industrial, and institutional accounts
	Landscape	5	Landscape	E	Large landscape conservation programs and incentives

Note:

1. Components of DMM A (Water survey programs for single-family residential and multi-family residential customers) applies to both BMP 3.1 (Residential assistance program) and BMP 3.2 (Landscape water survey).

7.2 Implementation of BMPs/DMMs

This section provides a description of the various programs and conservation activities implemented in the Barstow System. Signatories to the MOU are permitted by Water Code Section 10631(j) to include their biennial CUWCC BMP reports in an UWMP to meet the requirements of the DMMs sections of the UWMP Act if the agency is meeting all provisions of the MOU. The Barstow System CUWCC BMP coverage report for 2009 through 2010 is included as Appendix C and supplements the summary of BMP implementation activities provided in this chapter.

GSWC is progressing towards implementing all Foundational BMPs required in the revised MOU and UWMP Act. In order to maintain consistency with the SBX7-7 planning process, GSWC has chosen to comply with the remainder of the CUWCC MOU through the gpcd compliance option for the Barstow Reporting Unit. The gpcd compliance option allows MOU signatories to employ any conservation program approach that attains a two percent per year per capita savings, for a total reduction of 18 percent by 2018. Since the CUWCC water savings goal is consistent with the 20 percent water savings requirement for SBX7-7, the CUWCC MOU and SBX7-7 compliance strategies are the same and the terms are used interchangeably throughout this chapter. Although current and planned implementation of programmatic BMPs need not be demonstrated under the gpcd compliance approach, a discussion of conservation programs and accomplishments in the Barstow System is provided for information.

GSWC partners with its wholesale water supplier, Mojave Water Agency (MWA) to implement BMPs for the Barstow System. MWA provides both technical and financial assistance to the retail agencies for implementing conservation programs and strategies. MWA works with water agencies and cities individually, collectively, and through the Alliance for Water Awareness and Conservation (AWAC) to provide conservation support. Barstow customers have been eligible for of a number of conservation programs offered by AWAC, providing water savings to GSWC. Examples of programs that have been offered by AWAC include public information and education programs, and rebates for High Efficiency Clothes Washers (HECW), High Efficiency Toilets (HET), and Cash for Grass.

7.3 Foundational DMMs

7.3.1 Utility Operations

7.3.1.1 Conservation Coordinator

This BMP is being implemented. GSWC maintains a fully staffed Conservation Department with a companywide Water Use Efficiency Manager, Water Conservation Analyst and a Water Conservation Coordinator supporting each of the three regions to administer conservation programs and support wholesaler programs. GSWC also employs a number of consultants to support program development and implementation.

7.3.1.2 Water Waste Prevention

Although GSWC does not have rule-making authority, it supports member agencies and local cities in efforts to adopt ordinances that will reduce water waste. This BMP is implemented through CPUC-approved rules provided in Appendix D, including: Rule No. 14.1, the Water Conservation and Rationing Plan, Rule 11, Discontinuance and Restoration of Service.

CPUC's methodology for water utilities to implement Rule 14.1 is documented in Standard Practice U-40-W, "Instructions for Water Conservation, Rationing, and Service Connection Moratoria." Rule No. 14.1 sets forth water use violation fines, charges for removal of flow restrictors, and the period during which mandatory conservation and rationing measures will be in effect. Water conservation restrictions include:

- Use of potable water for more than minimal landscaping.
- Use through a broken or defective water meter.
- Use of potable water which results in flooding or runoff in gutters or streets.
- Use of potable water for washing private cars or commercial aircrafts, cars, buses, boats, or trailers, except at a fixed location where water is properly maintained to avoid wasteful use.
- Use of potable water for washing buildings, structures, driveways, street cleaning or other hard-surfaced areas.
- Use of potable water to irrigate turf, lawns, gardens or ornamental landscaping.
- Use of potable water for construction purposes.
- Use of potable water for filling or refilling of swimming pools.

Rule No. 20 (approved in 1978) discourages wasteful use of water and promotes use of water-saving devices. The stated purpose of the rule is to "ensure that water resources available to the utility are put to a reasonable beneficial use and that the benefits of the utility's water supply and service extend to the largest number of persons." Together, Rules 11, 14.1 and 20 prohibit negligent or wasteful use of water, create a process for mandatory conservation and rationing, and promote the use of water-saving devices.

7.3.1.3 Water Loss Control

Unaccounted for water losses are monitored by the Water Loss Control Department (WLCD) by reviewing the Water Audit program's survey results. If the amount of unaccounted for water exceeds the established tolerance levels, a Leak Detection Audit is performed. This is conducted by the Water Loss Control Technician with the most current leak detection technology, a Sonic Leak Detection Sound Amplification Instrument. To pinpoint leaks, the technician conducts a comprehensive survey of the system by making physical contact with all available main line valves, hydrant valves and all service connections.

For calendar year 2009, GSWC implemented the American Water Works Association (AWWA) M36 Standard Water Audit methodology. The approach consists of a component analysis of leaks for designation into "revenue" and "non-revenue" categories and an economic analysis of recoverable loss. Results of the analysis, which are included in Appendix E, show an infrastructure leakage index (ILI) of 3.08. According to general guidelines, an ILI between 3.0 to 5.0 is appropriate for systems where water resources can be developed or purchased at reasonable expense, and existing water supply infrastructure is sufficient to meet long-term demand, as long as reasonable leakage management controls are in place (AWWA). The initial evaluation suggests that the Barstow System is within the parameters of a moderately functioning system, as defined by the AWWA.

Before the AWWA Standard Water Audit M36 methodology was implemented, prescreening for water losses was conducted by comparing the total volume of water sales and other verifiable uses against the total water supply into the system. A full audit was triggered if the total sales and verifiable uses was less than 90 percent of the total supply (i.e. unaccounted-for-water exceeded 10 percent). Table 7-2 summarizes the results.

Table 7-2: Water Loss Control Evaluation Summary

Report Year	Prescreen Completed	Prescreen Result
2006	No	N/A
2007	No	N/A
2008	Yes	86.30%
2009	Yes	84.45%

Implementation Steps and Schedule

Effective 2010, GSWC will continue to implement the Standard Audit and Water Balance worksheets procedures following the AWWA M36 protocol for the next 4 years, taking measurable steps to improve data accuracy while cost-effectively reducing non-revenue water through repair of leaks and other measures. The water audit for calendar year 2010 will be completed by mid-2011.

GSWC used version 3.0 of the AWWA Water Audit software for its initial evaluation, and will use the current software for all future evaluations which includes metrics for evaluating the validity of the data. GSWC already has a comprehensive work order management system in place that documents leak locations and repair history.

7.3.1.4 Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

All customers of the Barstow System are metered and billed by volume on a monthly basis. A meter maintenance and repair plan has been submitted to the CUWCC. In addition, GSWC follows the requirements of CPUC General Order 103-A which prescribes minimum water system design, operation and maintenance (O&M) standards for water utilities includes requirements for calibrating, testing frequency, and replacing water meters.

7.3.1.5 Retail Conservation Pricing

All metered customers in the Barstow System are charged volumetrically. In addition, effective December 2010, GSWC has implemented a three-tiered conservation pricing rate structure for residential customers, as approved by the CPUC for Region 3, including the Barstow System customers. The current rate structure for residential customers has a fixed charge as well as volumetric escalating pricing tiers, depending on customer usage. Non-residential customers have a fixed charge and a fixed volumetric charge. Implementation of this revised pricing policy is the result of GSWC's collaboration with CPUC to implement conservation tiered rates for residential customers of investor-owned utilities. Tiered rates are consistent with the CPUC's Water Action Plan.

Implementation Steps and Schedule

2009 and 2010 volumetric and fixed price revenue data for the Barstow Reporting Unit are summarized in the BMP Coverage Report located in Appendix C. In 2010, volumetric revenue consisted of 63.1 percent of Barstow Reporting Unit's total revenue which is on track to meet the 2012 MOU goal of 70 percent.

GSWC will be submitting a General Rate Case filing to the CPUC in 2011, which includes a proposed rate increase for volumetric charges for Region III customers. If approved, this rate increase will allow GSWC to increase volumetric revenues and progress towards fulfilling the requirements of the Retail Conservation Pricing BMP by 2015.

7.3.1.6 Education

Public Information Programs

GSWC offers public information programs for Barstow customers. For 2011, GSWC has an approved budget of $200,000 for public education and outreach in the water systems that comprise Region 3, including the Barstow System. GSWC offers free conservation literature and brochures in the Customer Service Area office, runs bi-annual water conservation ads in the local paper, participates in various conservation events, and coordinates a home and garden show in the high desert.

In addition, AWAC promotes conservation through extensive outreach programs including an annual calendar with conservation tips; newsletters; newspaper inserts; public service announcements and paid advertisements; promotional items; flyers and bill inserts for retailers; a conservation website; presentations to the Chamber of Commerce for commercial sector outreach; speaker's bureau; public workshops; and demonstration gardens. Outreach activities completed by GSWC between 2006 and 2010 are summarized in Table 7-3.

Table 7-3: Outreach Activities

Item	2006	2007	2008	2009	2010
Contacts with the Media /Paid Advertising	1	1	2	6	6
Bill Inserts / Newsletters / Brochures	2	1	2	4	4
Bill showing water usage in comparison to previous year's usage	No	No	No	Yes	Yes
Special Events, Media Events	2	1	1	4	4
Speaker's Bureau	1	0	0	0	0
Program to coordinate with other government agencies, industry, public interest groups and media	Yes	No	No	No	No

School Education Programs

GSWC sponsors the WaterWise school education program in Barstow elementary schools, as implemented by its vendor, Resource Action Programs. Students learn about conservation practices and receive a free conservation kit that includes a water survey, 1.5 gpm low-flow shower head, 1.5 gpm kitchen sink and 1.0 gpm bathroom aerators, leak detection dye tablets, a watering gauge, and step-by-step instructions. The students are given a homework assignment to complete a water audit form and replace inefficient showerheads and aerators with water-saving devices provided in the kit. The program has been a very effective way for GSWC to reach a large number of customers and educate students, who in turn educate their parents about water efficiency practices and low-flow plumbing devices.

Results from the program are tracked, and a comprehensive Program Summary Report is generated at the end of each school year. This report documents the estimated reduction in water usage that was achieved through the retrofits and provides data on the percentage of students who participated in the program. Table 7-4 provides a summary of program participation results between 2006 and 2010.

Table 7-4: School Education Activities

	2006	2007	2008	2009	2010
Presentations	N/A	N/A	4	2	6
Grade	4th – 6th	N/A	4th – 6th	6th	6th
Number of students	604	N/A	450	450	408

In addition to GSWC's program, AWAC conducts educational programs that are open to MWA member agencies, including GSWC's Barstow System customers. AWAC has partnerships with various school districts and charter schools, as well as Barstow College. AWAC also works with agency staff on implementing the Water Education for Teachers (WET) program training.

7.3.1.7 Methods Used to Evaluate the Effectiveness and Water Savings from Foundational BMPs

Effective implementation of the Foundational BMPs is critical to ensuring the long-term success of GSWC's conservation efforts. GSWC will utilize quantitative methods to assess the effectiveness of each BMP, to the extent practicable. The effectiveness of the Water Waste Prevention and Water Loss Control BMPs can be measured, in part, by completing the annual M36 water loss audits, improving ILI to score between 1 and 3, and documenting a year-over-year reduction in unaccounted-for water. GSWC will track the impact of new conservation pricing by using its upgraded billing system to carefully monitor consumption of residential customers.

The effectiveness of implementing Public Education BMPs will be measured by tracking the number of public outreach events and education programs where customers receive information on conservation. A successful public information program should encourage customers to take advantage of conservation incentives being offered by GSWC and MWA as Programmatic DMMs.

There are no direct estimates of water savings applicable to the Foundational BMPs; however, these measures will continue to contribute to reducing the Barstow System's demand.

7.4 Programmatic DMMs

GSWC intends to continue to comply with the MOU using the gpcd compliance approach for the Barstow System. The baseline gpcd is equal to the average annual potable water gpcd for the years 1997 through 2006. This approach requires the purveyor to submit biennial gpcd target reports to the CUWCC. The biennial targets are computed by multiplying the agency's baseline gpcd by the applicable reduced target, as a percentage. The targets will gradually decrease to 82 percent of the baseline in 2018. This approach allows the purveyor to choose which programs they would like to implement, as long as the combined water savings attributable to these programs is sufficient to meet their biennial gpcd targets. The gpcd compliance option water savings targets are comparable to those required by SBX7-7, as detailed in Section 7.5.

Once the pending rate case is approved by the CPUC, GSWC will develop a prioritized water use efficiency program and implementation schedule for all customer service areas in the company, focusing on systems with the highest SBX7-7 water use reduction targets and those where specific conservation activities can be implemented that are locally cost-effective.

The gpcd compliance option does not require specific implementation plans for each programmatic BMP, and the following descriptions of current program offerings are provided for information purposes only. Water savings estimates are also not available for each program, as implementation levels have not been defined under the gpcd compliance option requirements. Most of the Programmatic DMMs described below for the Barstow System are being implemented by MWA. Additional detailed description of MWA's programs can be found in MWA's 2010 UWMP.

7.4.1 Residential DMMs

7.4.1.1 Residential Assistance Programs

GSWC has an audit program targeting high-use single-family (SF) and multi-family (MF) customers. GSWC identifies these customers based on billing data and contacts them to offer free audits. Audits are also offered to walk-in customers at the local customer service area office. Additional home audits are conducted as part of the school education program (Section 7.3.1.6). Low-flow devices are available for free to customers at the GSWC office and are distributed to students as part of the free conservation kits they receive in the school education program. Devices are also distributed by AWAC at outreach events, but the number of devices provided specifically to Barstow customers is not recorded.

7.4.1.2 Landscape Water Surveys

GSWC offers large landscape water surveys to high water-use SF and MF customers throughout the company's service area AWAC currently offers "cash for grass" landscape incentives as one of their conservation programs available to water agency customers. They offer small to large landscape rebates: $0.50 per square foot of turf converted to desert-adaptive landscaping with 25 percent canopy coverage. GSWC has added an additional $0.50 per square foot to this program matching AWAC's program requirements and maximum rebate. Customers in the Barstow System have the opportunity to participate in this program in the future.

7.4.1.3 High-Efficiency Clothes Washers

GSWC customers are eligible to participate in the HECW rebate program provided by AWAC, which has been available since 2008. The rebate is for $200 per HECW. GSWC's funds 12.5 percent of this program ($25 per rebate), while MWA funds the remaining 87.5 percent of the program ($175 per rebate).The GSWC webpage for Barstow advertises the rebates and provides a link to the AWAC website for full program details.

7.4.1.4 WaterSense Specification (WSS) Toilets

GSWC customers have been eligible to participate in a residential (High Efficiency Toilet) HET rebate program administered by AWAC since 2008. The GSWC webpage for Barstow advertises the rebates and provides a link to the AWAC website for full details. Customers were offered a $200 rebate per HET; with GSWC contributing $25 per rebate and MWA $175.

7.4.1.5 WaterSense Specification for Residential Development

Integration of WSS fixtures for new development will be accelerated by the 2010 California Green Building Standards Code (CAL Green Code), which became effective in January 2011. The CAL Green Code sets mandatory green building measures, including a 20 percent reduction in indoor water use, as well as dedicated meter requirements and regulations addressing landscape irrigation and design. Local jurisdictions, at a minimum, must adopt the mandatory measures; the CAL Green Code also identifies voluntary measures that set a higher standard of efficiency for possible adoption. AWAC jurisdictions have developed and adopted AB 1881, Water-efficient Landscape Ordinance.

7.4.2 Commercial, Industrial, and Institutional DMMs

GSWC is not currently implementing any conservation programs for CII customers in the Barstow System. However, customers are eligible to participate in a number of MWA CII programs, including the Cash for Grass rebate program for large landscapes.

7.4.2.1 Large Landscape

GSWC's landscape program consists of identifying and contacting high-use customers, providing information and offering water use surveys, voluntary water use budgets, and landscape training. While the program is available to all customers free of charge, none have chosen to participate. An increase in conservation pricing rates in 2011 is expected to generate increased participation as is the funding mechanism that will allow for increased resources for program marketing.

7.5 SBX7-7 and CUWCC MOU Compliance Strategy

The SBX7-7 water use baseline for the Barstow system is 259 gpcd. The 2020 compliance goal is 229 gpcd, as detailed in Chapter 3. The CUWCC gpcd compliance option requires 18 percent water use reduction by 2018 (see Appendix C for detailed calculations), which is consistent with the SBX7-7 twenty percent water savings targets shown in Table 7-5 below. For this reason, the same compliance strategy will be implemented to meet both SBX7-7 and the MOU targets.

Table 7-5: SBX7-7 and CUWCC MOU Compliance Targets				
		Targets		
	Baseline	2015	2018	2020
SBX7-7	287	258	---	229
CUWCC MOU – gpcd compliance option	287	--	235	--

Several factors have contributed to a rapid reduction in gpcd over the past few years including the economic recession, recent mild climate conditions, implementation of a residential tiered conservation pricing structure, and other conservation measures. Overall, there has been a 24 percent reduction in per capita water use over the past 9 years: from 282 gpcd in 2002 to an estimated 213 gpcd in 2010. The Barstow System currently is on track to satisfy its SBX7-7 and MOU goals and GSWC will focus on maintaining these savings over the next 10 years.

However, if the gpcd begins to increase to previous levels, GSWC's continued commitment to complying with the CUWCC MOU and implementation of all BMPs should provide sufficient water savings to meet the 58 gpcd water savings objective. GSWC will assess implementation of a suite of programs over the next 2 to 3 years to meet conservation targets companywide, potentially providing further reductions. Implementation levels and specific program offerings will vary by system depending on system goals, existing programs, demographics, and hydrologic characteristics.

GSWC is developing a companywide approach that will include assessment of options such as accelerating the current programs and adding additional programmatic, regulatory and information-based activities to meet the requirements of SBX7-7. This systematic approach may allow GSWC to do more with less, in essence administering overall conservation program operations from a centralized location while allowing local resources for direct implementation of BMPs and other water savings practices. A number of the programs that will be considered by GSWC to meet SBX7-7 requirements combine financial incentives, regulations, and information elements that build on current activities. Specific programs that may be implemented by 2014 on a company-wide basis include:

Conservation Pricing

GSWC is in the process of filing a General Rate Case application to increase volumetric charges for residential and CII metered customers in its systems. If approved, increased tiered rates for residential and uniform rates for CII accounts are expected to significantly increase water savings and participation in conservation incentive programs in many of GSWC's systems.

Financial Incentives

Ongoing and/or additional financial incentives may be offered directly to customers by GSWC or in partnership with other agencies:

1. HECWs rebates: Clothes washer rebates are already being implemented by MWA on behalf of GSWC and will continue to provide measurable water savings.

2. Zero and low-flow urinal rebates: Rebates would include CII fixtures such as zero consumption and ultra-low volume urinals as well as CII specific HETs.

3. Expansion of fixture rebates to CII and multi-family customers in all systems: currently, the toilet rebate programs are only available to CII and MF customers in select systems. GSWC will evaluate expansion of the programs to all customers and there will be increased focus on marketing to large Home Owner Association accounts.

4. Larger variety of fixture rebates: This may include hot water distribution tanks, pressurized water brooms and high-pressure spray nozzles.

5. Cash-for-grass rebates: Customers are currently provided with an incentive of up to $0.5 per square-foot of turf removed and replaced with landscape appropriate plants. Depending on the success of MWA's program, this program will be considered by GSWC for both residential and CII customers; it is currently being offered in select GSWC systems.

6. Expansion of large landscape program: GSWC will be evaluating the effectiveness of the current landscape program and making adjustments depending on the results. If the program is found to be successful at meeting reduction targets, the program may be accelerated and more devices will be offered, such as precision nozzles.

Building Code/New Standards

Although it does not have regulatory authority, GSWC supports adoption of new building standards, beyond those currently in code to enhance conservation. If all current code changes that improve the efficiency of fixtures and design are implemented, it could account for up to 60 percent of the expected reduction in demand. Some of the changes proposed will be captured in the CAL Green Building Code, adopted January 2011 as well as SB407 (Plumbing Retrofit on Resale) and standard updates for toilets and washers that are being phased in.

Information/Tracking

Information and tracking represents a new element to the existing programs focusing on collecting and processing information and ensuring that the programs are on track to meet the goals. These activities will also help in program design by providing more robust information about customers and their water use patterns. The immediate priorities include:

1. Automatic Meter Reading (AMR): GSWC will continue to implement and utilize AMR in its systems as a priority to obtain real time data for water usage and identify customer-side leaks. GSWC currently follows the requirements of CPUC General Order 103-A, which prescribe minimum water system design, O&M standards for water utilities, and includes requirements for calibrating, testing frequency, and replacing water meters. AMR data, where available can also help GSWC monitor the impacts of existing programs, make adjustments where necessary and develop new programs.

2. Water Use Tracking Tools: Another priority, GSWC will consider plans to design and develop database tracking tools for water savings associated with its conservation plans and increase flexibility in adding or changing program elements.

7.5.1 Consideration of Economic Impacts

Since funding for all conservation activities is subject to approval by the CPUC before programs can be implemented, the economic impacts of complying with SBX7-7 have not yet been fully determined. However, an economic analysis to help develop programs that avoid placing disproportionate burdens on any single sector will be prepared during development of the SBX7-7 water use efficiency program. The annual costs associated with implementing all traditional CUWCC programmatic BMPs cannot be determined because it represents the combined efforts of MWA and GSWC, where funding levels, incentives and particular measures change from year to year. To continue benefiting customers, GSWC will take advantage of applicable partnership programs that will make conservation programs more efficient and cost effective.

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Chapter 8: Water Shortage Contingency Plan

Section 10632 of the Act details the requirements of the water-shortage contingency analysis. The Act states the following:

> *Section 10632. The plan shall provide an urban water-shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:*
>
> *(a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions, which are applicable to each stage.*
>
> *(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.*
>
> *(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.*
>
> *(d) Additional, mandatory prohibitions against specific water-use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.*
>
> *(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water-use reduction consistent with up to a 50 percent reduction in water supply.*
>
> *(f) Penalties or charges for excessive use, where applicable.*
>
> *(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.*
>
> *(h) A draft water shortage contingency resolution or ordinance.*
>
> *(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.*

This chapter documents GSWC's Water Shortage Contingency Plan for the Barstow System per requirements of Section 10632 of the Act. The Water Shortage Contingency Plan is based on Rule No. 14.1 Mandatory Water Conservation, Restrictions and Ratings Program adopted by GSWC and on file with CPUC. Appendix D contains the full text of the rule.

The purpose of the Water Shortage Contingency Plan is to provide a plan of action to be followed during the various stages of a water shortage. The plan includes the following elements: action stages, estimate of minimum supply available, actions to be implemented during a catastrophic interruption of water supplies, prohibitions, penalties and consumption reduction methods, revenue impacts of reduced sales, and water use monitoring procedures.

8.1 Action Stages

The Act requires documentation of actions to be undertaken during a water shortage. GSWC has developed actions to be undertaken in response to water supply shortages, including up to a 50 percent reduction in water supply. Implementation of the actions is dependent upon approval of the CPUC, especially for implementing mandatory water use restriction. CPUC has jurisdiction over GSWC because GSWC is an investor-owned water utility. Section 357 of the California Water Code requires that suppliers subject to regulation by the CPUC secure its approval before imposing water consumption regulations and restrictions required by water supply shortage emergencies.

GSWC has grouped the actions to be taken during a water shortage into four stages, I through IV, that are based on the water supply conditions. Table 8-1 describes the water supply shortage stages and conditions. The stages will be implemented during water supply shortages according to shortage level, ranging from 5 percent shortage in Stage I to 50 percent shortage in Stage IV. A water shortage declaration will be made by the American States Water Company Board. The water shortage stage determination during a water supply shortage will be made by the Regional Vice President Customer Service.

Table 8-1: Water Supply Shortage Stages and Conditions

Stage No.	Water Shortage Supply Conditions	Shortage Percent
I	Minimum	5 - 10
II	Moderate	10 - 20
III	Severe	20 - 35
IV	Critical	35 - 50

Note:
This table is based on the DWR Guidebook Table 35.

The actions to be undertaken during each stage include, but are not limited to, the following:

Stage I (5 - 10 percent shortage) – Water alert conditions are declared and voluntary conservation is encouraged. The drought situation is explained to the public and governmental bodies. GSWC explains the possible subsequent water shortage stages in order to forecast possible future actions for the customer base. The activities performed by GSWC during this stage include, but are not limited to:

- Public information campaign consisting of distribution of literature, speaking engagements, website updates, bill inserts, and conversation messages printed in local newspapers
- Educational programs in area schools
- Conservation Hotline, a toll-free number with trained Conservation Representatives to answer customer questions about conservation and water use efficiency

Stage II (10 - 20 percent shortage) – Stage II will include actions undertaken in Stage I. In addition, GSWC may propose voluntary conservation allotments and/or require mandatory conservation rules. The severity of actions depends upon the percent shortage. The level of voluntary or mandatory water use reduction requested from the customers is also based on the severity. It needs to be noted that prior to implementation of any mandatory reductions, GSWC must obtain approval from CPUC. If necessary, GSWC may also support passage of drought ordinances by appropriate governmental agencies.

Stage III (20 - 35 percent shortage) – Stage III is a severe shortage that entails or includes allotments and mandatory conservation rules. This phase becomes effective upon notification by the GSWC that water usage is to be reduced by a mandatory percentage. GSWC implements mandatory reductions after receiving approval from CPUC. Rate changes are implemented to penalize excess usage. Water use restrictions are put into effect, i.e. prohibited uses can include restrictions of daytime hours for watering, excessive watering resulting in gutter flooding, using a hose without a shutoff device, use of non-recycling fountains, washing down sidewalks or patios, unrepaired leaks, etc. GSWC monitors production weekly for compliance with necessary reductions. Use of flow restrictors is implemented if abusive practices are documented.

Stage IV (35 - 50 percent shortage) – This is a critical shortage that includes all steps taken in prior stages regarding allotments and mandatory conservation. All activities are intensified and production is monitored daily by GSWC for compliance with necessary reductions.

8.2 Minimum Supply

The Act requires an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for GSWC's water supply.

Table 8-2 summarizes the minimum volume of water available from each source during the next three years based on multiple-dry water years and normal water year. The driest three-year historic sequence is provided in Chapter 6. The water supply quantities for 2011 to 2013 are calculated by linearly interpolating between the projected water supplies of 2010 and 2015 for normal years. The water supplies for 2010 and 2015 are presented in Chapter 4.

GSWC currently obtains all of its water supply for the Barstow System from several groundwater wells located in the Mojave Basin's Centro Subarea. The amount of groundwater pumped from the Basin is regulated by the terms of the judgment entered by the Mojave Basin. Imported water in the Mojave Basin is presently used as replenishment water to recharge groundwater. GSWC's groundwater supply for the Barstow System is expected to continue to be 100 percent reliable. Groundwater reliability is based on GSWC's share of the projected Mojave Basin's annual FPA, its ability under the Judgment to produce groundwater in excess of its FPA subject to payment of a replenishment assessment, and the numerous current and planned projects in the Mojave Basin designed to compensate for all overproduction from the Basin and to generally increase the reliability of the groundwater supply.

Table 8-2: Three-Year Estimated Minimum Water Supply in ac-ft/yr

Source	2011	2012	2013	2010 Average Year
Purchased water	0	0	0	0
FPA Groundwater	7,818	8,341	8,863	7,295
Recycled water	0	0	0	0
Total	7,818	8,341	8,863	7,295

Note:
This table is based on the DWR Guidebook Table 31.

8.3 Catastrophic Supply Interruption Plan

The Act requires documentation of actions to be undertaken by the water supplier to prepare for, and implement during, a catastrophic interruption of water supplies. A catastrophic interruption constitutes a proclamation of a water shortage and could result from any event (either natural or man-made) that causes a water shortage severe enough to classify as either a Stage III or Stage IV water supply shortage condition.

In order to prepare for catastrophic events, GSWC has prepared an Emergency Response Plan (ERP) in accordance with other state and federal regulations. The purpose of this plan is to design actions necessary to minimize the impacts of supply interruptions due to catastrophic events.

The ERP coordinates overall company response to a disaster in any and all of its districts. In addition, the ERP requires each district to have a local disaster plan that coordinates emergency responses with other agencies in the area. The ERP also provides details on actions to be undertaken during specific catastrophic events. Table 8-3 provides a summary of actions cross-referenced against specific catastrophes for three of the most common possible catastrophic events: regional power outage, earthquake, and malevolent acts.

In addition to specific actions to be undertaken during a catastrophic event, GSWC performs maintenance activities, such as annual inspections for earthquake safety, and budgets for spare items, such as auxiliary generators, to prepare for potential events.

Table 8-3: Summary of Actions for Catastrophic Events

Possible Catastrophe	Summary of Actions
Regional power outage	• Isolate areas that will take the longest to repair and/or present a public health threat. Arrange to provide emergency water. • Establish water distribution points and ration water if necessary. • If water service is restricted, attempt to provide potable water tankers or bottled water to the area. • Make arrangements to conduct bacteriological tests, in order to determine possible contamination. • Utilize backup power supply to operate pumps in conjunction with elevated storage.
Earthquake	• Assess the condition of the water supply system. • Complete the damage assessment checklist for reservoirs, water treatment plants, wells and boosters, system transmission and distribution. • Coordinate with Cal EMA utilities group or fire district to identify immediate fire fighting needs. • Isolate areas that will take the longest to repair and/or present a public health threat. Arrange to provide emergency water. • Prepare report of findings, report assessed damages, advise as to materials of immediate need and identify priorities including hospitals, schools and other emergency operation centers. • Take actions to preserve storage. • Determine any health hazard of the water supply and issue any “Boil

Possible Catastrophe	Summary of Actions
	Water Order" or "Unsafe Water Alert" notification to the customers, if necessary. • Cancel the order or alert information after completing comprehensive water quality testing. • Make arrangements to conduct bacteriological tests, in order to determine possible contamination.
Malevolent acts	• Assess threat or actual intentional contamination of the water system. • Notify local law enforcement to investigate the validity of the threat. • Get notification from public health officials if potential water contamination • Determine any health hazard of the water supply and issue any "Boil Water Order" or "Unsafe Water Alert" notification to the customers, if necessary. • Assess any structural damage from an intentional act. • Isolate areas that will take the longest to repair and or present a public health threat. Arrange to provide emergency water.

Table 8-3: Summary of Actions for Catastrophic Events

8.4 Prohibitions, Penalties, and Consumption Reduction Methods

The Act requires an analysis of mandatory prohibitions, penalties, and consumption reduction methods against specific water use practices which may be considered excessive during water shortages. Given that GSWC is an investor-owned entity, it does not have the authority to pass any ordinance enacting specific prohibitions or penalties. In order to enact or rescind any prohibitions or penalties, GSWC would seek approval from CPUC to enact or rescind Rule No. 14.1, Mandatory Conservation and Rationing, which is included in Appendix D. When Rule No. 14.1 has expired or is not in effect, mandatory conservation and rationing measures will not be in force.

Rule No. 14.1 details the various prohibitions and sets forth water use violation fines, charges for removal of flow restrictors, as well as establishes the period during which mandatory conservation and rationing measures will be in effect. The prohibitions on various wasteful water uses, include, but are not limited to, the hose washing of sidewalks and driveways using potable water, and cleaning for filling decorative fountains. Table 8-4 summarizes the various prohibitions and the stages during which the prohibition becomes mandatory.

Table 8-4: Summary of Mandatory Prohibitions	
Examples of Prohibitions	**Stage When Prohibition Becomes Mandatory**
Uncorrected plumbing leaks	II, III, IV
Watering which results in flooding or run-off in gutters, waterways, patios, driveway, or streets	II, III, IV
Washing aircraft, cars, buses, boats, trailers, or other vehicles without a positive shut-off nozzle on the outlet end of the hose	II, III, IV
Washing buildings, structures, sidewalks, walkways, driveways, patios, parking lots, tennis courts, or other hard-surfaced areas in a manner which results in excessive run-off	II, III, IV
Irrigation of non-permanent agriculture	II, III, IV
Use of water for street watering with trucks or for construction purposes unless no other source of water or other method can be used	II, III, IV
Use of water for decorative fountains or the filling or topping off of decorative lakes or ponds	II, III, IV
Filling or refilling of swimming pools	II, III, IV

Note:
This table is based on the DWR Guidebook Table 36.

In addition to prohibitions during water supply shortage events requiring a voluntary or mandatory program, GSWC will make available to its customers water conservation kits as required by GSWC's Rule No. 20. GSWC will notify all customers of the availability of conservation kits.

In addition to prohibitions, Rule No. 14.1 provides penalties and charges for excessive water use. The enactment of these penalties and charges is contingent on approval of Rule 14.1 implementation by the CPUC. When the rule is in effect, violators receive one verbal and one written warning after which a flow-restricting device may be installed in the violator's service for a reduction of up to 50 percent of normal flow or 6 ccf per month, whichever is greater.

Table 8-5 summarizes the penalties and charges and the stage during which they take effect.

Table 8-5: Summary of Penalties and Charges for Excessive Use	
Penalties or Charges	**Stage When Penalty Takes Effect**
Penalties for not reducing consumption	III, IV
Charges for excess use	III, IV
Flat fine; Charge per unit over allotment	III, IV
Flow restriction	III, IV
Termination of service	III, IV

Note:
This table is based on the DWR Guidebook Table 38.

In addition to prohibitions and penalties, GSWC can use other consumption reduction methods to reduce water use up to 50 percent. Based on the requirements of the Act, Table 8-6 summarizes the methods that can be used by GSWC in order to enforce a reduction in consumption, where necessary.

Table 8-6: Summary of Consumption Reduction Methods

Consumption Reduction Method	Stage When Method Takes Effect	Projected Reduction Percentage
Demand reduction program	All Stages	N/A
Reduce pressure in water lines; Flow restriction	III, IV	N/A
Restrict building permits; Restrict for only priority uses	II, III, IV	N/A
Use prohibitions	II, III, IV	N/A
Water shortage pricing; Per capita allotment by customer type	II, IV	N/A
Plumbing fixture replacement	All Stages	N/A
Voluntary rationing	II	N/A
Mandatory rationing	III, IV	N/A
Incentives to reduce water consumption; Excess use penalty	III, IV	N/A
Water conservation kits	All Stages	N/A
Education programs	All Stages	N/A
Percentage reduction by customer type	III, IV	N/A

Note:
This table is based on the DWR Guidebook Table 37.

8.5 Revenue Impacts of Reduced Sales

Section 10632(g) of the Act requires an analysis of the impacts of each of the actions taken for conservation and water restriction on the revenues and expenditures of the water supplier. Because GSWC is an investor-owned water utility and, as such, is regulated by the CPUC, the CPUC authorizes it to establish memorandum accounts to track expenses and revenue shortfalls caused by both mandatory rationing and voluntary conservation efforts. Utilities with CPUC-approved water management plans are authorized to implement a surcharge to recover revenue shortfalls recorded in their drought memorandum accounts. Table 8-7 provides a summary of actions with associated revenue reductions; while Table 8-8 provides a summary of actions and conditions that impact expenditures. Table 8-9 summarizes the proposed measures to overcome revenue impacts. Table 8-10 provides a summary of the proposed measures to overcome expenditure impacts.

Table 8-7: Summary of Actions and Conditions that Impact Revenue	
Type	**Anticipated Revenue Reduction**
Reduced sales	Reduction in revenue will be based on the decline in water sales and the corresponding quantity tariff rate
Recovery of revenues with CPUC-approved surcharge	Higher rates may result in further decline in water usage and further reduction in revenue

Table 8-8: Summary of Actions and Conditions that Impact Expenditures	
Category	**Anticipated Cost**
Increased staff cost	Salaries and benefits for new hires required to administer and implement water shortage program
Increased O&M cost	Operating and maintenance costs associated with alternative sources of water supply
Increased cost of supply and treatment	Purchase and treatment costs of new water supply

Table 8-9: Proposed Measures to Overcome Revenue Impacts	
Names of Measures	**Summary of Effects**
Obtain CPUC-approved surcharge	Allows for recovery of revenue shortfalls brought on by water shortage program
Penalties for excessive water use	Obtain CPUC approval to use penalties to offset portion of revenue shortfall

Table 8-10: Proposed Measures to Overcome Expenditure Impacts	
Names of Measures	**Summary of Effects**
Obtain CPUC-approved surcharge	Allows for recovery of increased expenditures brought on by water shortage program
Penalties for excessive water use	Obtain CPUC approval to use penalties to offset portion of increased expenditures

8.6 Water-Use Monitoring Procedures

The Act asks for an analysis of mechanisms for determining actual reduction in water use when the Water Shortage Contingency Plan is in effect. Table 8-11 lists the possible mechanisms used by GSWC to monitor water use and the quality of data expected.

Table 8-11: Water-Use Monitoring Mechanisms

Mechanisms for Determining Actual Reductions	Type and Quality of Data Expected
Customer meter readings	Hourly/daily/monthly water consumption data for a specific user depending on frequency of readings
Production meter readings	Hourly/daily/monthly water production depending on frequency of readings; correlates to water use plus system losses

In addition to the specific actions that GSWC can undertake to verify level of conservation, GSWC can monitor long-term water use through regular bi-monthly meter readings, which give GSWC the ability to flag exceptionally high usage for verification of water loss or abuse.

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Chapter 9: References

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Appendix A

Urban Water Management Planning Act

CALIFORNIA WATER CODE DIVISION 6
PART 2.6. URBAN WATER MANAGEMENT PLANNING

All California Codes have been updated to include the 2010 Statutes.

WATER CODE
SECTION 10610-10610.4

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. (a) The Legislature finds and declares all of the following:

(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.

(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.

(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.

(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.

(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.

(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.

(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.

(9) The quality of source supplies can have a significant impact

on water management strategies and supply reliability.
(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:
(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.
(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.
(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

WATER CODE
SECTION 10611-10617

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

WATER CODE
SECTION 10620-10621

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621. (a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

WATER CODE
SECTION 10630-10634

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter that shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.

(B) A single dry water year.

(C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.
(K) Conservation pricing.
(L) Water conservation coordinator.
(M) Water waste prohibition.
(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

(j) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivisions (f) and (g) by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum.

(k) Urban water suppliers that rely upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).

10631.1. (a) The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

(b) It is the intent of the Legislature that the identification of projected water use for single-family and multifamily residential housing for lower income households will assist a supplier in complying with the requirement under Section 65589.7 of the Government Code to grant a priority for the provision of service to housing units affordable to lower income households.

10631.5. (a) (1) Beginning January 1, 2009, the terms of, and eligibility for, a water management grant or loan made to an urban water supplier and awarded or administered by the department, state board, or California Bay-Delta Authority or its successor agency shall be conditioned on the implementation of the water demand management measures described in Section 10631, as determined by the department pursuant to subdivision (b).

(2) For the purposes of this section, water management grants and loans include funding for programs and projects for surface water or groundwater storage, recycling, desalination, water conservation, water supply reliability, and water supply augmentation. This section does not apply to water management projects funded by the federal American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

(3) Notwithstanding paragraph (1), the department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, if the urban water supplier has submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for implementation of the water demand management measures. The supplier may request grant or loan funds to implement the water demand management measures to the extent the request is consistent with the eligibility requirements applicable to the water management funds.

(4) (A) Notwithstanding paragraph (1), the department shall

determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, if an urban water supplier submits to the department for approval documentation demonstrating that a water demand management measure is not locally cost effective. If the department determines that the documentation submitted by the urban water supplier fails to demonstrate that a water demand management measure is not locally cost effective, the department shall notify the urban water supplier and the agency administering the grant or loan program within 120 days that the documentation does not satisfy the requirements for an exemption, and include in that notification a detailed statement to support the determination.

(B) For purposes of this paragraph, "not locally cost effective" means that the present value of the local benefits of implementing a water demand management measure is less than the present value of the local costs of implementing that measure.

(b) (1) The department, in consultation with the state board and the California Bay-Delta Authority or its successor agency, and after soliciting public comment regarding eligibility requirements, shall develop eligibility requirements to implement the requirement of paragraph (1) of subdivision (a). In establishing these eligibility requirements, the department shall do both of the following:

(A) Consider the conservation measures described in the Memorandum of Understanding Regarding Urban Water Conservation in California, and alternative conservation approaches that provide equal or greater water savings.

(B) Recognize the different legal, technical, fiscal, and practical roles and responsibilities of wholesale water suppliers and retail water suppliers.

(2) (A) For the purposes of this section, the department shall determine whether an urban water supplier is implementing all of the water demand management measures described in Section 10631 based on either, or a combination, of the following:

(i) Compliance on an individual basis.

(ii) Compliance on a regional basis. Regional compliance shall require participation in a regional conservation program consisting of two or more urban water suppliers that achieves the level of conservation or water efficiency savings equivalent to the amount of conservation or savings achieved if each of the participating urban water suppliers implemented the water demand management measures. The urban water supplier administering the regional program shall provide participating urban water suppliers and the department with data to demonstrate that the regional program is consistent with this clause. The department shall review the data to determine whether the urban water suppliers in the regional program are meeting the eligibility requirements.

(B) The department may require additional information for any determination pursuant to this section.

(3) The department shall not deny eligibility to an urban water supplier in compliance with the requirements of this section that is participating in a multiagency water project, or an integrated regional water management plan, developed pursuant to Section 75026 of the Public Resources Code, solely on the basis that one or more of

the agencies participating in the project or plan is not implementing all of the water demand management measures described in Section 10631.

(c) In establishing guidelines pursuant to the specific funding authorization for any water management grant or loan program subject to this section, the agency administering the grant or loan program shall include in the guidelines the eligibility requirements developed by the department pursuant to subdivision (b).

(d) Upon receipt of a water management grant or loan application by an agency administering a grant and loan program subject to this section, the agency shall request an eligibility determination from the department with respect to the requirements of this section. The department shall respond to the request within 60 days of the request.

(e) The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities. In addition, for urban water suppliers that are signatories to the Memorandum of Understanding Regarding Urban Water Conservation in California and submit biennial reports to the California Urban Water Conservation Council in accordance with the memorandum, the department may use these reports to assist in tracking the implementation of water demand management measures.

(f) This section shall remain in effect only until July 1, 2016, and as of that date is repealed, unless a later enacted statute, that is enacted before July 1, 2016, deletes or extends that date.

10631.7. The department, in consultation with the California Urban Water Conservation Council, shall convene an independent technical panel to provide information and recommendations to the department and the Legislature on new demand management measures, technologies, and approaches. The panel shall consist of no more than seven members, who shall be selected by the department to reflect a balanced representation of experts. The panel shall have at least one, but no more than two, representatives from each of the following: retail water suppliers, environmental organizations, the business community, wholesale water suppliers, and academia. The panel shall be convened by January 1, 2009, and shall report to the Legislature no later than January 1, 2010, and every five years thereafter. The department shall review the panel report and include in the final report to the Legislature the department's recommendations and comments regarding the panel process and the panel's recommendations.

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

(2) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic

sequence for the agency's water supply.

(3) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(4) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(5) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(6) Penalties or charges for excessive use, where applicable.

(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(8) A draft water shortage contingency resolution or ordinance.

(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

(b) Commencing with the urban water management plan update due December 31, 2015, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

(c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

WATER CODE SECTION 10635

10635. (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

WATER CODE
SECTION 10640-10645

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).
The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. (a) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.
(b) The department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall identify the exemplary elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has submitted its plan to the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.
(c) (1) For the purpose of identifying the exemplary elements of the individual plans, the department shall identify in the report those water demand management measures adopted and implemented by specific urban water suppliers, and identified pursuant to Section

10631, that achieve water savings significantly above the levels established by the department to meet the requirements of Section 10631.5.

(2) The department shall distribute to the panel convened pursuant to Section 10631.7 the results achieved by the implementation of those water demand management measures described in paragraph (1).

(3) The department shall make available to the public the standard the department will use to identify exemplary water demand management measures.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

WATER CODE
SECTION 10650-10656

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the

"Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

Appendix B

Public Hearing Notices, Notifications, and Meeting Minutes

Golden State
Water Company
A Subsidiary of American States Water Company

19 July 2010

Mike Massimini
Assistant City Planner
City of Barstow
222 E. Mountain View St., Suite A
Barstow, CA 92311

Subject: Golden State Water Company - Barstow System
2010 Urban Water Management Plan Preparation Notification and Information Request
K/J 1070001*00

Dear Mike Massimini:

Golden State Water Company (GSWC) is currently in the process of preparing its 2010 Urban Water Management Plan (UWMP) for the Barstow system as required by State of California Law through the Urban Water Management Planning Act. The UWMP Act requires that Urban Water Retailers document water supply, reliability and other issues through the year 2035. This letter is provided as your official notice of UWMP preparation and request for information since your agency has governmental jurisdiction, possibly including land use planning over the Barstow system area. The UWMP process is intended to be a collaborative effort between all project stakeholders to the extent practicable.

Please review the enclosed figure showing the Barstow system service area and advise whether there are any issues that should be considered by GSWC in preparation of this UWMP. Items for consideration may include land developments anticipated between 2010 and 2035 within or immediately adjacent to the water system. Please also provide any pertinent supporting documentation. We will be happy to provide you with an electronic copy of the 2005 UWMP at your request.

We appreciate timely attention to the information requested above and ask you to provide a response no later than **3 August 2010**. Kennedy/Jenks Consultants is preparing the UWMP under contract with GSWC and will be contacting you directly within the next few weeks to follow up on this request. In the meantime, should you have any questions or concerns please feel free to contact Sean Maguire with Kennedy/Jenks Consultants at seanmaguire@kennedyjenks.com or (916) 858-2700.

Very truly yours,

GOLDEN STATE WATER COMPANY

Dan W. Talaga

Dan W. Talaga, P.E.
Sr. Civil Engineer

Enclosure

3035 Prospect Park Drive, Ste. 60, Rancho Cordova, CA 95670
Tel: (916) 853-3600 Fax: (916) 852-0171 www.aswater.com

Golden State
Water Company
A Subsidiary of American States Water Company

19 July 2010

Michael Hays
Director Land Use Services Department
County of San Bernardino
385 N. Arrowhead Avenue
San Bernardino, CA 92415

Subject: Golden State Water Company - Barstow System
2010 Urban Water Management Plan Preparation Notification and Information Request
K/J 1070001*00

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Very truly yours,

GOLDEN STATE WATER COMPANY

Dan W. Talaga

Dan W. Talaga, P.E.
Sr. Civil Engineer

Enclosure

3035 Prospect Park Drive, Ste. 60, Rancho Cordova, CA 95670
Tel: (916) 853-3600 Fax: (916) 852-0171 www.aswater.com

Golden State
Water Company
A Subsidiary of American States Water Company

April 28, 2011

City of Barstow
Assistant City Planner
Mike Massimini
222 E. Mountain View St., Suite A
Barstow, CA 92311

Subject: Notification of Public Hearing for the 2010 Urban Water Management Plan (UWMP)
Golden State Water Company – Barstow System

Dear Mike:

Golden State Water Company (GSWC) is providing you this reminder of our July 19, 2010 notice pursuant to Water Code, section 10621, subdivision (b) of the Act, which requires an urban water supplier to notify any city or county within which it provides water Barstow. We anticipate the UWMP will be available for public review one week prior to the public hearing and can be reviewed during normal business hours. **Please call 1-800-999-4033 to make an appointment to view the plan at:**

Barstow Customer Service Office
1521 East Main Street
Barstow, CA 92311

A public hearing to solicit comments on the draft UWMP will be held at 6:00 p.m., on Thursday, June 9, 2011 and take place at:

Golden State Water Company Barstow Office
1521 East Main Street
Barstow, CA 92311

If you have any questions please contact me at (916) 853-3612.

Very truly yours,

GOLDEN STATE WATER COMPANY

Ernest A Gisler

Ernest A Gisler
Planning Manager

Golden State Water Company
A Subsidiary of American States Water Company

April 28, 2011

County of San Bernardino
Michael Hayes
Director Land Use Services Department
385 N. Arrowhead Avenue
San Bernardino, CA 92415

Subject: Notification of Public Hearing for the 2010 Urban Water Management Plan (UWMP)
Golden State Water Company – Barstow System

Dear Michael:

Golden State Water Company (GSWC) is providing you this reminder of our July 19, 2010 notice pursuant to Water Code, section 10621, subdivision (b) of the Act, which requires an urban water supplier to notify any city or county within which it provides water that it is reviewing its plan and considering changes to the plan for the following water system: Barstow. We anticipate the UWMP will be available for public review one week prior to the public hearing and can be reviewed during normal business hours. **Please call 1-800-999-4033 to make an appointment to view the plan at:**

Barstow Customer Service Office
1521 East Main Street
Barstow, CA 92311

A public hearing to solicit comments on the draft UWMP will be held at 6:00 p.m., on Thursday, June 9, 2011 and take place at:

Golden State Water Company Barstow Office
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Barstow, CA 92311

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Very truly your

GOLDEN STATE WATER COMPANY

Ernest A Gisler
Planning Manager-

PROOF OF PUBLICATION

(2015.5 C.C.P.)

STATE OF CALIFORNIA,
County of San Bernardino

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the publisher of the DESERT DISPATCH, a newspaper of general circulation, published in the City of Barstow, County of San Bernardino, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of San Bernardino, State of California, under the date of February 27, 1996, Case Number BVC 02359, that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

April 5

All in the year 2011.

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated this: 5th **day of** April **2011.**

Leslie Jacobs

Signature

Leslie Jacobs

This space is the County Clerk's Filing Stamp

Proof of Publication of
NOTICE OF PUBLIC HEARING

Golden State
Water Company

Notice of Public Hearing

In conformance with the California Urban Water Management Planning Act, Golden State Water Company is hosting a public hearing on June 9, from 4 to 5 p.m. at the Golden State Water Company Barstow office, 1521 East Main Street, Barstow, to solicit comments on the Urban Water Management Plan (UWMP) for the company's Barstow Water System.

The UWMP is available for public review prior to the public hearing and can be reviewed during normal business hours. Please call 1-800-999-4033 to make an appointment to view the plan at:

Barstow Customer Service Office
1521 East Main Street,
Barstow, CA 92311

For more information, visit
www.gswater.com.

CNS#2074800

Published In The Desert Dispatch
April 5, 2011
(Tu-15)

A000002136889

Golden State Water Company
A Subsidiary of American States Water Company

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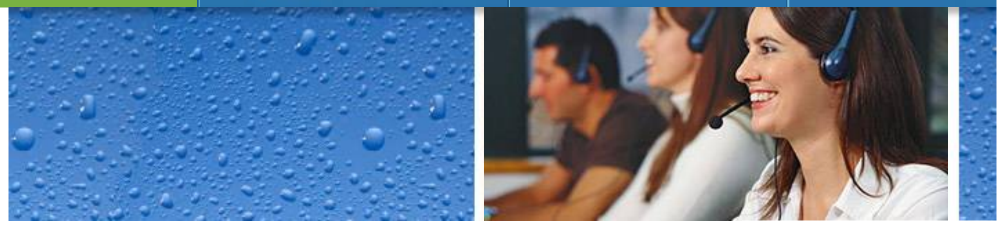
About Golden State Water Company | Customer Service | Conservation Information & Rebates | Rates, Schedules & Tariffs | Water Quality



Customer Service Home Page
Find Local Office Information
Payment Options
Understanding Your Bill
How to Read Your Meter
Definitions and Terminology
Frequently Asked Questions
New Customer Brochure

For 24-hour customer service or emergency please call

1-800-999-4033
24 hours, 7 days a week

877-933-9533
TTY (hearing impaired)

Find Local Office Information » Barstow

Barstow Customer Service Area

Areas Serviced
This Customer Service Area serves approximately 8,910 customers in Barstow

Office Location
Barstow CSA
1521 E. Main Street
Barstow, CA 92311

24 hour Customer Service and Emergency
800-999-4033 (24 hours, 7 days a week)
877-933-9533 (TTY hearing impaired)
Email: customerservice@gswater.com

WATER CONSERVATION TIPS

Run only full loads in the washing machine and dishwasher and save 300 to 800 gallons a month.

Urban Water Management Plan
Public Meeting Notice

Golden State Water Company is in the process of updating its Barstow Urban Water Management Plan and is seeking public input. To review the plan, please click here.

See public notice for more information.

March 3, 2011 Update

Golden State Water Company's
Barstow Water System
Continues to Meet Drinking Water Standards

Since a Do Not Drink Water Advisory ended Nov. 24, 2010, no detectable levels of perchlorate have been found in any of the wells in service operated by Golden State Water Company (GSWC) in Barstow, and the water system meets all drinking water standards.

The one GSWC operating well that was found to have exceeded the limit for perchlorate in November has been shut down and remains out of service.

GSWC is following the California Department of Public Health directions on monitoring for perchlorate. The company also is working with the Lahontan Regional Water Quality Control Board in its investigation into the cause of the perchlorate contamination.

For more information about our response to the perchlorate situation, read the following:

Customer Q&A
en español

GSWC Files a Cost of Capital Application

A Cost of Capital application was filed May 2, 2011 with the the California Public Utilities Commission (CPUC). The CPUC regulates GSWC to ensure adequate levels of service are provided at the lowest reasonable costs.

In this filing, GSWC is requesting for the CPUC to review and authorize an increase in the cost of capital reflected in rates for 2012, 2013, and 2014. A decision is expected in December 2011.

A copy of the application is here.

New Rates Established
in Barstow Customer Service Area
for 2011 and 2012

The CPUC issued a final decision on the company's 2008 General Rate Case on Nov. 19, 2010. The decision established rates for GSWC to charge customers for 2010, 2011 and 2012 in its Region III, which includes the Barstow Customer Service Area.

Fact Sheet

RATES, SCHEDULES & TARIFFS

Residential Metered Service
Non-Residential Metered Service

CLICK HERE to view all our rates, tariffs and advice letters

Third Tier Added to Tiered Rates for Barstow Customer Service Area to Encourage Water Use Efficiency

Golden State Water Company (GSWC) residential customers in the utility's Barstow Customer Service Area (CSA) had a third tier added to their tiered rates to promote water use efficiency. The change, approved by the California Public Utilities Commission, began in December 2010. GSWC will not exceed CPUC authorized revenues as a result of tiered rates.

Here's how tiered rates work. Customers get charged for each unit of water they use. A unit is equal to one hundred cubic feet of water, or Ccf (748 gallons). In the Barstow CSA, residential customers will pay the lowest rate for each Ccf they use in tier one, up to 13 Ccf. For every unit of water used in tier two, which is 14-21 Ccf, customers will pay a 15 percent higher rate. In tier three, customers will pay an additional 15 percent for every unit of water from 22 Ccf and above.

The top of the first tier is based on the average winter month usage for the service area. The top of second tier is based on the midpoint between the annual average usage and the average summer month usage for the service area. The per unit price differential between each tier is approximately 15 percent, a sufficient amount to encourage water use efficiency.

For more information, see our Residential Metered Service tariff in the article above.

LOW INCOME PROGRAM
California Alternate Rates for Water (CARW)

Golden State Water Company offers a discount through the California Alternate Rates for Water (CARW) program to eligible customers. The amount of the discount is $8 per month, which is equal to 15 percent of the average bill in your customer service area.

If you qualify for a rate discount on your electricity, you may be eligible for a discount on your water bill. Qualifications are based on the number of people living in your home and your total household income, including wages, government checks and benefits, and other financial support you and members of your family receive.

For further information, see the application below or contact our CARW hotline at (866) 360-CARW (2279).

Application (English)
Application (Spanish)

WATER CONSERVATION REBATE PROGRAMS

Golden State Water Company partners with other agencies to offer various rebate programs as an incentive for customers to purchase water-efficient products. Here are some programs created for Barstow customers. Funding is limited.

Cash for Grass
Up to $1.50 per square foot and up to $3,000 per household is offered to replace lawn with eligible water-efficient landscaping.
Call 1-800-999-4033.

High-Efficiency Toilet and High Efficiency Clothes Washer Rebates
Rebates up to $125.
Call 1-800-999-4033.

To learn more about our current rebate programs, please call customer service at 800-999-4033.

WATER QUALITY ANNUAL REPORT

Barstow

Terms of Use | Privacy Policy

Home Page | About Golden State Water Company | Customer Service | Find Your Local Office | Understanding Your Bill
Conservation Information and Rebate Programs | Rates, Schedules and Tariffs | Water Quality | Contact Us

For 24-hour emergency and customer service, please call: 1-800-999-4033 or 877-933-9533 TTY (hearing impaired)
customerservice@gswater.com

Website design by NetPilot Web Solutions

No Meeting Minutes were taken since there was no attendance by the public.

Appendix C

Council Annual Reports for Demand Management Measures

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Agency: **Golden State Water Company** **District Name:** **Barstow** **CUWCC Unit #:** **5033**
Retail

Primary Contact John Turner **Telephone** (909) 394-3600 Ext 74 **Email:** johnturner@gswater.com

Compliance Option Chosen By Reporting Agency:
(Traditional, Flex Track or GPCD)
GPCD if used:

GPCD in 2010	**257**
GPCD Target for 2018	261

Year	Report	Target		Highest Acceptable Bound	
		% Base	**GPCD**	**% Base**	**GPCD**
2010	1	96.4%	306	100%	318
2012	2	92.8%	295	96%	306
2014	3	89.2%	284	93%	295
2016	4	85.6%	272	89%	284
2018	5	82.0%	261	82%	261

Not on Track if 2010 GPCD is ≥ than target

GPCD in 2010	**257**
Highest Acceptable GPCD for 2010	**318**

On Track

Agency: **Golden State Water Company** District Name: **Barstow** CUWCC Unit #: **5033**
Retail

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Foundational BMPs

BMP 1.1 Operational Practices

Conservation Coordinator provided with necessary resources to implement BMPs?

		2009	2010
1.Conservation Coordinator provided with necessary resources to implement BMPs?	Name	Albert Frias	Albert Frias
	Title	Water Conservation Coordinator	Water Conservation Coordinator
	Email		AlbertFrias@gswa
		On Track	**On Track**

2. Water waste prevention documentation

On Track if any one of the 6 ordinance actions done, plus documentation or links provided

	2009	2010
Descriptive File	Rule 20 = Water Conservation.	
Descriptive File 2010		Rule 20 = Water Conservation. Rule 11B = Discontinuance of Service based upon Water Wastage. Rule 14.1 can be implemented when
URL	Where negligent or wasteful use of water exists on customer's	
URL 2010		http://www.aswater.com/Organization/Rates_and_Regulations/Rates_and_Tariffs/Rule_20.pdf
Describe Ordinance Terms	Where negligent or wasteful use of water exists on customer's	
Describe Ordinance Terms 2010		Where negligent or wasteful use of water exists on customer's premises, the utility may discontinue the service if such practices are not remedied
	On Track	**On Track**

Agency: Golden State Water Company **District Name:** Barstow **CUWCC Unit #:** 5033
Retail

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

BMP 1.2 Water Loss Control

	2009		
Compile Standard Water Audit using AWWA Software?	yes	On Track	On Track if Yes, Not on Track if No
AWWA file provided to CUWCC?	Yes	On Track	On Track if Yes, Not on Track if No
AWWA Water Audit Validity Score?	72		Info only until 2012
Completed Training in AWWA Audit Method?			
Completed Training in Component Analysis Process?			Info only until 2012
Complete Component Analysis?			Info only until 2012
Repaired all leaks and breaks to the extent cost effective?	yes	On Track	On Track if Yes, Not on Track if No
Locate and repair unreported leaks to the extent cost effective.	yes	On Track	On Track if Yes, Not on Track if No
Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	yes		Info only until 2012

Provided 7 types of Water Loss Control Info — Info only until 2012

Leaks Repaired	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost of Interventions	Water Saved
0	$ -	$ -	0	0	$ -	0

	2010		
Compile Standard Water Audit using AWWA Software?	Yes	On Track	On Track if Yes, Not on Track if No
AWWA file provided to CUWCC?	Yes	On Track	On Track if Yes, Not on Track if No
AWWA Water Audit Validity Score?	78		Info only until 2012
Completed Training in AWWA Audit Method?			
Completed Training in Component Analysis Process?			Info only until 2012
Complete Component Analysis?			Info only until 2012
Repaired all leaks and breaks to the extent cost effective?	Yes	On Track	On Track if Yes, Not on Track if No
Locate and repair unreported leaks to the extent cost effective.	Yes	On Track	On Track if Yes, Not on Track if No
Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.			Info only until 2012

Provided 7 types of Water Loss Control Info — Info only until 2012

Leaks Repaired	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost of Interventions	Water Saved
0	$ -	$ -	0	0	$ -	0

Agency: **Golden State Water Company** District Name: **Barstow** CUWCC Unit #: **5033**
Retail

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

1.3 METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING CONNECTIONS

		2009		2010		
Exemption or 'At least as Effective As' accepted by CUWCC						If signed MOU prior to 31 Dec 1997, On Track if all connections metered; If signed after 31 Dec 1997, complete meter installations by 1 July 2012 or within 6 yrs of signing and 20% biannual reduction of unmetered connections.
Numbered Unmetered Accounts	2008	0	On Track	Off	On Track	On Track if no unmetered accounts
Metered Accounts billed by volume of use		Yes	On Track	Yes	On Track	Volumetric billing required for all connections on same schedule as metering
Number of CII accounts with Mixed Use meters		170		174		Info only
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?		No	On Track Until 2012	No	On Track Until 2012	On Track if Yes, Not on Track if No
Feasibility Study provided to CUWCC?		No	On Track Until 2012	No	On Track Until 2012	On Track if Yes, Not on Track if No
Completed a written plan, policy or program to test, repair and replace meters		Yes	On Track	Yes	On Track	On Track if Yes, Not on Track if No

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Agency: Golden State Water Company **District Name:** Barstow **CUWCC Unit #:** 5033

Retail

Primary Contact John Turner **Email:** johnturner@gswater.com

On Track if: Increasing Block, Uniform, Allocation, Standby Service; Not on Track if otherwise

1.4 Retail Conservation Pricing

Metered Water Rate Structure

Customer Class	2009 Rate Type	Conserving Rate?	Customer Class	2010 Rate Type	Conserving Rate?
Single-Family	Increasing Block	Yes	Single-Family	Increasing	Yes
Multi-Family	Increasing Block	Yes	Multi-Family	Increasing	Yes
Commercial	Uniform	Yes	Commercial	Uniform	Yes
Industrial	Uniform	Yes	Industrial	Uniform	Yes
Institutional	Uniform	Yes	Institutional	Uniform	Yes
	On Track			On Track	

Year Volumetric Rates began for Agencies with some Unmetered Accounts

Info only

Agencies with Partially Metered Service Areas: If signed MOU prior to 31 Dec. 1997, implementation starts no later than 1July 2010. If signed MOU after 31 Dec. 1997, implementation starts no later than 1July 2013, or within seven years of signing the MOU, Agency: Golden State Water Company District Name: Barstow CUWCC Unit #: 5033

Retail

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Adequacy of Volumetric Rates) for Agencies with No Unmetered Accounts

Customer Class	2009 Rate Type	2009 Volumetric Revenues $1000s	2010 Rate Type	2010 Volumetric Revenues $1000s
Single-Family	Increasing Block	$ 3,268	Single-Family	$ 3,239
Multi-Family	Increasing Block	$ 136	Multi-Family	$ 135
Commercial	Uniform	$ 1,813	Commercial	$ 1,797
Industrial	Uniform	$ 27	Industrial	$ 27
Institutional	Uniform	$ 379	Institutional	$ 376
Dedicated Irrigation		$ 138		$ 137
Other		$ 35		$ 35
Total Revenue Commodity Charges (V):		$ 5,797		$ 5,745
Total Revenue Fixed Charges (M):		$ 3,266		$ 3,353
Calculate: V / (V + M):		64%		63%
		On Track		On Track

Agency Choices for rates:

A) Agencies signing MOU prior to 13 June2007, implementation starts 1 July2007: On Track if (V / (V + M) ≥ 70% x .8 = **56% for 2009** and 70%x0.90 = **63% for 2010**; Not on track if (V / (V + M)) < 70%;

B) Use Canadian model.

Agencies signing MOU after 13June2007, implementation starts July 1 of year following signing.

	2009	2010
Canadian Water & Wastewater Rate Design Model Used and Provided to CUWCC	No On Track	No On Track
If Canadian Model is used, was 1 year or 3 year period applied?		

Wastewater Rates

	2009		2010
Does Agency Provide Sewer Service?	No	If 'No', then wastewater rate info not required.	No

Customer Class	2009 Rate Type	Conserving Rate?	Customer Class	2010 Rate Type	Conserving Rate?
		Yes			Yes
		Yes			Yes
		Yes			Yes
		Yes			Yes
		Yes			Yes
		Yes			Yes
		Yes			Yes
	On Track			On Track	

On Track if: 'Increasing Block', 'Uniform', 'based on long term marginal cost' or 'next unit of capacity'

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

BMP 2. EDUCATION PROGRAMS

BMP 2.1 Public Outreach Actions Implemented and Reported to CUWCC

	2009	2010	
1) Contacts with the public (minimum = 4 times per year)	20	14	
2) Water supplier contacts with media (minimum = 4 times per year, i.e., at least quarterly).	4	4	
3) An actively maintained website that is updated regularly (minimum = 4 times per year, i.e., at least quarterly).	Yes	Yes	All 6 action types implemented and reported to CUWCC to be 'On Track')
4) Description of materials used to meet minimum requirement.	General water conservation information Newsletter articles on conservation Newsletter articles on conservation Website Newspaper contacts	General water conservation information Newsletter articles on conservation Newsletter articles on conservation Website Newspaper contacts	
5) Annual budget for public outreach program.	$ 2,376	$ 2,978	
6) Description of all other outreach programs	Description is too large for text area. Data will be stored in the BMP Reporting database when online.	Description is too large for text area. Data will be stored in the BMP Reporting database when online.	
	On Track	On Track	

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

2.2 School Education Programs Implemented and Reported to CUWCC

	2009	2010	
Does a wholesale agency implement School Education Programs for this unility's benefit?	No	No	
Name of Wholesale Supplier?		0	
1) Curriculum materials developed and/or provided by agency	Discover Science Center Each participant receives classroom materials and a water conservation and activity Kit containing efficiency measures for their homes to perform the hands-on activities. Modifications were made to select materials which incorporat	Discover Science Center Each participant receives classroom materials and a water conservation and activity Kit containing efficiency measures for their homes to perform the hands-on activities. Modifications were made to select materials which incorporat	Yes/ No
2) Materials meet state education framework requirements and are grade-level appropriate?	Yes	Yes	All 5 actions types implemented and reported to CUWCC to be 'On Track'
3) Materials Distributed to K-6?	Yes	Yes	
Describe K-6 Materials	Description is too large for text area. Data will be stored in the BMP Reporting database when online.	Description is too large for text area. Data will be stored in the BMP Reporting database when online.	Describe materials to meet minimum requirements
Materials distributed to 7-12 students?	No	No	Info Only
4) Annual budget for school education program.	No Data Provided	No Data Provided	
5) Description of all other water supplier education programs	Harvest Festival & Water Awareness Month held at West Basin.	Harvest Festival & Water Awareness Month held at West Basin.	
	0 **On Track**	0 **On Track**	

Appendix D

CPUC Water Conservation and Rationing Rules and Regulations

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE

A. Customer's Request for Discontinuance of Service

1. A customer may have service discontinued by giving not less than two day's advance notice thereof to the utility. Charges for service may be required to be paid until the requested date of discontinuance or such later date as will provide not less than the required two days' advance notice.

2. When such notice is not given, the customer will be required to pay for service until two days after the utility has knowledge that the customer has vacated the premises or otherwise has discontinued water service.

B. Discontinuance of Service by Utility

1. For Nonpayment of Bills

a. Past-Due Bills. When bills are rendered monthly or bimonthly, they will be considered past due if not paid within 19 days from the date of mailing. The utility shall allow every residential customer at least 19 days from the date of mailing its bill for services, postage prepaid, to make payment of the bill. The utility may not discontinue residential service for nonpayment of a delinquent account unless the utility first gives notice of the delinquency and impeding discontinuance, at least 10 days prior to the proposed discontinuance, by means of a notice mailed, postage prepaid, to the customer to whom the service is provided if different than to whom the service is billed, not earlier than (T) 19 days from the date of mailing the utility's bill for services. The 10-day discontinuance of service notice shall not commence until five days after the mailing of the notice.

b. When a bill for water service has become past due and a 10-day discontinuance of residential service notice or a 7-day discontinuance of residential service notice for nonpayment has been issued, service may be discontinued if bill is not paid within the time required by such notice. The customer's service, however, will not be discontinued for nonpayment until the amount of any deposit made to establish credit for that service has been fully absorbed.

(Continued)

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

B. Discontinuance of Services by Utility (Continued)

1. For Nonpayment of Bills (Continued)

c. Any customer, residential as well as nonresidential, who has initiated a billing complaint or requested an investigation within 5 days of receiving a disputed bill or who has, before discontinuance of service made a request for extension of the payment period of a bill asserted to be beyond the means of the customer to pay in full within the normal period for payment, shall not have residential water service discontinued for nonpayment during the pendency of an investigation by the utility of such customer complaint or request and shall be given an opportunity for review of the complaint, investigation, or request by a review manager of the utility. The review shall include consideration of whether a residential customer shall be permitted to make installment payments on any unpaid balance of the delinquent account over a reasonable period of time, not to exceed 12 months. Such service shall not be discontinued for nonpayment for any customer complying with an installment payment agreement entered into with the utility, provided the customer also keeps current his account for water service as charges accrue in each subsequent billing period. If a residential customer fails to comply with an installment payment agreement, the utility will give a 10-day discontinuance of service notice before discontinuing such service, but such notice shall not entitle the customer to further investigation by the utility.

d. Any customer whose complaint or request for an investigation pursuant to subdivision (c) has resulted in an adverse determination by the utility may appeal the determination to the Commission. Any subsequent appeal of the dispute or complaint to the Commission shall be in accordance with the Commission adopted Rules of Practice and Procedure.

e. Service to a residential water customer will not be discontinued for nonpayment when the customer has previously established to the satisfaction of the utility that:

(Continued)

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

B. Discontinuance of Services by Utility (Continued)

1. For Nonpayment of Bills (Continued)

e. (Continued)

(1) The customer is elderly (age 62 or over) or handicapped,* or upon certification of a licensed physical or surgeon that to discontinue water will be life threatening to the customer; and

*Proof of age must be supported by certificate of birth, driver's license, passport or other reliable document. Proof of handicap must be by certification from a licensed physician, surgeon, public health nurse or social worker.

(2) The customer is temporarily unable to pay for such service in accordance with the provisions of the utility's tariffs; and

(3) The customer is willing to arrange installment payments satisfactory to the utility, over a period not to exceed 12 months, including arrangements for prompt payment of subsequent bills.

However, service may be discontinued to any customer who does not comply with an installment payment agreement or keep current his account for water service as charges accrue in each subsequent billing period.

(f) A customer's residential service may be discontinued for nonpayment of a bill for residential service previously rendered him at any location served by the utility.

A nonresidential service may be discontinued for nonpayment of a bill for residential as well as nonresidential service previously rendered him at any location served by the utility.

The discontinuance of service notice as set forth in subdivision (b) will be given in both cases stated above before discontinuance of service takes place.

(Continued)

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

B. Discontinuance of Services by Utility (Continued)

1. For Nonpayment of Bills (Continued)

f. (Continued)

Residential services will not, however, be discontinued for nonpayment of bills for separate nonresidential service.

g. Service will not be discontinued by reason of delinquency in payment for service on any Saturday, Sunday, legal holiday, or at any time during which the business offices of the utility are not open to the public.

h. Where water service is provided to residential users in a multi-unit residential structure, mobilehome park, or permanent residential structures in a labor camp, where the owner, manager, or operator is listed by the utility as the customer of record, the utility will make every good faith effort to inform the users, when the account is in arrears, that service will be dicontinued. Notice will be in as prescribed in subdivision (a) above, and in Rules Nos. 5 and 8. (T)

(T)

(1) Where said users are individually metered. (N)

The utility is not required to make service available to these users unless each user agrees to the terms and conditions of service and meets the requirement of the law and the utility's rules and tariffs. However, if one or more users are willing and able to assume responsibility for subsequent charges by these users to the account to the satisfaction of the utility, and if there is a practical physical means, legally available to the utility of selectively providing services to these users who have met the requirements of the utility's rules and tariffs, the utility will make service available to these users. For these selected users establishment of credit will be as prescribed in Rule No. 6, except that where prior service for a period of time is a condition for establishing credit with the utility, proof that is acceptable to the utility of residence and prompt payment of rent or other credit obligation during that period of time is a satisfactory equivalent.

(N)

(Continued)

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

B. Discontinuance of Services by Utility (Continued)

1. For Nonpayment of Bills (Continued)

h. (Continued)

(2) Where said users are master metered. (N)

The utility is not required to make service available to these users unless each user agrees to the terms and conditions of service, and meets the requirements of the law and the utility's rules and tariffs and the following:

The same Rule 11, item B.1.h. (1) above which applies to individually metered users also applies to master metered users, except a representative may act on the behalf of a master metered user, and the utility will not discontinue service in any of the following situations:

(a) During the pendency of an investigation by the utility of a master-meter customer dispute or complaint.

(b) When the master-metered customer has been granted an extension of the period for repayment of a bill.

(c) For an indebtedness owned by the master metered customer to any other person or corporation or when the obligation represented by the delinquent account or any other indebtedness was incurred with a person or corporation other than the utility demanding payment therefor.

(d) When a delinquent account relates to another property owned, managed, or operated by the master-metered customer.

(e) When a public health or building officer certifies that determination would result in a significant threat to the health or safety of the residential occupants or the public. Proof of age or handicap are described in Rule 11.B.1.e. (N)

(Continued)

B. Discontinuance of Services by Utility (Continued)

1. For Nonpayment of Bills (Continued)

i. A reasonable attempt must be made by the utility to personally contact an adult person on the residential customer's premises either by telephone, or in person, at hours prior to discontinuance. For elderly or (C) handicapped residential customers, the utility shall provide at least 48 hours' notice by telephone or in person. For these customers, if telephone or personal contact cannot be made, a notice of discontinuance of service shall be posted in a conspicuous location at the service address at least 48 hours prior to discontinuance. Such notice shall be (N) independent of and in addition to, other notices(s) as may be prescribed (N) in the utility's tariffs. (N)

j. Residential Customer's Remedies Upon Receipt of Discontinuance Notice.

(1) If upon receipt of a 10 day discontinuance notice, a residential customer is unable to pay, he must contact the utility before discontinuance of service to make payment arrangements to avoid discontinuance of service.

(2) If, after contacting the utility, the residential customer alleges to the Commission an inability to pay and that he is unable to make payment arrangements with the utility he should write to the Commission's Consumer Affairs Branch (CAB) to make an informal complaint. This action must be taken within the 10-day discontinuance of service notice.

(3) The CAB's resolution of the matter will be reported to the utility and the residential customer within ten business days after receipt of the informal complaint. If the customer is not satisfied with such resolution, he must file, within ten business days after the date of the CAB's letter, a formal complaint with the Commission under Public Utilities Code Section 1702 on a form provided by the CAB.

(Continued)

B. Discontinuance of Services by Utility (Continued)

1. For Nonpayment of Bills (Continued)

j. Residential Customer's Remedies Upon Receipt of Discontinuance Notice.

(4) Failure of the residential as well as the nonresidential customer to observe these time limits shall entitle the utility to insist upon payment or, upon failure to pay, to discontinue the customer's service.

k. Designation of a Third-Party Representative (Elderly or Handicapped only)

(1) Customer must inform utility if he desires that a third party receive discontinuance or other notices on his behalf.

(2) Utility must be advised of name, address and telephone number of third party with a letter from third party accepting this responsibility.

(3) Only customers who certify that they are elderly or handicapped are entitled to third-party representation.*

2. For Noncompliance with Rules

The utility may discontinue service to any customer for violation of these rules after it has given the customer at least five days' written notice of such intention. Where safety of water supply is endangered, service may be discontinued immediately without notice.

3. For Waste of Water

a. Where negligent or wasteful use of water exists on customer's premises, the utility may discontinue the service if such practices are not remedied within five days after it has given the customer written notice to such effect.

(Continued)

* Proof of age must be supported by certificate of birth, driver's license, passport or other reliable document. Proof of handicap must be by certification from a licensed physician, public health nurse or social worker.

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

B. Continuance of Services by Utility (Continued)

3. For Waste of Water (Continued)

b. In order to protect itself against serious and unnecessary waste or misuse of water, the utility may meter any flat rate service and apply the regularly established meter rates where the customer continues to misuse or waste water beyond five days after the utility has given the customer written notice to remedy such practices.

4. For Unsafe Apparatus or Where Service is Detrimental or Damaging to the Utility or its Customers

If an unsafe or hazardous condition is found to exist on the customer's premise, or if the use of water thereon by apparatus, appliances, equipment or otherwise is found to be detrimental or damaging to the utility or its customers, the service may be shutoff without notice. The utility will notify the customer immediately of the reasons for the discontinuance and the corrective action to be taken by the customer before service can be restored.

5. For Fraudulent Use of Service

When the utility has discovered that a customer has obtained service by fraudulent means, or has diverted the water service for unauthorized use, the service to that customer may be discontinued without notice. The utility will not restore service to such customer until that customer has complied with all filed rules and reasonable requirements of the utility and the utility has been reimbursed for the full amount of the service rendered and the actual cost to the utility incurred by reason of the fraudulent use.

C. Restoration of Service

1. Reconnection Charge

Where service has been discontinued for violation of these rules or for nonpayment of bills, the utility may charge $25.00 for reconnection of service during regular working hours or $37.50 (I)
for reconnection of service at other than regular working hours when the customer has requested that the reconnection be made at other than regular working hours.

(Continued)

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

C. Restoration of Service (Continued)

2. To be Made During Regular Working Hours

The utility will endeavor to make reconnections during regular working hours on the day of the request, if the conditions permit; otherwise reconnections will be made on the regular working day following the day the request is made.

3. To Be Made at Other Than Regular Working Hours

When a customer has requested that the reconnection be made at other than regular working hours, the utility will reasonably endeavor to so make the reconnection if practicable under the circumstances.

4. Wrongful Discontinuance

A service wrongfully discontinued by the utility, must be restored without charge for the restoration to the customer within 24 hours.

D. Refusal to Serve

1 Conditions for Refusal

The utility may refuse to serve an applicant for service under the following conditions:

a. If the applicant fails to comply with any of the rules as filed with the Public Utilities Commission.

b. If the intended use of the service is of such a nature that it will be detrimental or injurious to existing customers.

c. If, in the judgment of the utility, the applicant's installation for utilizing the service is unsafe or hazardous, or of such nature that satisfactory service cannot be rendered.

(Continued)

Rule No. 11

DISCONTINUANCE AND RESTORATION OF SERVICE
(Continued)

C. Restoration of Service (Continued)

1. Conditions for Refusal (Continued)

d. Where service has been discontinued for fraudulent use, the utility will not serve an applicant until it has determined that all conditions of fraudulent use or practice has been corrected.

2. Notification to Customers

When an applicant is refused service under the provisions of this rule, the utility will notify the applicant promptly of the reason for the refusal to service and of the right of applicant to appeal the utility's decision to the Public Utilities Commission.

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

GENERAL INFORMATION

(N)

1. If water supplies are projected to be insufficient to meet normal customer demand, and are beyond the control of the utility, the utility may elect to implement voluntary conservation using the portion of this plan set forth in Section A of this Rule, after notifying the Director of the Commission's Division of Water and Audits of its intent, via a letter in both hard-copy and e-mailed formats.

2. Prior to declaration of mandatory rationing, a utility may request authorization of a Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff, via a Tier 2 advice letter.

3. If, in the opinion of the utility, more stringent water measures are required, the utility shall request Commission authorization to implement the staged mandatory conservation and rationing measures set forth in Sections B through E.

4. The utility shall file a Tier 1 advice letter to request activation of a particular stage of Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff.

   a. If a Declaration of Mandatory Rationing is made by utility or governing agency, or

   b. If the utility is unable to address voluntary conservation levels set by itself, supplier, or governing agency, or

   c. If the utility chooses to subsequently activate a different stage

5. When Schedule 14.1 is in effect and the utility determines that water supplies are again sufficient to meet normal demands, and mandatory conservation and rationing measures are no longer necessary, the utility shall seek Commission approval via a Tier 1 advice letter to de-activate the particular stage of mandatory rationing that had been authorized.

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

GENERAL INFORMATION (Continued) (N)

6. In the event of a water supply shortage requiring a voluntary or mandatory program, the utility shall make available to its customers water conservation kits as required by its version of Rule 20. The utility shall notify all customers of the availability of conservation kits via a bill insert or direct mailers.

A. CONSERVATION - NON-ESSENTIAL OR UNAUTHORIZED WATER USE

No customer shall use utility-supplied water for non-essential or unauthorized uses, including but not limited to:

1. Use of potable water for more than minimal landscaping, as defined in the landscaping regulated of the jurisdiction or as described in Article 10.8 of the California Government Code in connection with new construction;
2. Use through any meter when the company has notified the customer in writing to repair a broken or defective plumbing, sprinkler, watering or irrigation system and the customer has failed to effect such repairs within five business days;
3. Use of potable water which results in flooding or runoff in gutters or streets;
4. Individual private washing of cars with a hose except with the use of a positive action shut-off nozzle. Use of potable water for washing commercial aircraft, cars, buses, boats, trailers, or other commercial vehicles at any time, except at commercial or fleet vehicle or boat washing facilities operated at a fixed location where equipment using water is properly maintained to avoid wasteful use;
5. Use of potable water washing buildings, structures, , driveways, patios, parking lots, tennis courts, or other hard-surfaced areas, except in the cases where health and safety are at risk;
6. Use of potable water to irrigate turf, lawns, gardens, or ornamental landscaping by means other than drip irrigation, or hand watering without quick acting positive action shut-off nozzles, on a specific schedule, for example: 1) before 8:00 a.m. and after 7:00 p.m.; 2) every other day; or 3) selected days of the week; (N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

GENERAL INFORMATION (Continued)

(N)

7. Use of potable water for watering streets with trucks, except for initial wash-down for construction purposes (if street sweeping is not feasible), or to protect the health and safety of the public;
8. Use of potable water for construction purposes, such as consolidation of backfill, dust control, or other uses unless no other source of water or other method can be used.
9. Use of potable water for construction purposes unless no other source of water or other method can be used;
10. Use of potable water for street cleaning;
11. Operation of commercial car washes without recycling at least 50% of the potable water used per cycle;
12. Use of potable water for watering outside plants, lawn, landscape and turf areas during certain hours if and when specified in Schedule No. 14.1 when the schedule is in effect;
13. Use of potable water for decorative fountains or the filling or topping off of decorative lakes or ponds. Exceptions are made for those decorative fountains, lakes, or ponds which utilize recycled water;
14. Use of potable water for the filling or refilling of swimming pools.
15. Service of water by any restaurant except upon the request of a patron; and
16. Use of potable water to flush hydrants, except where required for public health or safety.

B. STAGED MANDATORY RATIONING OF WATER USAGE

1. Prior to declaration of mandatory rationing, a utility may request authorization of a Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff, via a Tier 2 advice letter, with full justification. The utility may not institute Schedule 14.1 until it has been authorized to do so by the Commission.

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

(N)

STAGED MANDATORY RATIONING OF WATER USAGE (Continued)

a. A staged Schedule 14.1 that has been authorized by the Commission shall remain dormant until triggered by specific conditions detailed in the Schedule 14.1 tariff and utility has requested and received authorization for activating a stage by Commission.

b. Notice of the Tier 2 advice letter (example shown in Appendix C) and associated public participation hearing shall be provided to customers under General Order (GO) 96-B rules.

c. Utility shall comply with all requirements of Sections 350-358 of the California Water Code.

d. The Tier 2 advice letter requesting institution of a Schedule 14.1 shall include but not be limited to:

   i. Proposed Schedule 14.1 tariff, which shall include but not be limited to:

      1. Applicability,
      2. Territory applicable to,
      3. A detailed description of each Stage of Rationing,
      4. A detailed description of the Trigger that Activates each Stage of Rationing,
      5. A detailed description of each water use restriction for each stage of rationing.
      6. Water use violation levels, written warning levels, associated fines, and exception procedures,

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

STAGED MANDATORY RATIONING OF WATER USAGE (Continued)

7. Conditions for installation of a flow restrictor, (N)
8. Charges for removal of flow restrictors, and
9. Special Conditions

ii. Justification for, and documentation and calculations in support of plan, including but not limited to each item in B.1.d.i above.

2. Number of Stages requested by each utility/district may vary, depending on specifics of water shortage event.
3. The utility shall file a Tier 1 advice letter to request activation of a particular stage of Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff.
   a. If a Declaration of Mandatory Rationing is made by utility or governing agency,
   b. If the utility is unable to address voluntary conservation levels set by itself or governing agency, or
   c. If the utility chooses to subsequently activate a different stage.
   d. The Tier 1 advice letter requesting activation of a Schedule 14.1 shall include but not be limited to:
      i. Justification for activating this particular stage of mandatory rationing, as well as period during which this particular stage of mandatory conservation and rationing measures will be in effect.
      ii. When the utility requests activation of a particular Stage, it shall notify its customers as detailed in Section E, below.
4. All monies collected by the utility through water use violation fines shall not be accounted for as income.
5. All expenses incurred by utility to implement Rule 14.1 and Schedule 14.1 that have not been considered in a General Rate Case or other proceeding, shall be recoverable by utility if determined to be reasonable by Commission.

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

STAGED MANDATORY RATIONING OF WATER USAGE (Continued)

(N)

a. These monies shall be accumulated by the utility in a separate memorandum account for disposition as directed or authorized from time to time by the Commission.

C. ENFORCEMENT OF STAGED MANDATORY CONSERVATION AND RATIONING

1. The water use restrictions of the conservation program, in Section A of this rule, become mandatory when the authorized Schedule 14.1-Staged Mandatory Rationing Program is triggered, the utility files a Tier 1 advice letter requesting activation of a particular stage, and authorization is received from the Commission.
   a. In the event a customer is observed to be using water for any nonessential or unauthorized use as defined in Section A of this rule, the utility may charge a water use violation fine in accordance with Schedule No. 14.1.

2. The utility may, after one written warning and one non-essential or unauthorized use violation notice , install a flow-restricting device on the service line of any customer observed by utility personnel to be using water for any non-essential or unauthorized use as defined in Section A above.

3. A flow restrictor shall not restrict water delivery by greater than 50% of normal flow. The restricting device may be removed only by the utility, only after a three-day period has elapsed, and only upon payment of the appropriate removal charge as set forth in Schedule No. 14.1.

4. After the removal of the restricting device, if any non-essential or unauthorized use of water shall continue, the utility may install another flow-restricting device. This device shall remain in place until water supply conditions warrant its removal and until the appropriate charge for removal has been paid to the utility.

5. Any tampering with flow restricting device by customer can result in fines or discontinuation of water use at the utility's discretion.

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

ENFORCEMENT OF STAGED MANDATORY CONSERVATION AND RATIONING (Continued)

(N)

6. If, despite installation of such flow-restricting device pursuant to the provisions of the previous enforcement conditions, any such non-essential or unauthorized use of water shall continue, then the utility may discontinue water service to such customer. In such latter event, a charge as provided in Rule No. 11 shall be paid to the utility as a condition to restoration of service.

7. All monies collected by the utility through water use violation fines shall not be accounted for as income. All expenses incurred by utility to implement Rule 14.1 and Schedule 14.1 that have not been considered in a General Rate Case or other proceeding, shall be recoverable by utility if determined to be reasonable by Commission. These additional monies shall be accumulated by the utility in a separate memorandum account for disposition as directed or authorized from time to time by the Commission.

8. The charge for removal of a flow-restricting device shall be in accordance with Schedule No. 14.1.

D. APPEAL PROCEDURE

1. Any customer who seeks a variance from any of the provisions of this water conservation and rationing plan shall notify the utility in writing, explaining in detail the reason for such a variation. The utility shall respond to each such request in writing.

2. Any customer not satisfied with the utility's response may file an appeal with the staff of the Commission. The customer and the utility will be notified of the disposition of such appeal by letter from the Executive Director of the Commission.

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

APPEAL PROCEDURE (Continued)

(N)

3. If the customer disagrees with such disposition, the customer shall have the right to file a formal complaint with the Commission. Except as set forth in this Section, no person shall have any right or claim in law or in equity, against the utility because of, or as a result of, any matter or thing done or threatened to be done pursuant to the provisions of this water conservation and rationing plan.

E. PUBLICITY

1. As stated under Section B.1.b and c, when a utility requests authorization of a Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff, via a Tier 2 advice letter, it shall provide notice of the Tier 2 advice letter (example shown in Attachment C) and associated public meeting provided to customers, under General Order (GO) 96-B rules, and shall comply with all requirements of Sections 350-358 of the California Water Code (CWC), including but not limited to the following:

    a. In order to be in compliance with both the GO and CWC, the utility shall provide notice via both newspaper and bill insert/direct mailing.

    b. Utility shall file one notice for each advice letter filed, that includes both notice of the filing of the Tier 2 advice letter as well as the details of the public meeting (date, time, place, etc).

    c. The public meeting shall be held after the utility files the Tier 2 advice letter, and before the Commission authorizes implementation of the tariff.

    d. Utility shall consult with Division of Water and Audits staff prior to filing advice letter, in order to determine details of public meeting.

2. In the event that a Schedule 14.1-Staged Mandatory Rationing Plan is triggered, and an utility requests activation through the filing of a Tier 1 advice letter, the utility shall notify its customers and provide each customer with a copy of Schedule 14.1 by means of bill insert or direct mailing. Notification shall take place prior to imposing any fines associated with this plan.

(N)

(Continued)

RULE 14.1
WATER CONSERVATION AND RATIONING PLAN

PUBLICITY (Continued)

(N)

3. During the period that a stage of Schedule 14.1 is activated, the utility shall provide customers with updates in at least every other bill, regarding its water supply status and the results of customers' conservation efforts.

(N)

Rule No. 20

WATER CONSERVATION (N)

A. Purpose

The purpose of this rule is to ensure that water resources available to the utility are put to a reasonable beneficial use and that the benefits of the utility's water water supply and service extend to the largest number of persons.

B. Waste of Water Discouraged

Refer to Rule 11 B. (3).

C. Use of Water-Saving Devices and Practices

Each customer of the utility is urged to install devices to reduce the quantity of water to flush toilets and to reduce the flow rate of showers.
Each customer is further urged to adopt such other water usage and reusage practices and procedures as are feasible and reasonable.

D. Water-Saving Kits

The utility will make available, without initial cost to the customer, for use in each residence receiving water service from the utility, a water-saving kit containing the following:

(1) A device or devices for reducing toilet flush water requirements;

(2) A device or devices for reducing shower flow rates;

(3) A dye tablet or tablets for determining if a toilet tank leaks;

(4) Other devices from time to time approved by the utility;

(5) Installation and other instructions and information pertinent to conservation of water. (N)

Appendix E

DMM Supporting Documents

Schedule No. R3-1-R
Region 3 Customer Service Areas
RESIDENTIAL METERED SERVICE

APPLICABILITY

Applicable to all residential metered water services provided to single-family residential customers.

TERRITORY

Barstow and vicinity, San Bernardino County, the City of Claremont, portions of Montclair, Pomona, Upland, within the area north of Thompson Creek and the Padua Hills Service Area, and adjacent unincorporated territory in Los Angeles and San Bernardino Counties, the City of Calipatria and community of Niland, and the adjacent territory in Imperial County, the vicinity of Victorville and Lucerne, San Bernardino County, all or portions of the Cities of Cypress, La Palma, Los Alamitos, Placentia, Seal Beach, Stanton, Yorba-Linda and vicinity, Cowan Heights, Orange County; San Dimas, Charter Oak and vicinity, Los Angeles County; and portions of the Cities of Arcadia, El Monte, Irwindale, Monrovia, Monterey Park, Rosemead, San Gabriel, Temple City and vicinity, Los Angeles County.

RATES

Quantity Rate:

First 1,300 cu. Ft., per 100 cu. ft.	$ 2.673
Next 800 cu. Ft., per 100 cu. ft.	$ 3.074
Over 2,100 cu. Ft., per 100 cu. ft.	$ 3.535

Service Charges:	Per Meter Per Month
For 5/8 x 3/4-inch meter	$ 15.15
For 3/4-inch meter	22.70
For 1-inch meter	37.80
For 1 1/2 inch meter	75.65
For 2-inch meter	121.00
For 3-inch meter	227.00
For 4-inch meter	378.00
For 6-inch meter	756.00
For 8-inch meter	1,210.00
For 10-inch meter	1,739.00
Sprinkler System Services	$16.65

The Service Charge is a readiness-to-serve charge applicable to all metered service and to which is added the charge for water used computed at the Quantity Rate.

SPECIAL CONDITIONS

1. All bills are subject to the reimbursement fee set forth on Schedule No. UF.
2. Residential customers are defined as all single family customers with one dwelling unit that are individually metered.
3. As authorized by the California Public Utilities Commission, an amount of $0.156 per Ccf for Tier 1, $0.180 per Ccf for Tier 2 and $0.207 per Ccf for Tier 3 is to be added to the Quantity Rate for a period of 24 months, beginning on the effective date of Advice Letter 1381-W, which is March 21, 2010. This surcharge will apply to all customers covered by the WRAM in 2009 which includes metered customers in Barstow, Claremont, San Gabriel, Los Alamitos, Placentia, San Dimas and Calipatria customers who were billed at the metered rate as of December 31, 2009
4. As authorized by the California Public Utilities Commission, an amount of $0.0735 per Ccf for Tier 1, $0.0845 per Ccf for Tier 2 and $0.0972 per Ccf for Tier 3 is to be added to the Quantity Rate for a period of 12 months, beginning on the effective date of Advice Letter 1401-W, which is June 7, 2010. This surcharge will recover the undercollection in the CARW Balancing Account, as of December 31, 2009.
5. Pursuant to Decision 10-11-035, a surcharge of $0.0035 per Ccf will be applied to all metered customers bills excluding customers that are receiving the CARW credit, beginning on the effective date of Advice Letter 1417-W. This surcharge will offset the CARW credits and CARW administrative program costs recorded in the CARW Balancing Account.
6. As authorized by the California Public Utilities Commission in D. 10-11-035, an amount of $0.20214 per Ccf is to be added to the Quantity Rate for a period of 24 months, beginning on January 1, 2011. This surcharge recovers the difference between the interim rates and final rates for the period of January 1, 2010 through December 1, 2010.
7. As authorized by the California Public Utilities Commission, an amount of $0.0053 per Ccf for Tier 1 and $0.0061 per Ccf for Tier 2 is to be added to the Quantity Rate for a period of 12 months, beginning on the effective date of Advice Letter 1408-WA. This surcharge will recover the undercollection in the Orange County Annexation Memorandum Account, as of March 31, 2010. (N)

Schedule No. R3-1-NR
Region 3 Customer Service Areas
NON-RESIDENTIAL METERED SERVICE

APPLICABILITY

Applicable to all metered water service except those covered under R3-1-R.

TERRITORY

Barstow and vicinity, San Bernardino County, the City of Claremont, portions of Montclair, Pomona, Upland, within the area north of Thompson Creek and the Padua Hills Service Area, and adjacent unincorporated territory in Los Angeles and San Bernardino Counties, the City of Calipatria and community of Niland, and the adjacent territory in Imperial County, the vicinity of Victorville and Lucerne, San Bernardino County, all or portions of the Cities of Cypress, La Palma, Los Alamitos, Placentia, Seal Beach, Stanton, Yorba-Linda and vicinity, Cowan Heights, Orange County; San Dimas, Charter Oak and vicinity, Los Angeles County; and portions of the Cities of Arcadia, El Monte, Irwindale, Monrovia, Monterey Park, Rosemead, San Gabriel, Temple City and vicinity, Los Angeles County.

RATES

Quantity Rate:

For all water delivered, per 100 cu. ft.. $ 2.489

Service Charges:	Per Meter Per Month
For 5/8 x 3/4-inch meter	$ 21.45
For 3/4-inch meter	32.15
For 1-inch meter	53.55
For 1 1/2 inch meter	107.00
For 2-inch meter	171.00
For 3-inch meter	321.00
For 4-inch meter	536.00
For 6-inch meter	1,071.00
For 8-inch meter	1,714.00
For 10-inch meter	2,464.00

The Service Charge is a readiness-to-serve charge applicable to all metered service and to which is added the charge for water used computed at the Quantity Rate.

SPECIAL CONDITIONS

1. All bills are subject to the reimbursement fee set forth on Schedule No. UF.
2. As authorized by the California Public Utilities Commission, an amount of $0.154 per Ccf is to be added to the Quantity Rate for a period of 24 months, beginning on the effective date of Advice Letter 1381-W, which is March 21, 2010. This surcharge will apply to all customers covered by the WRAM in 2009 which includes metered customers in Barstow, Claremont, San Gabriel, Los Alamitos, Placentia, San Dimas and Calipatria customers who were billed at the metered rate as of December 31, 2009.
3. As authorized by the California Public Utilities Commission, an amount of $0.06879 per Ccf is to be added to the Quantity Rate for a period of 12 months, beginning on the effective date of Advice Letter 1401-W, which is June 7, 2010. This surcharge will recover the undercollection in the CARW Balancing Account, as of December 31, 2009.
4. Pursuant to Decision 10-11-035, a surcharge of $0.0035 per Ccf will be applied to all metered customers bills excluding customers that are receiving the CARW credit, beginning on the effective date of Advice Letter 1417-W. This surcharge will offset the CARW credits and CARW administrative program costs recorded in the CARW Balancing Account.
5. As authorized by the California Public Utilities Commission in D. 10-11-035, an amount of $0.20214 per Ccf is to be added to the Quantity Rate for a period of 24 months, beginning on January 1, 2011. This surcharge recovers the difference between the interim rates and final rates for the period of January 1, 2010 through December 1, 2010.
6. As authorized by the California Public Utilities Commission, an amount of $0.0047 per Ccf is to be added to the Quantity Rate (N)
for a period of 12 months, beginning on the effective date of Advice Letter 1408-WA. This surcharge will recover the (N)
undercollection in the Orange County Annexation Memorandum Account, as of March 31, 2010. (N)

AWWA WLCC Water Audit Software: Reporting Worksheet

WASv3.0

Back to Instructions

? Click to access definition

Water Audit Report for: Golden State Water Company - Barstow
Reporting Year: 2008

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

All volumes to be entered as: ACRE-FEET PER YEAR

WATER SUPPLIED

Volume from own sources:	M	9,046.000	acre-ft/yr
Master meter error adjustment:	E	0.000	under-registered acre-ft/yr
Water imported:	M	0.000	acre-ft/yr
Water exported:	M	0.000	acre-ft/yr
WATER SUPPLIED:		9,046.000	acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:
Billed metered:	M	7,654.000	acre-ft/yr		
Billed unmetered:		0.000	acre-ft/yr		
Unbilled metered:		138.000	acre-ft/yr		
Unbilled unmetered:		113.075	acre-ft/yr	1.25%	
AUTHORIZED CONSUMPTION:		7,905.075	acre-ft/yr		

Use buttons to select percentage **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption) 1,140.925 acre-ft/yr

Apparent Losses

				Pcnt:	Value:
Unauthorized consumption:		22.615	acre-ft/yr	0.25%	
Customer metering inaccuracies:		159.020	acre-ft/yr	2.00%	
Systematic data handling errors:		10.000	acre-ft/yr		
Apparent Losses:		191.635	acre-ft/yr		

Real Losses

Real Losses = (Water Losses - Apparent Losses):	949.290	acre-ft/yr
WATER LOSSES:	1,140.925	acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 1,392.000 acre-ft/yr

SYSTEM DATA

Length of mains:	168.0	miles
Number of active AND inactive service connections:	9,895	
Connection density:	59	conn./mile main
Average length of customer service line:	50.0	ft (pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	89.0	psi

COST DATA

Total annual cost of operating water system:	M	**$5,630,805**	$/Year
Customer retail unit cost (applied to Apparent Losses):		**$31.96**	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):		**$0.00**	$/acre-ft/yr

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
  - **5 as measured values**
  - **1 as estimated values**
  - **2 as default values**
  - **10 without specifying measured, estimated or default**
- Water Supplied Data: No problems identified
- Unbilled unmetered consumption: No problems identified
- Unauthorized consumption: No problems identified
- It is important to accurately measure the master meter - you have entered the measurement type as: measured

#DIV/0!

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	15.4%
Non-revenue water as percent by cost:	47.4%
Annual cost of Apparent Losses:	$2,667,905
Annual cost of Real Losses:	$0

Operational Efficiency Indicators

Apparent Losses per service connection per day:	17.29	gallons/connection/day
Real Losses per service connection per day*:	85.65	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	0.96	gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	100.57	million gallons/year
Infrastructure Leakage Index (ILI) [Real Losses/UARL]:	3.08	

* only the most applicable of these two indicators will be calculated

Appendix F.a.

Groundwater Basin Water Rights Stipulation/Judgment

Judgment After Trial

JUDGMENT AFTER TRIAL

JANUARY 10, 1996

MOJAVE BASIN AREA ADJUDICATION
CITY OF BARSTOW, ET AL V. CITY OF ADELANTO, ET AL
RIVERSIDE COUNTY SUPERIOR COURT CASE NO. 208568

Superior Court

STATE OF CALIFORNIA
COUNTY OF RIVERSIDE

CHAMBERS OF
VICTOR MICELI
JUDGE OF THE SUPERIOR COURT

COURTHOUSE
4050 MAIN STREET
RIVERSIDE, CALIFORNIA 92501

January 10, 1996

TO: ALL PARTIES LISTED ON THE ATTACHED MAILING LIST

FROM: E. MICHAEL KAISER, JUDGE by ss

SUBJECT: CITY OF BARSTOW VS CITY OF ADELANTO, Case No.: 208568

The Judgment in the above-entitled case was signed on January 10, 1996. Please find attached the amended two pages of Exhibit B, Table B-1.

Please find attached two amended pages of Exhibit B, Table B-1.

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
SAN BERNARDINO CO SERVICE AREA 70J	1,005	0.8213	1,005	954	904	854	804
SAN BERNARDINO CO SERVICE AREA 70L	355	0.2901	355	337	319	301	284
SAN FILIPPO, JOSEPH & SHELLEY	35	0.0286	35	33	31	29	28
SILVER LAKES ASSOCIATION	3,987	3.2583	3,987	3,787	3,588	3,388	3,189
SOUTHDOWN, INC	1,519	1.2414	1,519	1,443	1,367	1,291	1,215
SOUTHERN CALIFORNIA WATER COMPANY	940	0.7682	940	893	846	799	752
SPRING VALLEY LAKE ASSOCIATION	3,056	2.4974	3,056	2,903	2,750	2,597	2,444
SPRING VALLEY LAKE COUNTRY CLUB	977	0.7984	977	928	879	830	781
STORM, RANDALL	62	0.0507	62	58	55	52	49
SUDMEIER, GLENN W	121	0.0989	121	114	108	102	96
SUMMIT VALLEY RANCH	452	0.3694	452	429	406	384	361
TATRO, RICHARD K & SANDRA A	280	0.2288	280	266	252	238	224
TATUM, JAMES B	829	0.6775	829	787	746	704	663
TAYLOR, ALLEN C / HAYMAKER RANCH	456	0.3727	456	433	410	387	364
THOMAS, S DALE	440	0.3596	440	418	396	374	352
THOMAS, WALTER	36	0.0294	36	34	32	30	28
THOMPSON, JAMES A	418	0.3416	418	397	376	355	334
THOMPSON, RODGER	76	0.0621	76	72	68	64	60
THRASHER, GARY	373	0.3048	373	354	335	317	298
THUNDERBIRD COUNTY WATER DISTRICT	118	0.0964	118	112	106	100	94
TURNER, ROBERT	70	0.0572	70	66	63	59	56
VAIL, JOSEPH B & PAULA E	126	0.1030	126	119	113	107	100
* VAN BURGER, CARL	710	0.5802	710	674	639	603	568
VAN LEEUWEN FAMILY TRUST	341	0.2787	341	323	306	289	272

* Durston Well, location 06N/04W-18F, APN 468-151-11 - water production right of 357 acre/feet, claimed by Durston/Van Burger/CVB Investments and Industrial Asphalt. Product right to be determined in a subsequent severed proceeding, jurisdiction reserved.

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AGCON, INC	0	0.0000	0	0	0	0	0
AGUAYO, JEANETTE L	212	0.3742	212	201	190	180	169
ATCHISON, TOPEKA, SANTA FE RAILWAY CO	120	0.2118	120	114	108	102	96
AVDEEF, THOMAS	34	0.0600	34	32	30	28	27
AZTEC FARM DEVELOPMENT COMPANY (Now, Virgil Gorman)	220	0.3883	220	209	198	187	176
BARNES, FAY - EXECUTOR OF ESTATE OF WAYNE BARNES	243	0.4289	243	230	218	206	194
BROMMER, MARVIN	361	0.6372	361	342	324	306	288
BURNS, RITA J & PAMELA E	16	0.0282	16	15	14	13	12
CHAPA, LARRY R	96	0.1694	96	91	86	81	76
CHOI, YONG IL & JOUNG AE	38	0.0671	38	36	34	32	30
CHRISTISON, JOEL	75	0.1324	75	71	67	63	60
COOK, KWON W	169	0.2983	169	160	152	143	135
DE VRIES, NEIL	3,800	6.7070	3,800	3,610	3,420	3,230	3,040
DESERT COMMUNITY BANK	156	0.2753	156	148	140	132	124
DURAN, FRANK T	50	0.0883	50	47	45	42	40
GAINES, JACK	117	0.2065	117	111	105	99	93
GESIRIECH, WAYNE	121	0.2136	121	114	108	102	96
GORMAN, VIRGIL	138	0.2436	138	131	124	117	110
GRIEDER, RAYMOND H & DORISANNE	30	0.0530	30	28	27	25	24
GRILL, NICHOLAS P & MILLIE D	21	0.0371	21	19	18	17	16
GROEN, CORNELIS	1,043	1.8409	1,043	990	938	886	834
HANIFY, DBA - WHITE BEAR RANCH	152	0.2683	152	144	136	129	121
HARMSEN, JAMES & RUTH ANN	1,522	2.6863	1,522	1,445	1,369	1,293	1,217
HARPER LAKE COMPANY	1,433	2.5293	1,433	1,361	1,289	1,218	1,146

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FILED
RIVERSIDE COUNTY

JAN 1 0 1996

ARTHUR A. Sims, Clerk
By Y.A. Burns Y.A. Burns
Deputy

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

CITY OF BARSTOW, et al, Plaintiff, v. CITY OF ADELANTO, et al, Defendant.	CASE NO. 208568 ASSIGNED TO JUDGE KAISER DEPT.4 FOR ALL PURPOSES JUDGMENT AFTER TRIAL
MOJAVE WATER AGENCY, Cross-complainant, v. ANDERSON, RONALD H. et al, Cross-defendants.	

TABLE OF CONTENTS

Exhibit "A" - Map entitled, "Map showing Mojave Water Agency, Mojave River, Mojave Basin Area and Hydrologic Subareas and Limits of Adjudicated Area Together with Geologic and Other Pertinent Features."

Exhibit "B" - Tables entitled, "Table B-1: Table Showing Base Annual Production, Base Annual Production Right of Each Producer Within Each Subarea, and Free Production Allowance for Subareas for First Five Years of the Judgment" and "Table B-2: Table Showing Total Water Production for Aquaculture and Recreational Lake Purposes."

Exhibit "C" - Engineering Appendix.

Exhibit "D" - Time Schedules.

Exhibit "E" - List of Producers and Their Designees.

Exhibit "F" - Transfers of Base Annual Production Rights.

Exhibit "G" - Subarea Obligations.

Exhibit "H" - Biological Resource Mitigation.

Exhibit "I" - Map Showing Potential Groundwater Recharge Areas

I. INTRODUCTION

A. The Complaint. The original complaint herein was filed by the City of Barstow and Southern California Water Company (collectively "Plaintiffs") in San Bernardino Superior Court, North Desert District, on May 30, 1990 as Case No. BCV6672, and transferred to Riverside County Superior Court on November 27, 1990. Plaintiffs allege that the cumulative water Production upstream of the City of Barstow Overdrafted the Mojave River system, and request an average Annual flow of 30,000 acre-feet of surface water to the City of Barstow area. The complaint also includes a request for a writ of mandate to require the Mojave Water Agency ("MWA") to act pursuant to its statutory authority to obtain and provide Supplemental Water for use within the Mojave Basin Area.

B. The MWA Cross-Complaint. On July 26, 1991, the MWA filed its first amended cross-complaint in this case. The MWA first amended cross-complaint and its ROE amendments name Producers who collectively claim substantially all rights of water use within the Mojave Basin Area, including Parties downstream of the City of Barstow. The MWA cross-complaint, as currently amended, requests a declaration that the available native water supply to the Mojave Basin Area (not including water imported from the California State Water Project) is inadequate to meet the demands of the combined Parties and requests a determination of the water rights of whatever nature within the MWA boundaries and the Mojave Basin Area. The MWA has named as Parties several hundred Producers within the Basin Area.

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C. The Arc Las Flores Cross-Complaint. On July 3, 1991, Arc Las Flores filed a cross-complaint for declaratory relief seeking a declaration of water rights of certain named cross-defendants and a declaration that the appropriative, overlying and riparian rights of Arc Las Flores be determined to be prior and paramount to any rights of the Plaintiffs and other appropriators.

D. Stipulation and Trial. On October 16, 1991, the Court ordered a litigation standstill. The purpose of the standstill was to give the parties time to negotiate a settlement and develop a solution to the overdraft existing in the Mojave River Basin.

A committee of engineers and attorneys, representing a variety of water users and interests throughout the Mojave River Basin, was created to develop a physical solution to the water shortage problem. The work of the committee resulted in a stipulated interlocutory order and judgment, which was entered by the court on September 23, 1993.

Several non-stipulating parties requested a trial. On April 20, 1994, the Court issued a memorandum setting forth the trial issues. This cause came on regularly for trial on February 6, 1995, and was tried in Department 4 of the above-entitled Court, the Honorable E. Michael Kaiser, Judge, Presiding, without a jury. Oral and documentary evidence was introduced on behalf of the respective parties and the cause was argued and submitted for decision.

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II. DECREE

NOW, THEREFORE, IT IS ORDERED, ADJUDGED AND DECREED:

A. JURISDICTION, PARTIES, DEFINITIONS.

1. Jurisdiction and Parties.

a. Jurisdiction. This Court has jurisdiction to enter Judgment declaring and adjudicating the rights to reasonable and beneficial use of water by the Parties in the Mojave Basin Area pursuant to Article X, Section 2 of the California Constitution. This Judgment constitutes an adjudication of water rights of the Mojave Basin Area pursuant to Section 37 of Chapter 2146 of Statutes of 1959 ("the MWA Act").

b. Parties. All Parties to the MWA cross-complaint are included in this Judgment. The MWA has notified those Persons claiming any right, title or interest to the natural waters within the Mojave Basin Area to make claims. Such notice has been given: 1) in conformity with the notice requirements of Water Code §§ 2500 et seq.; 2) pursuant to Section 37 of the MWA Act; and 3) pursuant to order of this Court. Subsequently, all Producers making claims have been or will be included as Parties. The defaults of certain Parties have been entered, and certain named cross-defendants to the MWA cross-complaint who are not Producers have been dismissed. All named Parties who have not been dismissed have appeared herein or have been given adequate opportunity to appear herein. The Court has jurisdiction of the subject matter of this action and of the Parties hereto.

c. Minimal Producers. There are numerous Minimal Producers in the Basin Area and their number is expected to increase in the future. In order to minimize the cost of administering this Judgment and to assure that every Person producing water in the Basin Area participates fairly in the Physical Solution, MWA shall:

i. within one Year following entry of this Judgment, prepare a report to the Court: 1) setting forth the identity and verified Base Annual Production of each Minimal Producer in each Subarea of the Basin Area; and 2) recommending a proposed system of Minimal Producer Assessments. The system of Minimal Producer Assessments shall achieve an equitable allocation of the costs of the Physical Solution that are attributable to Production of verified Base Annual Production amounts by Minimal Producers in each Subarea to and among such Minimal Producers. Minimal Producer Assessments need not be the same for existing Minimal Producers as for future Minimal Producers.

ii. within one Year following entry of this Judgment, prepare a report to the Court setting forth a proposed program to be undertaken by MWA, pursuant to its statutory authority, to implement the proposed system of Minimal Producer Assessments. The Court may order MWA to implement the proposed program or, if MWA's statutory authority is inadequate to enable implementation, or if either the proposed program or the proposed system of Minimal Producer Assessments is unacceptable to the Court, the Court may then order MWA either to implement an alternative program or system, or in the alternative, to name all Minimal Producers as Parties to this litigation and to serve them for the purpose of adjudicating their water rights.

Any Minimal Producer whose Annual Production exceeds ten (10) acre-feet in any Year following the date of entry of Judgment shall be made a Party pursuant to Paragraph 12 and shall be subject to Administrative, Replacement Water, Makeup Water and Biological Resources Assessments. Any Minimal Producer who produced during the 1986-1990 period may become a Party pursuant to Paragraph 40 with a Base Annual Production Right based on such Minimal Producer's verified Base Annual Production. To account properly for aggregate Production by Minimal Producers in each Subarea, Table B-1 of Exhibit B shall include an estimated aggregate amount of Base Annual Production by all Minimal Producers in each Subarea. The Base Annual Production of any Minimal Producer who becomes a Party shall be deducted from the aggregate amount and assigned to such Minimal Producer.

2. Physical and Legal Complexity. The physical and legal issues of the case as framed by the complaint and cross-complaints are extremely complex. Production of more than 1,000 Persons producing water in the Basin Area has been ascertained. In excess of 1,000 Persons have been served. The water supply and water rights of the entire Mojave Basin Area and its hydrologic Subareas extending over 4000 square miles have been brought into issue. Most types and natures of water right known to California law are at issue in the case. Engineering studies by the Parties, jointly and severally, leading toward adjudication of these rights and a Physical Solution, have required the expenditure of over two Years' time and hundreds of thousands of dollars.

3. Need for a Declaration of Rights and Obligations and for Physical Solution. A Physical Solution for the Mojave Basin

Area based upon a declaration of water rights and a formula for Intra- and Inter-Subarea allocation of rights and obligations is necessary to implement the mandate of Article X, Section 2 of the California Constitution and California water policy. Such Physical Solution requires the definition of the individual rights of all Producers within the Basin Area in a manner which will equitably allocate the natural water supplies and which will provide for equitable sharing of costs for Supplemental Water. Nontributary supplemental sources of water are or will be available in amounts, which when combined with water conservation, water reclamation, water transfers, and improved conveyance and distribution methods within the Basin Area, will be sufficient in quantity and quality to assure implementation of a Physical Solution. Sufficient information and data are known to formulate a reasonable and just allocation of existing water supplies as between the hydrologic Subareas within the Basin Area and as among the water users within each Subarea. Such Physical Solution will allow the public water supply agencies and individual water users within each hydrologic Subarea to proceed with orderly water resource planning and development. It will be necessary for MWA to construct conveyance facilities to implement the Physical Solution. Absent the construction of conveyance facilities, some Subareas may be deprived of an equitable share of the benefits made possible by the Physical Solution. Accordingly, this Physical Solution mandates the acquisition or construction of conveyance facilities for importation and equitable distribution of Supplemental Water to the respective Subareas. Such construction is dependent on the availability of appropriate financing, and any such financing assessed to the Parties will be based upon benefit to the Parties in accordance with the MWA Act.

4. Definitions. As used in this judgment, the following terms shall have the meanings herein set forth:

a. Afton - The United States Geological Survey gauging station "Mojave River at Afton, CA."

b. Annual or Year - As used in this Judgment refers to the Annual period beginning October 1 and ending September 30 of the following Year.

c. Aquaculture Water - Water so identified in Exhibit "B". Such water may be used only for fish breeding and rearing. The Annual Consumptive Use of such water in acre-feet is equal to the water surface area, in acres, of the fish rearing facilities multiplied by seven (feet).

d. Assessments - Those Assessments levied and collected pursuant to this judgment including Replacement Water, Makeup Water, Administrative and Biological Resource Assessments.

e. Barstow - The United States Geological Survey Gauging Station "Mojave River at Barstow, CA."

f. Base Annual Production - The verified maximum Year Production, in acre-feet, for each Producer for the five Year Period 1986-1990 as set forth in Table B-1 of Exhibit "B", except where otherwise noted therein. The maximum Year Production for each Producer was verified based on one or more of the following: flow meter readings, electrical power or diesel usage records or estimated applied water duty. The Base Annual Production for recreational lakes in the Baja Subarea and for Aquaculture shall be equal either to the area of water surface multiplied by seven feet or to verified Production, whichever is less. The five Year period 1986-1990 shall also be the time period for which Base Annual Production for Minimal Producers shall be calculated.

g. Base Annual Production Right - The relative Annual right of each Producer to the Free Production Allowance within a given Subarea, expressed as a percentage of the aggregate of all Producers' Base Annual Production in the Subarea. The percentage for each Producer is calculated by multiplying that Producer's Base Annual Production in a Subarea times one hundred (100) and dividing the result by the aggregate Base Annual Production for all Producers in the Subarea. The percentage shall be rounded off to the nearest one ten-thousandth of one per cent.

h. Base Flow - That portion of the total surface flow measured Annually at Lower Narrows which remains after subtracting Storm Flow.

i. Carry Over Right - The right of a Producer to delay and accumulate the Production of such Producer's share of a Subarea Free Production Allowance until

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and only until the following Year free of any Replacement Water Assessment.

j. <u>Consumption or Consumptive Use</u> - The permanent removal of water from the Mojave Basin Area through evaporation or evapo-transpiration. The Consumptive Use rates resulting from particular types of water use are identified in Paragraph 2 of Exhibit "F".

k. <u>Free Production Allowance</u> - The total amount of water, and any Producer's share thereof, that may be Produced from a Subarea each Year free of any Replacement Obligation.

l. <u>Groundwater</u> - Water beneath the surface of the ground and within the zone of saturation; i.e., below the existing water table, whether or not flowing through known and definite channels.

m. <u>Harper Lake Basin</u> - That portion of the Centro Subarea identified as such on Exhibit "A".

n. <u>Lower Narrows</u> - The United States Geological Survey gauging station "Mojave River near Victorville, CA."

o. <u>Makeup Water</u> - Water needed to satisfy a Minimum Subarea Obligation.

p. <u>Makeup Obligation</u> - The obligation of a Subarea to pay for Makeup Water to satisfy its Subarea Obligation.

q. <u>Minimal Producer</u> - Any Person whose Base Annual Production, as verified by MWA is not greater than ten (10) acre-feet. A Person designated as a Minimal Producer whose Annual Production exceeds ten (10) acre-feet in any Year following the date of entry of Judgment is no longer a Minimal Producer.

r. Minimum Subarea Obligation - The minimum Annual amount of water a Subarea is obligated to provide to an adjoining downstream Subarea or the Transition Zone or, in the case of the Baja Subarea, the minimum Annual Subsurface Flow at the MWA eastern boundary toward Afton in any Year, as set forth in Exhibit "G".

s. Mojave Basin Area or Basin Area - The area shown on Exhibit "A" that lies within the boundaries of the line labelled "Limits of Adjudicated Area" which generally includes the area tributary to the Mojave River and its tributaries except for such area not included within the Mojave Water Agency's jurisdiction.

t. MWA - Cross complainant Mojave Water Agency.

u. Overdraft - A condition wherein the current total Annual Consumptive Use of water in the Mojave Basin Area or any of its Subareas exceeds the long term average Annual natural water supply to the Basin Area or Subarea.

v. Party (Parties) - Any Person(s) named in this action who has intervened in this case or has

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become subject to this Judgment either through stipulation, default, trial or otherwise.

w. Person(s) - Any natural person, firm, association, organization, joint venture, partnership, business, trust, corporation, or public entity.

x. Produce - To pump or divert water.

y. Producer(s) - A Person, other than a Minimal Producer, who Produces water.

z. Production - Annual amount of water produced, stated in acre-feet of water.

aa. Production Safe Yield - The highest average Annual Amount of water that can be produced from a Subarea: (1) over a sequence of years that is representative of long-term average annual natural water supply to the Subarea net of long-term average annual natural outflow from the Subarea, (2) under given patterns of Production, applied water, return flows and Consumptive Use, and (3) without resulting in a long-term net reduction of groundwater in storage in the Subarea.

bb. Purpose of Use - The broad category of type of water use including but not limited to municipal, irrigation, industrial, aquaculture, and lakes purposes. A change in Purpose of Use includes any reallocation of water among mixed or sequential uses, excluding direct reuse of municipal wastewater.

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cc. Recirculated Water - Water that is Produced but not consumed by the Parties listed in Table B-2 of Exhibit "B" and then returned either to the Mojave River or to the Groundwater basin underlying the place of use.

dd. Replacement Obligation - The obligation of a Producer to pay for Replacement Water for Production from a Subarea in any Year in excess of the sum of such Producer's share of that Year's Free Production Allowance for the Subarea plus any Production pursuant to a Carry Over Right.

ee. Replacement Water - Water purchased by Watermaster or otherwise provided to satisfy a Replacement Obligation.

ff. Responsible Party - The Person designated by a Party as the Person responsible for purposes of filing reports and receiving notices pursuant to the provisions of this Judgment.

gg. Stored Water - Water held in storage pursuant to a Storage Agreement with Watermaster.

hh. Storm Flow - That portion of the total surface flow originating from precipitation and runoff without having first percolated to Groundwater storage in the zone of saturation and passing a particular point of reckoning, as determined annually by the Watermaster.

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ii. Subareas - The five Subareas of the Mojave Basin Area -- Este, Oeste, Alto, Centro and Baja -- as shown on Exhibit "A".

jj. Subarea Obligation - The average Annual amount of water that a Subarea is obligated to provide to an adjoining downstream Subarea or the Transition Zone or, in the case of the Baja Subarea, the average Annual Subsurface Flow toward Afton at the MWA eastern boundary as set forth in Exhibit "G".

kk. Subsurface Flow - Groundwater which flows beneath the earth's surface.

ll. Supplemental Water - Water imported to the Basin Area from outside the Basin Area, water that would otherwise be lost from the Basin Area but which is captured and made available for use in the Basin Area, or any Producer's share of Free Production Allowance that is not Produced and is acquired by Watermaster pursuant to this Judgment.

mm. Transition Zone - The portion of the Alto Subarea, shown on Exhibit "A", that lies generally between the Lower Narrows and the Helendale Fault.

nn. Watermaster - The Person(s) appointed by the Court to administer the provisions of this Judgment.

5. Exhibits. The following exhibits are attached to this Judgment and made a part hereof.

Exhibit "A" - Map entitled, "Map showing Mojave Water Agency, Mojave River, Mojave Basin Area and Hydrologic Subareas and

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Limits of Adjudicated Area Together with Geologic and Other Pertinent Features."

Exhibit "B" - Table entitled, "Table B-1: Table Showing Base Annual Production and Base Annual Production Right of Each Producer Within Each Subarea, and Free Production Allowances for Subareas for First Five Years after entry of the Interlocutory Judgment" and "Table B-2: Table Showing Total Water Production for Aquaculture and Recreational Lake Purposes."

Exhibit "C" - Engineering Appendix.

Exhibit "D" - Time Schedules.

Exhibit "E" - List of Producers and Their Designees.

Exhibit "F" - Transfers of Base Annual Production Rights.

Exhibit "G" - Subarea Obligations.

Exhibit "H" - Biological Resource Mitigation.

Exhibit "I" - Map Showing Potential Groundwater Recharge Areas

B. DECLARATION OF HYDROLOGIC CONDITIONS.

6. Mojave Basin Area as Common Source of Supply. The area shown on Exhibit "A" as the Mojave Basin Area is comprised of five Subareas. The waters derived from the Mojave River and its tributaries constitute a common source of supply of the five Subareas and of the Persons producing therefrom.

7. Existence of Overdraft. In each and every Year, for a period in excess of five (5) years prior to the May 30, 1990 filing date of Plaintiffs' Complaint, the Mojave Basin Area and each of its respective Subareas have been and are in a state of Overdraft, and it is hereby found that there is no water available

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for Production from the Basin Area or any Subarea therein except pursuant to this Judgment.

C. DECLARATION OF RIGHTS AND OBLIGATIONS.

8. Production Rights of the Parties. The Base Annual Production and Base Annual Production Right of each Party are declared as set forth in Table B-1 of Exhibit "B". Certain Parties also have the right to continue to Produce Recirculated Water in the amounts set forth in Table B-2 of Exhibit "B", subject to the following:

a. Aquaculture. Two of the Producers listed in Table B-2 of Exhibit "B", California Department of Fish and Game Mojave River Fish Hatchery (Hatchery) and Jess Ranch Water Company (Jess), Produce Recirculated Water for Aquaculture. The Hatchery and Jess or their successors or assignees shall have the right to continue to Produce up to the amounts listed in Table B-2 of Exhibit "B" as Recirculated Water for Aquaculture on the property where it was used in the Year for which Base Annual Production was verified. Production of such amount of Recirculated water by Jess shall be free of any Replacement Water Assessments, Makeup Water Assessments or Administrative Assessments but shall be subject to Biological Resources Assessments and each Jess well producing Recirculated Water shall be subject to an Annual administrative fee equal to the lowest Annual fee paid to MWA by a Minimal Producer. Neither the Hatchery nor Jess Recirculated Water may be transferred or used for any other purpose or transferred for use on any other property, except as provided in Paragraph 7 of Exhibit "F" for the Hatchery. Any Production of Recirculated Water by Jess in excess of the amount shown in Table B-2 shall be subject to all

Assessments. Production of Recirculated Water by the Hatchery will be subject to the rules set forth in Paragraph 7 of Exhibit "F". All Jess Aquaculture Recirculated Water shall be discharged immediately and directly to the Mojave River.

b. Camp Cady. One Producer listed in Table B-2 of Exhibit "B", California Department of Fish and Game-Camp Cady (Camp Cady), Produces Recirculated Water for Lakes containing Tui Chub, an endangered species of fish. Camp Cady or its successors or assignees shall have the right to continue to Produce up to the amount listed in Table-B-2 of Exhibit "B" as Recirculated Water at Camp Cady. Production of each amount of Recirculated water shall be free of any Assessments. Camp Cady Recirculated Water may not be transferred or used for any other purpose or transferred for use on any other property. Any Production of Recirculated Water by Camp Cady in excess of the amount shown in Table B-2 of Exhibit "B" shall be subject to all Assessments except Biological Resource Assessments. All Camp Cady Recirculated Water shall be allowed to percolate immediately and directly to the Groundwater basin underlying Camp Cady.

c. Recreational Lakes in Baja Subarea. All Producers listed in Table B-2 of Exhibit "B" except the Hatchery, Jess and Camp Cady Produce Recirculated Water for recreational lakes in the Baja Subarea. Such Producers or their successors or assignees shall have the right to continue to Produce up to the amounts identified in Table B-2 of Exhibit "B" as Recirculated Water for use in recreational lakes on the property where it was used in the Year for which Base Annual Production was verified, free of any Replacement Water Assessments, Makeup Water

Assessments, or Administrative Assessments, but such Production shall be subject to any Biological Resource Assessment. Each well producing such Recirculated Water shall be subject to an Annual administrative fee equal to the lowest Annual fee paid by a Minimal Producer. Recirculated Water cannot be transferred or used for any other purpose. All recreational lake Recirculated Water shall be allowed to percolate immediately and directly to the Groundwater basin underlying the recreational lake.

9. MWA Obligations. The Physical Solution is intended to provide for delivery and equitable distribution to the respective Subareas by MWA of the best quality of Supplemental Water reasonably available. MWA shall develop conveyance or other facilities to deliver this Supplemental Water to the areas depicted in Exhibit "I," unless prevented by forces outside its reasonable control such as an inability to secure financing consistent with sound municipal financing practices and standards.

a. Secure Supplemental Water. MWA, separate and apart from its duties as the initial Watermaster designated under this Judgment, shall exercise its authority under Sections 1.5 and 15 of the MWA Act to pursue promptly, continuously and diligently all reasonable sources to secure Supplemental Water as necessary to fully implement the provisions of this Judgment.

b. Supplemental Water Prices. The MWA shall establish fair and equitable prices for Supplemental Water delivered to the Watermaster under this Judgment.

c. Supplemental Water Delivery Plan. Not later than September 30, 1996, MWA shall prepare a report on potential alternative facilities or methods to deliver Supplemental Water to the areas shown on Exhibit "I." The report shall include, for each alternative, a development time schedule, a summary of cost estimates, an analysis of the relative benefits to Producers in each Subarea and an analysis of alternative methods of financing and cost allocation, including any state or federal sources of funding that may be available.

d. <u>Water Delivery Cost Allocation</u>. The report required by subdivision (c) above shall recommend methods of financing and cost allocation that are based on benefits to be received. MWA's cost allocation plan shall be subject to Court review as provided in subdivision (f) below to verify that costs are allocated fairly and according to benefits to be received. The MWA financing and cost allocation plan may include a mix of revenue sources including the following:

(1) Developer or connection fees to the extent MWA can demonstrate a nexus, as required by law, between the fees and the impact of the development upon the water resources of the Mojave Basin Area and each subarea thereof;

(2) Other methods of financing available to MWA, including but not limited to property based taxes, assessments or standby charges;

(3) Water sales revenues, but only to the extent other sources are not available or appropriate, and in no event shall the water sales price to cover facility

capital costs exceed a rate equal to fifty percent of the variable cost rate charged to MWA under its contract for water delivery from the California State Water Project;

e. Legislative Changes. MWA shall seek promptly to have enacted amendments to the MWA Act (Water Code Appendix, Part 97) that allow MWA to implement any methods of governmental financing available to any public entity in California.

f. Court Review and Determination of Benefit. Not later than September 30, 1996, MWA shall submit its report to the Court in a noticed motion pursuant to Paragraph 36. The report shall set forth MWA's recommendations as to the following: (1) which alternatives should be implemented; (2) methods of cost allocation for the recommended alternatives; (3) financing for the recommended alternatives; and (4) a time schedule to complete the recommended alternatives. The Court may approve or reject the recommendations. The Court may further order the use of alternatives and time schedules or it may order additional studies and resubmittals, as it may deem proper.

10. Priority and Determination of Production Rights. The water rights involved herein are of differing types and commenced at different times. Many of the rights involved are devoted to public uses. The Declaration of Water Rights that is part of the judgment and the Physical Solution decreed herein takes into consideration the competing priorities which have been asserted in addition to the equitable principles applicable to apportionment of water in this situation. The following factors

have been considered in the formulation of each Producer's Base Annual Production Right:

a. The Mojave Basin Area and each of its hydrologic Subareas have continuously for many Years been in a state of system-wide Overdraft;

b. All Producers have contributed to the Overdraft;

c. None of the priorities asserted by any of the Producers is without dispute;

d. Under the complex scheme of California water law, the allocation of water and rights mechanically based upon the asserted priorities would be extremely difficult, if not impossible, and would not result in the most equitable apportionment of water;

e. Such mechanical allocation would, in fact, impose undue hardship on many Parties;

f. There is a need for conserving and making maximum beneficial use of the water resources of the State;

g. The economy of the Mojave Basin Area has to a great extent been established on the basis of the existing Production;

h. The Judgment and Physical Solution take into consideration the unique physical and climatic conditions of the Mojave Basin Area, the Consumptive Use of water in the several sections of the Basin, the character and rate of return flows, the extent of established uses, the availability of storage water, the relative benefits and detriments between upstream areas and downstream areas if a limitation is imposed on one and not the

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other, and the need to protect public interest and public trust concerns.

In consideration of the foregoing factors, and in accordance with the terms and conditions of this Judgment, the Parties are estopped and barred from asserting special priorities or preferences.

11. <u>Exercise of Carry Over Rights</u>. The first water Produced by a Producer during any Year shall be deemed to be an exercise of any Carry Over Right. Such Carry Over Right may be transferred in accordance with Exhibit "F".

12. <u>Production Only Pursuant to Judgment</u>. This Judgment, and the Physical Solution decreed herein, addresses all Production within the Mojave Basin Area. Because of the existence of Overdraft, any Production outside the framework of this Judgment and Physical Solution will contribute to an increased Overdraft, potentially damage the Mojave Basin Area and public interests in the Basin Area, injure the rights of all Parties, and interfere with the Physical Solution. Watermaster shall bring an action or a motion to enjoin any Production that is not pursuant to the terms of this Judgment.

13. <u>Declaration of Subarea Rights and Obligations</u>. In the aggregate, Producers within certain Subareas have rights, as against those in adjoining upstream Subareas, to receive average Annual water supplies and, in any one Year, to receive minimum Annual water supplies equal to the amounts set forth in Exhibit "G", in addition to any Storm Flows. In turn, in the aggregate, Producers within certain Subareas have an obligation to provide to adjoining downstream Subareas such average Annual water supplies in

the amounts and in the manner set forth in Exhibit "G". In any one Year, Producers within certain Subareas have an obligation to provide to adjoining downstream Subareas such minimum Annual water supplies in the amounts and in the manner set forth in Exhibit "G". The Producers in the Baja Subarea have an obligation to provide average and minimum Subsurface Flows toward Afton at the MWA eastern boundary equal to the amounts shown in Exhibit "G". Producers in each of the Subareas have rights in the aggregate, as against each adjoining downstream Subarea or, in the case of the Baja Subarea, as against flows at the MWA eastern boundary toward Afton, to divert, pump, extract, conserve, and use all surface water and Groundwater supplies originating therein or accruing thereto, and so long as the adjoining downstream Subarea Obligations are satisfied under this Judgment and there is compliance with all of its provisions. Watermaster shall maintain a continuing account of the status of each Subarea's compliance with its Subarea Obligation, including any cumulative credits or debits and any requirement for providing Makeup Water. The accounting and determinations relative to Subarea Obligations shall be made in accordance with procedures set forth in Exhibit "G".

III. <u>INJUNCTION</u>

14. <u>Injunction Against Unauthorized Production</u>. Each and every Party, its officers, agents, employees, successors, and assigns, is ENJOINED AND RESTRAINED from Producing water from the Basin Area except pursuant to the provisions of the Physical Solution in this Judgment.

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15. Injunction Re Change in Purpose of Use Without Notice Thereof to Watermaster. Each and every Party, its officers, agents, employees, successors, and assigns, is ENJOINED AND RESTRAINED from changing its Purpose of Use at any time without first notifying Watermaster of the intended change.

16. Injunction Against Unauthorized Recharge. Each and every Party, its officers, agents, employees, successors and assigns, is ENJOINED AND RESTRAINED from claiming any right to recapture Water that has been recharged in the Basin Area except pursuant to a Storage Agreement with Watermaster. This provision does not prohibit Parties from importing Supplemental Water into the Basin Area for direct use.

17. Injunction Against Transportation from Mojave Basin Area. Except upon further order of the Court, each and every Party, its officers, agents, employees, successors and assigns, is ENJOINED AND RESTRAINED from transporting water hereafter Produced from the Basin Area to areas outside the Basin Area.

18. Injunction Against Diverting Storm Flows. No Party may undertake or cause the construction of any project that will directly reduce the amount of Storm Flow that would otherwise go through the naturally occurring hydrologic regime to a downstream Subarea or that will reduce the surface area over which Storm Flow currently occurs by alteration to the bed of the Mojave River. This paragraph shall not prevent any flood control agency or municipality from taking such emergency action as may be necessary to protect the physical safety of its residents and its structures from flooding. Any such action shall be done in a manner that will minimize any reduction in the quantity of Storm Flows.

IV. CONTINUING JURISDICTION

19. Jurisdiction Reserved. Full jurisdiction, power and authority are retained by and reserved to the Court for purposes of enabling the Court upon the application of any Party, by a motion noticed in accordance with the notice procedures of Paragraph 36 hereof, to make such further or supplemental order or directions as may be necessary or appropriate for interim operation before the Physical Solution is fully operative, or for interpretation, enforcement or carrying out of this Judgement, and to modify, amend or amplify any of the provisions of this Judgment or to add to the provisions thereof consistent with the rights herein decreed; provided, that nothing in this paragraph shall authorize either a reduction of the Base Annual Production Right of any Party, except in accordance with the rules set forth in Exhibit "F", or a reduction of the Base Flow portion of any Subarea Obligation.

V. Physical Solution

A. GENERAL

20. Purpose and Objective. The Court hereby declares and decrees that the Physical Solution herein contained: 1) is a fair and equitable basis for satisfaction of all water rights in the Mojave Basin Area; 2) is in furtherance of the mandate of the State Constitution and the water policy of the State of California; and 3) takes into account applicable public trust interests; and therefore adopts and orders the Parties to comply with the Physical Solution. As noted in Paragraph 3 of this Judgment, the declaration of rights and obligations of the Parties and Subareas is a necessary component of this Physical Solution. The purpose of

the Physical Solution is to establish a legal and practical means for making the maximum reasonable beneficial use of the waters of the Basin Area by providing for the long-term conjunctive utilization of all water available thereto to meet the reasonable beneficial use requirements of water users therein.

21. Need for Flexibility. It is essential that this Physical Solution provide maximum flexibility and adaptability in order that the Court may be free to use existing and future technological, social, institutional and economic options in order to maximize reasonable beneficial use of the waters of the Basin Area. To that end, the Court's retained jurisdiction may be utilized where appropriate, to supplement the Physical Solution.

22. General Pattern of Operations. The Producers will be divided into five Subareas for purposes of administration. The Subarea rights and obligations are herein decreed. A fundamental premise of the Physical Solution is that all Parties will be allowed, subject to this Judgment, to Produce sufficient water to meet their reasonable beneficial use requirements. To the extent that Production by a Producer in any Subarea exceeds such Producer's share of the Free Production Allowance of that Subarea, Watermaster will provide Replacement Water to replace such excess Production according to the methods set forth herein. To the extent that any Subarea incurs a Makeup Obligation, Watermaster will provide Supplemental Water to satisfy such Makeup Obligation according to the methods set forth herein. For the initial five (5) full Years after entry of this Judgment (including any interlocutory Judgment), the Free Production Allowance for each Subarea shall be set as the amount of water equal to the following

percentages of the aggregate Base Annual Production for that Subarea:

	Judgment Year	Percentage
1993-1994	First Full Year	100
1994-1995	Second Full Year	95
1995-1996	Third Full Year	90
1996-1997	Fourth Full Year	85
1997-1998	Fifth Full Year	80

The extent of Overdraft now varies between Subareas and the reasonableness of any physical solution as applied to each Producer depends in part upon such Producer's foreseeable needs and the present and future availability of water within the Subarea in which each Producer is located. The Physical Solution described in this Judgment in part generally contemplates (i) initially allowing significant unassessed production on a substantially uniform basis for all Producers and Subareas and (ii) a phasing in of the monetary obligations necessary to obtain Supplemental Water. The above two provisions will affect each Subarea differently, may not be sufficient to ultimately eliminate the condition of Overdraft in each Subarea and could result in increased Overdraft within a Subarea. Any adverse impact to any Subarea caused by the implementation of the provisions shall be the responsibility of the Producers in each such Subarea.

B. <u>ADMINISTRATION</u>.

23. <u>Administration by Watermaster</u>. Watermaster shall administer and enforce the provisions of the Judgment and any subsequent instructions or orders of this Court.

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(a) Standard of Performance. Watermaster shall, in carrying out its duties, powers and responsibilities herein, act in an impartial manner without favor or prejudice to any Subarea, Producer, Party or Purpose of Use.

(b) Removal of Watermaster. Full jurisdiction, power and authority are retained and reserved by the Court for the purpose of enabling the Court on its own motion, or upon application of any Party, and upon notice in accordance with the notice procedures of paragraph 36 hereof, and after hearing thereon, to remove any appointed Watermaster and substitute a new Watermaster in its place. The Court shall find good cause for the removal of Watermaster upon a showing that Watermaster has failed to perform its duties, powers and responsibilities in an impartial manner, or has otherwise failed to act in the manner consistent with the provisions set forth in this Judgment or subsequent order of the Court.

(c) MWA Appointed as Initial Watermaster. The MWA is hereby appointed, until further order of the Court, as Watermaster to administer and enforce the provisions of this Judgment and any subsequent orders of this Court issued in the performance of its continuing jurisdiction. In carrying out this appointment, MWA shall segregate and separately exercise in all respects the Watermaster powers delegated by the Court under this Judgment from MWA's statutory powers. All funds received, held, and disbursed by MWA as Watermaster shall be by way of separate Watermaster accounts, subject to separate accounting and auditing. Meetings and hearings held by the MWA Board of Directors when acting as Watermaster shall be noticed and conducted separately from MWA meetings. All Watermaster staff and consultant functions shall be separate and distinct from MWA staff and consultant functions; provided, however, that pursuant to duly adopted Watermaster rules, which shall be subject to review according to Paragraph 36 hereof, Watermaster staff and consultant functions may be accomplished by MWA staff and consultants, subject to strict time and cost accounting principles so that Watermaster functions, and the Assessments provided under this Judgment, do not subsidize, and are not subsidized by, MWA functions. Subject to these principles, MWA shall implement practicable cost efficiencies through consolidation of Watermaster and MWA staff and consultant functions.

24. Powers and Duties. Subject to the continuing supervision and control of the Court, Watermaster shall have and may exercise the following express powers, and shall perform the following duties, together with any specific powers, authority and duties granted or imposed elsewhere in this Judgement or hereafter ordered or authorized by the Court in the exercise of its continuing jurisdiction:

a. Rules and Regulations. To adopt any and all appropriate rules and regulations for conduct pursuant to this Judgment after public hearing. Notice of hearing and a copy of the proposed rules and regulations, and any amendments thereof, shall be mailed to all Parties thirty days prior to the date of the hearing thereon.

b. Employment of Experts and Agents. To employ such administrative personnel, engineering, legal, accounting, or other specialty services and consulting assistants as may be deemed appropriate in carrying out the terms of this Judgment.

c. Makeup and Replacement Obligations. To determine the Makeup Obligations for each Subarea and Replacement Obligations for each Producer and each Subarea, pursuant to the terms of the Judgment.

d. Measuring Devices, etc. To adopt rules and regulations regarding determination of amounts of Production and installation of individual water meters. The rules and regulations shall provide for approved devices or methods to measure or estimate Production. Producers who meter Production on the date of entry of this Judgment shall continue to meter Production. Thereafter, Producers who do not meter Production on the effective date of entry of this Judgment may be required by Watermaster rules and regulations to install water meters upon a showing that then employed measurement devices or methods do not accurately determine actual Production. The rules and regulations shall require that within three Years after the date of entry of this Judgment, any Producer who provides piped water for human Consumption to more than five service connections shall have installed an individual water meter on each service connection.

e. Hydrologic Data Collection. To install, operate and maintain such wells, measuring devices and/or meters necessary to monitor stream flow, precipitation and groundwater levels and to obtain such other data as may be necessary to carry out the provisions of this Judgment, including a study of the Basin Area phreatophyte consumptive use.

f. Assessments. To set, levy and collect all Assessments specified herein.

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g. Purchase of and Recharge with Supplemental Water. In accordance with Paragraph 27, to the extent Supplemental Water is available and is reasonably needed for Replacement Water or Makeup Water, to use Replacement Water Assessment proceeds to purchase Replacement Water, and to use Makeup Water Assessment proceeds to purchase Makeup Water and to have such Replacement Water and Makeup Water provided to the appropriate Subarea as soon as practicable. Watermaster may prepurchase Supplemental Water and apply subsequent Assessments towards the costs of such prepurchases.

h. Water Quality. To take all reasonable steps to assist and encourage appropriate regulatory agencies to enforce reasonable water quality regulations affecting the Basin Area, including regulation of solid and liquid waste disposal.

i. Notice List. To maintain a current list of Responsible Parties to receive notice hereunder.

j. Annual Administrative Budget. To prepare a proposed administrative budget for each Year, hold hearings thereon, and adopt an administrative budget according to the time schedule set forth in Exhibit "D". The administrative budget shall set forth budgeted items and Administrative Assessments in sufficient detail to show the allocation of the expense among the Producers. Following the adoption of the budget, expenditures within budgeted items may thereafter be made by Watermaster in the exercise of powers herein granted, as a matter of course.

k. Annual Report to Court.

(1) To file an Annual report with this Court not later than April 1 of each Year beginning April 1 following the

first full Year after entry of Judgment. Prior to filing the Annual report with the Court, Watermaster shall notify all Parties that a draft of the report is available for review and shall provide notice of a hearing to receive comments and recommendations for changes in the report. The public hearing shall be conducted on the same date and at the same place as the hearings required by Paragraphs 3 and 4 of Exhibit "D". The notice of hearing may include such summary of the draft report as Watermaster may deem appropriate. Watermaster shall also distribute the report to the Parties requesting copies.

(2) The Annual report shall include an Annual fiscal report of the preceding Year's operation and shall include details as to operation of each of the Subareas and an audit of all Assessments and expenditures pursuant to this Physical Solution and a review of Watermaster activities pursuant to this Judgment. The Annual report shall include a compilation of at least the following:

Determinations and data required by:

i) Paragraph 24(c) (Makeup and Replacement Obligations)

ii) Paragraph 24(e) (Hydrologic Data Collection)

iii) Paragraph 24(g) (Purchase of and Recharge with Supplemental Water)

iv) Paragraph 24(i) (Notice List)

Rules and regulations adopted pursuant to:

v) Paragraph 24(a) (Rules and Regulations)

vi) Paragraph 24(d) (Measuring Devices, etc.)

vii) Paragraph 24(s) (Storage Agreements)

Reports required by:

viii)Paragraph 24(j) (Annual Administrative Budget)

ix) Paragraph 24(n) (Transfers)

x) Paragraph 24(o) (Free Production Allowance)

xi) Paragraph 24(p) (Production Reports)

xii)Exhibit "D" (Prior Year Report)

xiii)Exhibit "F" (Transfers of Base Annual Production Rights)

xiv) Exhibit "G" (Status of Subarea Obligation)

xv) Exhibit "H" (Biological Resource Mitigation)

l. Investment of Funds. To hold and invest any funds in investments authorized from time to time for public agencies in the State of California.

m. Borrowing. To borrow in anticipation of receipt of Assessment proceeds in an amount not to exceed the Annual amount of Assessments levied but uncollected.

n. Transfers. To prepare on an Annual basis and maintain a report or record of any transfer of Base Annual Production Rights. Such report or record shall be available for inspection by any Party upon reasonable notice to the Watermaster.

o. Free Production Allowance. Not later than the end of the 1997-1998 Water Year, and Annually thereafter, to recommend in the Watermaster Annual Report an adjustment, if needed, to the Free Production Allowance for any Subarea. In making its recommendation, Watermaster shall be guided by the factors set forth in Exhibit "C", including but not limited to an annual calculation of the change of water in storage. The Annual report shall include all assumptions and calculations relied upon in making its recommendations. Following the 1997-1998 Water Year, or any time thereafter, Watermaster shall obtain prior Court approval for any increase or reduction of any Subarea's Free Production Allowance. In no event shall a reduction in any Year for a Subarea exceed five percent of the aggregate Base Annual Production of that Subarea. In the event Watermaster recommends in its report to the Court that the Free Production Allowance for any Subarea may need to be increased or reduced, the Court shall conduct a hearing, after notice given by Watermaster according to paragraph 36, upon Watermaster's recommendations and may order such changes in Subarea Free Production Allowance. The most recent Subarea Free Production Allowances shall remain in effect until revised according to this Paragraph 24(o).

p. Production Reports. To require each Producer to file with Watermaster, pursuant to procedures and time schedules to be established by Watermaster, a report on a form to be prescribed by Watermaster showing the total Production of such Party for each reporting period rounded off to the nearest tenth of an acre foot, and such additional information and supporting documentation as Watermaster may require.

q. Production Adjustment for Change in Purpose of Use. If Watermaster determines, using the Consumptive Use rates set forth in Exhibit "F", that a new Purpose of Use of any Producer's Production for any Year has resulted in a higher rate of Consumption than the rate applicable to the original Purpose of Use of that Producer's Production in the Year for which Base Annual Production was determined, Watermaster shall use a multiplier (1) to adjust upward such Production for the purpose of determining the Producer's Replacement Water Assessment and, (2) to adjust upward the Free Production Allowance portion of such Production for the purpose of determining the Producer's Makeup Water Assessment. The multiplier shall be determined by dividing the number of acre feet of Consumption that occurred under the new Purpose of Use by the number of acre feet of Consumption that would have occurred under the original Purpose of Use for the same Production.

r. Reallocation of Base Annual Production Rights. To reallocate annually the Base Annual Production Rights in each Subarea to reflect any permanent transfers of such Rights among Parties.

s. Storage Agreements. To enter into Storage Agreements with any Party in order to accommodate the acquisition of Supplemental Water. Watermaster may not enter into Storage Agreements with non-Parties unless such non-Parties become subject to the provisions of this Judgment and the jurisdiction of the Court. Such Storage Agreements shall by their terms preclude operations which will have a substantial adverse impact on any Producer. If a Party pursuant to a Storage Agreement has provided for predelivery or postdelivery of Replacement Water for the Party's use, Watermaster shall at the Party's request credit such water to the Party's Replacement Obligation. Watermaster shall adopt uniformly applicable rules for Storage Agreements. Watermaster shall calculate additions, extractions and losses of water stored under Storage Agreements and maintain an Annual account of all such water.

t. Subarea Advisory Committee Meetings. To meet on a regular basis and at least semi-annually with the Subarea Advisory Committees to review Watermaster activities pursuant to this Judgment and to receive advisory recommendations from the Subarea Advisory Committees.

u. Unauthorized Production. To bring such action or motion as is necessary to enjoin unauthorized Production as provided in Paragraph 12 hereinabove.

v. Meetings and Records. To ensure that all meetings and hearings by Watermaster shall be noticed and conducted according to then current requirements of the Ralph M. Brown Act, Government Code Sections 54950, et seq. Watermaster files and records shall be available to any person according to the provisions of the Public Records Act, Government Code §§ 6200 et seq.

w. Data, Estimates and Procedures. To rely on and use the best available records and data to support the implementation of this Judgment. Where actual records of data are not available, Watermaster shall rely on and use sound scientific and engineering estimates. Watermaster may use preliminary records of measurements, and, if revisions are subsequently made, Watermaster may reflect such revisions in subsequent accounting. Exhibit "C" sets forth methods and procedures for determining surface flow components. Watermaster shall use either the same procedures or procedures that will yield results of equal or greater accuracy.

x. Biological Resource Mitigation. To implement the Biological Resource Mitigation measures set forth in Exhibit "H" herein.

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C. ASSESSMENTS

25. Purpose. Watermaster shall levy and collect Assessments from the Parties based upon Production in accordance with the time schedules set forth in Exhibit "D". Watermaster shall levy and collect such Assessments as follows:

a. Administrative Assessments. Administrative Assessments to fund the Administrative Budget adopted by the Watermaster pursuant to Paragraph 24(j) shall be levied uniformly against each acre foot of Production. A Producer who does not Produce in a given Year shall pay an Administrative Assessment in amount equal to the lowest MWA assessment for Minimal Producers for that Year.

b. Replacement Water Assessments. Replacement Water Assessments shall be levied against each Producer on account of such Producer's Production, after any adjustment pursuant to Paragraph 24(q), in excess of such Producer's share of the Free Production Allowance in each Subarea during the prior Year.

c. Makeup Water Assessments. Makeup Water Assessments shall be levied against each Producer in each Subarea on account of each acre-foot of Production therein which does not bear a Replacement Assessment hereunder, after any adjustment pursuant to Paragraph 24(q), to pay all necessary costs of satisfying the Makeup Obligation, if any, of that Subarea.

d. Biological Resource Assessment. To establish and, to the extent needed, to maintain the Biological Resource Trust Fund balance at one million dollars (in 1993 dollars) pursuant to Paragraph 24(x) and Exhibit "H", a Biological Resource Assessment in an amount not to exceed fifty cents (in 1993 dollars) for each acre-feet of Production shall be levied uniformly against each producer except the California Department of Fish and Game.

e. MWA Assessment of Minimal Producers. The MWA shall identify and assess Minimal Producers through its own administrative procedures, and not acting as Watermaster.

26. Procedure. Each Party hereto is ordered to pay the Assessments herein provided for, which shall be levied and collected in accordance with the procedures and schedules set forth in Exhibit "D". Any Assessment which becomes delinquent, as defined in Paragraph 7 of Exhibit "D", shall bear interest at the then current San Bernardino County property tax delinquency rate Said interest rate shall be applicable to any said delinquent Assessment from the due date thereof until paid. Such delinquent Assessment, together with interest thereon, costs of suit, attorneys fees and reasonable costs of collection, may be collected pursuant to motion giving notice to the delinquent Party only, or Order to Show Cause proceeding, or such other lawful proceeding as may be instituted by the Watermaster; and shall, if provided for in the MWA Act, constitute a lien on the property of the Party as of the same time and in the same manner as does the tax lien securing County property taxes. The Watermaster shall Annually certify a list of all such unpaid delinquent Assessments to the MWA (in accordance with applicable provisions of the MWA Act). The MWA (in accordance with applicable provisions of the MWA Act) shall include the names of those Parties and the amounts of the liens in its list to the County Assessor's Office in the same manner and at the same time as it does its administrative assessments. MWA shall account for receipt of all collections of Assessments collected pursuant to

this Judgment, and shall pay such amounts collected pursuant to this Judgment to the Watermaster. The Watermaster shall also have the ability to enjoin production of those Persons who do not pay Assessments pursuant to this Judgment.

27. Availability of Supplemental Water. All Replacement and Makeup Water Assessments collected by the Watermaster shall be used to acquire Supplemental Water from MWA. Watermaster shall determine when to request Supplemental Water from MWA and shall determine the amount of Supplemental Water to be requested. MWA shall use its best efforts to acquire as much Supplemental Water as possible in a timely manner. If MWA encounters delays in the acquisition of Supplemental Water which, due to cost increases, results in collected assessment proceeds being insufficient to purchase all Supplemental Water for which the Assessments were made, MWA shall purchase as much water as the proceeds will allow when the water becomes available. If available Supplemental Water is insufficient to meet all Makeup and Replacement Water obligations, Watermaster shall allocate the Supplemental Water for delivery to the Subareas on an equitable and practicable basis pursuant to duly adopted Watermaster rules and regulations, giving preference to: First, Transition Zone Replacement Water Obligations as set forth in Exhibit "G"; Second, Makeup Water Obligations; and Third, other Replacement Water Obligations. MWA may acquire Supplemental Water at any time. MWA shall be entitled to enter into a Storage Agreement with Watermaster to store water MWA acquires prior to being paid to do so by Watermaster. Such water, including such water acquired and stored prior to the date of this Judgment or prior to the entry of

a Storage Agreement, may later be used to satisfy MWA's duty under this paragraph.

28. Use of Replacement Water Assessment Proceeds and Makeup Water Assessment Proceeds. The Proceeds of Replacement Water Assessments and any interest accrued thereon shall only be used for the purchase of Replacement Water for that Subarea from which they were collected. In addition, the proceeds of Replacement Water Assessments collected on account of Production in the Transition Zone, except as provided in Exhibit "G", shall only be used for the purchase of Replacement Water for the Transition Zone, and the proceeds of Replacement Water Assessments collected on account of Production in that portion of the Baja Subarea downstream of the Calico-Newberry fault shall only be used for the purchase of Replacement Water for that portion of the Baja Subarea downstream of the Calico-Newberry fault. The proceeds of Makeup Water Assessments and any interest accrued thereon shall only be used for the purchase of Makeup Water to satisfy the Makeup Obligation for which they are collected.

29. MWA Annual Report to the Watermaster. MWA shall Produce and deliver to Watermaster an Annual written report regarding actions of MWA required by the terms of this Judgment. The report shall contain: 1) a summary of the actions taken by MWA in identifying and assessing Minimal Producers, including a report of Assessments made and collected; 2) a summary of other MWA activities in collecting Assessment on behalf of Watermaster; 3) a report of water purchases and water distribution for the previous Year; 4) actions taken to implement its Regional Water Management Plan, including actions relating to conveyance facilities referred

to in this Judgment. The MWA report will be provided to Watermaster not less than 30 days prior to the Annual Watermaster report to the Court required by this Judgment.

D. SUBAREA ADVISORY COMMITTEES.

30. Authorization. The Producers in each of the five Subareas are hereby authorized and directed to cause committees of Producer representatives to be organized and to act as Subarea Advisory Committees.

31. Composition and Election. Each Subarea Advisory Committee shall consist of five (5) Persons who shall be called advisors. In the election of advisors, every Party shall be entitled to one vote for every acre-foot of Base Annual Production for that Party in that particular Subarea. Parties may cumulate their votes and give one candidate a number of votes equal to the number of advisors to be elected multiplied by the number of votes to which the Party is normally entitled, or distribute the Party's votes on the same principle among as many candidates as the Party thinks fit. In any election of advisors, the candidates receiving the highest number of affirmative votes of the Parties are elected. Elections shall be held upon entry of this Judgment and thereafter every third year. In the event a vacancy arises, a temporary advisor shall be appointed by unanimous decision of the other four advisors to continue in office until the next scheduled election. The California Department of Fish and Game shall serve as a permanent ex-officio member of the Alto and Baja Subarea Advisory Committees. Rules and regulations regarding organization, meetings and other activities shall be at the discretion of the individual

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Subarea Advisory Committees, except that all meetings of the committees shall be open to the public.

32. Compensation. The Subarea Advisory Committee members shall serve without compensation.

33. Powers and Functions. The Subarea Advisory Committee for each Subarea shall act in an advisory capacity only and shall have the duty to study, review and make recommendations on all discretionary determinations made or to be made hereunder by Watermaster which may affect that Subarea.

E. TRANSFERABILITY.

34. Assignment, Transfer, etc. of Rights. In order to further the purposes of this Judgment and Physical Solution, any Base Annual Production Right, or any portion thereof, may be sold, assigned, transferred, licensed or leased pursuant to the rules and procedures set forth in Exhibit "F".

F. MISCELLANEOUS PROVISIONS.

35. Water Quality. Nothing in this Judgment shall be interpreted as relieving any Party of its responsibilities to comply with state or federal laws for the protection of water quality or the provisions of any permits, standards, requirements, or orders promulgated thereunder.

36. Review Procedures. Any action, decision, rule or procedure of Watermaster pursuant to this Judgment shall be subject to review by the Court on its own motion or on timely motion by any Party, as follows:

a. Effective Date of Watermaster Action. Any order, decision or action of Watermaster pursuant to this Judgment on noticed specific agenda items shall be deemed to have occurred on the date of the order, decision or action.

b. Notice of Motion. Any Party, may, by a regularly noticed motion, petition the Court for review of Watermaster's action or decision pursuant to this Judgment. The motion shall be deemed to be filed when a copy, conformed as filed with the Court, has been delivered to Watermaster together with the service fee established by Watermaster sufficient to cover the cost to photocopy and mail the motion to each Party. Watermaster shall prepare copies and mail a copy of the motion to each Party or its designee according to the official service list which shall be maintained by Watermaster according to Paragraph 37. A Party's obligation to serve notice of a motion upon the Parties is deemed to be satisfied by filing the motion as provided herein. Unless ordered by the Court, any such petition shall not operate to stay the effect of any Watermaster action or decision which is challenged.

c. Time for Motion. A motion to review any Watermaster action or decision shall be filed within ninety (90) days after such Watermaster action or decision, except that motions to review Watermaster Assessments hereunder shall be filed within thirty (30) days of mailing of notice of the Assessment.

d. De Novo Nature of Proceeding. Upon filing of a petition to review Watermaster action, the Watermaster shall notify the Parties of a date when the Court will take evidence and hear argument. The Court's review shall be *de novo* and the Watermaster decision or action shall have no evidentiary weight in such proceeding.

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e. Decision. The decision of the Court in such proceeding shall be an appealable Supplemental Order in this case. When the same is final, it shall be binding upon Watermaster and the Parties.

f. Payment of Assessments. Payment of Assessments levied by Watermaster hereunder shall be made pursuant to the time schedule in Exhibit "D"; notwithstanding any motion for review of Watermaster actions, decisions, rules or procedures, including review of Watermaster Assessments.

37. Designation of Address for Notice and Service. Each Party shall designate the name and address to be used for purposes of all subsequent notices and service herein, either by its endorsement on the Stipulation for Judgment or by a separate designation to be filed within thirty (30) days after Judgment has been entered. Said designation may be changed from time to time by filing a written notice of such change with Watermaster. Any Party desiring to be relieved of receiving notices of Watermaster activity may file a waiver of notice on a form to be provided by Watermaster. Watermaster shall maintain at all times a current list of Parties to whom notices are to be sent and their addresses for purposes of service. Watermaster shall also maintain a full current list of names and addresses of all Parties or their successors, as filed herein. Copies of such lists shall be available to any Person. If no designation is made, a Party's designee shall be deemed to be, in order of priority: i) the Party's attorney of record; ii) if the Party does not have an attorney of record, the Party itself at the address on the Watermaster list.

38. Service of Documents. Delivery to or service upon any Party by Watermaster, by any other Party, or by the Court, of any document required to be served upon or delivered to a Party under or pursuant to the Judgment shall be deemed made if made by Deposit thereof (or by copy thereof) in the mail, first class, postage prepaid, addressed to the designee of the Party and at the address shown in the latest designation filed by that Party.

39. No Abandonment of Rights. It is in the interest of reasonable beneficial use of the Basin Area and its water supply that no Party be encouraged to take and use more water in any Year than is actually required. Failure to Produce all of the water to which a Party is entitled hereunder shall not, in and of itself, be deemed or constitute an abandonment of such Party's right, in whole or in part.

40. Intervention After Judgment. Any person who is not a Party or successor to a Party and who proposes to Produce water from the Basin Area may seek to become a Party to this Judgment through a Stipulation for Intervention entered into with Watermaster. Watermaster may execute said Stipulation on behalf of the other Parties herein but such Stipulation shall not preclude a Party from opposing such Intervention at the time of the Court hearing thereon. Said Stipulation for Intervention must thereupon be filed with the Court, which will consider an order confirming said intervention following thirty (30) days' notice to the Parties. Thereafter, if approved by the Court, such intervenor shall be a Party bound by this Judgment and entitled to the rights and privileges accorded under the Physical Solution herein.

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41. Recordation of Notice. MWA shall within sixty (60) days following entry of this Judgment record in the Office of the County Recorder of the County of San Bernardino a notice substantially complying with the notice content requirements set forth in Section 2529 of the California Water Code.

42. Judgment Binding on Successors, etc. Subject to specific provisions hereinbefore contained, this Judgment and all provisions thereof are applicable to and binding upon and inure to the benefit of not only the Parties to this action, but as well to their respective heirs, executors, administrators, successors, assigns, lessees, licensees and to the agents, employees and attorneys in fact of any such Persons.

43. Costs. No Party stipulating to this Judgment shall recover any costs or attorneys fees in this proceeding from another stipulating Party.

44. Entry of Judgment. The Clerk shall enter this Judgment.

Dated: JAN 1 0 1996

E. MICHAEL KAISER

E. Michael Kaiser, Judge
Superior Court of the State
of California for the
County of Riverside

EXHIBIT A

MAP OF MOJAVE BASIN AREA

[INDEX MAP AND DETAIL SHEET CONSISTING OF 42 1" = 4,000' SCALE MAPS COVERING THE BASIN AREA; THE MAP IS ON DISPLAY AT THE OFFICE OF THE MOJAVE WATER AGENCY, 22450 HEADQUARTERS, APPLE VALLEY, CA 92307 AND ON FILE WITH THE COURT]

EXHIBIT B

PRODUCTION TABLES

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TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
ABSHIRE, DAVID V	24	0.1093	24	22	21	20	19
ANDERSON, ROSS C & BETTY J	34	0.1548	34	32	30	28	27
BAR H MUTUAL WATER COMPANY	53	0.2414	53	50	47	45	42
BELL, CHUCK	494	2.2497	494	469	444	419	395
BURNS, BOBBY J & EVELYN J	1,300	5.9204	1,300	1,235	1,170	1,105	1,040
CASA COLINA FOUNDATION	90	0.4099	90	85	81	76	72
CENTER WATER CO	40	0.1822	40	38	36	34	32
CLUB VIEW PARTNERS	1,276	5.8111	1,276	1,212	1,148	1,084	1,020
CROSS, LAWRENCE E	23	0.1047	23	21	20	19	18
CRYSTAL HILLS WATER COMPANY	194	0.8835	194	184	174	164	155
DAHLQUIST, GEORGE R	594	2.7052	594	564	534	504	475
DELPERDANG, ROBERT H	56	0.2550	56	53	50	47	44
DESERT DAWN MUTUAL WATER COMPANY	15	0.0683	15	14	13	12	12
GAETA, TRINIDAD	512	2.3317	512	486	460	435	409
GAYJIKIAN, SAMUEL & HAZEL	102	0.4645	102	96	91	86	81
GRACETOWN INVESTMENT CO - JETCO PROP FUND	752	3.4247	752	714	676	639	601
GUBLER, HANS	30	0.1366	30	28	27	25	24
HAL-DOR LTD	23	0.1047	23	21	20	19	18
HANDLEY, DON R & MARY ANN	73	0.3325	73	69	65	62	58
HART, MERRILL W	473	2.1541	473	449	425	402	378
HERT, SCOTT	276	1.2569	276	262	248	234	220
HI-GRADE MATERIALS	442	2.0129	442	419	397	375	353
HITCHIN LUCERNE, INC	16	0.0729	16	15	14	13	12
JAMS RANCH	28	0.1275	28	26	25	23	22

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ESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
JUBILEE MUTUAL WATER COMPANY	142	0.6467	142	134	127	120	113
JUNIPER RIVIERA COUNTY WATER DISTRICT	37	0.1685	37	35	33	31	29
LEE, DOO HWAN	78	0.3552	78	74	70	66	62
LOPEZ, BALTAZAR	385	1.7533	385	365	346	327	308
LUA, ANTONIO	348	1.5848	348	330	313	295	278
LUCERNE VALLEY MUTUAL WATER COMPANY	54	0.2459	54	51	48	45	43
LUCERNE VALLEY PARTNERS	1,213	5.5242	1,213	1,152	1,091	1,031	970
LUCERNE VISTA WATER CO	21	0.0956	21	19	18	17	16
MITSUBISHI CEMENT CORPORATION	1,299	5.9158	1,299	1,234	1,169	1,104	1,039
MONACO INVESTMENT COMPANY	70	0.3188	70	66	63	59	56
MOSS, LAWRENCE W & HELEN J	43	0.1958	43	40	38	36	34
PARK, CHANHO	597	2.7188	597	567	537	507	477
PARK, JEONG, IL & HEA JA	96	0.4372	96	91	86	81	76
PEREZ, EVA	247	1.1249	247	234	222	209	197
PETTIGREW, DAN	1,422	6.4760	1,422	1,350	1,279	1,208	1,137
PETTIGREW, HOWARD L	1,500	6.8312	1,500	1,425	1,350	1,275	1,200
PLUESS-STAUFER CALIFORNIA INC	23	0.1047	23	21	20	19	18
REED, MIKE	58	0.2641	58	55	52	49	46
ROGERS, ROY	1,449	6.5990	1,449	1,376	1,304	1,231	1,159
SAN BERNARDINO CO SERVICE AREA 29	21	0.0956	21	19	18	17	16
SEALS, LAWRENCE	113	0.5146	113	107	101	96	90
SON'S RANCH	140	0.6376	140	133	126	119	112
SOUTHERN CALIFORNIA WATER COMPANY	178	0.8106	178	169	160	151	142
SPECIALTY MINERALS, INC	42	0.1913	42	39	37	35	33

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ESTE SUBAREA	BASE ANNUAL PRODUCTION [1]	BASE ANNUAL PRODUCTION RIGHT [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
SPILLMAN, JAMES R & NANCY J	23	0.1047	23	21	20	19	18
STEWART WATER COMPANY	54	0.2459	54	51	48	45	43
STRINGER, W EDWARD	573	2.6095	573	544	515	487	458
THE CUSHENBURY TRUST, C/O SPECIALTY MINERALS, INC	10	0.0455	10	9	9	8	8
TURNER, LOYD & CAROL	77	0.3507	77	73	69	65	61
VISOSKY, JOSEPH F JR	1,120	5.1006	1,120	1,064	1,008	952	896
WEISER, SIDNEY & RAQUEL	90	0.4099	90	85	81	76	72
WILLOW WELLS MUTUAL WATER COMPANY	30	0.1366	30	28	27	25	24

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ESTE SUBAREA / PRODUCER	BASE ANNUAL PRODUCTION[1] (ACRE-FEET)	BASE ANNUAL PRODUCTION RIGHT[2] (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
			FIRST YEAR	SECOND YEAR[3]	THIRD YEAR[3]	FOURTH YEAR[3]	FIFTH YEAR[3]
MINIMAL PRODUCER POOL	2,000	9.1083	2,000	1,900	1,800	1,700	1,600
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	1,485	6.7629					
ESTE SUBAREA TOTALS =	21,958	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN OESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

OESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AEROCHEM, INC	660	5.3645	660	627	594	561	528
BROWN, DOUG & SUE	46	0.3739	46	43	41	39	36
CHAMISAL MUTUAL	96	0.7803	96	91	86	81	76
DAVIS, PAUL	19	0.1544	19	18	17	16	15
DOSSEY, D A	14	0.1138	14	13	12	11	11
MEADOWBROOK DAIRY	2,335	18.9791	2,335	2,218	2,101	1,984	1,868
RESSEGUE, JOHN & BILL	259	2.1052	259	246	233	220	207
SAN BERNARDINO CO SERVICE AREA 70G	110	0.8941	110	104	99	93	88
SAN BERNARDINO CO SERVICE AREA 70L	1,306	10.6153	1,306	1,240	1,175	1,110	1,044
THORESON, ROBERT F & A KATHLEEN	40	0.3251	40	38	36	34	32
TROEGER, RICHARD H	112	0.9103	112	106	100	95	89
VAN DAM BROTHERS	1,860	15.1183	1,860	1,767	1,674	1,581	1,488

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OESTE SUBAREA / PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
			FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MINIMAL PRODUCER POOL	1,500	12.1921	1,500	1,425	1,350	1,275	1,200
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	3,946	32.0735					
OESTE SUBAREA TOTALS =	12,303	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

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TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
ABBOND, EDWARD & GRACE	28	0.0229	28	26	25	23	22
ABBOTT, LEONARD C	284	0.2321	284	269	255	241	227
ADELANTO, CITY OF	1,573	1.2855	1,573	1,494	1,415	1,337	1,258
ADELANTO, CITY OF - GEORGE A F B	3,433	2.8055	3,433	3,261	3,089	2,918	2,746
AGCON, INC	384	0.3138	384	364	345	326	307
APPLE VALLEY COUNTRY CLUB	709	0.5794	709	673	638	602	567
APPLE VALLEY DEVELOPMENT	724	0.5917	724	687	651	615	579
APPLE VALLEY FOOTHILL CO WATER DISTRICT	167	0.1365	167	158	150	141	133
APPLE VALLEY HEIGHTS COUNTY WATER DISTRICT	125	0.1022	125	118	112	106	100
APPLE VALLEY RANCHOS WATER COMPANY	13,022	10.6419	13,022	12,370	11,719	11,068	10,417
APPLE VALLEY RECREATION & PARKS	45	0.0368	45	42	40	38	36
APPLE VALLEY VIEW MUTUAL WATER CO	36	0.0294	36	34	32	30	28
APPLE VALLEY, TOWN OF	298	0.2435	298	283	268	253	238
ARC LAS FLORES	6,331	5.1739	6,331	6,014	5,697	5,381	5,064
BACA, ENRIQUE	74	0.0605	74	70	66	62	59
BALDY MESA WATER DISTRICT	1,495	1.2218	1,495	1,420	1,345	1,270	1,196
BASS, NEWTON T	514	0.4201	514	488	462	436	411
BASTIANON, REMO	77	0.0629	77	73	69	65	61
BASURA, STEVE	25	0.0204	25	23	22	21	20
BEINSCHROTH, A J	90	0.0736	90	85	81	76	72
BOYCE, KENNETH & WILLA	102	0.0834	102	96	91	86	81
BROWN, BOBBY G & VALERIA R	42	0.0343	42	39	37	35	33
BURNS, ULYSSES & ANNIE L	164	0.1340	164	155	147	139	131
CARDOZO, MANUEL & MARIA	909	0.7429	909	863	818	772	727

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ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
CDFG - MOJAVE NARROWS REGIONAL PARK	2,107	1.7219	2,107	2,001	1,896	1,790	1,685
CDFG - MOJAVE RIVER FISH HATCHERY	20	0.0163	20	19	18	17	16
CLARK, KENNETH R	223	0.1822	223	211	200	189	178
CLEAR VIEW FARMS	501	0.4094	501	475	450	425	400
COPELAND, ET AL (C/O DON W. LITTLE)	175	0.1430	175	166	157	148	140
CRAMER, MARGARET MUIR	280	0.2288	280	266	252	238	224
CUNNINGHAM, WILLIAM	29	0.0237	29	27	26	24	23
DEXTER, CLAIR F	175	0.1430	175	166	157	148	140
DEXTER, J P	515	0.4209	515	489	463	437	412
DIBERNARDO, JOHN	203	0.1659	203	192	182	172	162
DOLCH, ROBERT & JUDY	426	0.3481	426	404	383	362	340
DOMBROWSKI, MICHAEL W & SUSAN M	19	0.0155	19	18	17	16	15
DOWSE, PHILIP	20	0.0163	20	19	18	17	16
EVENSON, EDWIN H & JOYCELAINE	70	0.0572	70	66	63	59	56
FISHER, DOLORES DR	48	0.0392	48	45	43	40	38
FISHER, JEROME	633	0.5173	633	601	569	538	506
FITZWATER, R E	291	0.2378	291	276	261	247	232
GARCIA, SONIA L	288	0.2354	288	273	259	244	230
GOMEZ, CIRIL - LIVING TRUST	330	0.2697	330	313	297	280	264
GREEN ACRES ESTATES	25	0.0204	25	23	22	21	20
GULBRANSON, MERLIN	163	0.1332	163	154	146	138	130
HELENDALE SCHOOL DISTRICT	18	0.0147	18	17	16	15	14
HESPERIA GOLF AND COUNTRY CLUB	678	0.5541	678	644	610	576	542
HESPERIA WATER DISTRICT	12,213	9.9808	12,213	11,602	10,991	10,381	9,770

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
HI-GRADE MATERIALS	149	0.1218	149	141	134	126	119
HODGE, STANLEY W	67	0.0548	67	63	60	56	53
HOLWAY, ROBERT	88	0.0719	88	83	79	74	70
HRUBIK, THOMAS A	3,862	3.1561	3,862	3,668	3,475	3,282	3,089
INDUSTRIAL ASPHALT	109	0.0891	109	103	98	92	87
JESS RANCH WATER COMPANY	7,480	6.1129	7,480	7,106	6,732	6,358	5,984
JOHNSON, LARRY & CARLEAN	82	0.0670	82	77	73	69	65
JOHNSON, RONALD	31	0.0253	31	29	27	26	24
JOHNSTON, HARRIET AND LARRY W	127	0.1038	127	120	114	107	101
KEMPER CAMPBELL RANCH	473	0.3865	473	449	425	402	378
LAKE ARROWHEAD COMMUNITY SERVICES DISTRICT	658	0.5377	658	625	592	559	526
LAWSON, ERNEST & BARBARA	15	0.0123	15	14	13	12	12
LENHERT, RONALD & TONI	37	0.0302	37	35	33	31	29
LEWIS HOMES OF CALIFORNIA	1,693	1.3836	1,693	1,608	1,523	1,439	1,354
LONGMAN, JACK	115	0.0940	115	109	103	97	92
LOUNSBURY, J PETER & CAROLYN	208	0.1700	208	197	187	176	166
LOW, ROBERT	399	0.3261	399	379	359	339	319
LUCKEY, MANLEY J	800	0.6538	800	760	720	680	640
LUTH, KEN	27	0.0221	27	25	24	22	21
MARIANA RANCHOS COUNTY WATER DISTRICT	245	0.2002	245	232	220	208	196
MCCALL, REX	44	0.0360	44	41	39	37	35
MCINNIS, WILLIAM S	30	0.0245	30	28	27	25	24
MITCHELL, ROBIN & JUDITH	36	0.0294	36	34	32	30	28
MURPHY, BERNARD H	25	0.0204	25	23	22	21	20

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EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MURPHY, BERNARD TRUST	162	0.1324	162	153	145	137	129
MURPHY, KENNETH	42	0.0343	42	39	37	35	33
MUTUAL FUNDING CORP	101	0.0825	101	95	90	85	80
NAVAJO MUTUAL WATER CO	88	0.0719	88	83	79	74	70
NUNN, DONALD & PEARL	66	0.0539	66	62	59	56	52
O'BRYANT, ROBERT C & BARBARA	107	0.0874	107	101	96	90	85
ORMSBY, HARRY G	386	0.3154	386	366	347	328	308
PALISADES RANCH	824	0.6734	824	782	741	700	659
PARKER, DAVID E	37	0.0302	37	35	33	31	29
PEARL, ALICE	147	0.1201	147	139	132	124	117
PEARSON, DERYL B	22	0.0180	22	20	19	18	17
PERRY, THOMAS A	35	0.0286	35	33	31	29	28
PETTIS TRUST	126	0.1030	126	119	113	107	100
PHENIX PROPERTIES LTD	652	0.5328	652	619	586	554	521
PITTMAN, LEROY W	148	0.1209	148	140	133	125	118
POLICH, LEE & DONNA	65	0.0531	65	61	58	55	52
RANCHERITOS MUTUAL WATER CO	169	0.1381	169	160	152	143	135
RIVERSIDE CEMENT CO - ORO GRANDE PLANT	3,452	2.8211	3,452	3,279	3,106	2,934	2,761
ROGERS, ROY (ORO GRANDE RANCH)	115	0.0940	115	109	103	97	92
RUDMAN, ROBERT T	300	0.2452	300	285	270	255	240
RUE RANCH	30	0.0245	30	28	27	25	24
SAN BERNARDINO CO SERVICE AREA 42	465	0.3800	465	441	418	395	372
SAN BERNARDINO CO SERVICE AREA 64	3,822	3.1234	3,822	3,630	3,439	3,248	3,057
SAN BERNARDINO CO SERVICE AREA 70C	2,346	1.9172	2,346	2,228	2,111	1,994	1,876

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
			FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
SAN BERNARDINO CO SERVICE AREA 70J	1,005	0.8213	1,005	954	904	854	804
SAN BERNARDINO CO SERVICE AREA 70L	355	0.2901	355	337	319	301	284
SAN FILIPPO, JOSEPH & SHELLEY	35	0.0286	35	33	31	29	28
SILVER LAKES ASSOCIATION	3,987	3.2583	3,987	3,787	3,588	3,388	3,189
SOUTHDOWN, INC	1,519	1.2414	1,519	1,443	1,367	1,291	1,215
SOUTHERN CALIFORNIA WATER COMPANY	940	0.7682	940	893	846	799	752
SPRING VALLEY LAKE ASSOCIATION	3,056	2.4974	3,056	2,903	2,750	2,597	2,444
SPRING VALLEY LAKE COUNTRY CLUB	977	0.7984	977	928	879	830	781
STORM, RANDALL	62	0.0507	62	58	55	52	49
SUDMEIER, GLENN W	121	0.0989	121	114	108	102	96
SUMMIT VALLEY RANCH	452	0.3694	452	429	406	384	361
TATRO, RICHARD K & SANDRA A	280	0.2288	280	266	252	238	224
TATUM, JAMES B	829	0.6775	829	787	746	704	663
TAYLOR, ALLEN C / HAYMAKER RANCH	456	0.3727	456	433	410	387	364
THOMAS, S DALE	440	0.3596	440	418	396	374	352
THOMAS, WALTER	36	0.0294	36	34	32	30	28
THOMPSON, JAMES A	418	0.3416	418	397	376	355	334
THOMPSON, RODGER	76	0.0621	76	72	68	64	60
THRASHER, GARY	373	0.3048	373	354	335	317	298
THUNDERBIRD COUNTY WATER DISTRICT	118	0.0964	118	112	106	100	94
TURNER, ROBERT	70	0.0572	70	66	63	59	56
VAIL, JOSEPH B & PAULA E	126	0.1030	126	119	113	107	100
VAN BURGER, CARL	710	0.5802	710	674	639	603	568
VAN LEEUWEN FAMILY TRUST	341	0.2787	341	323	306	289	272

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND

BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA

TOGETHER WITH FREE PRODUCTION ALLOWANCES

FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL PRODUCTION [1]	BASE ANNUAL PRODUCTION RIGHT [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
VANNI, MIKE	54	0.0441	54	51	48	45	43
VICTOR VALLEY COMMUNITY COLLEGE DIST	240	0.1961	240	228	216	204	192
VICTOR VALLEY WATER DISTRICT	13,354	10.9133	13,354	12,686	12,018	11,350	10,683
VICTORVILLE, CITY OF	12	0.0098	12	11	10	10	9
VOGLER, ALBERT H	132	0.1079	132	125	118	112	105
WACKEEN, CAESAR	1,635	1.3362	1,635	1,553	1,471	1,389	1,308
WAKULA, JOHN	291	0.2378	291	276	261	247	232
WARD, KEN & BARBARA	65	0.0531	65	61	58	55	52
WEBER, DAVE	80	0.0654	80	76	72	68	64
WEST, CAROLYN & SMITH, RICHARD	24	0.0196	24	22	21	20	19
WEST, HOWARD & SUZY	72	0.0588	72	68	64	61	57
WHITTINGHAM, RICHARD V	15	0.0123	15	14	13	12	12
YEAGER, E L - CONSTRUCTION COMPANY INC	34	0.0278	34	32	30	28	27

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL PRODUCTION[1]	BASE ANNUAL PRODUCTION RIGHT[2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND YEAR[3]	THIRD YEAR[3]	FOURTH YEAR[3]	FIFTH YEAR[3]
MINIMAL PRODUCER POOL	4,000	3.2689	4,000	3,800	3,600	3,400	3,200
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	4,967	4.0592					
ALTO SUBAREA TOTALS =	122,365	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1]	BASE ANNUAL [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	PRODUCTION (ACRE-FEET)	PRODUCTION RIGHT (PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AGCON, INC	0	0.0000	0	0	0	0	0
AGUAYO, JEANETTE L	212	0.3742	212	201	190	180	169
ATCHISON, TOPEKA, SANTA FE RAILWAY CO	120	0.2118	120	114	108	102	96
AVDEEF, THOMAS	34	0.0600	34	32	30	28	27
AZTEC FARM DEVELOPMENT COMPANY	220	0.3883	220	209	198	187	176
BARNES, FAY - EXECUTOR OF ESTATE OF WAYNE BARNES	243	0.4289	243	230	218	206	194
BROMMER, MARVIN	361	0.6372	361	342	324	306	288
BURNS, RITA J & PAMELA E	16	0.0282	16	15	14	13	12
CHAFA, LARRY R	96	0.1694	96	91	86	81	76
CHOI, YONG IL & JOUNG AE	38	0.0671	38	36	34	32	30
CHRISTISON, JOEL	75	0.1324	75	71	67	63	60
COOK, KWON W	169	0.2983	169	160	152	143	135
DE VRIES, NEIL	3,800	6.7070	3,800	3,610	3,420	3,230	3,040
DESERT COMMUNITY BANK	156	0.2753	156	148	140	132	124
DURAN, FRANK T	50	0.0883	50	47	45	42	40
GAINES, JACK	117	0.2065	117	111	105	99	93
GESIRIECH, WAYNE	121	0.2136	121	114	108	102	96
GORMAN, VIRGIL	138	0.2436	138	131	124	117	110
GRIEDER, RAYMOND H & DORISANNE	30	0.0530	30	28	27	25	24
GRILL, NICHOLAS P & MILLIE D	21	0.0371	21	19	18	17	16
GROEN, CORNELIS	1,043	1.8409	1,043	990	938	886	834
HANIFY, DBA - WHITE BEAR RANCH	152	0.2683	152	144	136	129	121
HARMSEN, JAMES & RUTH ANN	1,522	2.6863	1,522	1,445	1,369	1,293	1,217
HARPER LAKE COMPANY	1,433	2.5293	1,433	1,361	1,289	1,218	1,146

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
HI DESERT MUTUAL WATER CO	34	0.0600	34	32	30	28	27
HILEMAN, KATHERINE	19	0.0335	19	18	17	16	15
HILL, MELVIN	2,335	4.1213	2,335	2,218	2,101	1,984	1,868
HOY, MIKE	632	1.1155	632	600	568	537	505
JORDAN, RAYMOND	460	0.8119	460	437	414	391	368
JUSTICE, CHRIS	421	0.7431	421	399	378	357	336
KING, GENEVIEVE E	69	0.1218	69	65	62	58	55
LEE, SEPOONG ETAL & WOO POONG	77	0.1359	77	73	69	65	61
LEYERLY, GENEVA	65	0.1147	65	61	58	55	52
LEYERLY, RICHARD	862	1.5214	862	818	775	732	689
LUDINGTON, JAMES E & JO ANN	58	0.1024	58	55	52	49	46
LYON, LOUIS & ERIKA	130	0.2295	130	123	117	110	104
MARTIN, LENDELL	14	0.0247	14	13	12	11	11
MCCOLLUM, CHARLES L	347	0.6125	347	329	312	294	277
MEAD, G C	90	0.1589	90	85	81	76	72
MEYERS, LONNIE	27	0.0477	27	25	24	22	21
MITCHELL, CHARLES A	201	0.3548	201	190	180	170	160
MOFFITT, THOMAS R & EDITH I	62	0.1094	62	58	55	52	49
MOST, MILTON W	9,660	17.0500	9,660	9,177	8,694	8,211	7,728
NELSON, MILDRED L	52	0.0918	52	49	46	44	41
NEWBERRY SPRINGS COMPANY, INC	2,489	4.3931	2,489	2,364	2,240	2,115	1,991
OHAI, REYNOLDS & DOROTHY	137	0.2418	137	130	123	116	109
OROPEZA, JOSE M	190	0.3354	190	180	171	161	152
OSTERKAMP, GEROLD	260	0.4589	260	247	234	221	208

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
OWL ROCK PRODUCTS COMPANY	466	0.8225	466	442	419	396	372
PG & E	1,657	2.9246	1,657	1,574	1,491	1,408	1,325
REDDY, BOMMI V & KARUNA V	24	0.0424	24	22	21	20	19
ROWLAND, JAMES & HELEN	22	0.0388	22	20	19	18	17
RUISCH, DALE W	650	1.1473	650	617	585	552	520
SHIRKEY, ALAN G & MARY E	35	0.0618	35	33	31	29	28
SMITH, ROBERT A	43	0.0759	43	40	38	36	34
SOPPELAND, WAYNE	783	1.3820	783	743	704	665	626
SOUTHERN CALIFORNIA WATER COMPANY	11,309	19.9605	11,309	10,743	10,178	9,612	9,047
SPINK, WALTHALL	44	0.0777	44	41	39	37	35
ST CHARLES, DONALD B	609	1.0749	609	578	548	517	487
SUN 'N SKY COUNTRY CLUB	337	0.5948	337	320	303	286	269
TALLAKSON, WILLIAM V	17	0.0300	17	16	15	14	13
TILLEMA, HAROLD	874	1.5426	874	830	786	742	699
VAN DAM, ELDERT & SUSAN	722	1.2743	722	685	649	613	577
VAN LEEUWEN, JOHN	1,922	3.3923	1,922	1,825	1,729	1,633	1,537
VAN VLIET, HENDRIKA	820	1.4473	820	779	738	697	656
VANHOY, LUTHER C	23	0.0406	23	21	20	19	18
VERNOLA, PAT	3,116	5.4998	3,116	2,960	2,804	2,648	2,492
VISSER, ANNIE	91	0.1606	91	86	81	77	72
YANG, YOUNG MO	371	0.6548	371	352	333	315	296
YKEMA HARMSEN DAIRY	1,000	1.7650	1,000	950	900	850	800

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1]	BASE ANNUAL [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	PRODUCTION (ACRE-FEET)	PRODUCTION RIGHT (PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MINIMAL PRODUCER POOL	2,000	3.5300	2,000	1,900	1,800	1,700	1,600
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	864	1.5250					
CENTRO SUBAREA TOTALS =	56,657	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AKE, CHARLES J & MARJORIE M	23	0.0333	23	21	20	19	18
ANGERER, ROBERT J & PEGGY	24	0.0347	24	22	21	20	19
ANTELOPE VALLEY DAIRY	5,430	7.8597	5,430	5,158	4,887	4,615	4,344
ARGUELLES, ALFREDO	1,047	1.5155	1,047	994	942	889	837
ATCHISON, TOPEKA, SANTA FE RAILWAY CO	80	0.1158	80	76	72	68	64
BAGLEY, ROY	20	0.0289	20	19	18	17	16
BALDERRAMA, ALFRED & LINDA	250	0.3619	250	237	225	212	200
BALL, DAVID P	81	0.1172	81	76	72	68	64
BARAK, RICHARD	132	0.1911	132	125	118	112	105
BARBER, JAMES B	167	0.2417	167	158	150	141	133
BARSTOW CALICO K O A	24	0.0347	24	22	21	20	19
BAUR, KARL & RITA	26	0.0376	26	24	23	22	20
BEDINGFIELD, LYNDELL & CHARLENE	56	0.0811	56	53	50	47	44
BENTON, PHILIP G	35	0.0507	35	33	31	29	28
BORGOGNO, STEVEN & LILLIAN B	1,844	2.6691	1,844	1,751	1,659	1,567	1,475
BOWMAN, EDWIN L	31	0.0449	31	29	27	26	24
BROWN, RONALD A	1,080	1.5632	1,080	1,026	972	918	864
BROWY, ORVILLE & LOUISE	33	0.0478	33	31	29	28	26
BRUINS, NICHOLAS	29	0.0420	29	27	26	24	23
CALICO LAKES HOMEOWNERS ASSOCIATION	1,031	1.4923	1,031	979	927	876	824
CALIF DEPT OF TRANSPORTATION	71	0.1028	71	67	63	60	56
CAMPBELL, M A & DIANNE	22	0.0318	22	20	19	18	17
CARTER, JOHN THOMAS	746	1.0798	746	708	671	634	596
CDFG - CAMP CADY	14	0.0203	14	13	12	11	11

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
CHANG, TIMOTHY & JANE	18	0.0261	18	17	16	15	14
CHASTAIN, W C	100	0.1447	100	95	90	85	80
CHEYENNE LAKE, INC	122	0.1766	122	115	109	103	97
CHIAO MEI DEVELOPMENT	451	0.6528	451	428	405	383	360
CHO BROTHERS RANCH	758	1.0972	758	720	682	644	606
CHUANG, MARSHAL	70	0.1013	70	66	63	59	56
CONNER, WILLIAM H	25	0.0362	25	23	22	21	20
COOL WATER RANCH	76	0.1100	76	72	68	64	60
CRYSTAL LAKES PROPERTY OWNERS ASSOCIATION	447	0.6470	447	424	402	379	357
DAGGETT COMMUNITY SERVICES DISTRICT	235	0.3402	235	223	211	199	188
DALJO CORPORATION	31	0.0449	31	29	27	26	24
DAVIS, RONALD & DONNA	53	0.0767	53	50	47	45	42
DE JONG, ALAN L	1,648	2.3854	1,648	1,565	1,483	1,400	1,318
DENNISON, QUENTIN D	29	0.0420	29	27	26	24	23
DESERT LAKES CORPORATION - (LAKE DOLORES)	483	0.6991	483	458	434	410	386
DOCIMO, DONALD P & PATRICIA J	23	0.0333	23	21	20	19	18
DONALDSON, JERRY & BEVERLY	90	0.1303	90	85	81	76	72
ELLISON, SUSAN	15	0.0217	15	14	13	12	12
EVKHANIAN, JAMES H	110	0.1592	110	104	99	93	88
FAWCETT, EDWARD C	20	0.0289	20	19	18	17	16
FELIX, ALAN E & CAROL L	36	0.0521	36	34	32	30	28
FERRO, DENNIS & NORMA	32	0.0463	32	30	28	27	25
FRIEND, JOSEPH & DEBORAH	60	0.0868	60	57	54	51	48
FUNDAMENTAL CHRISTIAN ENDEAVOR	285	0.4125	285	270	256	242	228

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
GARCIA, DANIEL	23	0.0333	23	21	20	19	18
GOLD, HAROLD	249	0.3604	249	236	224	211	199
GRAVES, CHESTER B	32	0.0463	32	30	28	27	25
HAIGH, WHILLDYN & MARGARET	32	0.0463	32	30	28	27	25
HALL, LARRY	23	0.0333	23	21	20	19	18
HARALIK, BESS & ROBERT	27	0.0391	27	25	24	22	21
HARDESTY, LESLIE E & BECKY J	47	0.0680	47	44	42	39	37
HARESON, NICHOLAS & MARY	30	0.0434	30	28	27	25	24
HARTER FARMS	1,083	1.5676	1,083	1,028	974	920	866
HARTER, JOE & SUE	738	1.0682	738	701	664	627	590
HARTLEY, LONNIE	19	0.0275	19	18	17	16	15
HARVEY, FRANK	38	0.0550	38	36	34	32	30
HENDLEY, RICK & BARBARA	48	0.0695	48	45	43	40	38
HIETT, PATRICIA J	16	0.0232	16	15	14	13	12
HILARIDES, FRANK	1,210	1.7514	1,210	1,149	1,089	1,028	968
HOLLISTER, ROBERT H & RUTH M	44	0.0637	44	41	39	37	35
HONG, PAUL B & MAY	95	0.1375	95	90	85	80	76
HORTON'S CHILDREN'S TRUST	106	0.1534	106	100	95	90	84
HORTON, JOHN MD	183	0.2649	183	173	164	155	146
HOSKING, JOHN W & JEAN	94	0.1361	94	89	84	79	75
HUBBARD, ESTER & MIZUNO, ARLEAN	28	0.0405	28	26	25	23	22
HUNT, RALPH M & LILLIAN F	31	0.0449	31	29	27	26	24
HUTCHISON, WILLIAM O	901	1.3042	901	855	810	765	720
HYATT, JAMES & BRENDA	210	0.3040	210	199	189	178	168

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
IRVIN, BERTRAND W	29	0.0420	29	27	26	24	23
J V A AIR INC	54	0.0782	54	51	48	45	43
JACKSON, RAY	20	0.0289	20	19	18	17	16
JOHNSON, JAMES R	247	0.3575	247	234	222	209	197
JUSTICE, CHRIS	6	0.0087	6	5	5	5	4
KAPLAN, ABRAHAM M	76	0.1100	76	72	68	64	60
KASNER, ROBERT	1,001	1.4489	1,001	950	900	850	800
KATCHER, AUGUST M & MARCELINE	23	0.0333	23	21	20	19	18
KEMP, ROBERT & ROSE	32	0.0463	32	30	28	27	25
KIEL, MARY	34	0.0492	34	32	30	28	27
KIM, JOON HO	764	1.1059	764	725	687	649	611
KOSHAREK, JOHN & JOANNE	54	0.0782	54	51	48	45	43
LAKE JODIE PROPERTY OWNERS ASSOCIATION	254	0.3677	254	241	228	215	203
LAKE WAIKIKI	98	0.1419	98	93	88	83	78
LAKE WAINANI OWNERS ASSOCIATION	202	0.2924	202	191	181	171	161
LANGLEY, MICHAEL R	20	0.0289	20	19	18	17	16
LAWRENCE, WILLIAM W	45	0.0651	45	42	40	38	36
LEE, MOON & OKBEA	49	0.0709	49	46	44	41	39
LEE, VIN JANG T	630	0.9119	630	598	567	535	504
LESHIN, CONNIE & SOL	1,416	2.0496	1,416	1,345	1,274	1,203	1,132
LESHIN, SOL	1,997	2.8906	1,997	1,897	1,797	1,697	1,597
LEVINE, DR LESLIE	1,637	2.3695	1,637	1,555	1,473	1,391	1,309
LONG, BALLARD	35	0.0507	35	33	31	29	28
M BIRD CONSTRUCTION	41	0.0593	41	38	36	34	32

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MAHJOUBI, AFSAR S	63	0.0912	63	59	56	53	50
MALIN, LILY	54	0.0782	54	51	48	45	43
MALONEY, JANICE	36	0.0521	36	34	32	30	28
MARCROFT, JAMES A & JOAN	38	0.0550	38	36	34	32	30
MARSHALL, CHARLES	20	0.0289	20	19	18	17	16
MAYBERRY, DONALD J	41	0.0593	41	38	36	34	32
MILBRAT, IRVING	73	0.1057	73	69	65	62	58
MITCHELL, CHARLOTTE	115	0.1665	115	109	103	97	92
MITCHELL, JAMES L & CHERYL A	155	0.2244	155	147	139	131	124
MOORE, WAYNE G & JULIA H	103	0.1491	103	97	92	87	82
MORRIS, KARL	304	0.4400	304	288	273	258	243
MULLIGAN, ROBERT & INEZ	35	0.0507	35	33	31	29	28
NEWBERRY COMMUNITY SERVICE DIST	23	0.0333	23	21	20	19	18
NU VIEW DEVELOPMENT, INC	2,899	4.1962	2,899	2,754	2,609	2,464	2,319
O F D L INC	109	0.1578	109	103	98	92	87
O'KEEFE, SARAH-LEE & JOKE E	50	0.0724	50	47	45	42	40
P & H ENGINEERING & DEV CORP	667	0.9654	667	633	600	566	533
PARKER, GEORGE R	144	0.2084	144	136	129	122	115
PATHFINDER INVESTORS	472	0.6832	472	448	424	401	377
PAYAN, PAUL	32	0.0463	32	30	28	27	25
PERKO, BERT K	132	0.1911	132	125	118	112	105
PITTS, JOE	30	0.0434	30	28	27	25	24
POHL, ANDREAS & CATHLYN	17	0.0246	17	16	15	14	13
POLAND, JOHN R & SANDRA M	92	0.1332	92	87	82	78	73

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
PRICE, ALAN E	37	0.0536	37	35	33	31	29
PRICE, DONALD	42	0.0608	42	39	37	35	33
PUCKHABER, WILLIAM F TRUST	63	0.0912	63	59	56	53	50
PURCIO, THOMAS F & PATRICIA A	80	0.1158	80	76	72	68	64
RANDOLPH, JOAN E	24	0.0347	24	22	21	20	19
REEVES, RICHARD	230	0.3329	230	218	207	195	184
RICE, DANIEL & MARY	121	0.1751	121	114	108	102	96
RICE, HENRY C & DIANA	24	0.0347	24	22	21	20	19
RIEGER, WALTER M	62	0.0897	62	58	55	52	49
RIKUO CORPORATION	1,517	2.1958	1,517	1,441	1,365	1,289	1,213
ROSSI, JAMES L & NAOMI I	614	0.8887	614	583	552	521	491
ROTEX CONSTRUCTION COMPANY	2,529	3.6606	2,529	2,402	2,276	2,149	2,023
SAN BERNARDINO COUNTY BARSTOW - DAGGETT AIRPORT	168	0.2432	168	159	151	142	134
SANTUCCI, ANTONIO & WILSA	30	0.0434	30	28	27	25	24
SCOGGINS, JERRY	105	0.1520	105	99	94	89	84
SHEPPARD, THOMAS & GLORIA	217	0.3141	217	206	195	184	173
SHORT, CHARLES & MARGARET	54	0.0782	54	51	48	45	43
SHORT, JEFF	30	0.0434	30	28	27	25	24
SILVER VALLEY RANCH, INC	109	0.1578	109	103	98	92	87
SMITH, WILLIAM E	19	0.0275	19	18	17	16	15
SNYDER, KRYL K & ROUTH, RICHARD J	64	0.0926	64	60	57	54	51
SOUTHERN CALIFORNIA EDISON CO - AGRICULTURE	5,858	8.4792	5,858	5,565	5,272	4,979	4,686
SOUTHERN CALIFORNIA EDISON CO - INDUSTRIAL	4,565	6.6076	4,565	4,336	4,108	3,880	3,652
SOUTHERN CALIFORNIA GAS COMPANY	98	0.1419	98	93	88	83	78

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1]	BASE ANNUAL [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	PRODUCTION (ACRE-FEET)	PRODUCTION RIGHT (PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
ST ANTONY COPTIC ORTHODOX MONASTERY	130	0.1882	130	123	117	110	104
STEWART, STANLEY & PATRICIA	27	0.0391	27	25	24	22	21
SUGA, TAKEAKI	154	0.2229	154	146	138	130	123
SUNDOWN LAKES, INC	168	0.2432	168	159	151	142	134
SWARTZ, ROBERT & IRENE	50	0.0724	50	47	45	42	40
TAPIE, RAYMOND & MURIEL	18	0.0261	18	17	16	15	14
TAYLOR, TOM	503	0.7281	503	477	452	427	402
THAYER, SHARON	58	0.0840	58	55	52	49	46
THE 160 NEWBERRY RANCH CALIFORNIA, LTD	1,033	1.4952	1,033	981	929	878	826
TRIPLE H PARTNERSHIP	993	1.4373	993	943	893	844	794
UNION PACIFIC RAILROAD COMPANY	249	0.3604	249	236	224	211	199
VAN BASTELAAR, ALPHONSE	78	0.1129	78	74	70	66	62
VAN DIEST, CORNELIUS	934	1.3519	934	887	840	793	747
VAN LEEUWEN, JOHN	1,084	1.5690	1,084	1,029	975	921	867
VANDER DUSSEN, AGNES	1,792	2.5938	1,792	1,702	1,612	1,523	1,433
VAUGHT, ROBERT E & KAREN M	43	0.0622	43	40	38	36	34
VERNOLA, PAT	1,310	1.8962	1,310	1,244	1,179	1,113	1,048
WARD, ERNEST & LAURA	38	0.0550	38	36	34	32	30
WARD, RONNY H	130	0.1882	130	123	117	110	104
WEBER, F R & JUNELL	96	0.1390	96	91	86	81	76
WEBSTER, THOMAS M & PATRICIA J	24	0.0347	24	22	21	20	19
WEIDKNECHT, ARTHUR J & PEGGY A	79	0.1143	79	75	71	67	63
WESTERN HORIZON ASSOCIATES INC	1,188	1.7196	1,188	1,128	1,069	1,009	950
WESTERN ROCK PRODUCTS	31	0.0449	31	29	27	26	24

~~12/10/92~~
~~01/20/93~~
~~03/02/93~~
~~04/19/93~~
~~04/28/93~~
09/25/95

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA TOGETHER WITH FREE PRODUCTION ALLOWANCES FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL PRODUCTION [1]	BASE ANNUAL PRODUCTION RIGHT [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND YEAR [3]	THIRD YEAR [3]	FOURTH YEAR [3]	FIFTH YEAR [3]
WET SET, INC	129	0.1867	129	122	116	109	103
WITTE, E DANIEL	27	0.0391	27	25	24	22	21
WLSR INC	133	0.1925	133	126	119	113	106
WORSEY, REVAE	29	0.0420	29	27	26	24	23
YARD, BETTY	26	0.0376	26	24	23	22	20
YERMO WATER COMPANY	453	0.6557	453	430	407	385	362
YOUNG, KEITH O - (DESERT TURF)	312	0.4516	312	296	280	265	249
MINIMAL PRODUCER POOL	3,500	5.0661	3,500	3,325	3,150	2,975	2,800
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	320	0.4632					
BAJA SUBAREA TOTALS =	69,087	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

EXHIBIT B
TABLE B-2
TABLE SHOWING TOTAL WATER PRODUCTION
FOR AQUACULTURE AND RECREATIONAL LAKE PURPOSES
ALTO SUBAREA

PRODUCER	TOTAL WATER PRODUCTION [1]	BASE ANNUAL PRODUCTION [2]	RECIRCULATED WATER [3]
	(ACRE-FEET)		
CDFG - MOJAVE RIVER FISH HATCHERY	10,678	20	10,658
JESS RANCH WATER COMPANY	18,625	7,480	11,145
ALTO SUBAREA TOTALS =	29,303	7,500	21,803

Total Water Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records; James C. Hanson site inspection; land use estimates from 1989 aerial photography; responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production as shown on Table B-1.

3 Amount shown is the difference between the Total Water Production and the Base Annual Production.

EXHIBIT B
TABLE B-2
TABLE SHOWING TOTAL WATER PRODUCTION FOR AQUACULTURE AND RECREATIONAL LAKE PURPOSES
BAJA SUBAREA

PRODUCER	TOTAL WATER PRODUCTION [1]	BASE ANNUAL PRODUCTION [2]	RECIRCULATED WATER [3]
	(ACRE-FEET)		
BROWY, ORVILLE & LOUISE	210	33	177
CALICO LAKES HOMEOWNERS ASSOCIATION	2,513	1,031	1,482
CDFG - CAMP CADY	102	14	88
CHEYENNE LAKE, INC	638	122	516
CRYSTAL LAKES PROPERTY OWNERS ASSOCIATION	6,575	447	6,128
DESERT LAKES CORPORATION - (LAKE DOLORES)	928	483	445
FUNDAMENTAL CHRISTIAN ENDEAVOR	440	285	155
HORTON'S CHILDREN'S TRUST	1,291	106	1,185
HORTON, JOHN MD	672	183	489
KIEL, MARY	188	34	154
LAKE JODIE PROPERTY OWNERS ASSOCIATION	2,805	254	2,551
LAKE WAIKIKI	400	98	302
LAKE WAINANI OWNERS ASSOCIATION	1,420	202	1,218
LEE, MOON & OKBEA	171	49	122
O F D L INC	434	109	325
RICE, DANIEL & MARY	614	121	493
SCOGGINS, JERRY	922	105	817
SILVER VALLEY RANCH, INC	455	109	346
SMITH, WILLIAM E	153	19	134
SUNDOWN LAKES, INC	1,109	168	941
TAPIE, RAYMOND & MURIEL	108	18	90
THAYER, SHARON	159	58	101
WET SET, INC	441	129	312
WLSR INC	678	133	545

EXHIBIT B
TABLE B-2
TABLE SHOWING TOTAL WATER PRODUCTION
FOR AQUACULTURE AND RECREATIONAL LAKE PURPOSES
BAJA SUBAREA

PRODUCER	TOTAL WATER PRODUCTION [1] (ACRE-FEET)	BASE ANNUAL PRODUCTION [2] (ACRE-FEET)	RECIRCULATED WATER [3] (ACRE-FEET)
BAJA SUBAREA TOTALS =	23,426	4,310	19,116

1 Total Water Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records; James C. Hanson site inspection; land use estimates from 1989 aerial photography; responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production as shown on Table B-1.

3 Amount shown is the difference between the Total Water Production and the Base Annual Production.

EXHIBIT C

ENGINEERING APPENDIX

CONTENTS

EXHIBIT C

ENGINEERING APPENDIX

The purpose of this Engineering Appendix is to establish the basis for measurements, calculations and determinations required in the operation of the Physical Solution.

A. Adjustment of Free Production Allowances. In the preparation of the report required by Paragraph 24 (o) of this Judgment, the Watermaster shall take into account all available pertinent hydrologic data and estimates, including at least the factors, or changes in the factors, shown in the attached Table C-1, "MOJAVE BASIN AREA ADJUDICATION SUBAREA HYDROLOGICAL INVENTORY BASED ON LONG-TERM AVERAGE NATURAL WATER SUPPLY AND OUTFLOW AND CURRENT YEAR IMPORTS AND CONSUMPTIVE USE," and changes in storage as determined by well levels, the factors listed in Paragraph 2(a) of Exhibit "H", and other pertinent data. The numbers for each of the factors for each Subarea shown in Table C-1 are Sample Numbers only, and are not intended to be used in determining actual water supply, Consumptive Use and outflow, or Free Production Allowance of the Subareas.

B. Determination of Surface Flow Components. The procedures used to determine the historical surface flow components of the Mojave River at various locations are summarized below.

1. Determination of Surface Flow Components at Lower Narrows. Since the records available for the discharge of the Mojave River at Lower Narrows only provide data on the total amount of surface flow and since Storm Flow occurs during and following periods of rainfall, it was necessary to determine what portion of

total measured surface flow at Lower Narrows was Storm Flow and what portion was Base Flow.

The Parties in reaching the physical solution provided for in the Judgment, used certain procedures to separate the Storm Flow and Base Flow components of the total measured surface flow at Lower Narrows. Hydrographs of the mean daily discharge at Lower Narrows were plotted for the Year under consideration together with corresponding rainfall data obtained from the National Oceanic and Atmospheric Administration (NOAA) for Lake Arrowhead. Hydrographs were also plotted for the combined flow of West Fork Mojave River and Deep Creek which together with the Lake Arrowhead precipitation data served as a guide for interpreting those periods during which Storm Flow was likely to have occurred at Lower Narrows.

Other factors considered included:

* Occurrences of Storm Flow at Barstow and Afton Canyon,
* Precipitation at Victorville and Barstow,
* Consideration of the time of Year and temperature, &
* Shape of hydrographs for Years having similar Base Flow characteristics.

Based on interpretation of all of the foregoing information, the flows occurring on those days during which Storm Flow most likely occurred were "scalped" by projecting an estimated Base Flow Curve through the Storm Flow Period. The Base Flow component of the total monthly flow was then determined as follows:

a. For those periods during which there was obviously no Storm Flow, the entire recorded mean daily flows were assumed to be Base Flow.

b. For the remaining Storm Flow periods, the Base Flow component was taken as the area under the Base Flow Curve, except that for those days within the Storm Flow period when the actual mean daily discharge is less than the amount indicated by the Base Flow Scalping Curves, then the actual recorded amount is used.

2. Determination of Surface Flow Components at Waterman Fault. The total amount of surface flow passing the Waterman Fault (under current riverbed conditions) is considered to be Storm Flow and can be estimated from the Storm Flow passing the USGS gauging station Mojave River at Barstow. The following table was developed to provide a method for estimating flow at Waterman Fault:

Storm Flow At Barstow Gage[1] (Acre-Feet)	Estimated Surface Flow at Waterman Fault (Acre-Feet)
2,000	0
10,000	6,200
20,000	14,300
30,000	22,600
40,000	31,400
50,000	40,500
60,000	49,200
70,000	58,400
80,000	67,800
90,000	76,800
100.000	85,400

[1]From Recorded Flow at USGS Gaging Station Mojave River at Barstow. Relationship is based on single storm events. More than one storm event separated by more than five day of zero flow will be considered as separate storms.

3. <u>Determination of Surface Flow Components at Afton</u>. Records available for the discharge of the Mojave River at Afton, California, provide data on the total mount of surface flow and since storm runoff occurs during and immediately following a major storm event in the watershed area tributary to the Baja Basin below Barstow or in the event of large Storm Flows at Barstow which reach Afton, it was necessary to determine what portion of the total measured surface flow at Afton is Storm Flow and what portion of Base Flow.

The Parties, in reaching the physical solution provided for in the Judgment, used certain procedures to separate the Storm Flow and Base Flow components of the total measured surface flow at Afton. Hydrographs of the mean daily discharge at Afton were plotted for the water Year under consideration. In the absence of Storm Flow, the Base Flow curve at Afton was generally a relatively constant amount. Storm Flows were evidenced by sharp spikes or abrupt departures from the antecedent Base Flow and a fairly rapid return to pre-storm Base Flow Condition. The hydrograph of flows at Barstow served as a guide for identifying those periods during which Storm Flow was likely to have occurred at Afton.

Based on interpretation of all of the foregoing information, the flows occurring on those days during which Storm Flow most likely occurred were "scalped" by projecting an estimated Base Flow Curve through the Storm Flow Period. The Base Flow component of the total monthly flow was then determined as follows:

a. For those periods during which there is obviously no Storm Flow, the entire recorded mean daily flows were assumed to be Base Flow.

b. For the remaining Storm Flow periods, the Base Flow component was taken as the area under the Base Flow Curve except that for those days within the Storm Flow period when the actual mean daily discharge was less than the amount indicated by the Base Flow Scalping Curves, then the actual recorded amount was used.

4. Engineers' Work Papers. These procedures are reflected in the Work Papers of the Engineers, copies of which are filed with the Watermaster.

TABLE C-1
Mojave Basin Area Adjudication
Subarea Hydrological Inventory Based On
Long-Term Average Natural Water Supply and Outflow
and Current Year Imports and Consumptive Use
(All Amounts in Acre-Feet)

	Este	Oeste	Alto	Centro	Baja	Basin Totals
WATER SUPPLY						
Surface Water Inflow						
Gaged	0	0	65,000	0	0	65,000
Ungaged	1,700	1,500	3,000	37,300 [1]	14,300 [2]	6,500 [3]
Subsurface Inflow	0	0	1,000	2,000	1,200	0 [4]
Deep Percolation of Precipitation	0	0	3,500	0	100	3,600
Imports						
Lake Arrowhead CSD	0	0	1,500	0	0	1,500
Big Bear ARWWA	2,000	0	0	0	0	2,000
TOTAL	3,700	1,500	74,000	39,300	15,600	78,600
CONSUMPTIVE USE AND OUTFLOW						
Surface Water Outflow						
Gaged	0	0	0	0	8,200	8,200
Ungaged	0	0	37,300 [1]	14,000 [5]	0	0
Subsurface Outflow	200	800	2,000	1,200	0	0
Consumptive Use						
Agriculture	6,800	2,900	16,300	20,300	30,200	76,500
Urban	1,900	1,200	36,300	9,500	9,700	58,600
Phreatophytes	0	0	5,100	900	1,500	7,500 [6]
Exports	0	0	0	0	0	0
TOTAL	8,900	4,900	97,000	45,900	49,600	150,800
Surplus / (Deficit)	(5,200)	(3,400)	(23,000)	(6,600)	(34,000)	(72,200)
Total Estimated Production (Current Year) [7]	15,700	7,600	98,900	46,500	54,300	223,000
PRODUCTION SAFE YIELD (Current Year) [7]	10,500	4,200	75,900	39,900	20,300	150,800

SAMPLE CALCULATIONS

[1] Estimated from reported flows at USGS gaging station, Mojave River at Victorville Narrows.

[2] Includes 14,000 acre-feet of Mojave River surface flow across the Waterman Fault estimated from reported flows at USGS gaging station, Mojave River at Barstow, and 300 acre-feet of local surface inflow from Kane Wash.

[3] Represents the sum of Este (1,700 af), Oeste (1,500 af), Alto (3,000 af) and Baja (300 af from Kane Wash).

[4] Inter subarea subsurface flows do not accrue to the total basin water supply.

[5] Estimated from reported flows at USGS gaging station, Mojave River at Barstow.

[6] Estimated by Bookman-Edmonston.

[7] For purposes of this Table, the current year is 1990.

EXHIBIT D

TIME SCHEDULES

EXHIBIT D

TIME SCHEDULES

1. Prior Year Report. Annually not later than February 1 Watermaster shall provide to each Party a report covering the prior Year and setting forth at least the following:

a. Each Producer's Replacement Water Assessment, including any surcharges, based on rates applicable during the prior Year.

b. Each Producer's Makeup Water Assessment, based on rates applicable during the prior water Year.

2. MWA Supplemental Water Rates. Annually, not later than December 1, MWA shall set the rates per acre foot to be charged for Supplemental Water for the following Year, and shall project the rates for the following two Years.

3. Budget and Assessment Rates. Annually, not later than February 1, Watermaster shall provide to all Parties its proposal for its Administrative Budget, Administrative Assessment Rates, Replacement Water Rates, and Makeup Water Rates for the next ensuing Year and its rate projections for the next two (2) years. No later than March 1 of each Year, the Watermaster shall hold a public hearing to receive comments from Parties as to its proposal. Not later than April 1 of each Year, Watermaster shall adopt its final Budget and assessment rates for the next ensuing Year, and shall notify all Parties of its final Budget and Assessments rates within fifteen (15) days of adoption.

4. Free Production Allowance Adjustment. In any Year that Watermaster prepares a report pursuant to Paragraph 24 (o) of this Judgment that includes a recommendation for an adjustment of a Free

Production Allowance, Watermaster shall notify all Parties as to its recommendation not later than February 1, shall hold a public hearing thereon not later than March 1, and shall submit any such recommendation, which may be revised pursuant to the public hearing, to the Court not later than April 1.

5. Payment of Administrative Assessments and Biological Resource Assessments. Each Producer shall submit quarterly along with the Production report required by Paragraph 24 (p) an Administrative Assessment payment in an amount equal to the current Year Administrative Assessment Rate multiplied times the acre-feet of water Produced during the quarter and a Biological Resource Assessment payment in an amount equal to the current Year Biological Resource Assessment Rate multiplied times the acre-feet of water Produced during the quarter.

6. Payment of Replacement Water Assessments and Makeup Water Assessments. Replacement Water Assessments and Makeup Water Assessments for the prior Year shall be due and payable on July 1.

7. Delinquency of Assessments. Any assessment payable pursuant to this Judgment shall be deemed delinquent: i) if paid in Person, if not paid within five (5) days of the date due; ii) if paid by electronic funds transfer, if not paid within three (3) banking days of the date due; or iii) if paid by any other means, if not paid within ten (10) days of the date due. "Payment" shall occur when good and sufficient funds have been received by the Watermaster. Any assessment shall also be deemed delinquent in the event that any attempted payment is by funds that are not good and sufficient.

EXHIBIT E

LIST OF PRODUCERS AND THEIR DESIGNEES

EXHIBIT E

PRODUCER	DESIGNEE
ABBOND, EDWARD & GRACE	Same
ABBOTT, LEONARD C	Therese E. Parker, Esq.
ABSHIRE, DAVID V	Same
ADELANTO, CITY OF	Michael B. Jackson, Esq.
ADELANTO, CITY OF/GEORGE AFB	
AEROCHEM, INC	James Heiser, Esq.
AGCON, INC	Robert E. Hove
AGCON, INC.	Robert E. Hove
AGUAYO, JEANETTE L.	Same
AKE, CHARLES J & MARJORIE M	Same
ANDERSON, ROSS C & BETTY J	Same
ANGERER, ROBERT J & PEGGY	Same
ANTELOPE VALLEY DAIRY	Dick Van Dam
APPLE VALLEY COUNTRY CLUB	Terry Caldwell, Esq.
APPLE VALLEY DEVELOPMENT	Same
APPLE VALLEY FOOTHILL CO WATER	Doreen Ryssel
APPLE VALLEY HEIGHTS CO. WATER	Elizabeth Hanna, Esq.
APPLE VALLEY RANCHOS WATER	Fredric Fudacz, Esq.
APPLE VALLEY REC. & PARKS	Elizabeth Hanna, Esq.
APPLE VALLEY VIEW MUTUAL WATER CO.	Joseph Saltmeris, Esq.
APPLE VALLEY, TOWN OF	Sandra Dunn, Esq.
ARC LAS FLORES	William De Wolfe, Esq.
ARGUELLES, ALFREDO	Therese Parker, Esq.
ATCHISON, TOPEKA, SANTA FE	Curtis Ballantyne, Esq.
ATCHISON, TOPEKA, SANTA FE	Curtis Ballantyne, Esq.
AVDEEF, THOMAS & LUCILLE	Same
AZTEC FARM DEVELOPMENT CO	Al Jackson
BACA, ENRIQUE	Same
BAGLEY, ROY	Same
BALDERRAMA, ALFRED & LINDA	Same
BALDY MESA WATER DISTRICT	William Smillie

PRODUCER	DESIGNEE
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BAR H MUTUAL WATER COMPANY	Paul Nelson, President
BARAK, RICHARD	Therese Parker, Esq.
BARBER, JAMES B	Same
BARNES, FAY	Kirtland Mahlum, Esq.
BARSTOW CALICO K O A	Robert L. Moore
BASS, NEWTON T	Barbara Davisson, Business Manager
BASTIANON, REMO	Same
BASURA, STEVE	Same
BAUR, KARL & RITA	Same
BEDINGFIELD, LYNDELL&CHARLENE	Same
BEINSCHROTH, A J	Same
BELL, CHUCK	Therese Parker, Esq.
BENTON, PHILIP G	Same
BORGOGNO, STEVEN & LILLIAN	Same
BOWMAN, EDWIN L	Same
BOYCE, KENNETH & WILLA	Same
BROMMER, MARVIN	Same
BROWN, BOBBY G & VALERIA R	Same
BROWN, DOUG & SUE	Same
BROWN, RONALD A	Same
BROWY, ORVILLE & LOUISE	Same
BRUINS, NICHOLAS	Same
BURNS, BOBBY J & EVELYN J	Therese Parker, Esq.
BURNS, RITA J & PAMELA E	Same
BURNS, ANNIE L	Same
CALICO LAKES HOMEOWNERS	Billy Wyckoff
CALIF DEPT OF TRANSPORTATION	Alexander De Vorkin, Esq.
CAMPBELL, M A & DIANNE	Same
CARDOZO, MANUEL & MARIA	Robert Dougherty, Esq.
CARTER, JOHN THOMAS	Therese Parker, Esq.
CASA COLINA FOUNDATION	Charles E. Schwartz
CDFG - CAMP CADY	Marilyn Levin, Esq.

PRODUCER	DESIGNEE
CDFG - MOJAVE NARROWS REG.	Marilyn Levin, Esq.
CDFG - MOJAVE RIVER FISH	Marilyn Levin, Esq.
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CHANG, TIMOTHY & JANE	Same
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CHEYENNE LAKE, INC	Michael Hayes
CHIAO MEI DEVELOPMENT	Maple Sia
CHO BROTHERS RANCH	Chung Cho Gong
CHOI, YONG IL & JOUNG AE	Same
CHRISTISON, JOEL	Same
CHUANG, MARSHAL	Therese Parker, Esq.
CLARK, KENNETH R	Same
CLEAR VIEW FARMS	Terry Caldwell, Esq.
CLUB VIEW PARTNERS	Manoucher Sarbaz
CONNER, WILLIAM H	Same
COOK, KWON W	Same
COOL WATER RANCH	Paul Henderson, Esq.
COPELAND, ETAL	Don W. Little
CRAMER, MARGARET MUIR	Terry Caldwell, Esq.
CROSS, LAWRENCE E & SHARON I	Same
CRYSTAL HILLS WATER COMPANY	Same
CRYSTAL LAKES PROPERTY OWNERS	Russell Khouri
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DAVIS, RONALD & DONNA	Same
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DEXTER, J P	Same
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DOMBROWSKI, MICHAEL W & SUSAN M	Same
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DOSSEY, D A	Same
DOWSE, PHILIP	Same
DURAN, FRANK T	Therese Parker, Esq.
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EVENSON, EDWIN H & JOYCELAINE	Same
EVKHANIAN, JAMES H & PHYLLIA	Same
FAWCETT, EDWARD C	Same
FELIX, ALAN E & CAROL L	Same
FERRO, DENNIS & NORMA	Same
FISHER, DR DOLORES	Same
FISHER, JEROME	Same
FITZWATER, R E	Robert Dougherty, Esq.
FRIEND, JOSEPH & DEBORAH	Same
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HANDLEY, DON R & MARY ANN	Same
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HARALIK, BESS & ROBERT	Same
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JUSTICE, CHRIS	Same
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LAKE WAINANI OWNERS ASSOCIATION	Same
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LEE, MOON & OKBEA	Same
LEE, SEPOONG ETAL & WOO POONG	Same
LEE PHD, VIN JANG T C/O ARCHIBEK, ERIC&SANDI	Same
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MITCHELL, JAMES L & CHERYL A	Same
MITCHELL, ROBIN & JUDITH	Same
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MURPHY, KENNETH	Same
MUTUAL FUNDING CORP	Ron Yee-Dong, President
NAVAJO MUTUAL WATER CO	James Hanson
NELSON, MILDRED L	Same
NEWBERRY COMMUNITY SERVICE DIST	Vicki Morris
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NUNN, DONALD & PEARL	Paul Henderson, Esq.
NU VIEW DEVELOPMENT, INC	Richard Slivkin, Esq.
O'BRYANT, ROBERT C & BARBARA	Same
O F D L INC	Virginia Cahill, Esq.
OHAI, REYNOLDS & DOROTHY	Same
O'KEEFE, SARAH-LEE & JOKE E	Same
ORMSBY, HARRY G	Same
OROPEZA, JOSE M	Same
OSTERKAMP, GEROLD	Robert Dougherty, Esq.
OWL ROCK PRODUCTS COMPANY	Vince Dommarito, Area Manager
P & H ENGINEERING & DEV CORP	Same
PALISADES RANCH	Robert Dougherty, Esq.
PARK, CHANHO	Same
PARK, HEA JA & JEONG IL	Same
PARKER, DAVID E	Same
PARKER, GEORGE R	Therese Parker, Esq.
PATHFINDER INVESTORS	Same
PAYAN, PAUL	Same
PEARL, ALICE	Same
BORUFF, PAUL & LINDA; PEARSON, DERYL B	Same
PEREZ, EVA	Therese Parker, Esq.
PERKO, BERT K	Same
PERRY, THOMAS A	Same

PRODUCER	DESIGNEE
PETTIGREW, DAN	Therese Parker, Esq.
PETTIGREW, HOWARD L	Therese Parker, Esq.
PETTIS FAMILY TRUST	Therese Parker, Esq.
P G & E	Robert Rickett, Esq.
PHENIX PROPERTIES LTD	Elizabeth Taylor, Manager
PITTMAN, LEROY W	Same
PITTS, JOE & STELLA	Same
PLUESS-STAUFER CALIFORNIA INC	David Aladjem, Esq.
POHL, ANDREAS & CATHLYN	Same
POLAND, JOHN R & SANDRA M	Same
POLICH, LEE & DONNA	Same
PRICE, ALAN E	Same
PRICE, DONALD & RUTH	Same
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PURCIO, THOMAS F & PATRICIA A	Same
RANCHERITOS MUTUAL WATER CO	Same
RANDOLPH, JOAN E	Therese Parker, Esq.
REDDY, BOMMI V & KARUNA V	Same
REED, MIKE	Same
REEVES, RICHARD	Same
RESSEQUE, JOHN & BILL	Same
RICE, DANIEL & MARY	Same
RICE, HENRY C & DIANA	Same
RIEGER, WALTER M	Same
RIKUO CORPORATION	Joseph Deering, Jr., Esq.
RIVERSIDE CEMENT CO - ORO GRANDE PLANT	Warren P. Felger, Esq.
ROGERS, ROY	Terry Caldwell, Esq.
ROGERS, ROY (ORO GRANDE RANCH)	Terry Caldwell, Esq.
ROSSI, JAMES L & NAOMI I	Same
ROTEX CONSTRUCTION COMPANY	Yong Cho
ROWLAND, JAMES & HELEN	Same
RUDMAN, ROBERT T	Terry Caldwell, Esq.
RUE RANCH	Joe Zack Feltz, President

PRODUCER	DESIGNEE
RUISCH, DALE W	Same
SAN BERNARDINO CSA #29	William Smillie
SAN BERNARDINO CSA #42	William Smillie
SAN BERNARDINO CSA #64	William Smillie
SAN BERNARDINO CSA #70C	William Smillie
SAN BERNARDINO CSA #70G	William Smillie
SAN BERNARDINO CSA #70J	William Smillie
SAN BERNARDINO CSA #70L	William Smillie
SAN BERNARDINO CO. BARSTOW-DAGGETT AIRPORT	William Smillie
SAN FILIPPO, JOSEPH & SHELLEY	Same
SANTUCCI, ANTONIO & WILSA	Same
SAN BERNARDINO CSA #70L	William Smillie
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SEALS, LAWRENCE	Same
SHEPPARD, THOMAS & GLORIA	Same
SHIRKEY, ALAN G & MARY E	Same
SHORT, CHARLES & MARGARET	Therese Parker, Esq.
SHORT, JEFF	Same
SILVER LAKES ASSOCIATION	Michael Davis, Esq.
SILVER VALLEY RANCH, INC	Richard A. Ruben, Esq.
SMITH, ROBERT A	Therese Parker, Esq.
SMITH, WILLIAM E	Same
SNYDER, KRYL K & ROUTH, RICHARD J	Terry Caldwell, Esq.
SON'S RANCH	Therese Parker, Esq.
SOPPELAND, WAYNE	Terry Caldwell, Esq.
SOUTHERN CALIFORNIA EDISON CO - AGRICULTURE	Douglas Ditonto, Esq.
SOUTHERN CALIFORNIA EDISON CO - INDUSTRIAL	Douglas Ditonto, Esq.
SOUTHERN CALIFORNIA GAS COMPANY	Jane Goichman, Esq.
SOUTHERN CALIFORNIA WATER CO	Arthur Kidman, Esq.
SOUTHDOWN, INC.	Steve Abbott, Esq.
SOUTHERN CALIFORNIA WATER CO	Arthur Kidman, Esq.
SOUTHERN CALIFORNIA WATER CO	Arthur Kidman, Esq.
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PRODUCER	DESIGNEE
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EXHIBIT F

TRANSFERS OF BASE ANNUAL PRODUCTION RIGHTS.

EXHIBIT F

TRANSFERS OF BASE ANNUAL PRODUCTION RIGHTS

1. Transferability. Any Base Annual Production Right, including any Carryover Right (Right) or any portion thereof may be sold, assigned, transferred, licensed or leased subject to the rules set forth in this Exhibit "F".

2. Consumptive Use Adjustments. A transferred Right shall be adjusted so as not to cause an increased Consumptive Use of water. For either inter Subarea or intra Subarea transfers, if the transferee's Consumptive Use of water Produced under the transferred Right would be at a higher rate than that of transferor, the transferred Right shall be reduced by Watermaster to a level that equalizes the Consumptive Use to that of transferor. Any such adjustments by Watermaster shall be made using the following Consumptive Use rates. If a transfer would cause the same or a decreased Consumptive Use, no adjustment shall be made.

Type of Water Use	Consumptive Use Rate
Municipal	50%
Irrigation	50%
Industrial	case by case
Lakes or Aquaculture	surface acres x 7 ft.

For mixed or sequential uses of water excluding direct reuse of municipal wastewater, the total acre-feet of Consumptive Use shall be the sum of Consumptive Uses for each use.

3. Notice to Watermaster. No transfer shall become operable until the Parties to the transfer have jointly notified Watermaster of the terms and conditions of the transfer, the price to be paid by the transferee, the name of the Responsible Party and the name of the Person who will pay any applicable Assessments. Intra-Subarea transfers shall not require Watermaster authorization after giving notice. No inter-Subarea transfer shall become operable until authorized by Watermaster after giving notice. Watermaster shall authorize such transfers in the order of the date of notice, provided that funds are available as set forth in Paragraph 4 of this Exhibit "F".

4. Inter Subarea Transfers of Rights. A Party's Right in a (Source) Subarea may be transferred (by lease only) to a Party in another (Use) Subarea provided that in any Year the resulting unconsumed water in the Source Subarea due to all such transfers shall not be greater than the Replacement Water requirement of the Source Subarea in the preceding Year. Watermaster shall replace the resulting Consumptive Use in the Use Subarea that is attributable to the transfer, utilizing Replacement Water Assessments from the Source Subarea.

5. Transfers to Meet Replacement Water or Makeup Water Obligations. Watermaster may use Assessment proceeds to purchase or lease Rights in a Subarea in order to obtain water to meet an Obligation. The water so obtained shall be equal to the Consumptive Use portion of the transferred and unproduced Rights. No such purchases of leases of Rights in the Harper Lake Basin may be used to satisfy Obligations in other parts of the Centro Subarea.

6. Inter Subarea Transfers of Water. Water Produced in one (source) Subarea and exported to another Subarea for use or disposal shall bear a Replacement Water Obligation equal to the sum of the Production in excess of the Producer's share of the Free Production Allowance in the source Subarea plus the amount of water exported that would normally have been returned to the source Subarea. Such exported water shall be credited to the appropriate Subarea Obligation unless it has been purchased or leased as Replacement Water pursuant to a transfer agreement.

7. Verde Ranch Producers. Together the Spring Valley Lake Country Club ("the Country Club"), the Spring Valley Lake Association ("the Association"), the California Department of Fish and Game (DFG) Mojave Narrows Regional Park ("the Park") the Kemper Campbell Ranch ("the Ranch") comprise a group herein called the Verde Ranch Producers. Each Verde Ranch Producer has the ability physically both to Produce Groundwater and to Produce water that originated as tailwater flowing from the DFG Mojave River Fish Hatchery. DFG Producer Groundwater to supply the Hatchery, and Hatchery tailwater can be discharged in part or entirely to the Mojave River or in part or entirely to a lined channel that conveys tailwater to points where the Verde Ranch Producers can Produce it. The present flow regimen is as follows: Hatchery Production flows through the Hatchery and is then discharged to the River and/or the lined channel. Water discharged to the lined channel flows to a Country Club lake. The Country Club Produces Groundwater that is discharged to the Country Club lake. The Country Club property is irrigated by pumping from the Country Club lake. Water overflowing from the Country Club lake flows through a lined channel and

through other Country Club lakes, and finally is discharged to Spring Valley Lake. The Association Produces Groundwater that is discharged to Spring Valley Lake. Water overflowing from Spring Valley Lake flows to lakes in the Park. The Park Produces Groundwater that is discharged to the lakes in the Park. The Park also Produces Groundwater that is used directly for irrigation of the Park. The Park is also irrigated by pumping from the lakes in the Park. Water overflowing from the lakes in the Park is discharged to the Mojave River. Some water from the lakes in the Park also flows to a lake on the Ranch. The Ranch also Produces Groundwater. The Ranch is irrigated from the lake on the Ranch. No water flows on the surface from the Ranch property to the Mojave River.

In order to continue the present arrangements among the Hatchery and the Verde Ranch Producers while assuring that they participate fairly in the Physical Solution the following rules shall apply:

a. Total Production by the Country Club will be calculated as the sum of Country Club Groundwater Production plus inflow of Hatchery tailwater minus outflow to Spring Valley Lake. The Country Club shall monitor and report to Watermaster the amounts of such Groundwater Production, inflow and outflow.

b. Total Production by the Association will be calculated as the sum of Association Groundwater Production plus inflow from the Country Club minus outflow to the Park. The Association shall monitor and report to Watermaster the amounts of such Groundwater Production, inflow and outflow.

c. Total Production by the Park will be calculated as the sum of Park Groundwater Production plus inflow from the Association minus outflow to the Ranch minus outflow to the Mojave River. The Park shall monitor and report to Watermaster as to such Groundwater Production, inflow and outflows.

d. Total Production by the Ranch will be calculated as the sum of Ranch Groundwater Production plus inflow from the Park. The Ranch shall monitor and report to Watermaster the amounts of such Groundwater Production and inflow.

e. Hatchery Production up to 10,678 acre-feet per Year will be permitted free of any Assessments against the Hatchery. The Hatchery shall monitor and report to Watermaster its Groundwater Production and the amounts of tailwater discharged to the River and to the artificial channel. In any Year the Hatchery may Produce more than 10,678 acre-feet free of any Assessments against the Hatchery, provided such Production in excess of 10,678 acre-feet is reported as Groundwater Production by one or more of the Verde Ranch Producers in the same Year pursuant to operating agreements by and between the Hatchery and such Producer(s) filed with the Watermaster. The operating agreement shall specify the responsibility for payment of assessments. In the operating agreement, the Verde Ranch Producers may elect to have assessments be based on the aggregate Production of the Verde Ranch Producers, and may freely transfer Base Annual Production Rights internally, provided that the aggregate consumptive use of the Verde Ranch Producers shall not be increased. In the absence of such operating agreements, or if the operating agreements do not otherwise allocate responsibility for payment of Assessments, the Hatchery shall be liable for Administrative, Replacement Water and Biological Resource Assessments on the amount of water Produced by the Hatchery in excess of 10,678 acre-feet in any Year. In the event that Verde Ranch Producer who is allocated responsibility for payment of Assessments pursuant to an operating agreement is delinquent in making any such payment, the Hatchery shall not be liable therefor.

f. In any Year, if the total discharge to the River from the Hatchery and the Verde Ranch Producers exceeds the Groundwater Production by the Hatchery, such excess discharge shall be subject to Administrative, Replacement Water and, except for the Park, Biological Resource Assessments. Such Assessments shall be levied against individual Verde Ranch Producers in proportion to the extent that outflow from each Producer exceeds inflow to that Producer.

g. The Hatchery and the Verde Ranch Producers shall install all stage recorders, meters or other measuring devices necessary to determine inflows, outflows and Production that they are responsible for monitoring and reporting to Watermaster. Such stage recorders, meters or other measuring devices shall be installed, calibrated and operated in manner satisfactory to Watermaster.

h. Any change in the flow regimen described above will be subject to the same general rules set forth in this Paragraph 7. Any such change shall be reported to Watermaster in advance.

8. Harper Lake Basin. No Producer in the Harper Lake Basin may transfer any Base Annual Production Right or any portion thereof to Producers outside of Harper Lake Basin except by

physically conveying the water in compliance with the rules set forth in this Exhibit "F".

EXHIBIT G

SUBAREA OBLIGATIONS

EXHIBIT G

SUBAREA OBLIGATIONS

1. Subarea Obligations. Producers in the respective Subareas shall have the obligation to provide the following average Annual and minimum Annual Subsurface Flows and/or Base Flows per Year:

a. Este Subarea Producers--200 acre-feet per Year of Subsurface Flow to the Alto Subarea, except that in any Year the Subsurface Flow obligation shall be not be less than 160 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 200 acre-feet.

b. Oeste Subarea Producers--800 acre-feet per Year of Subsurface Flow to the Alto Subarea, except that in any Year the Subsurface Flow obligation shall be not less than 640 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 800 acre-feet.

c. Centro Subarea Producers--1200 acre-feet per Year of Subsurface Flow to the Baja Subarea, except that in any Year the Subsurface Flow Obligation shall be not less than 960 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 1200 acre-feet.

d. Baja Subarea Producers--400 acre-feet per Year of Subsurface Flow toward Afton across the MWA eastern boundary, except that in any Year the Subsurface Flow Obligation shall not be less than 320 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 400 acre-feet.

e. Alto Subarea Producers--an average Annual combined Subsurface Flow and Base Flow of 23,000 acre-feet per Year to the Transition Zone. For the purposes of Paragraph 6 of this Exhibit G, the Subsurface Flow component shall be deemed to be 2,000 acre-feet per Year. In any Year Alto Subarea Producers shall have an obligation to provide to the Transition Zone a minimum combined Subsurface Flow and Base Flow as follows:

i. If the accounting pursuant to Paragraph 5, below, reflects a net cumulative credit at the beginning of the Year, the combined minimum flow obligation shall be 18,400 acre-feet minus any net cumulative credit, but shall be not less than 15,000 acre-feet.

ii. If the accounting pursuant to Paragraph 5, below, does not reflect a net cumulative credit at the beginning of the Year, the combined minimum flow obligation shall be 18,400 acre-feet plus one-third of any net cumulative debit plus any additional amount of water required to reduce the net cumulative debit to 23,000 acre-feet.

2. <u>Obligation for Transition Zone Replacement Water</u>.

a. Until the Court approves Groundwater levels to be established and maintained pursuant to Subparagraph 2b of this Exhibit, Watermaster shall provide Replacement Water in the Transition Zone equal to Production in the Transition Zone that is in excess of the Transition Zone Producers' share of the Alto Subarea Free Production Allowance for that Year. All such Replacement Water shall be provided as soon as practicable during the next ensuing Year.

b. As soon as is practicable, the MWA shall establish key wells to be used to monitor Groundwater levels in the Transition Zone and, subject to approval by the Court, Watermaster shall establish minimum water levels to be maintained in the key wells.

c. After water level elevations have been established pursuant to Subparagraph 2b of this Exhibit, Watermaster shall provide Replacement Water in the Transition Zone as necessary to maintain the minimum water levels. Water purchased with Replacement Water Assessments paid by Producers in the Transition Zone in excess of the quantity of water needed to maintain said water levels shall be provided elsewhere in the Alto Subarea.

3. Other Water. "Other Water" that may be credited to a Subarea Obligation may include water conveyed and discharged across a boundary or Free Production Allowance water that is not Produced. Water other than Base Flow, Subsurface Flow or Storm Flow that is conveyed and discharged across a boundary between Subareas other than pursuant to a transfer agreement, shall be credited or debited, as appropriate, to the pertinent Subarea Obligation during the Year in which it is so conveyed and discharged. Any portion of the Subarea's Free Production Allowance that is allowed to remain unproduced in a Subarea pursuant to transfer agreements in order to satisfy a Subarea Obligation shall be credited to the pertinent Subarea Obligation in accordance with the terms of the transfer agreements.

4. Makeup Water. Assessments for Makeup Water shall be paid in accordance with the time schedule set forth in Exhibit D.

Makeup Water shall be credited to the Subarea Obligation at the end of the Year in which the Makeup Water Assessment is paid.

5. Accounting. Watermaster shall Annually not later than February 1 cause to be prepared a report of the status of each Subarea Obligation as of the end of the prior Year. The report shall set forth at least the following information for each Subarea Obligation:

a. The cumulative total of the average Annual Subarea Obligations since the Judgment was entered as of the beginning of the prior Year;

b. The cumulative total of all water credited to the Subarea Obligation since the Judgment was entered as of the beginning of the prior Year;

c. The net cumulative credit or debit [the difference between (a) and (b)] as of the beginning of the prior Year;

d. The amounts of water credited to the Subarea Obligation during the prior Year including, as appropriate, Base Flow, Subsurface Flow, Other Water and Makeup Water;

e. The cumulative total of the average Annual Subarea Obligations as of the end of the prior Year;

f. The cumulative total of all water credited to the Subarea Obligation as of the end of the prior Year;

g. The net cumulative credit or debit as of the end of the prior Year;

h. Any Makeup Water Obligation;

i. The Minimum Subarea Obligation for the current Year.

6. Subsurface Flow Assumptions. Some Subarea Obligations are expressed as average Annual or minimum Annual Subsurface Flow.

In all cases the Subsurface Flow obligations have been established initially at amounts equal to the estimated historical average Subsurface Flow across Subarea boundaries. Not later than two Years following entry of this Judgment MWA shall begin to install monitoring wells to be used to obtain data to enable improved estimates of Subsurface Flow at each Subarea boundary where there is a Subsurface Flow obligation and to develop methodology for future determinations of actual Subsurface Flow. Not later than ten years following entry of this Judgment Watermaster shall prepare a report setting forth the results of the monitoring program and the future methodology. Following opportunity for review of Watermaster's report by all Parties, Watermaster shall prepare a recommendation to the Court as to the likely accuracy of the estimated historical Subsurface Flows and any revision of Subarea Obligations that may be indicated. Pending Watermaster's report to the Court, Subsurface Flows shall be assumed to be equal to the Subsurface Flow obligations for purposed of accounting for compliance therewith.

7. Example Calculation. Table G-1 sets forth an example of Subarea Obligation accounting procedures using hypothetical flows.

TABLE G-1
HYPOTHETICAL EXAMPLE
ACCOUNTING FOR COMPLIANCE WITH SUBAREA OBLIGATIONS

OBLIGATION OF SUBAREA A TO SUBAREA B
AVERAGE ANNUAL: 23,000 AFA (21,000 AFA BASEFLOW + 2,000 AFA SUBSURFACE FLOW)
MINIMUM ANNUAL: 18,400 AFA + 1/3 OF ANY NET CUMULATIVE DEBIT; OR 18,400 AFA - ANY NET CUMULATIVE CREDIT, BUT NOT LESS THAN 15,000 AFA

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF
STATUS AT BEGINNING OF YEAR										
CUMULATIVE OBLIGATION	0	23,000	46,000	69,000	92,000	115,000	138,000	161,000	184,000	207,000
CUMULATIVE FLOW	0	17,000	32,600	50,800	69,067	87,067	107,111	139,978	168,378	198,978
NET CUMULATIVE CREDIT (DEBIT)	0	(6,000)	(13,400)	(18,200)	(22,933)	(27,933)	(30,889)	(21,022)	(15,622)	(8,022)
FLOW DURING THE YEAR (HYPOTHETICAL)										
BASE FLOW	8,000	5,000	4,000	4,000	2,000	2,000	15,000	18,000	20,000	23,000
SUBSURFACE FLOW	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
OTHER WATER	7,000	7,200	7,400	7,600	7800	8,000	8,200	8,400	8,600	8800
MAKEUP WATER PURCHASED	0	1,400	4,800	4,667	6,200	8,044	7,667	0	0	0
TOTAL FLOW	17,000	15,600	18,200	18,267	18,000	20,044	32,867	28,400	30,600	33,800
MINIMUM OBLIGATION DURING THE YEAR	18,400	20,400	22,867	24,467	26,044	27,711	28,696	25,407	23,607	21,074
MAKEUP OBLIGATION INCURRED	1,400	4,800	4,667	6,200	8,044	7,667	0	0	0	0
STATUS AT END OF YEAR										
CUMULATIVE OBLIGATION	23,000	46,000	69,000	92,000	115,000	138,000	161,000	184,000	207,000	230,000
CUMULATIVE FLOW	17,000	32,600	50,800	69,067	87,067	107,111	139,978	168,378	198,978	232,778
NET CUMULATIVE CREDIT (DEBIT)	(6,000)	(13,400)	(18,200)	(22,933)	(27,933)	(30,889)	(21,022)	(15,622)	(8,022)	2,778
FOLLOWING YEAR MINIMUM OBLIGATION										
18,400 + 1/3 OF NET CUM. DEBIT	20,400	22,867	24,467	26,044	27,711	28,696	25,407	23,607	21,074	0
ADDITIONAL TO REDUCE DEBIT TO 23,000	0	0	0	0	0	0	0	0	0	0
18,400 - CUM. CREDIT, BUT NLT 15,000	0	0	0	0	0	0	0	0	0	15,622
MINIMUM OBLIGATION	20,400	22,867	24,467	26,044	27,711	28,696	25,407	23,607	21,074	15,622

EXHIBIT H

BIOLOGICAL RESOURCE MITIGATION

EXHIBIT H

BIOLOGICAL RESOURCE MITIGATION

1. Protection of and Description of Existing Riparian Habitat. In arriving at a Physical Solution, the Parties have taken into consideration the water needs of the public trust resources of the Mojave Basin Area, including but not limited to, those species listed in Table H-1 within each of the areas as shown on Figure H-1 and the riparian habitat areas shown on Figure H-1 and described generally as follows:

a. The area which extends, south to north, in the Alto Subarea, from the intersection of the north line of Section 36, Township 5 North, Range 4 West with the Mojave River channel to the United States Geological Survey gauging station at the Lower Narrows;

b. The Lower Narrows to the Helendale Fault (Transition Zone);

c. The Harvard/Eastern Baja Subarea reach of the Mojave River that extends west to east, from Harvard Road to the Iron Ranch/Iron Mountain area (0.5 miles east of the west line of Section 20, Township 10 North, Range 4 East).

2. Protection Pursuant to Physical Solution. The following aspects of the Physical Solution must be implemented to seek to achieve the water table standards set forth in Table H-2 which were proposed by DFG as being necessary to maintain and converse the riparian resources in the areas shown on Figure H-1, including the species listed in Table H-1:

a. Pursuant to Paragraph 24(o) of the Judgment, the Watermaster in recommending an adjustment in Free Production

Allowance, shall compare the Free Production Allowance with the estimated Production Safe Yield. In the event the Free Production Allowance exceeds the estimated Production Safe Yield by five percent or more, Watermaster shall recommend a reduction of the Free Production Allowance equal to a full five percent of the aggregate Subarea Base Annual Production. In considering whether to increase or decrease the Free Production Allowance in a Subarea, Watermaster shall, among other factors, take into consideration for the areas shown on Figure H-1 the Consumptive Use of water by riparian habitat, the protection of public trust resources, including the species listed in Table H-1 and the riparian habitat areas shown on Figure H-1, and whether an increase would be detrimental to the protection of public trust resources.

b. If, pursuant to Paragraph 27, Watermaster buys or leases Free Production Allowance in the Baja Subarea below the Calico-Newberry Fault to satisfy the need for Replacement Water, priority shall be given to purchases or leases that will result in reducing Production in or near the area described in Subparagraph 1(c) of this Exhibit.

c. Pursuant to Paragraph 2 of Exhibit "G", Watermaster shall purchase Replacement Water to maintain Groundwater levels in the Transition Zone.

3. <u>Additional Protection Pursuant to Trust Fund Established by Watermaster Using the Proceeds of Biological Resource Assessments</u>.

a. Watermaster shall establish a Biological Resources Trust Fund account for the benefit of the riparian habitat areas shown on Figure H-1 and the species listed on Table H-1. To establish and maintain the Trust Fund Watermaster shall levy against each acre-foot of Production within the Basin Area, other than Production by the California Department of Fish and Game (DFG), a Biological Resource Assessment of fifty cents ($0.50) (1993 dollars) to be collected at the same time and in the same manner as the Administrative Assessment, except that no Biological Resources Assessment shall be levied whenever the Trust Fund account balance exceeds $1,000,000 (1993 dollars).

b. Watermaster shall make funds held in the Biological Resources Trust Fund available to DFG only in the event that Groundwater levels are not maintained as set forth in Table H-2. Watermaster shall take action to acknowledge any proposed expenditure from the Biological Resources Trust Fund by DFG. Such Watermaster action shall be subject to the review procedures set forth in Paragraph 36 of the Judgment, provided that any motion made pursuant thereto and any Court disapproval of such Watermaster action and proposed DFG expenditure may be based only: 1) on the ground that the Groundwater levels set forth in Table H-2 are being maintained; and/or 2) the ground that the proposed expenditure is not for any of the purposes set forth in Subparagraphs 3.b.(i), (ii), or (iii) below in this Exhibit. The Biological Resources Trust Fund may be used only for the following purposes and only in the three areas identified on Figure H-1:

i. not to exceed $100,000 for the preparation by DFG of a DFG habitat water supply management plan, which plan shall include the water needs of the species listed in Table H-1 and the riparian habitat areas shown on Figure H-1.

ii. the purchase or lease by DFG of Supplemental Water or the lease or purchase of DFG of Base Annual Production Rights to be used to meet riparian habitat water needs of the species listed in Table H-1 and the riparian habitat areas shown on Figure H-1.

iii. the construction, repair and replacement of wells or other facilities identified in the plan prepared pursuant to Subparagraph (i), above, and/or any other measures necessary to implement the plan.

DFG shall not prepare or make any expenditure from the trust fund for the payment of administrative overhead or staff of DFG.

4. DFG agrees that absent substantial changed circumstances, DFG shall not seek to modify the provisions of this Judgment in any way to add to or change the above-stated measures to protect the referenced species or habitat. Nothing stated in this Judgment or in this Exhibit "H" is intended nor shall be deemed to relieve any Party hereto from any obligation or obligations not specifically referenced in this Exhibit H. Nothing in this Judgment or in this Exhibit H is intended or shall be construed to be a waiver by the State or any of its departments or agencies, including DFG, of its rights and obligations under the common law, the public trust doctrine, the constitution, statutes and regulations to preserve, protect or enhance the natural resources of the State including rare, threatened or endangered species or species of concern.

TABLE H-1

LIST OF SPECIES

SPECIES	ALTO			CENTRO		BAJA		
	Forks Dam to Upper Narrows	Upper Narrows to Lower Narrows	Lower Narrows to Helendale	Helendale to Hodge	Hodge to Barstow	Barstow to Harvard Road	Harvard Road to Mannix Wash	Afton Canyon
Purple Monkeyflower	6							
Mohave Monkeyflower	6		6	6	6	6		
Mohave Tarweed	5							
Desert Cymopterus	6							
Barstow Woolly Sunflower					6	6		
Victorville Shoulderband	6	6						
Mohave Tui Chub							1, 3	
California Red-legged Frog	6	6	6	6				
Southwestern Pond Turtle	6		6	6		6	6	6
Desert Tortoise	2, 4		2, 4	2, 4	2, 4	2, 4		
San Diego horned Lizard	6							
Cooper's Hawk	8	8						
Ferruginous Hawk	8	8						
Swainson's Hawk	4	4						
Bald Eagle	1, 3	1,3						
Merlin	6, 8	6, 8						
Prairie Falcon	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8		
Western Yellow-billed Cuckoo	3, 7			3, 7	3, 7			
Southwestern Willow Flycatcher	8							
Brown-crested Flycatcher		8						
Vermillion Flycatcher	8					8	8	8
Le Conte's Thrasher	8							
Least Bell's Vireo	1, 3							1, 3

TABLE H-1

LIST OF SPECIES
(CONT'D)

SPECIES	ALTO			CENTRO		BAJA		
	Forks Dam to Upper Narrows	Upper Narrows to Lower Narrows	Lower Narrows to Helendale	Helendale to Hodge	Hodge to Barstow	Barstow to Harvard Road	Harvard Road to Mannix Wash	Afton Canyon
Yellow Warbler	9							
Yellow-breasted Chat	8	8			8	8		
Summer Tanager	8	8						8
Pale Big Earred Bat	8							
Mohave Ground Squirrel	4, 6		4, 6	4, 6				
Mohave Vole			6	6				
Nelson's Bighorn Sheep					10	10		10
TOTAL NUMBER OF SPECIES = 30 TOTAL NUMBER OF SPECIES IN EACH AREA:	25	11	7	8	7	8	3	5

1 = Federally Endangered
2 = Federally Threatened
3 = State Endangered
4 = State Threatened
5 = Federal Category: 1
6 = Federal Category: 2
7 = Federal Category: 3b
8 = State: Special Concern
9 = State: Sensitive
10 = State: Fully Protected

TABLE H-2

RIPARIAN HABITAT MONITORING WELL WATER LEVEL CRITERIA

ZONE	WELL NUMBER	MAXIMUM DEPTH BELOW GROUND
Victorville/Alto	H1-1	Seven (7) Feet
Victorville/Alto	H1-2	Seven (7) Feet
Lower Narrows/Transition	H2-1	Ten (10) Feet
Harvard/Eastern Baja Riparian Forest Habitat	H3-1	Seven (7) Feet
Harvard/Eastern Baja Surface Water Habitat	H3-2	Plus One (1) Foot (1705 Ft msl)*

* Surface Water Habitat water surface elevation of 1705 ft. msl is approximate pending ground elevation survey.

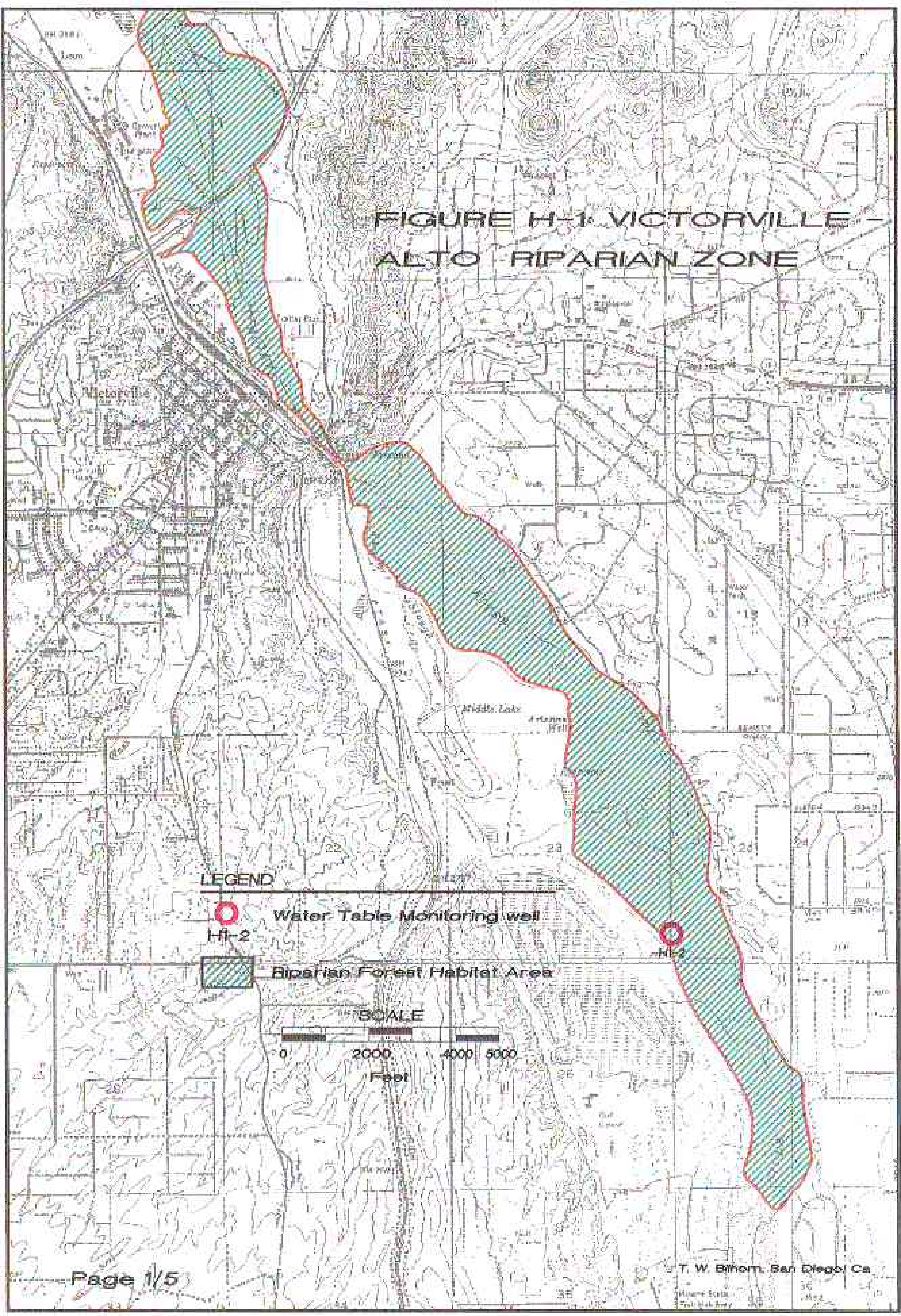


FIGURE H-1 VICTORVILLE - ALTO RIPARIAN ZONE
LEGEND
Water Table Monitoring well
H1-2
Riparian Forest Habitat Area
SCALE
0
2000
4000
5000
Feet
Victorville
Middle Lake
T. W. Bilhorn, San Diego, Ca

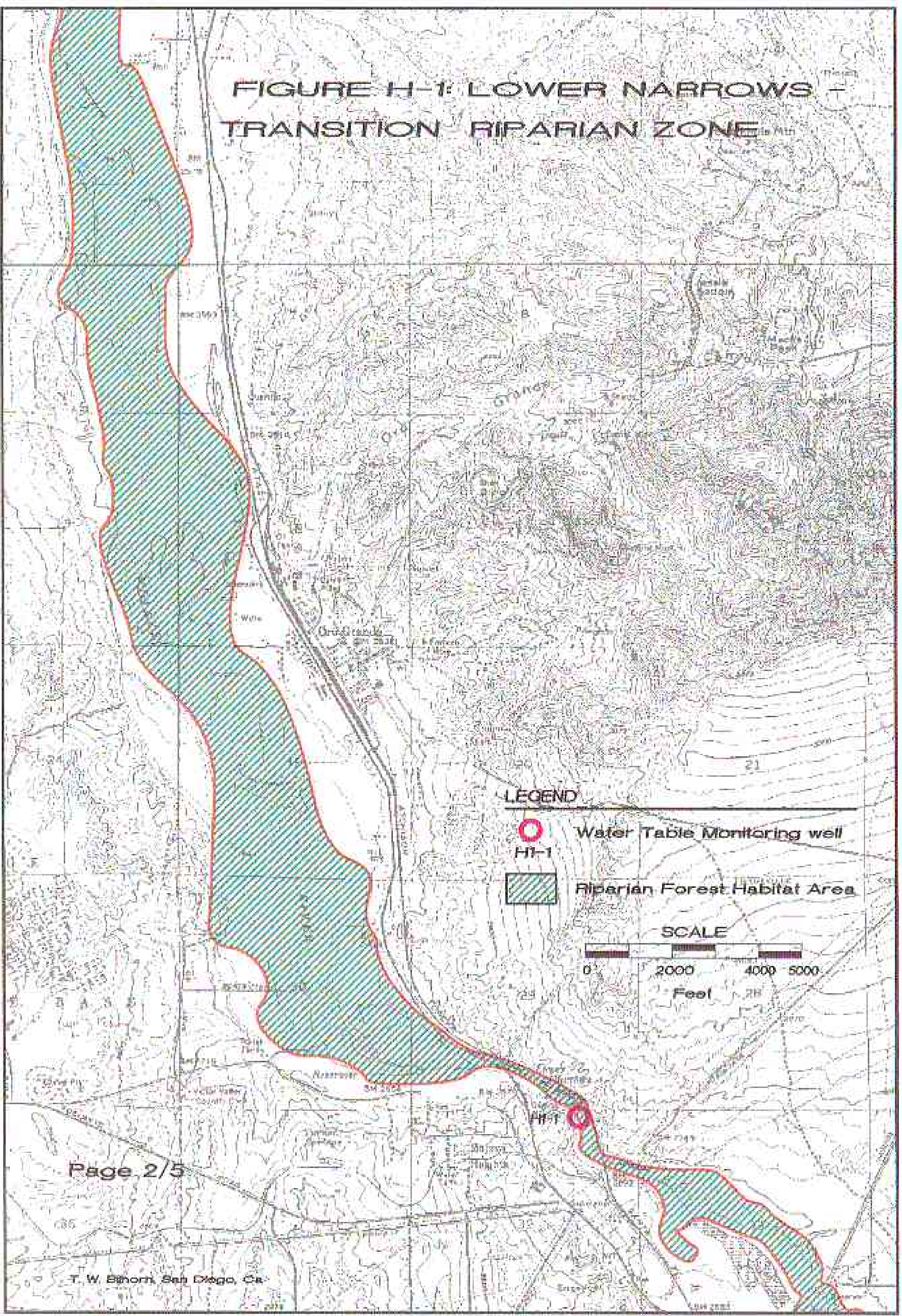


FIGURE H-1: LOWER NARROWS - TRANSITION RIPARIAN ZONE

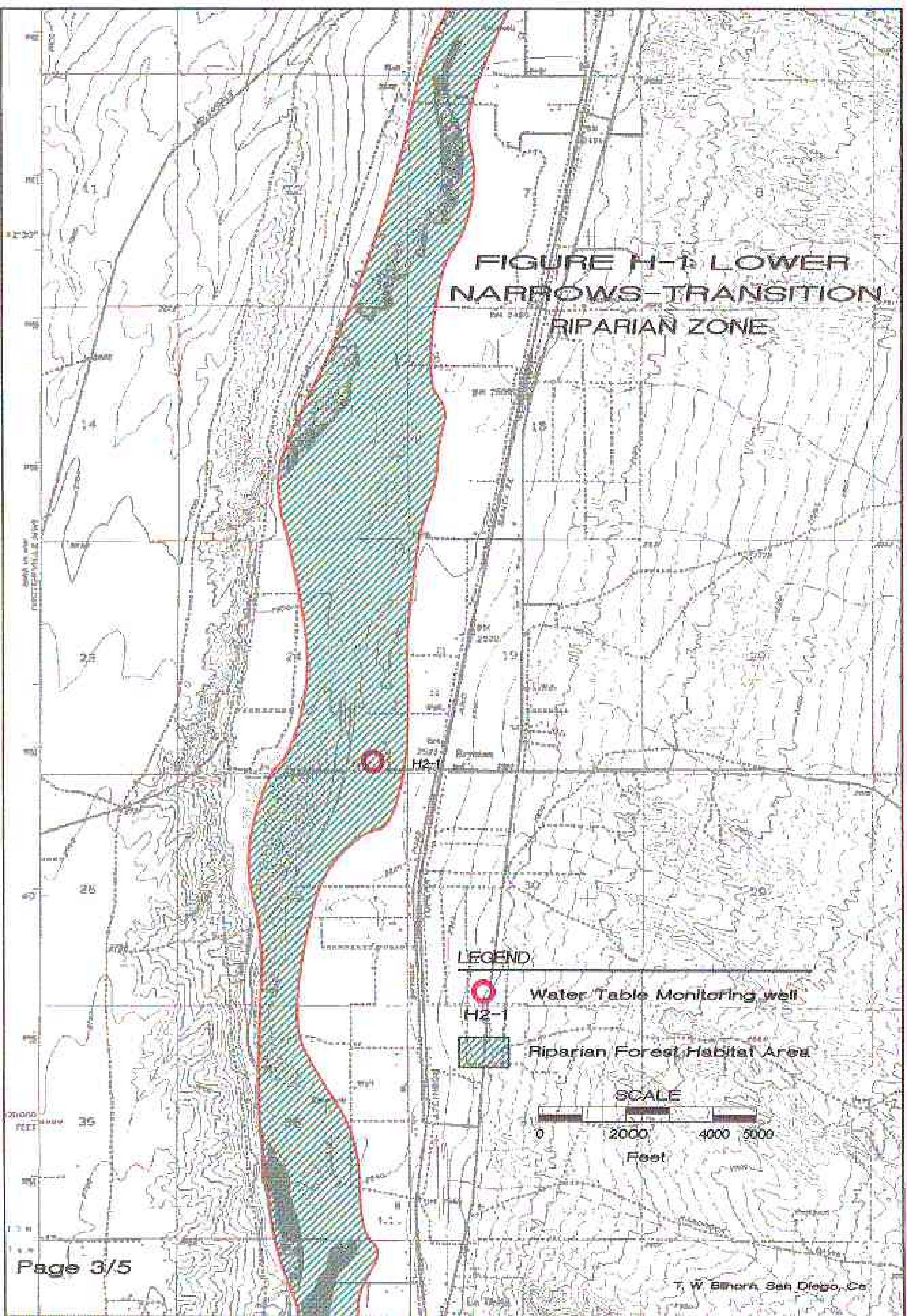


FIGURE H-1: LOWER NARROWS-TRANSITION RIPARIAN ZONE
LEGEND
Water Table Monitoring well
H2-1
Riparian Forest Habitat Area
SCALE
0
2000
4000
5000
Feet
T. W. Bilhorn, San Diego, Ca

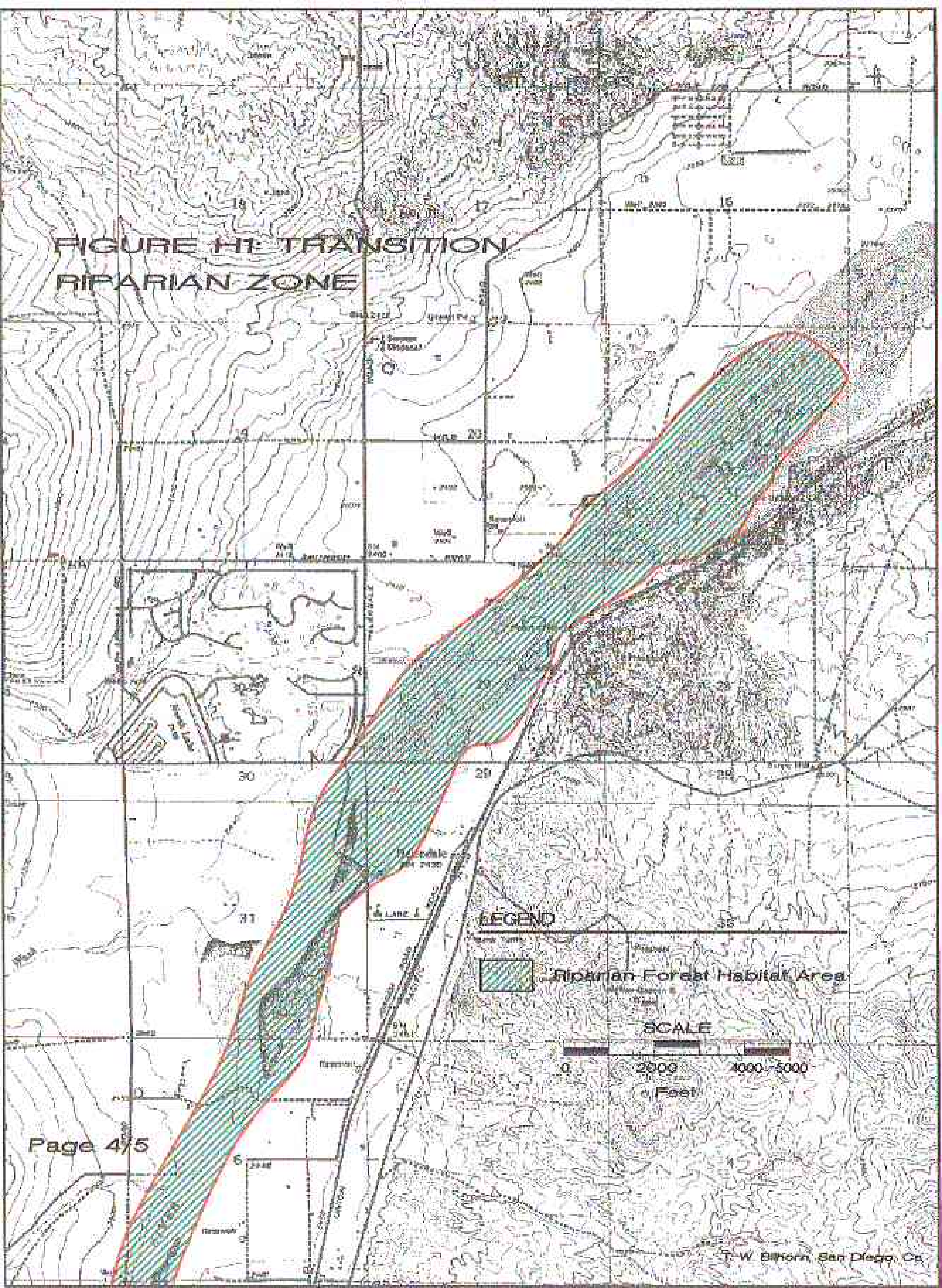


FIGURE H1: TRANSITION
RIPARIAN ZONE
LEGEND
Riparian Forest Habitat Area
SCALE
0
2000
4000 5000
Feet
Page 4/5
T. W. Bilhorn, San Diego, Co.

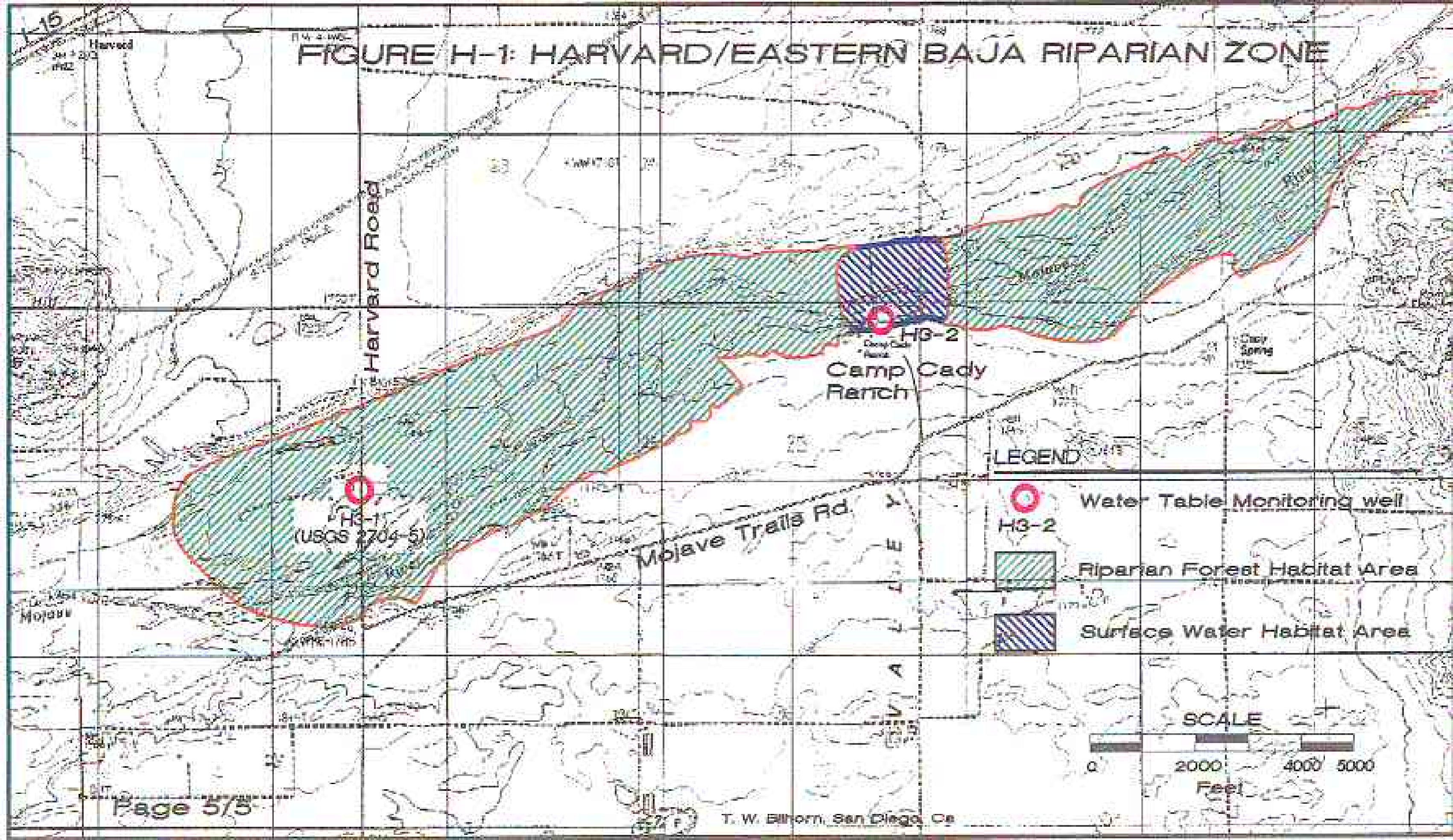
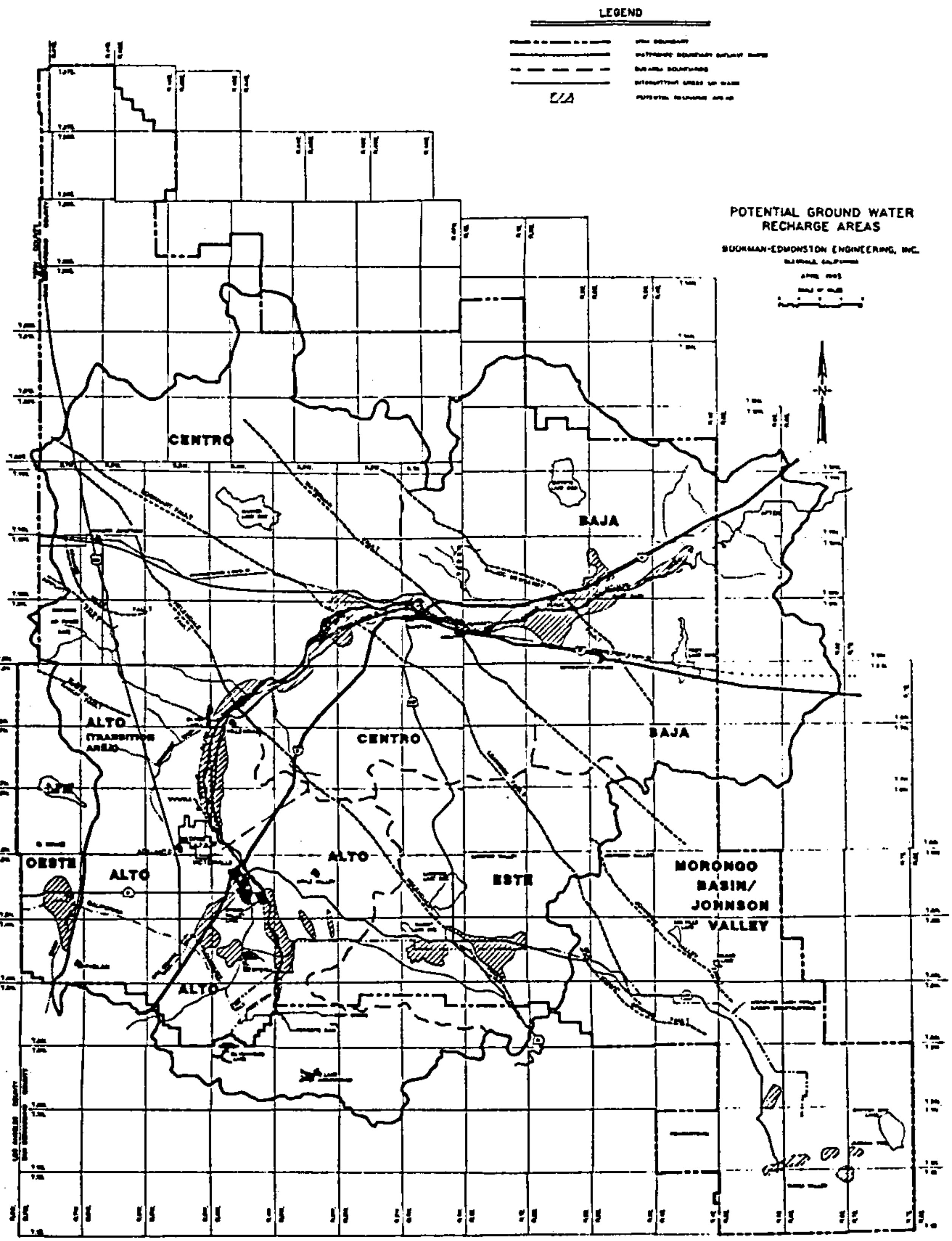


FIGURE H-1: HARVARD/EASTERN BAJA RIPARIAN ZONE



MOJAVE WATER AGENCY

REGIONAL WATER MANAGEMENT PLAN

Appendix F.b.

Groundwater Basin Water Rights Stipulation/Judgment

MWA Regional Water Management Plan

MOJAVE WATER AGENCY

2004 REGIONAL WATER MANAGEMENT PLAN

INTEGRATED REGIONAL WATER MANAGEMENT PLAN
GROUNDWATER MANAGEMENT PLAN
URBAN WATER MANAGEMENT PLAN

VOLUME 1:
REPORT

September 2004
Adopted February 24, 2005

Mojave Water Agency

Schlumberger Water Services

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Appendix D	Issues Questionnaire, Summary of Responses to the Issues Questionnaire
Appendix E	Technical Advisory Committee to the Mojave Water Agency Minutes
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1

INTRODUCTION

The Mojave Water Agency (MWA) was formed in 1959 by an act of the California Legislature and was activated by a vote of the residents in 1960 to manage declining groundwater levels in the Mojave Basin Area, Lucerne Valley and El Mirage Basin. The Morongo Basin and Johnson Valley areas were annexed in 1965. MWA covers over 4,900 square miles, a hydrologically diverse region that has a unique set of water management issues. Over the last decade, much has been accomplished toward the development and implementation of a comprehensive water resources plan to address these issues. Key accomplishments and events of recent years include:

1. The 1993 Stipulated Judgment, 1996 Judgment After Trial and several court decisions that have followed
2. Adoption of the 1994 Regional Water Management Plan
3. Construction of a number of key facilities including the Morongo Basin Pipeline, Rock Springs Outlet, Hi-Desert Water District recharge facilities, Mojave River Pipeline and the Hodge, Lenwood and Dagget recharge facilities
4. Purchase of an additional 25,000 acre-feet of supply from the State Water Project
5. Completion of several studies by USGS including the report entitled "Simulation of Ground-Water Flow in the Mojave River Basin"

Essentially all water supplies within MWA are pumped from the local groundwater basins and groundwater levels generally have been declining for the past 50 years or more. Adjudication proceedings were initiated due to concerns that rapid population growth would lead to further overdraft. The resulting Warren Valley Basin Judgment and the Mojave Basin Area Judgment both require that additional surface water be imported to help balance the basins.

MWA has an annual contract for up to 75,800 acre-feet of water from the State Water Project (SWP) although due to variability in deliveries of SWP water, the average annual supply available to MWA is currently estimated to be 58,400 acre-feet. In order to balance the basin by the year 2020, it will be necessary for MWA to utilize its full SWP supply. Construction of projects by MWA within its service area is necessary to build, operate, maintain and replace the State Water Project facilities to which MWA is contractually obligated. These projects are necessary to fulfill MWA's contractual obligations with the State of California and to insure water availability to all of its residents.

Purpose

MWA first prepared a Regional Water Management Plan in 1994 (Bookman-Edmonston Engineering, Inc. 1994). Since that time, several developments have prompted MWA to prepare a plan update. These developments include advancements in the basin adjudication process, a more refined understanding of the hydrology and hydrogeology of the service area, population increases, shifts in agricultural and urban water demands, and the growing realization that the Mojave region can be a strategic element in the long-term management of California's water supplies. The Mojave Groundwater Basin is located along the California Aqueduct and has nearly two million acre-feet of available storage, which could make the region a strategic player in solving state-wide water storage and conjunctive use problems while addressing its internal water resources needs. Recent additions to California law promote development of integrated water resource management plans and groundwater management plans by providing preference to agencies with such plans for funding through state grant programs. **This Plan serves as an Integrated Regional Water Management Plan, Groundwater Management Plan and Urban Water Management Plan and meets the requirements of SB 221, SB 610, SB 1938 and AB 901.**

The RWMP was supported through a March 22, 2001 Memorandum of Understanding (MOU) with the DWR Integrated Storage Investigation which requires a "Basin Advisory Panel" of local civic and technical leaders and other stakeholders. This update was prepared in three phases with input from a Technical Advisory Committee (TAC) convened as the advisory panel. Objectives were: 1) to review and revise, as necessary, previous estimates of water supply and demand, 2) identify and solicit input from stakeholders with interest in long-term reliable water supplies for the region, and 3) identify a suite of preliminary alternatives that will help MWA achieve its goals in water supply management for the next two decades. Proposed projects and management actions are tailored to address at least one key water management issue in the basin.

The following six key water management issues emerged as a result of this process:

- Current demand exceeds supply; future demand will also exceed supply unless corrective actions are taken
- Naturally occurring water quality problems affect drinking water supplies
- Many of the groundwater basins are in overdraft
- All but two of the subareas have riparian ecosystem maintenance issues

- Wastewater infrastructure issues affect the two subareas with the largest water demands
- Many subareas within MWA are impacted by activities in other subareas

Fundamental objectives established with the input of the TAC are to: 1) balance future water demands with available supplies and, 2) maximize the overall beneficial use of water throughout MWA. To compare expected performance of alternative combinations of projects and management alternatives, a screening model was developed. The screening model simulates the changes to groundwater hydrology, Mojave River flows, and pumping and return flows that would result from implementation of the identified projects and management actions. Each alternative was evaluated and ranked according to its effectiveness in meeting the long-term needs of the basin.

This draft Regional Water Management Plan incorporates the highest-ranking alternatives. The draft will undergo an environmental review and the MWA Board of Directors will adopt a final Plan. This Plan provides MWA with long-term direction for management and development of resources and describes MWA's resource management and development strategy through the year 2020. The Plan concludes with 60 Management Actions. Chapters of the Plan are summarized below.

Chapter 2, Agency and Stakeholder Background, describes the MWA and the adjudications of the Mojave Basin Area and Morongo Basin/Johnson Valley Area. The previous 1994 Regional Water Management Plan is summarized and the major stakeholders are identified.

Chapter 3, Physical Setting, describes geography, geology, groundwater conditions, aquifers, groundwater basins, water districts, surface water resources, climate, and wastewater systems.

Chapter 4, Water Supply, provides a detailed description of natural and imported water supplies and their variability within the MWA.

Chapter 5, Water Demand, describes current and projected future water demand in the Mojave Basin Area and Morongo Basin/Johnson Valley Area. Water balances for the year 2020 are presented for two different agricultural demand scenarios, including single dry year and multiple dry year scenarios.

Chapter 6, Water Shortage Contingency Planning, summarizes water shortage contingency plans of MWA and service area water purveyors.

Chapter 7, Water Conservation and Demand Management Measures, provides an overview of water conservation plans and practices of the MWA, cities, water agencies and other groups in the MWA service area.

Chapter 8, Stakeholder Assessment and Public Outreach, describes the public outreach efforts taken by the MWA during the development of this Plan and summaries water management issues of stakeholders in the MWA service area.

Chapter 9, Basin Management Objectives and Alternatives, describes the development of Basin Management Objectives and performance measures developed with the Technical Advisory Committee, a description of supply enhancement projects, and the development and evaluation of alternatives.

Chapter 10, Management Actions, contains 60 actions for implementation of the Plan.

Integrated Water Management Plan

California Water Code Section 79562.5 (b) states that DWR shall establish standards that address, at a minimum “the major water related objectives and conflicts of the watersheds in the region covered by the plan, including water supply, groundwater management, ecosystem restoration, and water quality elements.” While specific standards for Integrated Regional Water Management Plans have not yet been developed, this Plan was developed to address all four Integrated Regional Water Management Plan elements identified in the Water Code.

MWA has developed this Regional Water Management Plan through a comprehensive systems approach. The Plan integrates components related to groundwater management, urban water management, agricultural water use, environmental habitat protection and restoration, water quality, and stakeholder and public outreach. The Plan meets requirements of the Urban Water Management Planning Act and requirements for Groundwater Management Plans pursuant to the Water Code and components recommended by DWR as elaborated below.

Urban Water Management Plan

This Regional Water Management Plan was prepared for the MWA in order to comply with 2003 California Urban Water Management Act requirements including amendments made by Senate Bill 610 and Assembly Bill 901. The California Urban Water Management Planning Act (Division 6 Part 2.6 of the Water Code) requires water suppliers with over 3,000 customers or that supply over 3,000 acre-feet of water annually to prepare Urban Water Management Plans (UWMP). MWA does not supply water directly, but holds the State Water Project contract and imports water to replenish groundwater basins and to meet obligations of the Mojave Basin Area and Warren Valley judgments. Seven water supply agencies within the MWA have developed UWMPs. The checklist at the end of this chapter indicates where in this Plan specific UWMP components are located.

Groundwater Management Plan

This Plan contains components included in California Water Code Sections 10750-10753.10 related to Groundwater Management Plans. The California State Legislature passed Assembly Bill 3030 (AB 3030) during the 1992 legislative session allowing local agencies to develop Groundwater Management Plans. The legislation declares that groundwater is a valuable resource that should be carefully managed to ensure its safe production and quality. The legislation also encourages local agencies to work cooperatively to manage groundwater resources within their jurisdiction. Senate Bill 1938 was passed by the Legislature September 16, 2002 and made changes and additions to sections of the Water Code created by AB 3030. This Plan addresses all the relevant components related to Groundwater Management Plans in the Water Code, as well as the components recommended by DWR in *California's Groundwater*, Bulletin 118 (DWR, 2003).

The Water Code sections related to Groundwater Management Plans apply to all groundwater basins identified in the California Department of Water Resources (DWR) Bulletin 118 (DWR, 1980), except those basins already subject to groundwater management by a local agency or a watermaster unless approved by the watermaster. The MWA overlies several groundwater basins (see Chapter 3), as defined by DWR in Bulletin 118. Nothing in this Plan supercedes the Mojave Basin or Warren Valley Basin adjudications. The checklist at the end of this chapter indicates where in this Plan specific Groundwater Management Plan components are located.

Public Outreach

Significant public outreach efforts were made during development of this Plan. These efforts involved evaluation of questionnaires and holding meetings with individuals, groups and a Technical Advisory Committee. Outreach efforts were directed at stakeholders from local water agencies, state and federal agencies, municipalities, San Bernardino County, and 13 local community groups. Lists of stakeholders are included in Chapter 2 of this Plan. Stakeholder assessment and public outreach efforts are discussed in Chapter 8.

Interrelation of Plan Elements

There is overlap in the requirements of Integrated Regional Water Management Plans, Urban Water Management Plans and Groundwater Management Plans. New laws now require UWMPs of water suppliers that utilize groundwater (all urban suppliers in MWA use groundwater) to include a description of the groundwater basin and location and amounts of groundwater pumped. Plan elements specific to Integrated Regional Water Management Plans, Urban Water Management Plans and Groundwater Management Plans are located throughout this Plan, placed in chapters according to general subject.

Checklists

Three checklists are contained on the following pages. The first relates to Integrated Regional Water Management Plans, the second relates to Urban Water Management Plans and the third relates to Groundwater Management Plans. The checklists contain a summary of Water Code elements to be addressed, section numbers of the Water Code where the requirement can be found, and the location in this Plan where the subject is addessed. Copies of the relevant Water Code sections are included in Appendix J.

Integrated Regional Water Management

Plan Checklist

Items to Address	Section of Law	Location in Plan
Water related objectives and conflicts	79562.5(b)	Chapter 9
Water supply	79562.5(b)	Chapter 4
Groundwater management	79562.5(b)	Chapter 10
Ecosystem Restoration	79562.5(b)	Chapter 10
Water quality	79562.5(b)	Chapter 10

Urban Water Management Plan Checklist

Checklist Organized According to Subject

Items to Address	Section of Law	Location in Plan
Public and Stakeholder Outreach		
Make plan available for public inspection before its adoption.	10642	Chapter 8 Appendix F
Adopt plan as prepared or as modified after the public hearing.		Appendix G
Coordinate the preparation of its plan with other appropriate agencies, including direct and indirect suppliers, wastewater, groundwater, and planning agencies (refer to Section 10633).	10620 (d) (2)	Pg. 2 - 8
Demand, Supply, Reliability and Contingency Planning		
Provide current and projected population in 5-year increments to 20 years.	10631 (a)	Table 5 - 20
Describe the climate and demographic factors.		Pg. 3 - 25
Identify and quantify the existing and planned sources of water available in 5-year increments to 20 years	10631 (b)	Table 4 - 9
Describe opportunities for exchanges or transfers of water on short-term or long-term basis.	10631 (d)	Pg. 4 - 36
Quantify current and past water use in 5-year increments to 20 years.	10631 (e) (1)	Pg. 5 - 21
Identify projected water uses among water use sectors in 5-year increments to 20 years.	10631 (e) (2)	Pg. 5 - 21
Describe average, single dry and multiple dry water year data.	10631 (c)	Tables 4 - 3, Pg. 4 - 4
Describe any plans to replace inconsistent water sources.		Pg. 4 - 30
Provide minimum water supply estimates based on driest three-year historic sequence.	10632 (b)	Table 4 - 4
Describe the reliability of water supply.	10631 (c)	Pg. 4 - 30
Describe the vulnerability of water supply to seasonal or climatic shortage.		Pg. 4 - 30
Provide an assessment of the reliability of the water supplier's water service to its customers during normal, single dry, and multiple dry water years.	10635 (a)	Pg. 4 - 17
Compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in 5-year increments (refer to 10631 (c)).		Table 5 - 15

Items to Address	Section of Law	Location in Plan
Compare normal, single dry, and multiple dry water year projected water supply sources available to the water supplier with the normal, single dry, multiple dry water year projected water uses (refer to 10631 (c)).		Table 5 - 14
Provide actions a water supplier will take to prepare for a catastrophe.	10632 (c)	Chapter 6
Provide a copy of a draft water shortage contingency resolution or ordinance	10632 (h)	
Provide water shortage stages of action, including up to a 50 percent reduction outlining specific water supply conditions at each stage.	10632 (a)	Chapter 6
Provide mandatory prohibitions.	10632 (d)	Chapter 6
Provide penalties or charges.	10632 (f)	Chapter 6
Provide consumption reduction methods	10632 (e)	Chapter 6
Provide an analysis of the impacts on the water supplier revenues and expenditures	10632 (g)	Chapter 6
Provide measures to overcome revenue and expenditure impacts.		Chapter 6
Provide a mechanism for determining actual reductions in water use.	10632 (i)	Chapter 6

Wastewater and Reclamation

Describe the wastewater collection and treatment systems in the supplier's service area.	10633 (a)	Pg. 3 - 25
Quantify the amount of wastewater collected and treated in the supplier's service area.		Pg. 3 - 27
Describe the methods of wastewater disposal in the supplier's service area.		Pg. 3 - 25
Describe the type, place, and quantity of recycled water currently used in the supplier's service area.	10633 (b)	Pg. 3 - 25
Describe and quantify potential uses of recycled water in 5-year increments to 20 years.	10633 (c) (d)	Table 3 - 4
Describe the technical and economic feasibility of serving the potential users of recycled water.		Pg. 3 - 27
Describe the actions that may be taken to encourage recycled water use.	10633 (e)	Pg. 3 - 25
Provide the projected acre-feet results of recycled water used per year.	10633 (e)	Table 3 - 4
Provide a plan for optimizing the use of recycled water in the supplier's service area.	10633 (f)	Pg. 3 - 25
Provide actions to facilitate the installation of dual distribution systems and to promote recirculating uses.		Pg. 3 - 25

Items to Address	Section of Law	Location in Plan
Groundwater		
Identification of groundwater as a water supply source.	10631 (b)(1)	Pg. 4 - 12
Groundwater management plan preparation.		Pg. 1 - 2
Groundwater management plan adoption.		Appendix G
Copy of the groundwater management plan.		This Plan
Describe groundwater basin(s).	10631 (b)(2)	Pg. 3 - 5
Identify the groundwater basin(s).		Pg. 3 - 6
Identify adjudicated basins.		Pg. 2 - 3
Copy of order or decree of adjudication.		Appendix A
Describe the amount of groundwater the supplier has the legal right to pump.		Appendix A
Describe and analyze location of groundwater pumped for past 5 years based on information that is reasonably available.	10631 (b) (3)	Appendix H
Describe and analyze amount of groundwater pumped for past 5 years based on information that is reasonably available.		
Describe and analyze sufficiency of groundwater pumped for past 5 years based on information that is reasonably available.		Pg. 4 - 13
Describe and analyze location of groundwater that is projected to be pumped based on information that is reasonably available.	10631 (b)(4)	Appendix H
Describe and analyze amount of groundwater that is projected to be pumped based on information that is reasonably available.		Chapter 5
Water Supply Projects and Water Supply Programs		
The description explains how all the water supply projects and water supply programs increase the water supplies to meet the total projected water use as established pursuant to subdivision (a) of Section 10635.	10631 (h)	Chapter 9
Identify specific future water supply projects and water supply programs that may be implemented to increase the amount of water available during average, single-dry and multiple-dry water years.		Chapter 9
Describe the increase in water supply that is expected to be available from each of the specific future water supply projects and water supply programs.		Chapter 9
Describe the estimated implementation timeline for each future water supply project and water supply program.		Chapter 9

Items to Address	Section of Law	Location in Plan
Water Quality		
Includes information, to the extent practicable, relating to the quality of existing water supply sources over the next 20 years in five year increments.	10634	Pg. 4 - 29
Describes the manner in which water quality affects water management strategies.		Chapter 10
Describes the manner in which water quality affects supply reliability.		Chapter 10

Groundwater Management Plan

Checklist Organized According to Required and Recommended Components

Items to Address	Section of Law	Location in Plan
Required Components		
Provide documentation that a written statement was provided to the public describing the manner in which interested parties may participate in developing the groundwater management plan.	10753.4(b)	Appendix F
Provide basin management objectives for the groundwater basin that is subject to the plan.	10753.7 (a)(1)	Chapter 9
Describe components relating to the monitoring and management of groundwater levels, groundwater quality, inelastic land surface subsidence and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by pumping.	10753.7 (a)(1)	Chapter 10 Appendix H
Describe plan to involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin.	10753.7 (a)(2)	Ch 8
Adoption of monitoring protocols for the components in Water Code Section 10753.7 (a)(1)	10753.7 (a)(4)	Appendix H
Provide a map showing the area of the groundwater basin as defined by DWR Bulletin 118 with the area of the local agency subject to the plan as well as the boundaries of other local agencies that overlie the basin in which the agency is developing a groundwater management plan.	10753.7 (a)(3)	Fig 3 - 2
Recommended Components		
Manage with the guidance of an Advisory Committee.		Chapter 8 Appendix E
Describe the area to be managed under the plan including historical data related to groundwater levels, quality, subsidence, groundwater/surface water interactions, issues of concern and a discussion of supplies and demands.		Chapter 3
Describe how each of the management objectives helps meet goals.		Chapter 9
Provide a map showing locations of monitoring sites for groundwater levels and quality and stream gauges.		Appendix H
Summarize types of monitoring, types and frequency of measurements.		Appendix H
List monitoring well characteristics including well depth, screened intervals and well type.		Appendix I

2

AGENCY AND STAKEHOLDER BACKGROUND

Mojave Water Agency

The California State Legislature authorized the formation of the Mojave Water Agency (MWA) in 1959 for the purpose of managing declining groundwater levels in the Mojave Basin Area, El Mirage Basin, and Lucerne Basin. The Legislature's act required the vote of the residents within the boundaries of the proposed agency, which would finalize the creation of the agency. With the vote of the people, MWA was formed on July 21, 1960. MWA was expanded by annexation in 1965 to include the Johnson Valley and Morongo Basin areas. Today, MWA covers an area of over 4,900 square miles, as seen in Figure 2-1.

MWA was formed to manage groundwater levels that have been in decline since the early 1950s. Today, overdraft has reduced groundwater stored in the region by nearly two million acre-feet. The enabling act authorizes MWA to do "any and every act necessary, so that sufficient water may be available for any present or future beneficial use of the lands and inhabitants within MWA's jurisdiction." Clearly, MWA needed to find ways to assure a long-term, reliable water supply and where possible, reverse the overdraft of the groundwater basin.

MWA was formed to manage groundwater levels that have been in decline since the early 1950s.

The first step MWA took to reduce the water shortage within its jurisdiction was to become a SWP contractor, which entitled it to 50,800 acre-feet per year of water delivered via the California Aqueduct. Later, MWA purchased an additional 25,000 acre-feet of entitlement from Berrenda Mesa Water District to bring its total annual entitlement to 75,800 acre-feet.

Schlumberger Water Services

MWA Location

Mojave Water Agency
2004 Regional Water Management Plan

Figure 2-1

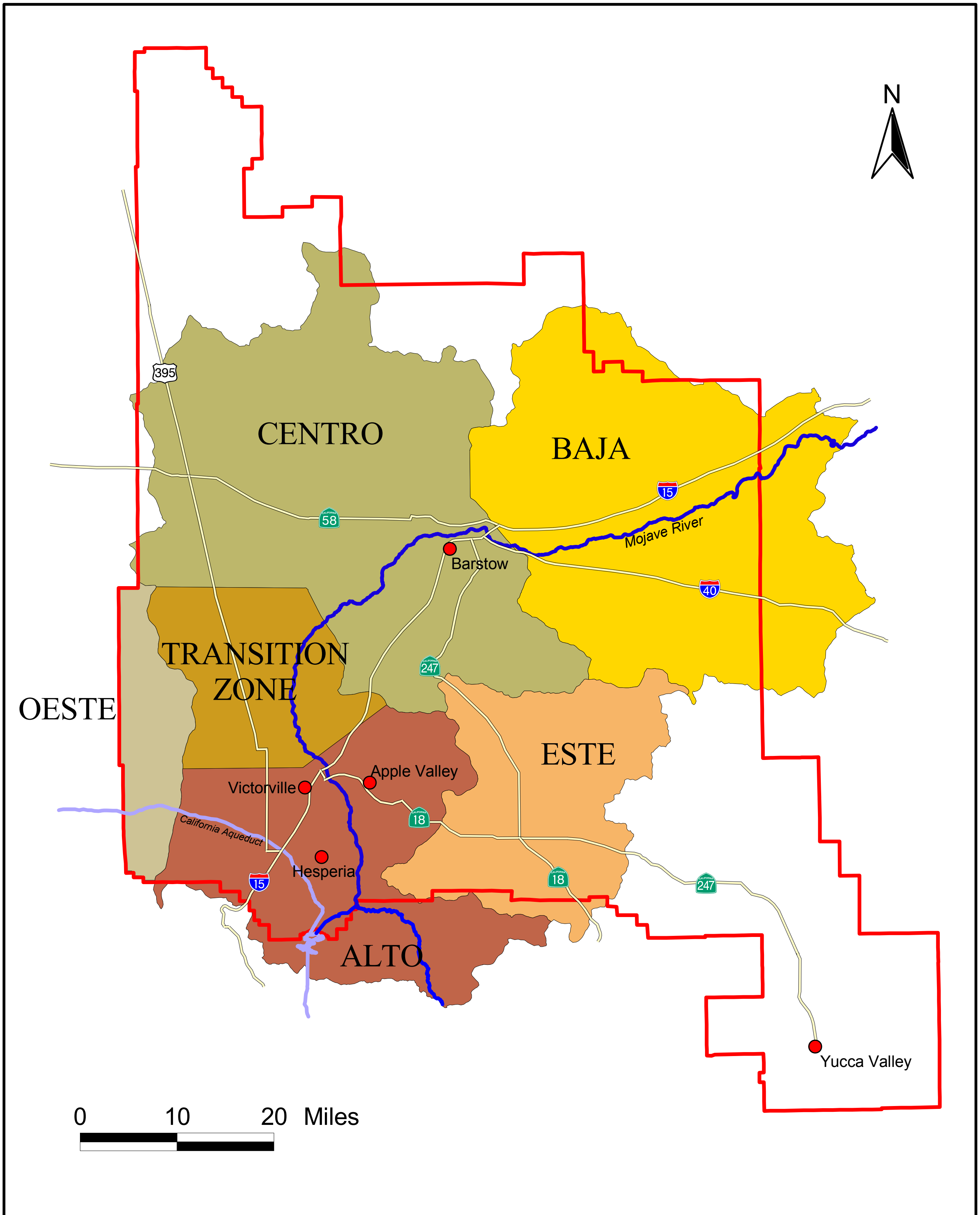
Date: January 2004

Prepared By: KTW

For management purposes under the Mojave Basin Area Judgment, MWA split the Mojave River watershed and associated groundwater basins into five separate "subareas." The locations of the five subareas (Oeste, Este, Alto, Centro, and Baja) are shown in Figure 2-2. The subarea boundaries are based on hydrologic divisions defined in previous studies (DWR 1967), evolving over time based on a combination of hydrologic, geologic, engineering and political considerations. Also for the purposes of implementing the Judgment, the northern part of the Alto Subarea was defined as a sub-management unit – the Alto Transition Zone; this zone was created to acknowledge local geology and to better address the water flow from Alto to Centro.

To distribute the water to the points of need, MWA has taken a central role in designing and constructing the Morongo Basin and Mojave River pipelines, which extend from the California Aqueduct. The Morongo Basin Pipeline was completed in 1994 and deliveries began in 1995 to the Hi-Desert Water District. Water flowing through the pipeline is diverted to recharge ponds in an effort to reduce overdraft in the Warren Valley Basin. The MWA also financed and constructed the oversize of reach 1 of the Morongo Basin Pipeline to facilitate artificial recharge of the Alto Subarea along the Mojave River in the vicinity of Hesperia and Apple Valley. The Mojave River pipeline is being built in phases. Facilities have been constructed from the California Aqueduct to the vicinity of Barstow. The Hodge and Lenwood Recharge Sites, located west of Barstow, have also been constructed and received a total of 3,842 acre-feet of water during 1999-2000. The Daggett Recharge Site, east of Barstow, was completed in 2001. Investigations are underway to site additional recharge basins in the Baja Subarea. Figure 2-3 shows the locations of MWA's current and future conveyance and recharge features.

MWA roles and responsibilities have expanded since 1960. Today, MWA is involved with educational programs, water rights administration, and data collection. Adjudication of water rights within the Mojave Basin Area is a major role of the agency today and will be discussed in greater detail later in this chapter. MWA also has gradually assembled the data necessary to better understand the dynamic interaction between surface water and groundwater flows in the basins, and in particular, the significant role that the geology in the area plays in the migration of groundwater from south to north. Teaming with the U.S. Geological Survey (USGS), MWA has



Schlumberger Water Services

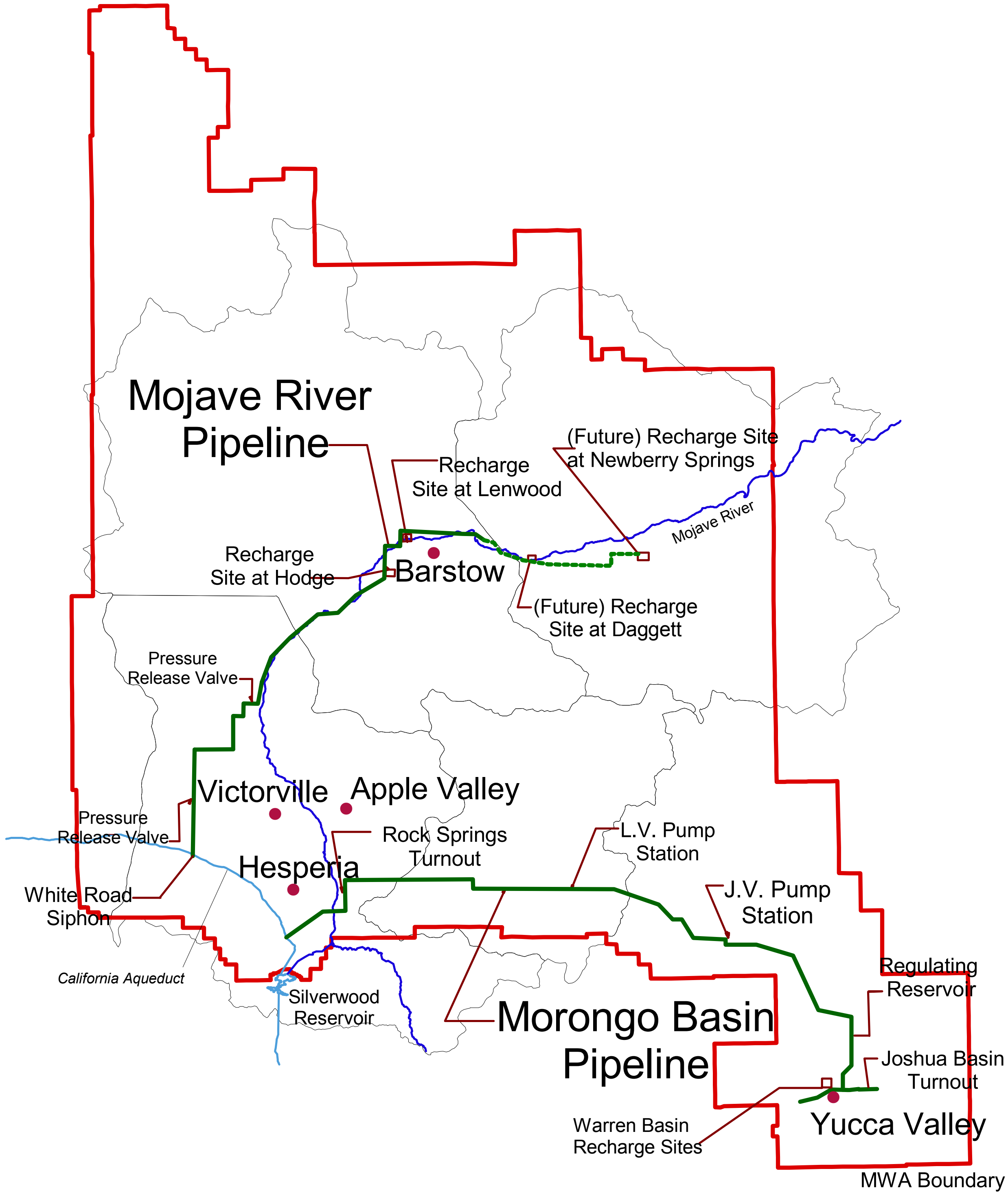
Base Map

Mojave Water Agency
2004 Regional Water Management

Figure 2-2

Date: January 2004

Prepared By: KTW



Schlumberger Water Services

Current and Future Facilities

Mojave Water Agency
2004 Regional Water Management Plan

Figure 2-3

Date: January 2004

Prepared By: KTW

constructed monitoring wells to measure groundwater quality and water levels, run geophysical surveys to understand variations in subsurface geology, installed an auxiliary Lower Narrows low flow gage on the bank opposite the main gage, took over as USGS cooperator for some gages that the California Department of Water Resources (DWR) had funded until the early 1990's, and established weather stations to monitor rainfall and evaporation. MWA also assumed responsibility for assignment of local well numbers in cooperation with DWR.

Adjudication

Mojave Basin Area

Fearing uncontrolled overdraft of the Mojave Basin, adjudication proceedings were initiated in the mid-1960s, but were never finalized. Triggered by the rapid growth within the Mojave Water Agency service area, particularly in the Victor Valley area, the City of Barstow and the Southern California Water Company filed a complaint in 1990 against upstream water users claiming that the increased withdrawals and lowering of groundwater levels reduced the amount of natural water available to downstream users. The complaint requested that 30,000 acre-feet of water be made available to the Barstow area annually and that MWA obtain supplemental water for use in other areas of MWA's service area.

About a year later, the Mojave Water Agency filed a cross-complaint which declared that the native waters of the Mojave River and underlying groundwater were insufficient to meet the current and future demands made upon them. The cross-complaint asked the court to determine the water rights of all surface water and groundwater users within the Mojave Basin Area and the Lucerne and El Mirage Basins. During the following two years, negotiations resulted in a proposed Stipulated Judgment that: 1) formed a minimal class of producers using 10 acre-feet or less per year who were dismissed from the litigation, and 2) offered a physical solution for water production by the remaining producers. The Superior Court bound the stipulating parties to the Stipulated Judgment in September 1993. The Court further bound the non-stipulating parties to the terms of the Stipulated Judgment in January 1996 following trial. The text of the Stipulated Judgment can be found in Appendix A.

Some of the non-stipulating parties appealed the Judgment of the Superior Court and the Appellate Court issued a final decision in June 1998. The final decision of the Appellate Court held the stipulating parties to the terms of the Stipulated Judgment, but excluded the appealing parties, with the exception of one appellant who sought a revised water production right under the Judgment. MWA requested the California Supreme Court to review the Appellate Court's decision in July 1998. The Supreme Court affirmed the Appellate Court's decision in August

2000 regarding the Stipulated Judgment and the exclusion of the appealing parties from the Judgment, but over-turned the decision of the Appeals Court as to the one party seeking additional production rights.

The Mojave Basin Judgment assigned Base Annual Production (BAP) quotas to each producer using 10 acre-feet per year or more, based on historical production. Users are assigned a variable Free Production Allowance (FPA), which is a uniform percentage of BAP set for each subarea. This percentage is reduced, or "ramped-down" over time until total FPA comes into balance with available supplies. This percentage was set at 70% for most subareas as of June 2003. Any water user that pumps more than their FPA is compelled to purchase replenishment water from MWA equal to the amount of production in excess of the FPA.

Warren Valley Basin

Groundwater from the Warren Valley Basin is used to supply Yucca Valley and its environs. Extractions from the Basin began exceeding extractions in the 1950s. The progressively increasing overdraft led to adjudication of the Basin in 1977.[1] In its Judgment, the court appointed the Hi-Desert Water District as Watermaster and ordered it to develop a physical solution for halting overdraft. Objectives identified by the Watermaster Board included managing extraction, importing water supplies, conserving stormwater, encouragement of conservation and reclamation, and protecting groundwater quality. A Basin Management Plan[2] was adopted that called for importing SWP water from MWA through the then-proposed Morongo Basin Pipeline to balance demand and replenish past overdraft. The text of the Warren Valley Judgment can be found in Appendix A.

Summary of 1994 Regional Water Management Plan

The first Regional Water Management Plan (RWMP) was completed in June 1994 by Bookman-Edmonston Engineering, Inc. The plan developed recommendations that followed the following broad objectives:

[1] Hi-Desert Water District v. Yucca Water Company Ltd., Case Number 172103, San Bernardino, California, September 16, 1977.
[2] Warren Valley Basin Management Plan, Kennedy/Jenks/Chilton, January 31, 1991. Adopted by Watermaster May 10, 1991.

1. Eliminate overdraft and meet future demands on the groundwater basins by obtaining additional imported water supplies and/or reducing consumptive use demands.
2. Protect the groundwater basins from degradations in water quality.
3. Participate in implementation of any judgment resulting from ongoing Mojave River adjudication.
4. Be responsive to changing conditions by modifying the present plan as necessary.
5. Work closely with local agencies and water purveyors on key issues, particularly water conservation.
6. Accomplish the above in a cost-effective and environmentally sound manner.

The plan provided the details for structural and non-structural projects that could be completed in part or in full over three phases. Phase 1 projects were proposed for development over the ensuing 5 years. Phase 2 projects were anticipated during the following 5 to 10 years, as financing would allow. Phase 3 projects were considered long-term goals scheduled for completion by the year 2015. The recommended projects for Phases 1, 2, and 3 are listed below, along with the current status of each.

Phase 1 (Structural)

- Drilling wells for monitoring program
  Status: incomplete; more wells are needed away from Mojave River and deeper beneath the river
- Rock Springs recharge facility & turnout
  Status: completed
- Increase recharge of natural supplies
  Status: no action
- Groundwater recharge in the Centro and Baja subareas from Mojave River Pipeline
  Status: Centro has two recharge basins (Hodge & Lenwood) and Baja has (Daggett). One additional basin is planned for Baja and siting studies are ongoing.
- Groundwater recharge in Este (Lucerne) from Morongo Basin Pipeline
  Status: incomplete; no recharge, purchased land in Lucerne Valley, prepared preliminary design and performed environmental review
- Groundwater recharge in Oeste (El Mirage)
  Status: no action, except for USGS feasibility of recharge in Sheep Creek
- Recharge in Morongo Basin with Morongo Basin Pipeline Extension
  Status: recharge taking place in Warren Valley Basin

Phase 1 (Non-structural)

- Release to Mojave River from Lake Silverwood
  Status: releases discontinued since the completion of the Rock Springs Turnout
- Water monitoring programs
  Status: completed, but expanding
- Purchase of State Water Project (SWP) Water
  Status: ongoing; however not all available water has been purchased due to financial constraints
- Legislative changes to MWA Act
  Status: Act amended to allow MWA to implement well programs in furtherance of the Judgment
- Water Quality Protection Programs
  Status: water quality monitoring for recharge programs at Rock Springs Outlet, Hodge, Lenwood and Warren Basin; MWA wells used to support water quality monitoring for Mojave Watershed program with State Board.
- Water conservation program to reduce consumptive use
  Status: ongoing through education programs and demonstration gardens
- Investigation of additional water importation projects
  Status: ongoing; purchased 25,000 acre-feet/yr of SWP entitlement from Berrenda-Mesa Water District; executed water exchange agreement with Solano County Water Agency
- Zones of Benefit to collect benefit assessments
  Status: no action
- Improvement districts to finance facilities
  Status: no action

Phase 2 (Structural)

- Groundwater extraction & delivery to Mojave River Aqueduct
  Status: no action

Phase 2 (Non-Structural)

- Zones of Benefit to collect benefit assessments
  Status: no action
- Improvement districts to finance facilities
  Status: no action
- Contracts with purveyors
  Status: ongoing

Phase 3 (Structural)

- Delivery of imported water and groundwater to water users

  Status: Ordinance 9 water sale approved for City of Victorville from Mojave River Pipeline, ongoing deliveries to Hi-Desert Water District, Makeup and Replacement Water deliveries under the Judgment
- Meeting peaking requirements and constructing water treatment facilities

  Status: no action

Phase 3 (Non-Structural)

- Contracts with purveyors

  Status: ongoing
- Water allocation policies

  Status: hierarchy of water delivery priorities during shortages identified through Ordinance 9; ongoing

Major Stakeholders

Success of any water management plan depends on the degree of involvement with the stakeholder community. In developing the water management alternatives for evaluation, MWA has been careful to involve stakeholders from the beginning of the process. This involvement has included one-on-one interviews, group meetings, and evaluation questionnaires. Water users form the core of the stakeholder group in the basin, including water districts, cities, private water agencies, and agribusiness. Additional essential stakeholder involvement includes environmental organizations, regulatory agencies, development interests, and community associations.

*Success of any water management plan depends on the degree of involvement with the stakeholder **community.***

The stakeholders noted in the following list have been notified regarding the outreach process organized by MWA during the RWMP update. Some of the common interests of the stakeholders in each group are also noted in the list. Chapter 8 provides a more detailed list of the stakeholder issues developed from the individual/group meetings and questionnaire process.

Water Agencies

Local water agencies share many issues related to local and regional water supplies. They are all interested in the ability of their individual systems to meet the needs of their customers. Each agency has its own set of quantity and quality needs and each agency has individual goals for the regional water system.

- Apple Valley Foothill County Water District
- Apple Valley Heights County Water District
- Apple Valley Ranchos Water Company
- Apple Valley View Water District
- Baldy Mesa Water District
- Bar H Mutual Water Company
- Bighorn-Desert View Water Agency
- Chamisal Mutual Water Company
- Daggett Community Services District
- Hesperia Water District
- Hi-Desert Water District
- Joshua Basin Water District
- Jubilee Mutual Water Company
- Juniper Riviera County Water District
- Lucerne Valley County Service Area 29
- Lucerne Valley Mutual Water Company
- Lucerne Vista Municipal Water Company
- Mariana Ranchos County Water District
- Newberry Community Services District
- Rancheritos Mutual Water Company
- San Bernardino County Special Districts
- Sheep Creek Water Company
- Silver Lakes Association
- Southern California Water Company
- Spring Valley Lake Association
- Thunderbird County Water District
- Victor Valley Water District
- Victor Valley Water Reclamation Authority
- Willow Wells Mutual Water
- Yermo Community Services District

State and Federal Agencies

The state regulatory agencies are charged with enforcing the State's laws associated with water rights, environmental protection, and the protection of water quality. The California Department of Water Resources has provided financial assistance for preparation of this plan. The U.S. Geological Survey has provided a variety of services for over 100 years, including stream gaging, hydrogeologic assessment and modeling. It is imperative that MWA works cooperatively with these agencies.

- California Department of Water Resources
- California Department of Fish and Game
- State Water Resources Control Board
- Lahontan Regional Water Quality Control Board
- U.S. Geological Survey

Municipalities (cities, county, other)

Municipalities may or may not be water purveyors. Regardless, all municipalities share a keen interest in their local and regional water supplies. The economic health of a region is tied to its ability to demonstrate that affordable high quality water is going to be available as the region develops.

- City of Adelanto
- City of Barstow
- City of Hesperia
- City of Victorville
- San Bernardino County Department of Public Works and Flood Control
- San Bernardino County Planning Department
- Town of Apple Valley
- Town of Yucca Valley

Miscellaneous Community Interests

Local community groups have an opportunity to provide input on issues and needs associated with their particular location. This type of specific input is very beneficial to the regional planning process.

- El Mirage Property Owners Association
- Public Works Advisory Committee, City of Hesperia
- Silver Valley Realty
- Mojave Basin Area Judgment Subarea Advisory Committees
- MWA Technical Advisory Committee (TAC)
- The Bradco Companies (real estate)
- Citizens for a Better Community
- Jess Ranch
- Newberry Springs – Harvard Property Owners Association
- Palisades Ranch
- Rancho Los Flores
- Silver Lakes Association
- Spring Valley Lakes Association

3

PHYSICAL SETTING

Much has been written about the geology and hydrology of the Mojave area, with some information dating back to the early 1900s. The U.S. Geological Survey (USGS), in cooperation with the Mojave Water Agency (MWA), conducted the most recent work in the area.[3] Their report culminated several years of intense field work that included installation of groundwater monitoring wells along the Mojave River, geophysical surveys, surface water hydrology measurements, groundwater level measurements, groundwater quality sampling, meteorological measurements, and well production tests. The final component of this effort was the development of a comprehensive groundwater flow simulation model, used as an analysis tool to evaluate past and present groundwater conditions, as well as a predictive tool to evaluate the effects of future water usage and management scenarios.

Developing viable alternatives requires a clear understanding of the region's physical setting.

This chapter summarizes the pertinent findings regarding the physical setting for the Mojave Basin Area and the Morongo Basin/Johnson Valley Area. The principal objective of this chapter is to highlight conclusions regarding the physical setting that have been developed since the publication of the 1994 Regional Water Management Plan (RWMP). The latest USGS study contains a more thorough presentation of these subjects.[4]

Physiographic Setting

The MWA service area lies in the California High Desert, which is part of the Mojave Desert (Figure 3-1). The High Desert Area is located on the northeastern flanks of the San Bernardino and San Gabriel Mountains, which separate the High Desert from the coastal basins and inland valleys of the greater Los Angeles area. These mountains, which reach elevations of over 10,000 feet above sea level, were uplifted along the San Andreas Fault. The High Desert Area is

[3] Stamos et al. 2001
[4] ibid

characterized overall as an alluvial plain. This plain consists of valleys and closed basins composed of water-bearing unconsolidated sediments. Hills and low mountains consisting of non-water-bearing consolidated bedrock separate these valleys and basins. The plain is criss-crossed by a series of northwest-trending geologic faults, resulting in offsets of geologic layering and barriers to groundwater flow. Overall, land surface elevations within the MWA service area range from 5,500 feet above sea level in the San Bernardino Mountains on the southern boundary to 1,500 feet near Afton Canyon on the eastern boundry.

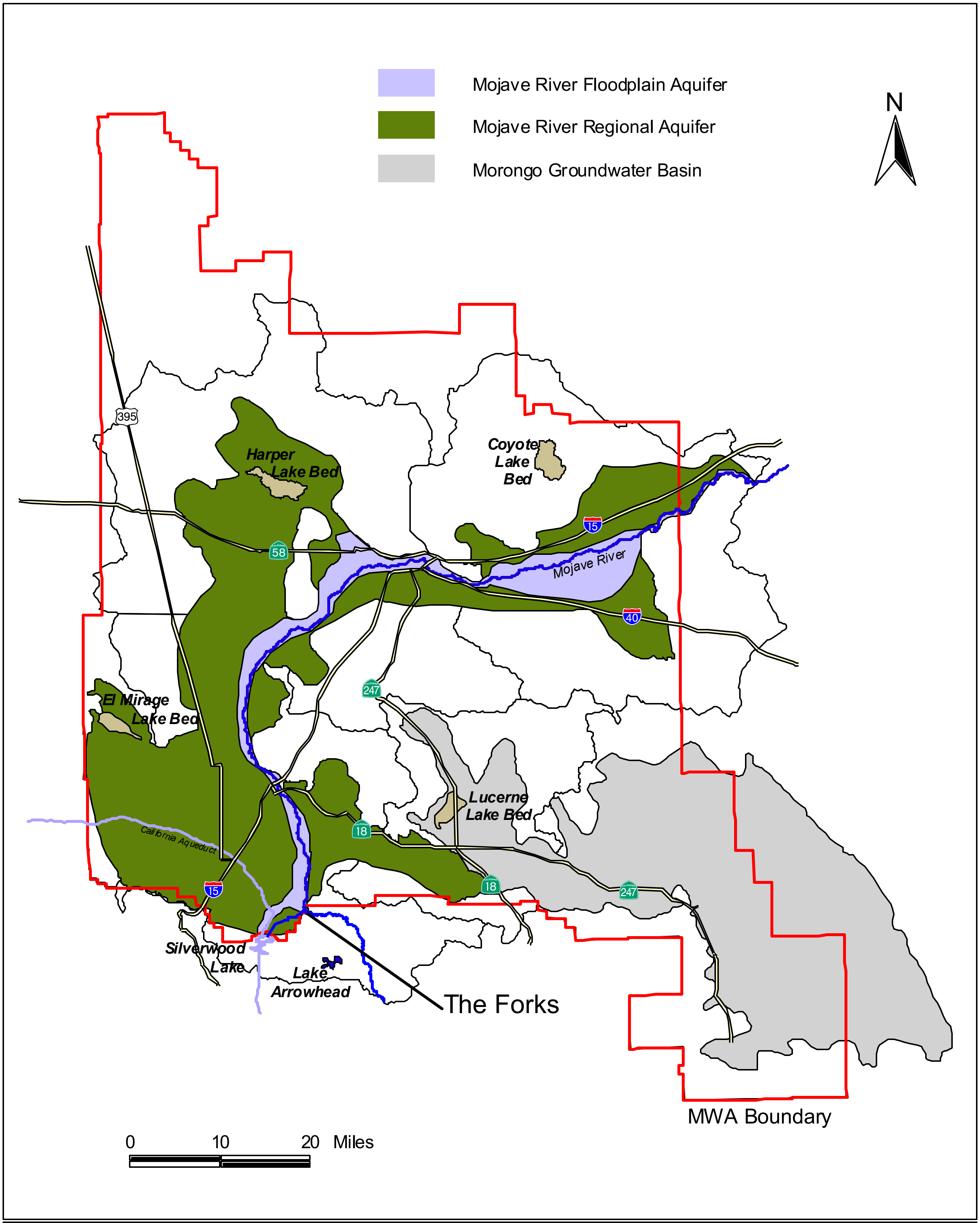
The MWA service area is divided into two major surface water drainage areas:

- the Mojave River Area that drains into the Mojave River or local terminal dry lakes. The Mojave River Area is the larger and more developed of the two.
- the Morongo Basin/Johnson Valley Area that drains into the Colorado River drainage or local terminal dry lakes.

Terminal dry lakes (often referred to as playas) are lake beds that collect water only during periods when there is sufficient runoff, have no outlet, and lose all their water to evaporation.

The Mojave River is the main surface water drainage feature within the MWA service area. The surface water drainage of the Mojave River covers an area of 3,800 square miles.[5] It is fed by rainfall and snow pack from the San Bernardino Mountains. The river is formed by the confluence of two smaller streams descending from the mountains at a place called The Forks (Figure 3-1).

[5] ibid



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Hydrologic Setting

Mojave Water Agency
2004 Regional Water Management Plan

Figure 3-1

Date: June 2002

Prepared By: BCW

The river then runs north and then east for about 100 miles, where it flows through Afton Canyon and terminates at Soda and East Cronese Lakes; these lakes pond water only after major storm events. At present the Mojave River is perennial (continuously flowing) only along a short section downstream of The Forks, in the vicinity of Upper and Lower Narrows and Afton Canyon, and in the section immediately downstream of the Victor Valley Wastewater Reclamation Authority's treatment plant, about 4 miles downstream of the Lower Narrows. However, during and immediately after storms (principally during the winter), the Mojave River flows along several (sometimes all) of its reaches. Most of the river flow occurs immediately after storms.

The Morongo Basin/Johnson Valley area has no sizeable rivers, only small ephemeral streams that collect runoff from surrounding mountains during storms. The mountain stream runoff either percolates into the stream bed or, during large storm events, flows to dry lake beds where it evaporates. The area encompasses parts of five separate surface water drainages – Warren, Copper Mountain, Emerson, Means, and Johnson.

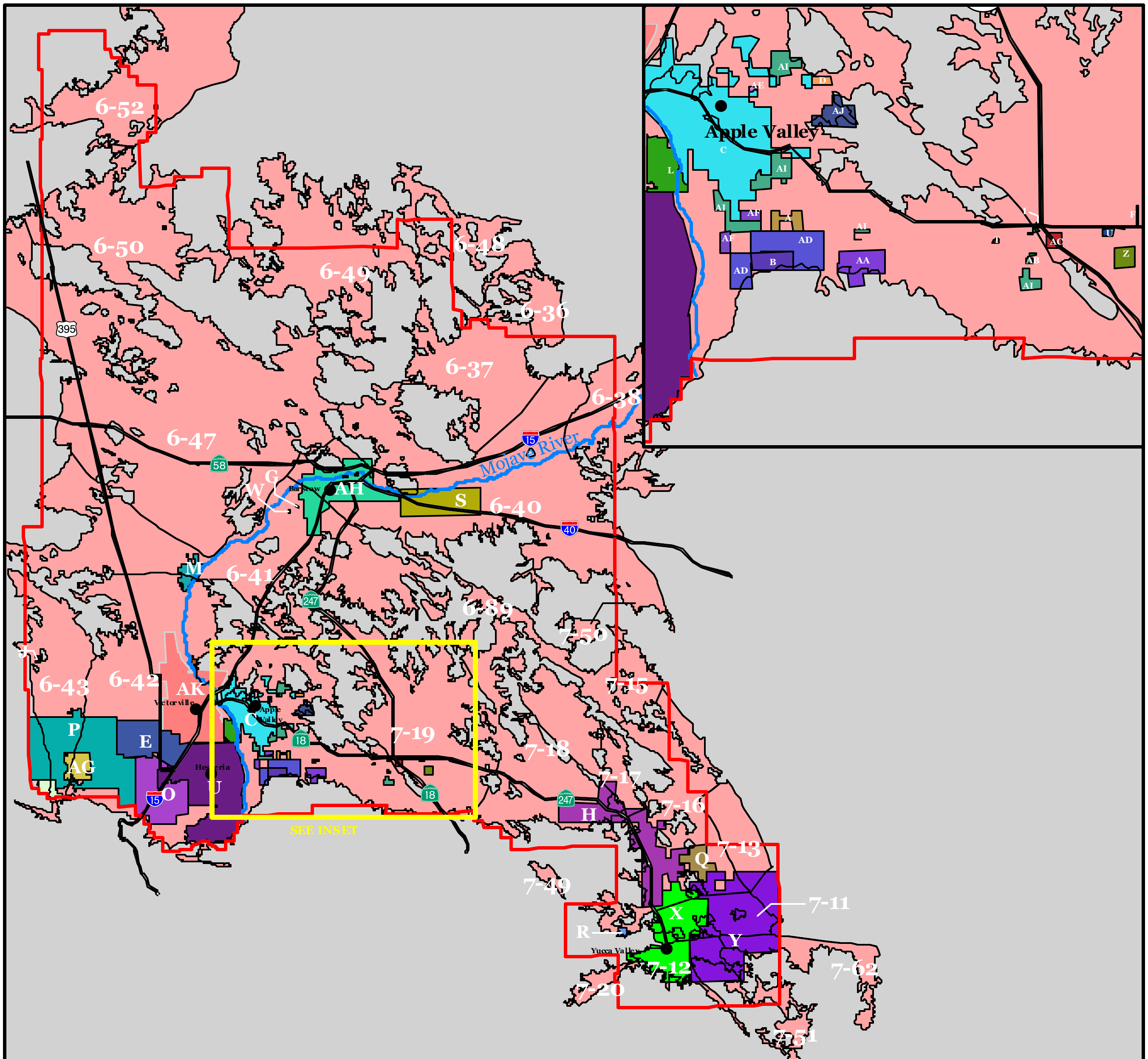
The groundwater basins have been designated in a number of ways. The Department of Water Resources Bulletin 118-03 defines 22 groundwater basins within the two broad hydrologic regions overlying the Mojave Water Agency area. The Mojave River Basin lies within the South Lahontan hydrologic region. The Warren Valley/Johnson Valley area and the portion of the Lucerne Valley east of the Helendale Fault lie in the Colorado River hydrologic region. The DWR basins are listed in Table 3-1. The DWR basins and the overlying water suppliers are displayed in Figure 3-2.

The DWR Coyote Lake Valley, Caves Canyon Valley, Kane Wash Area and Lower Mojave River Valley groundwater basins lie primarily in the Baja subarea. The Middle Mojave River Valley includes parts of the Transition Zone and Centro subarea. The Harper Valley groundwater basin is within the Centro subarea. The Upper Mojave River Valley basin includes parts of the Transition Zone, Alto, and Este subareas. The El Mirage Valley groundwater basin is primarily within the Oeste subarea. The Mojave River Valley basins cover an area of 1,400 square miles (Figure 3-1).

Table 3-1: DWR Groundwater Basins

Basin Number	Basin Name	Area[6] (acres)	Groundwater Budget Type[7]
South Lahontan Hydrologic Region			
6-37	Coyote Lake Valley	88,200	A
6-38	Caves Canyon Valley	73,100	A
6-40	Lower Mojave River Valley	286,000	A
6-41	Middle Mojave River Valley	211,000	A
6-42	Upper Mojave River Valley	413,000	A
6-43	El Mirage Valley	75,900	A
6-47	Harper Valley	410,000	A
6-49	Superior Valley	120,000	C
6-50	Cuddeback Valley	94,900	C
6-52	Searles Valley	197,000	C
6-89	Kane Wash Area	5,960	C
Colorado River Hydrologic Region			
7-11	Copper Mountain Valley	30,300	A
7-12	Warren Valley	17,200	A
7-13	Deadman Valley	118,500	C
7-15	Bessemer Valley	39,100	C
7-16	Ames Valley	110,000	C
7-17	Means Valley	15,000	C
7-18	Johnson Valley Area	111,600	C
7-19	Lucerne Valley	148,000	A
7-20	Morongo Valley	7,240	C
7-50	Iron Ridge Area	5,250	C
7-62	Joshua Tree	33,800	A

[6] Total area of basin both in and outside of MWA boundary
[7] Type A – either a groundwater budget or model exists, or actual extraction data is available
Type C – not enough available data to provide an estimate of the groundwater budget or basin extraction



	DWR groundwater basin (#-#)
	MWA boundary
A	Apple Valley Foothill Company WD
B	Apple Valley Heights (South)
C	Apple Valley Ranchos Water Co
D	Apple Valley View Mutual Water Co
E	Baldy Mesa WD
F	Bar 'H' Mutual Water Co
G	Bar Len Mutual Water Co
H	Bighorn Desert View WA
I	Center Water Co
J	Chamisal Mutual Water Co
K	County Svc Area-42
L	County Svc Area-64
M	County Svc Area-70c
N	County Svc Area-70g
O	County Svc Area-70j
P	County Svc Area-70l
Q	County Svc Area-w1
R	County Svc Area-w4
S	Daggett Community Svcs District
T	Desert Dawn Mutual Water Co
U	Desert Springs Mutual Water Co
V	Hesperia WD
W	Hi Desert Mutual Water Co
X	Hi Desert WD
Y	Joshua Basin WD
Z	Jubilee Mutual Water Co
AA	Juniper Riviera Co WD
AB	Lucerne Valley Mutual Water Co
AC	Lucerne Vista Mutual Water Co
AD	Mariana Ranchos Co
AE	Navajo Mutual Water Co
AF	Rancheritos Mutual Water Co
AG	Sheep Creek Water Co
AH	So Cal Water Co- North
AI	So Cal Water Co- South
AJ	Thunderbird Co WD
AK	Victor Valley Water District

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Groundwater Basins and Water Districts

Mojave Water Agency
2004 Regional Water Management Plan

Figure 3-2

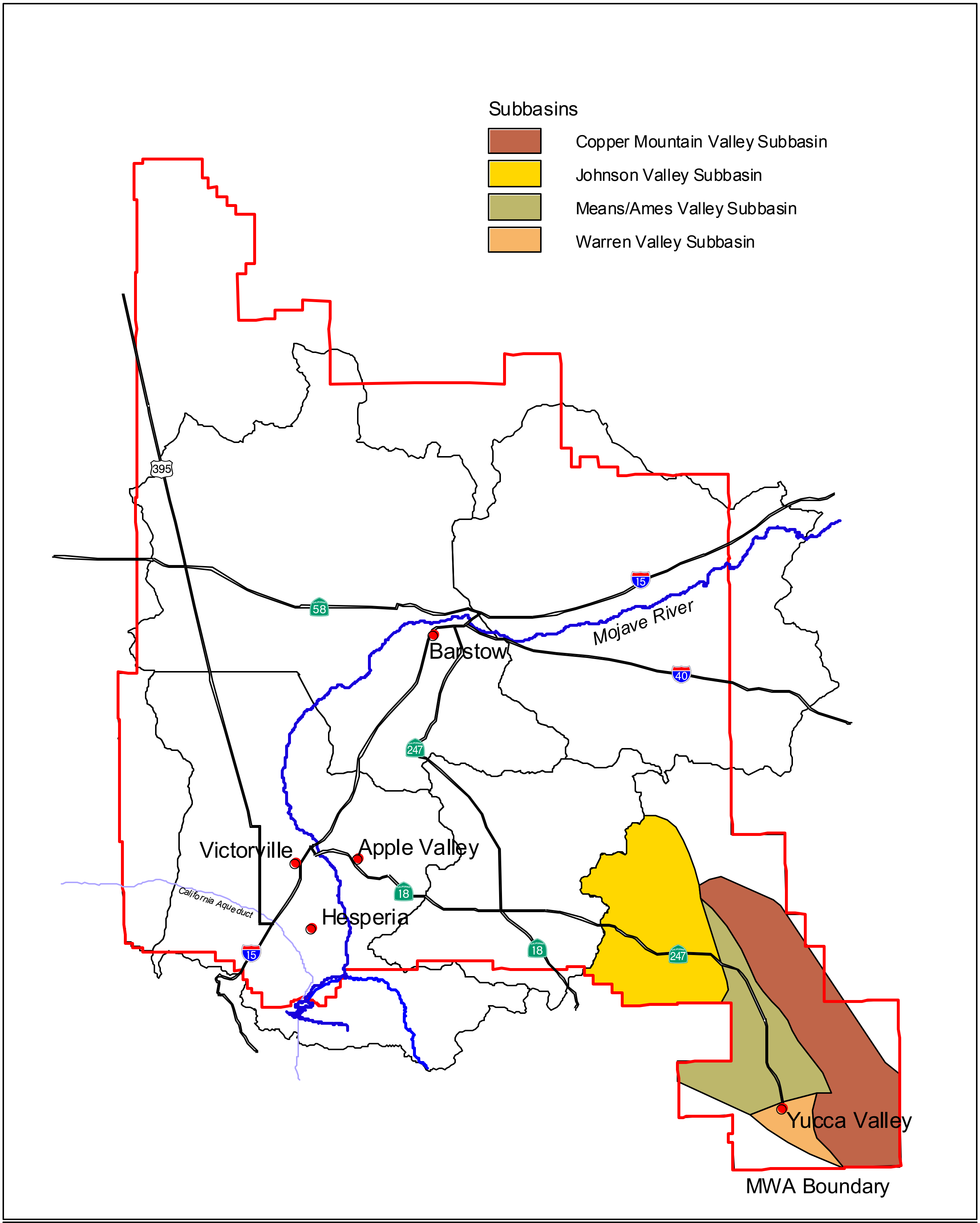
Date: October 2003

Prepared By: KTW

The northern potion of MWA also overlies portions of the Searles Valley, Cuddeback Valley, and Superior Valley groundwater basins. These areas are mostly unpopulated Federal lands administered by the Bureau of Land Management (BLM).

During recent investigations, USGS has grouped the other basins within the MWA service area into the Morongo Groundwater Basin. Including the portion of the Lucerne Valley east of the Helendale Fault in the Este subarea, this grouping encompasses nearly 1,000 square miles (Figure 3-1). The Morongo Groundwater Basin has been divided into as many as 17 subbasins by investigators in the past. All or part of 11 of these groundwater basins are within the MWA boundary. Three of these, Deadman Valley, Bessemer Valley, and Iron Ridge groundwater basins are mostly unpopulated Federal lands administered by BLM and lie near MWA's eastern boundary. Bulletin 118-03 states that there is not enough available data to provide either an estimate of groundwater budgets nor extractions from these basins. These basins are not further considered in this Plan.

There have been many different and conflicting references to the basins and subbasins within the MWA service area. For the purposes of this report, major "basins" are referred to as the Mojave Basin Area and the Morongo Basin/Johnson Valley Area. The Mojave Basin Area subbasin classifications used in this report are the: Este, Alto, Oeste, Centro, and Baja subareas defined in the Mojave Basin Judgment. The Morongo Basin/Johnson Valley Area subbasin classifications are shown in Figure 3-3. The subbasin classifications are Johnson Valley, Means/Ames Valley, Warren Valley, and Copper Mountain Valley. These are the same classifications used in the 1994 RWMP. ***Groundwater*** basins defined in DWR Bulletin 118 are different from the major basins and are shown in Figure 3-2. This figure also shows the boundaries of the overlying water supply agencies.



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Morongo Basin/Johnson Valley Area Subbasins

Mojave Water Agency
2004 Regional Water Management Plan

Figure 3-3

Date: January 2004

Prepared By: KTW

Geology

The geology of the Mojave Basin Area is characterized by sedimentary alluvial basins bordered by igneous and metamorphic mountain ranges and uplands; the uplands dominated by the San Gabriel and San Bernardino Ranges along the Mojave Basin's southern border. A typical geologic cross-section depicting the geologic sequence is shown in Figure 3-4. The recently updated geologic map for the basin is shown in Figure 3-5.[8] The ranges and uplands are composed of pre-Tertiary (greater than 65 million years ago) igneous and metamorphic rocks (labeled as pTb in accompanying figures), and Tertiary (1.64 to 65 million years ago) volcanic and sedimentary rocks (Tv and Ts, respectively). Numerous extensive strike-slip faults trend northwest to southeast across the basin, causing predominantly horizontal displacement (but also vertical displacement for some faults) in the geologic section.

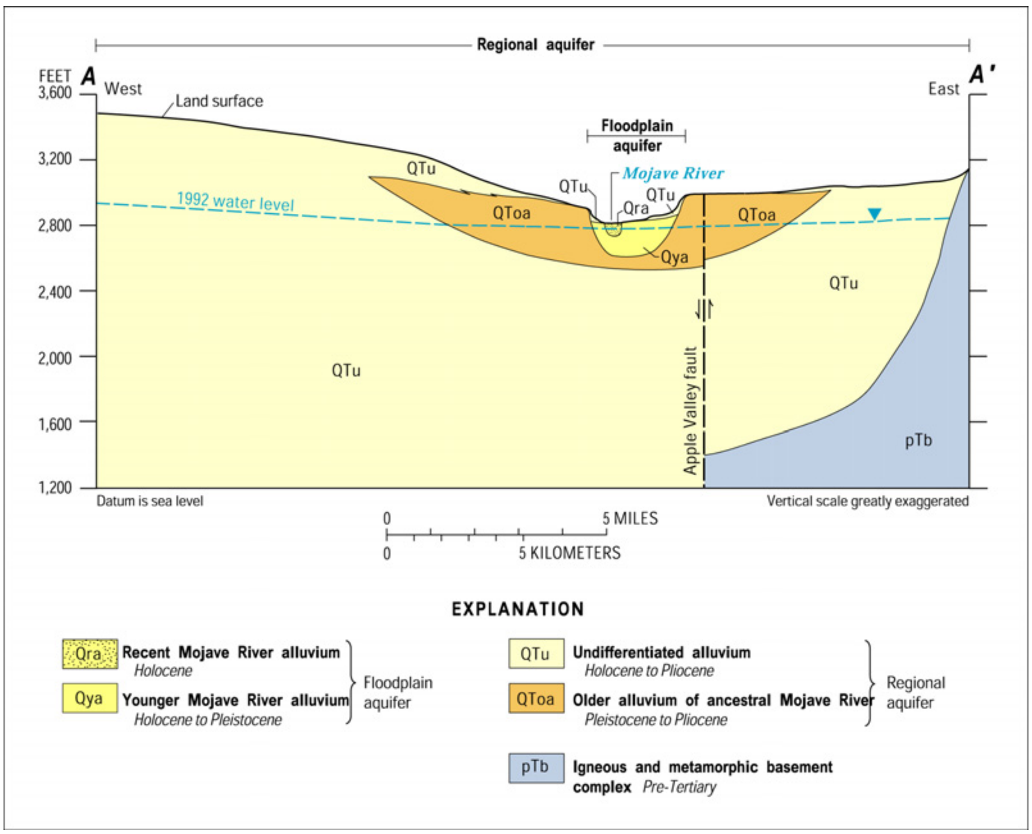
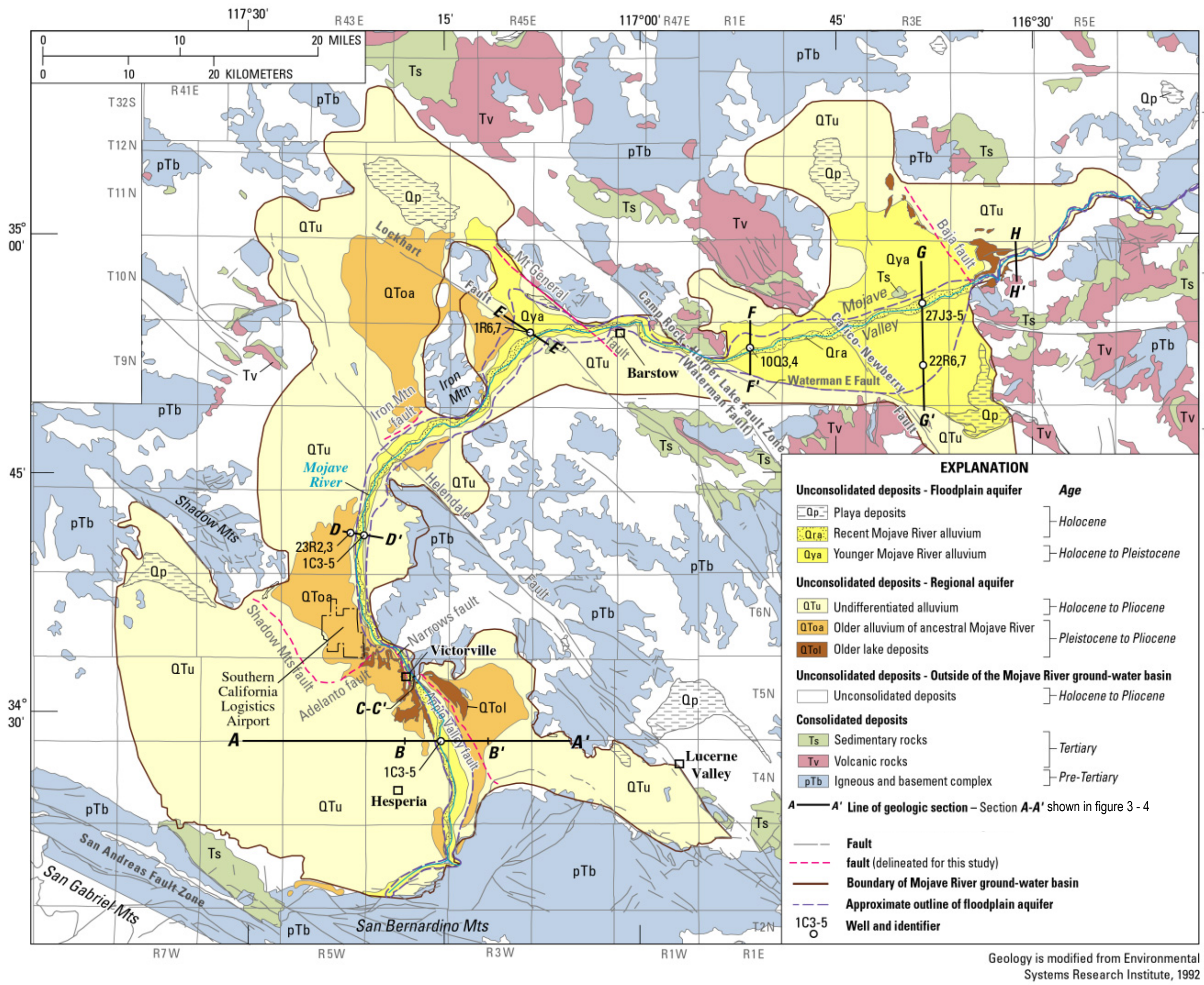


Figure 3-4: Typical Geologic Cross-Section of Mojave River Groundwater Basin[9]

[8] Stamos, et al., 2001
[9] ibid



Source: Stamos et al., 2001

Geology of Mojave River Groundwater Basin

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Mojave Water Agency
2004 Regional Water Management Plan

Figure 3-5

Date: January 2004

Prepared By: KTW

The alluvial basins are composed of Quaternary (0 to1.64 million years ago) unconsolidated river, lake, and playa deposits. The river deposits comprise different ages of granitic sand, silt, and gravel laid down by the Mojave River and its predecessors – the youngest deposits directly surrounding the current river bed, with progressively older deposits further from the river or deeper below it. Surrounding and underlying the current and ancestral Mojave River alluvium are poorly sorted alluvial deposits from ancestral alluvial fans, braided-streams, lakes or playas.

The geology of the Morongo Basin/Johnson Valley Area has not been investigated to the same degree as the Mojave Basin Area. In general, the area is similar to the Mojave Basin Area – sedimentary basins surrounded by igneous/metamorphic mountain ranges/uplands. The sedimentary basins are composed of Quaternary and Tertiary continental deposits (Smith and Pimentel 2000).[10] The mountain ranges include the Ord and Granite Mountains in the north, Bullion Mountains in the east, San Bernardino Mountains in the southwest, and Pinto and Little San Bernardino Mountains in the south. As in the Mojave Basin Area, numerous northwest to southeast trending strike-slip faults traverse the Morongo Basin/Johnson Valley Area.

Groundwater

The predominant groundwater basin within the MWA service area is the Mojave River Groundwater Basin, encompassing 1,400 square miles as outlined in Figure 3-1, and having an estimated total water storage capacity of nearly 5 million acre-feet.[11] This basin is essentially a closed basin – very little groundwater enters or exits the basin. However, within the basin groundwater movement occurs between the different subareas, as well as groundwater-surface water and groundwater-atmosphere interchanges. Groundwater is recharged into the basin predominantly by (1) infiltration of water from the Mojave River, accounting for 80% of the total basin natural recharge[12] (2) infiltration of storm runoff from the mountains, and (3) manmade recharge (from irrigation, wastewater, fish hatcheries, and imported water).

The Mojave River Groundwater Basin has nearly 5 million acre-feet of storage capacity.

Over 90% of the basin groundwater recharge originates in the San Gabriel and San Bernardino Mountains.[13] Groundwater is discharged from the basin primarily by well pumping, evaporation through the soil, transpiration by plants, seepage into dry lakes where accumulated water evaporates, and seepage into the Mojave River.

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[10] Smith and Pimentel 2000
[11] Bookman-Edmonston Engineering, Inc. 1994
[12] Stamos et al. 2001b
[13] Hardt 1971

The Morongo Groundwater Basin (including a portion of the Lucerne Basin which is in the Este Subarea) encompasses 1,000 square miles, of which about 60% lies within the MWA service area (Figure 3-1). This basin is composed of a large number of both closed and connected subbasins. Groundwater is recharged into the basin primarily by (1) infiltration of water from ephemeral streams and (2) manmade recharge. In 1995, artificial recharge ponds were installed by MWA near Yucca Valley in the Warren Valley subbasin with funding provided by a DWR loan which is currently being repaid by Hi-Desert Water District customers.

Groundwater is discharged from the Morongo Groundwater Basin primarily by well pumping, evaporation through the soil, transpiration by plants, and seepage into dry lakes where accumulated water evaporates.

Figure 3-6 shows a water table contour map of the Mojave River and Morongo Groundwater basins determined from well water level measurements in 1998. The direction of groundwater flow is perpendicular to the contours. Within the Mojave Basin Area, the groundwater flow direction is generally to the north from the base of the San Gabriel and San Bernardino mountains to near Iron Mountain; the flow then changes to the east from Iron Mountain to Afton Canyon. On a subbasin scale, the groundwater flow direction is as follows:

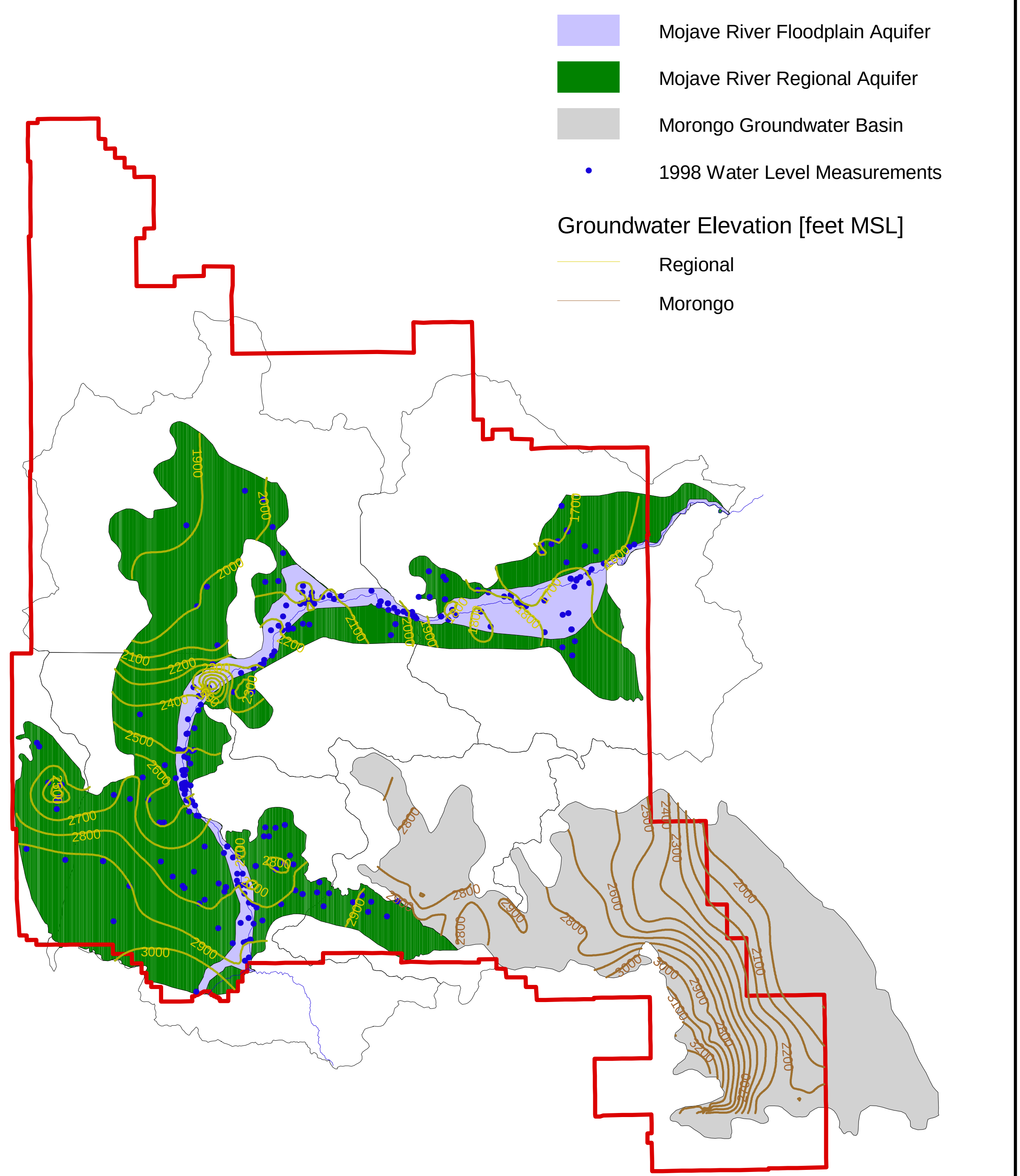
- Este Subarea – east to west on the southwest side of the Helendale Fault, changing to more northward at the Alto Subarea boundary. The Helendale Fault acts as a groundwater flow barrier, resulting in higher groundwater levels on the southwest side of the fault. On the northeast side of the fault, flow is radially inwards towards the northeast part of Lucerne (dry) Lake – an evaporation discharge site

- Oeste Subarea – south to north/northeast, with a dry lake in the northern part of the subarea (El Mirage Lake) that acts as an evaporation discharge site

- Alto Subarea – south to north/northeast

- Centro Subarea – south to north on the west side of Iron Mountain, leading to Harper Lake that acts as an evaporation discharge site. East of Iron Mountain there is flow south to north and northwest around the mountain, ending at Harper Lake, as well as flow to the east/northeast

- Baja Subarea – west to east/northeast towards Afton Canyon, with some flow heading northward to Coyote Lake – another evaporative discharge site



Schlumberger Water Services

1998 Water Level Contours

Mojave Water Agency
2004 Regional Water Management Plan

Figure 3-6

Date: January 2004

Prepared By: KTW

Groundwater flow in the Morongo Groundwater Basin east of the Este Subarea is generally from west to east-northeast (Figure 3-6). Natural recharge influx originates from the mountains on the southern and western boundaries of the basin – resulting in groundwater flow gradients to the north, east, and south adjacent to these boundaries, before turning to the east-northeast. Groundwater is almost universally flowing in an east-northeast direction to the eastern boundary of MWA. There is no water level data to verify whether the flow continues in this direction beyond MWA boundary. Localized groundwater flow conditions exist in the vicinity of the developed area of Yucca Valley, where there is an artificial recharge site.

The Regional Aquifer in the Morongo Groundwater Basin is composed of Quaternary and Tertiary sediments of continental origin, bounded and traversed by faults in many of the subbasins.[14] The sediments are unconsolidated near the surface, becoming partly consolidated and less permeable at depth; most well production comes from the unconsolidated section. Aquifer thickness is not well known throughout the basin, but is known to be greater than 750 feet near Yucca Valley and Joshua Tree based on well depths and is believed to be as much as 10,000 feet thick.[15] The aquifer system in the Morongo Groundwater Basin has not been characterized in detail. Water quality is not known at depth.

The major development in understanding the geology and hydrogeology of the Mojave Basin Area in the past few years has been a better differentiation of the alluvial aquifers that lie beneath and near the Mojave River, and in particular, the nature of groundwater flow through these units. In the past, the conceptual model for the alluvium that lies beneath the Mojave River has been more or less a homogeneous unit of interbedded sands, gravels, silts and clays. Recently studies have led researchers to conclude that the permeability of the alluvium changes significantly with horizontal and vertical distance from the river course, resulting in two interconnected aquifers: the Floodplain Aquifer and the Regional Aquifer.[16]

The new conceptual model is illustrated by the USGS cross-section[17] presented herein as Figure 3-4. Directly beneath the river, unconsolidated alluvium up to 250 feet thick called Recent Mojave River Alluvium (Qra) and Younger Mojave River Alluvium (Qya) has relatively high permeability with mostly clean sands and gravels, which results in rapid percolation of surface flow. In some places Qra and Qya are separated by a low permeability, clay-rich layer; this layer is most pervasive in the Alto Transition Zone. This alluvium (Qra and Qya) has been designated

[14] Smith and Pimentel 2000
[15] Moyle 1984
[16] Stamos, et al., 2001
[17] ibid

the Floodplain Aquifer. The aquifer extends in width from 120 feet at the Upper Narrows to more than five miles in parts of the Baja Subarea, as shown in Figure 3-1.[18]

One of the formations comprising the Regional Aquifer is an older unconsolidated alluvial unit called the Older Alluvium of the Ancestral Mojave River (QToa). This unit lies directly beneath and alongside the Qya alluvium, extending up to five miles on each side of the present river course – not always outcropping at the surface (Figure 3-4). The thickness of the unit is about 400 to 500 feet south of the Southern California Logistics Airport and about 25 to 80 feet north of that point.[19] The Older Alluvium has lower permeability than the Floodplain Aquifer units and is made up of fluvial sands, gravels, and silts deposited by the ancestral Mojave River during the middle Pleistocene (about 800,000 years ago).

The unique characteristics of the Floodplain and Regional Aquifers are important considerations for developing alternatives.

The other unit comprising the Regional Aquifer is the Undifferentiated Alluvium (QTu), which is generally less influenced by the recent and ancestral Mojave River. This is by far the largest alluvial unit in the basin, consisting of poorly sorted sands, gravels, silts, and clays. The Undifferentiated Alluvium has lower permeability than the alluvium deposited by the recent and ancestral Mojave River due to the accumulation of secondary cementing agents and poor grain sorting. Also, the permeability in this unit decreases with increasing depth, resulting in reduced flow between the upper 300 to 800 feet and lower zones (as deep as 2,000 feet). The surface boundaries of the two aquifers approximated by USGS are shown in Figure 3-1.

The difference in groundwater flow characteristics between the Floodplain and Regional aquifers is well illustrated by the difference in representative hydrologic properties. The two most important characteristics describing the occurrence and movement of groundwater are the rate at which water can move through a cross-section of the aquifer and the amount of water that can be drained from a volume of the aquifer; these characteristics are quantified by the properties of transmissivity and specific yield, respectively.

Transmissivity is directly proportional to a particular aquifer's thickness. Comparison of transmissivity estimates in the two aquifers, determined from well pumping analysis[20] and calibration of the USGS simulation model,[21] indicate that as much as a 10 to over 1,000 times greater amount of water can be moved across an identical width of the Floodplain Aquifer within

[18] ibid
[19] ibid
[20] Hardt 1971
[21] Stamos, et al., 2001

the same time period as compared to the Regional Aquifer. Comparison of specific yield estimates determined from calibration of the USGS simulation model[22] indicate that the Floodplain Aquifer can store about two to four times as much removable water per unit volume than the Regional Aquifer.

While the Floodplain and Regional aquifers have different hydrologic properties, they are connected hydraulically; that is, water and fluid pressure responses are transmitted between the aquifers.[23] Unlike many of the faults in the area that are barriers to flow, there is not a continuous impermeable barrier between the two aquifers; the geologic conceptual model is that the younger, higher permeability, unconsolidated alluvium of the Floodplain Aquifer lays directly on top of the older, lower permeability, unconsolidated alluvium of the Regional Aquifer.[24] The hydraulic connection between aquifers is supported by chemical and isotopic data which indicate that in areas near the river the Regional Aquifer contains water that was recharged by the Mojave River less than 50 years ago.[25] However, the same study concludes that the earliest the water at some distance from the Mojave River (located within the Regional Aquifer) has been recharged is on the order of thousands of years.

Recent groundwater simulation model runs by the USGS have shown that in the Alto, Transition Zone and Baja subareas the groundwater flowed from the Regional Aquifer to the Floodplain Aquifer during predevelopment conditions and from the Floodplain Aquifer to the Regional Aquifer (a reversal of flow) during the adjudication period from 1931-90.[26] In the Centro Subarea groundwater flowed from the Floodplain Aquifer to the Regional Aquifer during both periods, but the rate of flow increased significantly during the adjudication period. These results indicate that pumpage can cause changes in fluid pressure that can dramatically reverse and increase the amount of groundwater flowing from the Floodplain to the Regional Aquifer – further supporting the contention that the aquifer systems are connected. However, the results do not necessarily show that the reverse scenario is plausible – that changes in the pumpage or recharge can cause a large inflow of groundwater from the Regional to the Floodplain Aquifer.

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[22] ibid
[23] Stamos et al. 2001b
[24] ibid
[25] Izbicki et al. 1995
[26] Stamos et al. 2001b

Nor do the results indicate how far into the Regional Aquifer, and at what rate, the inflow from the Floodplain Aquifer reaches.

The USGS has applied their model to simulate the effect of artificial recharge on groundwater levels in the Mojave River Groundwater Basin.[27] These modeled results show that 20 years of artificial recharge at eight sites along the Mojave River and a few locations in the Regional Aquifer markedly mitigate the decline in groundwater levels within a ten mile radius of the recharge sites, particularly compared to drought conditions. The simulation does not explicitly account for the movement of the artificial recharge water through the unsaturated zone to the water table, a process that could take a long time and result in considerable water losses. A chemical tracer study performed by the USGS at a potential artificial recharge site near Victorville (Alto Subarea)[28] in a wash off the main Mojave River channel concludes that it takes about 200 years for natural recharge water from an intermittent stream bed to infiltrate to the water table 130 meters below the surface. However, it should be noted that constant wetting from artificial recharge should considerably decrease the time required for water to reach the water table.

The significance of the recent geologic and hydrogeologic findings from a regional water management standpoint is that water moves through the Floodplain Aquifer at much higher rates than through the Regional Aquifer, although the two aquifers appear to be hydraulically linked. As a consequence, stresses originating from either of the aquifers can significantly affect groundwater flow direction and rates in the Floodplain Aquifer, as well as recharge rates from the Mojave River into the Floodplain Aquifer – which accounts for 80% of the total recharge to the Mojave River Groundwater Basin.[29]

The slow groundwater flow rates in the Regional Aquifer and the preferential groundwater flow path along the much more permeable Mojave River may make it difficult to recharge the pumping depressions in the Regional Aquifer by way of percolation ponds along the river. Therefore, overcoming low groundwater levels in pumping depressions that are away from the river will require recharge facilities overlying the Regional Aquifer. Further, because of the very low permeability zones layered within the undifferentiated alluvium that might restrict vertical migration of recharge water, injection wells should be investigated as a mechanism to recharge these areas.

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[27] ibid
[28] Izbicki et al. 2000
[29] Stamos et al. 2001b

Another key finding is how significantly the numerous geologic faults impede groundwater flow in the basin. At least 12 of the faults that cross the basin (faults are shown in Figure 3-4), mostly in a northwest-southeast direction, are horizontal barriers, or partial barriers, to flow in the Regional Aquifer and, in some cases, the Floodplain Aquifer.[30] These faults are characterized by large, "stair step" drops in the water table across the faults and, in some cases, significant changes in the groundwater flow direction – indicating limited groundwater movement across the faults.

DWR Documentation of Overdraft Conditions

The Department of Water Resources' Bulletin 118 series documents conditions in California's groundwater basins. The 1980 edition of Bulletin 118 states that there is evidence of overdraft in the following basins: Lower Mojave River Valley, Middle Mojave River Valley, Upper Mojave River Valley, Harper Valley, Warren Valley and Lucerne Valley.

The 2003 edition of Bulletin 118 did not include an evaluation of individual groundwater basins to determine if they were in overdraft.

Efforts to Eliminate Overdraft

Each of the groundwater basins that are identified as being in overdraft in Bulletin 118 has been subjected to adjudication. The Lucerne Valley and Upper, Middle, and Lower Mojave River Valley basins are included in the Mojave Basin Area Judgment. The Warren Valley Basin is adjudicated by the Warren Valley Basin Judgment. The Mojave Basin Area and Warren Valley adjudications mandate that the groundwater extractions from each basin do not exceed the estimated annual supplies, and empower the Watermasters of each basin to enforce pumping limits to ensure that the groundwater basins are not overdrafted.

One of the fundamental objectives of this Plan is to "balance future water demands with available supplies recognizing the need to stabilize the groundwater basin storage balance over long-term hydrologic cycles." As part of preparation of this Plan update, projects and management actions were identified that would allow MWA to meet this objective by 2020 while also meeting a second objective to "maximize the overall beneficial use of water throughout MWA by supplying water in quantity and of quality suitable to the various beneficial uses." These objectives are described in greater detail in Chapter 9.

[30] ibid

Surface Water

Riparian Habitat/Wetlands

Within the Mojave Water Agency boundaries are various habitat types that are mostly characterized by desert plants and animals. However, there are some important wetland and riparian areas that exist along the Mojave River, Harper Dry Lake, portions of Sheep Creek, and various other drainages. How the agency addresses these areas is mostly dependent on whether they lie within, or outside, the Mojave Basin adjudicated area and Exhibit H to the Judgment. Exhibit H outlines a Biological Resource Mitigation Trust Fund that provides funding to support water table elevations that DFG proposes as necessary to maintain the riparian habitat of these areas, including specific species. Specific wells and monitoring locations are established in Exhibit H. A biological mitigation fund is described which will be expended for mitigation if certain criteria aren't met. For a detailed list of species, monitoring requirements, and biological trust fund conditions please refer to Exhibit H of the Mojave River Area Judgment located in Appendix A of this Plan.

Exhibit H

Exhibit H of the Mojave River Area Judgment defines riparian areas to be maintained in the Mojave River Floodplain from approximately the Upper Narrows to the Lower Narrows, the Lower Narrows to the Helendale Fault, Transition Zone, and the Baja Subarea reach of the Mojave River also referred to as the Camp Cady area (refer to habitat figures in Exhibit H). Mitigations defined for these riparian areas consist of hydrologic flow requirements and groundwater or surface water elevations.

Exhibit H specifies the flow desired by Fish and Game to maintain riparian habitat in the Transition Zone to be 21,000 acre-feet per year. Much of the flow in the Transition Zone comes from the wastewater treatment facility owned and operated by the Victor Valley Wastewater Reclamation Authority (VVWRA) who is not a party to the adjudication. In order to assure maintenance of the riparian area in the Transition Zone, DFG entered into a Memorandum of Understanding with VVWRA in July 2003 to maintain flows from the wastewater treatment facility that will, in conjunction with base flow, provide 15,000 acre-feet per year to the Transition Zone. VVWRA discharge obligations will be limited to 9,000 acre-feet per year from the treatment facility. This MOU was entered into to ensure that any construction and operation of sub-regional treatment facilities would not adversely affect the riparian areas of the Transition Zone.

Riparian areas between the Upper and Lower Narrows consist mostly of Cottonwood Willow habitat that is in fairly good condition. The San Bernardino County Flood Control District does regular mechanical maintenance of the channel, and the area is highly urbanized. DFG is not currently concentrating efforts to restore habitat in this area.[31]

As recent as the mid-1970s, the Camp Cady area had thriving Mesquite groves with three ponds in the central and eastern sections. Since then, groundwater elevations have dropped about 40 feet and most of the Mesquite trees on the western end are dead or dying. Flood flows in the 1990s damaged earthen dikes impounding water in the channel and the ponds have since emptied leaving little water in the river channel. DFG has purchased property at the western edge of this area and is focusing efforts on maintaining channel flows, and perhaps reestablishing surface water ponding, to provide habitat for terrestrial animals.

Groundwater levels were established in Exhibit H for key wells in the Mojave River floodplain. These wells, and their associated groundwater levels as measured from the ground surface to standing water are included below in Table 3-2.

Table 3-2: Groundwater Elevations Established in Exhibit H

Well	Location	Groundwater Level (feet)
H1-1	Victorville/Alto zone (upper Narrows area)	7.0 below surface
H1-2	Victorville/Alto zone (upper Narrows area)	7.0 below surface
H2-1	Lower Narrows/Transition Zone zone	10.0 below surface
H3-1	Harvard/Eastern Baja Riparian Forest Habitat (Camp Cady Area)	7.0 below surface
H3-2	Harvard/Eastern Baja Riparian Forest Habitat (Camp Cady Area)	1.0 above surface

Note: Of these wells, only H3-1 has been installed; other monitoring is accomplished using surrogate wells or gauging stations (L. Eckhart, personal communication, November 26, 2003).

Areas outside Exhibit H

There are also riparian areas outside of the adjudicated area boundary both within and outside the MWA service area. Most notably are riparian areas from Big Bear to the adjudicated area along the Deep Creek, the Western Fork of the Mojave River from Silverwood Lake, the Afton Canyon area on the eastern end of the adjudicated area, and areas in Harper Dry Lake and Lucerne Valley.[32]

Most of the land along Deep Creek is owned and managed by the U.S. Forest Service. The riparian habitat from the Fish Hatchery to the adjudicated area is in good condition. An area known as Rancho Los Flores has riparian habitat in good condition that is currently under

[31] T. Billhorn, personal communication, Nov. 17, 2003
[32] B. Jones, personal communication, Nov. 24, 2003

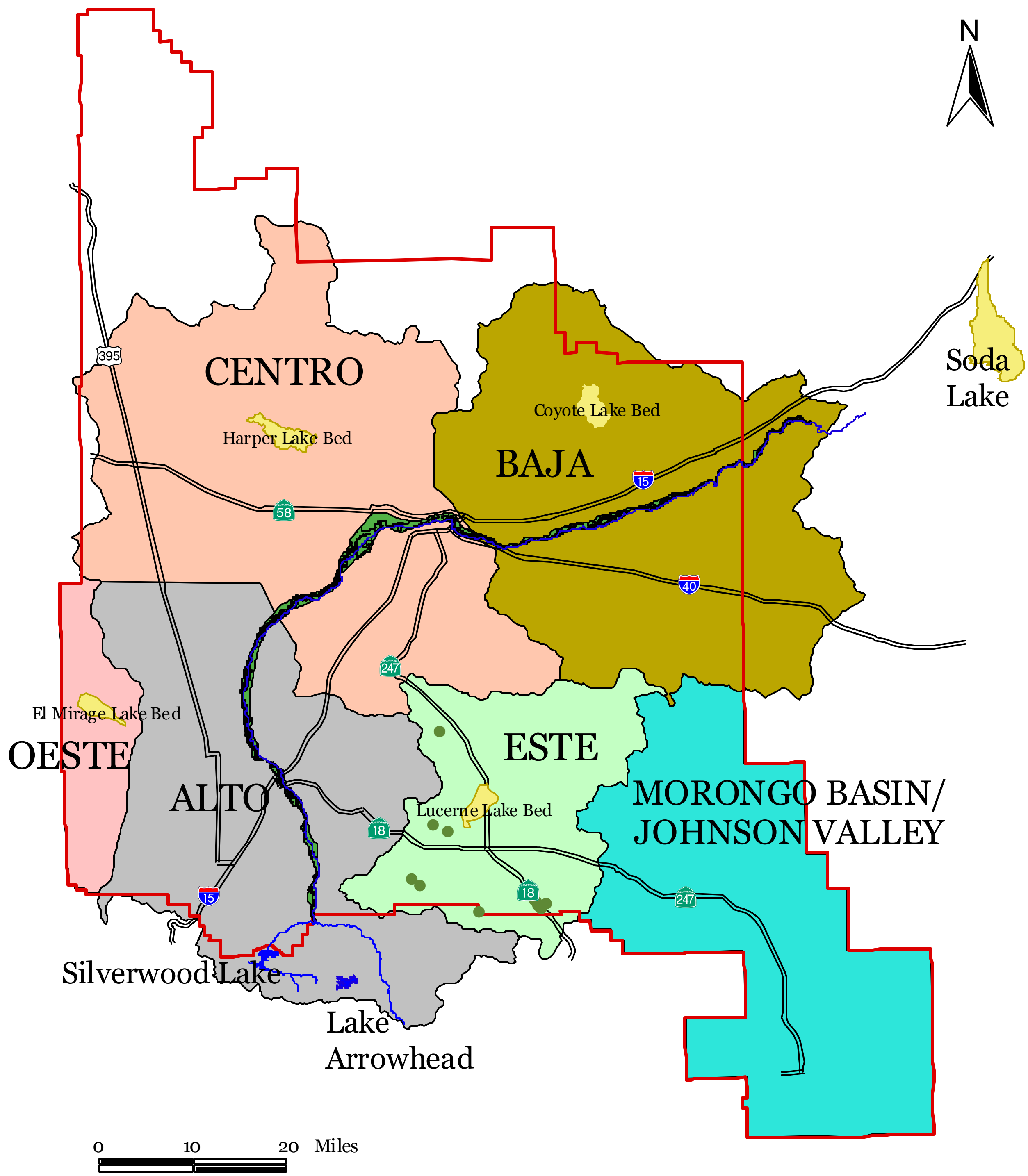
pressure from development. The DFG is working with the developers to address these issues. The Fish Hatchery diverts about 9,000 acre-feet per year of water, but most of this is returned to the river after flowing through the hatchery.

Harper Dry Lake has federally-designated wetlands (marked by emergent vegetation) that historically were maintained mostly by agricultural irrigation runoff from the Most agricultural property that went out of business in the early 1990s. Since then, the Bureau of Land Management (BLM) has been working with FPL Energy Operating Services, a company that manages a nearby solar power plant, to reestablish flows to specific marsh areas, mostly the southeastern portion of Harper Dry Lake. The California Energy Commission made enhancement of the marsh areas a condition of the power plant permit and incorporated this into the mitigation measures. BLM designated this area a Watchable Wildlife Area, which has abundant wildlife species including migrant waterfowl. BLM is currently looking to acquire more property in the area to further enhance the wetland areas.

Lucerne Valley has some riparian areas scattered mainly around washes and springs along the mountain ranges to the south. These areas include Rabbit Springs, Old Woman Springs, and various washes. Most of these properties, such as Rabbit Springs, are in private ownership. The habitat is marked by Cottonwood/Willow habitat with many sensitive species. The source of water for these areas is naturally occurring springs that continue to produce good quality water. Most of the habitat is located at spots along the Helendale fault. There are groups of individuals working with the property owners to preserve portions of the riparian areas on the property.[33]

Afton Canyon Natural Area is located 37 miles northeast of Barstow along Interstate 15 between the Afton Road and Basin Road exits. Afton Canyon is designated as an Area of Critical Environmental Concern to protect plant and wildlife habitat, and to preserve scenic values of the riparian area within the canyon. Afton Canyon is one of two stretches of the Mojave River that maintains continuous flow throughout the year. The BLM is currently in the fourth year of a multi-year effort to restore the riparian and wetland values in the area. Riparian areas determined by MWA are shown in Figure 3-7.

[33] C. Bell, personal communication, Nov. 25, 2003



MWA boundary
Riparian locations
Riparian vegetation

Schlumberger Water Services

Riparian Habitat and Dry Lake Beds

Mojave Water Agency
2004 Regional Water Management Plan

Figure 3-7

November 2003

Prepared by: KTW

Climate

The Mojave Water Agency maintains a Climatology Network that consists of 14 weather stations collecting various weather data on temperature, precipitation, and evaporation. Rain gages are mostly located within the Mojave Basin Area and the surrounding mountains. Runoff in the upper watershed contributes substantially more to the recharge of the basin than precipitation falling in the basin. Average rainfall within the lower lying areas of the Mojave Basin Area and Morongo Basin/Johnson Valley area is roughly five inches per year. Data for precipitation at the Lake Arrowhead gage, located in the San Bernardino Mountains, was analyzed to evaluate the extreme annual variations in stream flow. The average yearly precipitation at this gage is 43.2 inches per year. The standard deviation about the mean is 19.7 inches per year. This high standard deviation correlates to large fluctuations in the annual amount of rainfall received in the San Bernardino and San Gabriel Mountains – the former being the primary source of recharge for the groundwater basin. The large variation in annual rainfall within the surrounding mountains directly affects the annual water supply of the basin, and is further discussed in Chapter 4 of this Plan.

Wastewater

Wastewater is imported to the Mojave Basin Area from the Lake Arrowhead Community Services District, Big Bear Area Regional Wastewater Agency, and Crestline Sanitation District.[34] In 2000, the Alto Subarea received 1,941 acre-feet from the Lake Arrowhead CSD, discharged into the Mojave River about two miles downstream of the Forks. The Crestline Sanitation District discharged 863 acre-feet into the Alto subarea upstream of the West Fork gage at the Los Flores Ranch. In 2000, the Este Subarea received 2,600 acre-feet from Big Bear ARWWA, discharged near Camp Rock Road and Highway 247 in the Lucerne Valley.

The City of Adelanto, the City of Barstow, and the Victor Valley Wastewater Reclamation Authority (VVWRA) provide wastewater collection and treatment services within the Mojave Water Agencies boundaries. The VVWRA serves Victorville, Hesperia, Apple Valley, and San Bernardino County Service Areas 42 and 64. VVWRA is by far the largest of the wastewater agencies with a current treatment capacity of 11.0 million gallons per day (MGD) with plans to expand by another 7.0 to 8.5 MGD by 2020. The City of Adelanto treats 1.2 MGD while the City of Barstow treats 0.066 MGD. County Service Area 70-C serves Silver Lakes. The USMC camp at Nebo also provides wastewater treatment services. There are currently no users of reclaimed wastewater in the MWA service area, although there are a number of entities identified to receive reclaimed wastewater in the future.

[34] Mojave Basin Area Watermaster 2001

The City of Adelanto

The City of Adelanto currently treats 1.2 MGD of wastewater and discharges this quantity to percolation ponds.

The City of Barstow

The City of Barstow collects wastewater through a system constructed starting in 1939. Barstow currently contracts the operation of its wastewater collection and treatment system. The system has the capacity to treat 7.5 MGD through aeration basins, secondary clarifiers, a chlorine contact chamber, and a chlorine contact lagoon. After treatment, the effluent is discharged to the Mojave River adjacent to the treatment facilities. Currently the City collects and treats 66 thousand gallons per day (0.066 MGD) of wastewater. With anticipated growth, the treatment plant is anticipated to treat 1.75 MGD by 2020. There is currently no wastewater recycling activity nor are there plans to recycle wastewater in the future.[35]

Victor Valley Wastewater Reclamation Authority

VVWRA conveys wastewater using 40.5 miles of interceptor sewer and two pump stations to its Regional Wastewater Reclamation Plant. Approximately 9.8 MGD is currently treated at the VVWRA facility which has a capacity of 11.0 MGD. Processes employed include screening, grit removal, primary clarification, biological oxidation of wastes with complete nitrification and partial denitrification, secondary clarification, coagulation, flocculation, filtration, and disinfection. Dissolved air flotation thickening and anaerobic digestion stabilizes biosolids that are then dewatered and dried prior to disposal via direct agricultural land application or by mixing with finished compost for agricultural markets. The reclaimed water is then discharged directly into the Mojave River channel or percolated into ponds in the Floodplain Aquifer. VVWRA and the Department of Fish and Game entered into an MOU to provide minimum discharge of approximately 9,000 acre-feet per year (24.7 acre-feet per day) to the Mojave River Channel to support riparian vegetation and habitat.

VVWRA estimates that its capacity to collect and treat wastewater with the existing facilities will be surpassed around 2006.[36] VVWRA estimates that the wastewater flow by 2020 will be approximately 18.62 MGD. The current plan for dealing with the additional growth and increase in wastewater treatment requirements is to construct two sub-regional recycled water facilities by the year 2005. Another two sub-regional facilities are projected to be built by 2010. These facilities will provide additional wastewater treatment and at the same time, produce recycled

[35] City of Barstow General Plan – Part C, Chapter VI.2 Utilities and Public Services, Technical Report 4/20/1997

[36] Sewerage Facilities Plan Update, Year 2000 Amendment, Adopted by the VVWRA Board of Commissioners October 26, 2000.

water for the surrounding communities. There are currently no off-site consumers of reclaimed wastewater in the VVWRA service area although in June 2003 the Lahontan Regional Water Quality Control Board granted VVWRA a permit to use recycled water to irrigate the golf course and landscaped areas at the Southern California Logistics Airport. The project represents VVWRA's first off-site recycled water use project (landscaping at the treatment facility on Shay Road is already irrigated with recycled water, and recycled water is used for processing, dust control, and fire protection at the on-site regional compost facility). 131 potential recycled water customers have been identified with a combined need for about 37,400 acre-feet per year (afy). Twenty-two large customers were identified with a total need for 8,677 afy including several golf courses, parks, municipalities, and schools. The quantity of expected wastewater flows is described in Table 3-3 in 5-year increments to 2020.

Table 3-3: Total Wastewater Flow Projections (MGD)

Member Agency	2000	2005	2010	2015	2020
Victorville including SCLA	5.38	6.33	7.58	8.96	10.29
CSA 42	0.05	0.05	0.05	0.05	0.05
CSA 64	0.74	0.89	1.04	1.21	1.28
Apple Valley	1.46	1.87	2.26	2.80	3.42
Hesperia	1.06	1.52	2.07	2.75	3.58
Total	**8.69**	**10.66**	**13.00**	**15.77**	**18.62**

Based on the assumption that all of the additional flows would be recycled, and the identified possible users, the projected recycled wastewater that will be produced and used is shown in Table 3-4.

Table 3-4: Recycled Water Projections (MGD)

Member Agency	2000	2005	2010	2015	2020
Victorville including SCLA	0.00	0.95	2.20	3.58	4.91
CSA 42	0.00	0.00	0.00	0.00	0.00
CSA 64	0.00	0.15	0.30	0.47	0.54
Apple Valley	0.00	0.41	0.80	1.34	1.96
Hesperia	0.00	0.46	1.01	1.69	2.52
Total	**0.00**	**1.97**	**4.31**	**7.08**	**9.93**

The estimated cost to provide facilities to reclaim the projected amount of wastewater is $75 million to $125 million. Annual operation and maintenance costs for each subregional facility ranges from $0.55 to $1.13 million. The project is to be funded from a number of federal or state grants and low-interest loans obtained through the State Revolving Fund. Consultants have been retained to provide engineering and environmental documentation services for the four subregional treatment facilities. The cost of providing reclaimed water, transmission infrastructure, and ownership of distribution facilities has yet to be determined.

The Wastewater Reclamation and Recycling Program address a number of issues in the VVWRA service area. The need for additional collection and transmission facilities, the desire of the member agencies to use water as wisely as possible, and the need for additional treatment capacity have all contributed to the aggressive pursuit of this program.

4

Water Supply

This chapter reviews the current understanding of the water supply within the Mojave Water Agency (MWA). The variability of water supply and delivery capability of the State Water Project (SWP) are summarized. Actual water deliveries from the SWP to the MWA from 1978-2001 are also presented.

Mojave Basin Area

A summary of the water supply for the Mojave Basin Area is included in this section based on the average and median surface water inflows. The average and median water supplies are compared to illustrate the extreme variations in annual water supply for the Basin. Elements of water supply examined in this section include: gaged surface flow, ungaged surface flow, subsurface flow, deep percolation of precipitation, wastewater imports, and phreatophyte consumption.

Water supplies in the Mojave Water Agency service area are highly variable – an important factor in developing project alternatives.

Gaged Surface Inflow and Outflow

The average water supply to the basin during the period 1931-2001 was determined in part from U.S. Geological Survey (USGS) stream gage records. A review of these records indicates the flow of the river and thus the Basin water supply is highly variable.

A number of sites on the Mojave River have historically been monitored for surface flow. Records for some sites extend as far back as 1900. Consistent records are available from 1931 when USGS established gaging stations on the Mojave River. Consequently, data from 1931 and forward are utilized for water supply planning purposes.

Five stream gage locations with records to at least 1931 are currently monitored on the Mojave River. Table 4-1 summarizes these gages, indicating the period of record, average, median, peak and minimum flow at each gage. The stream gages are maintained and operated by the USGS under a cooperative program with MWA. All gages currently in operation record river stage data in fifteen-minute increments. USGS personnel take a direct stream measurement at least once a month and more frequently during storm events. The Lower Narrows Gage has direct measurements taken at least once a week.

Table 4-1: Mojave River Stream Gages

Gage Name and Station Number	Period of Record[1]	Average Flow[2]	Median Flow[2]	Peak Flow[2] (Year)	Minimum Flow[2] (Year)
West Fork Near Hesperia (10261000)[3]	1930	23,500	6,200	134,400 (1978)	0 (1951)
Deep Creek Near Hesperia (10260500)	1905	47,800	21,000	304,400 (1993)	2,200 (1951)
Lower Narrows Near Victorville (10261500)[4]	1900	52,400	23,200	298,500 (1969)	5,300 (2001)
Barstow (10262500)	1931	16,700	0	151,800 (1969)	0 (Many)
Afton (10263000)	1930-32, 1952-78, 1981-02[5]	8,100	900	75,600 (1969)	200 (1975)

[1]All gages listed are currently operational.
[2]For period of record 1931-2001. Flow refers to acre-feet per year.
[3]The USGS has operated two gages at West Fork since 1930, 10261000 and 10260950.
[4]The Lower Narrows Gage was located about 3 miles upstream from its current location and operated there from 1900-1906 and 1931-36.
[5]USGS has estimated the record for the missing periods.

Three additional sites on the Mojave River were previously gaged to monitor stream flow. These sites were eventually determined to be unsuitable primarily due to unstable controls and changing stage-discharge relationships, and were abandoned. The sites and their periods of record include Below Forks Near Hesperia (1972– 96), Wild's Crossing Near Helendale (1967-70) and Hodge (1931, 1971-92).

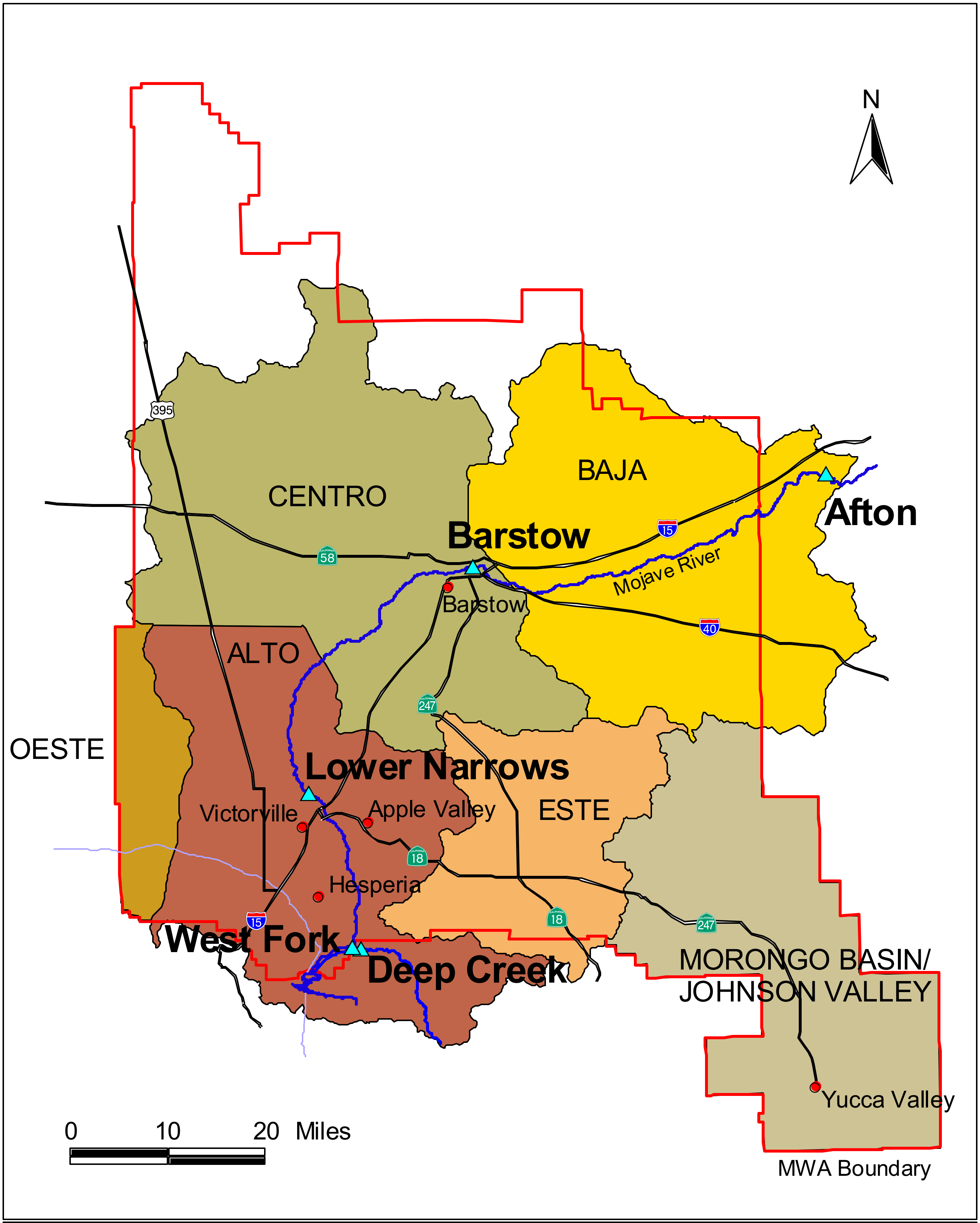
Figure 4-1 shows the location of the operating stream gages summarized in Table 4-1. The Deep Creek station is located about 1 mile upstream of the confluence with the West Fork of the Mojave River (known as the "Forks"). The drainage area tributary to the Deep Creek Gage is 134 square miles.

Two gaging stations have been operated on the West Fork of the Mojave River. The first station (10261000) was located approximately 0.5 mile upstream of the Forks and operated from 1930-71, before the construction of the Cedar Springs Dam at Silverwood Lake and the Mojave River Dam at the Forks. The second station (10260950) is located approximately 0.6 mile upstream of the Forks and has been operated since 1974. The drainage area tributary to the West Fork Gage is 70.3 square miles.

The dam at the Forks is ungated and serves to attenuate peak flows during large storm events and prevent downstream flooding. The flow at this location constitutes the primary water supply to the main stem of the Mojave River; consequently, the combined data from the Deep Creek and West Fork gages represent the total flow at the headwaters of the Mojave River. The average annual discharge at the Forks is 71,300 acre-feet for the period 1931 through 2001.

The source of water at the Forks is runoff from snowmelt and rainfall originating in the San Bernardino Mountains. Lower velocity flows from snowmelt and smaller storm events usually percolate into the riverbed a short distance downstream of the Forks. The surface water tends to flow in a northerly direction within the river channel towards the Narrows, which is approximately five miles in length and is subdivided into the Upper and Lower Narrows. The groundwater gradient is in the same general direction and groundwater is discharged into the River upstream of the Upper Narrows about 12 miles below the Forks. This occurs due to shallow bedrock that forces groundwater back into the River channel.

The Lower Narrows gage is located approximately 18 miles downstream of the Forks near the City of Victorville. The drainage area tributary to the gage is 513 square miles. A second gage was installed at this site in 1996 to refine recordings of low flows. The low flow gage was washed out in the winter of 1998 and replaced the following summer.



Schlumberger Water Services

Stream Guage Locations

Mojave Water Agency
Regional Water Management Plan Update

Figure 4-1

Date: January 2004

Prepared By: KTW

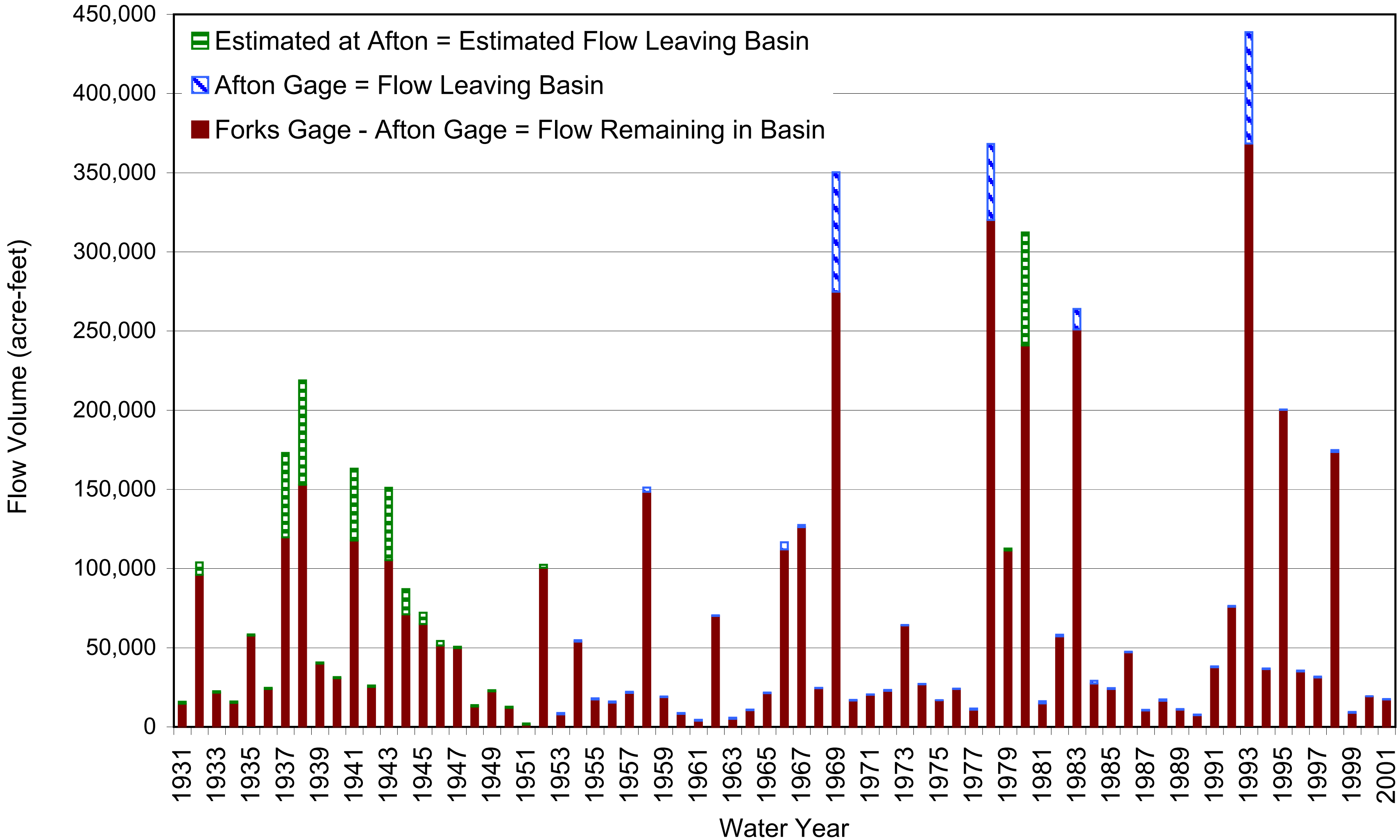
Data from this site is used to determine compliance with obligations for the maintenance of a certain minimum base flow from the Alto to the Centro Subarea as mandated by the Mojave Basin Area Judgment (1996). Base flow is defined by the Judgment as "that portion of the total surface flow measured annually at Lower Narrows which remains after subtracting storm flow." The average annual discharge of total flows at Lower Narrows is 52,400 acre-feet for the period from 1931 to 2001. Base flow there has historically been as high as 26,700 acre-feet in Water Year 1940-41 and averaged approximately 21,000 acre per year for the period 1931-90. The base flow at the Lower Narrows in Water Year 2001 is at a historic low of 5,345 acre-feet.

Base flow leaving the Lower Narrows region quickly infiltrates back into the river channel. Surface flows are augmented about 22 miles downstream of the Forks (4 miles downstream of the Lower Narrows) by discharges from the Victor Valley Wastewater Reclamation Authority (VVWRA). The discharges from the treatment plant continue as surface flows for about 4 miles nearly to the community of Silver Lakes. Discharges from the VVWRA totaled 9,006 acre-feet in Water Year 2000.

The Barstow gage is approximately 53 miles downstream from the Forks. This gage site is typically dry because the River flows at Barstow only in response to large storm events in the watershed. The average annual discharge at this location is 16,700 acre-feet for the period from 1931 to 2001. The Barstow gage has recorded surface flow in 35 of the 71 years of operation. The tributary drainage area is 1,291 square miles.

The Afton gage is located about 100 miles downstream of the Forks and is about 6 miles downstream (east) of the eastern boundary of the Baja Subarea, providing a measure of surface water exiting the Mojave Basin Area. The Afton gage generally has a small component of baseflow, caused by thinning of the aquifer and associated low groundwater discharge. In some years the base flow has ceased, but averages about 400 acre-feet per year. The combined baseflow and stormflow results in an average annual discharge of 8,100 acre-feet at the Afton gage between 1931 and 2001. The drainage area for the Afton site is 2,121 square miles.

The stream gage data demonstrate that the majority of flow in the Mojave River is retained (recharged) in the Basin. During approximately 80% of the recorded years, discharge at the Afton gage averaged less than 1,000 acre-feet. The average difference between flow entering the Basin at the Forks and flow leaving the Basin at Afton is roughly 63,200 acre-feet per year during 1931 through 2001. Figure 4-2 compares the total flow entering the Basin to the total flow exiting the Basin annually. In most years, almost all of the surface water entering the Basin infiltrates within the Basin. Records show that a few large flows pass the Afton gage every nine



Schlumberger Water Services

Annual Volume of Gaged Surface Water Entering and Exiting the Basin (1931-2001)

Mojave Water Agency
Regional Water Management Plan Update

Figure 4-2

Date: January 2004

Prepared By: KTW

years on average. However, the recharge from these large storm event years (inflows minus outflows) contributes substantial amounts of water to the regional groundwater supply, and almost all of the water supply to the Centro and Baja subareas.

Annual Variability of Water Supply

Average water supplies derived from a specific period of record are typically selected to be representative of long-term water supply conditions. Precipitation and runoff are highly variable and reliance upon an inappropriate period of record will misrepresent the quantity of water that may be available over the longer term. A representative hydrologic base period should contain a distribution of wet, dry and normal years. Determining average water supplies in this manner provides some certainty to the process of planning for the quantity of water that should be available and can accrue to groundwater storage.

The 1994 RWMP and the Mojave Basin Area Judgment utilize the hydrologic base period encompassing Water Years 1931 through 1990. This period was selected because the data available for the gages was continuous. The average flow at the Forks from 1931-90 was 65,000 acre-feet, with annual flows ranging from less than 6,500 acre-feet to more than 360,000 acre-feet. The median flow at the Forks for this same period was 24,700 acre-feet. Given the range of measured annual flows during this 60-year period, the median flow is the best representation of the amount of supply that can be expected in any given year over a long-term period.

A plot of the accumulated annual departure from the base period (1931-1990) average of 65,000 acre-feet for surface flows measured at the Forks is shown in Figure 4-3. This plot illustrates water supply trends on an annual basis for inflow recorded at the Forks. A negative sloping line from one water year to the next indicates a below average inflow and a positive sloping line indicates an above average inflow. The purpose of Figure 4-3 is to illustrate that since the base period (1931-1990) average of 65,000 acre-feet was established, the basin has experienced a wetter hydrologic period relative to that established average. This report recognizes the recent wet period (1991-2001) and utilizes this hydrologic data to calculate an updated basin water supply.

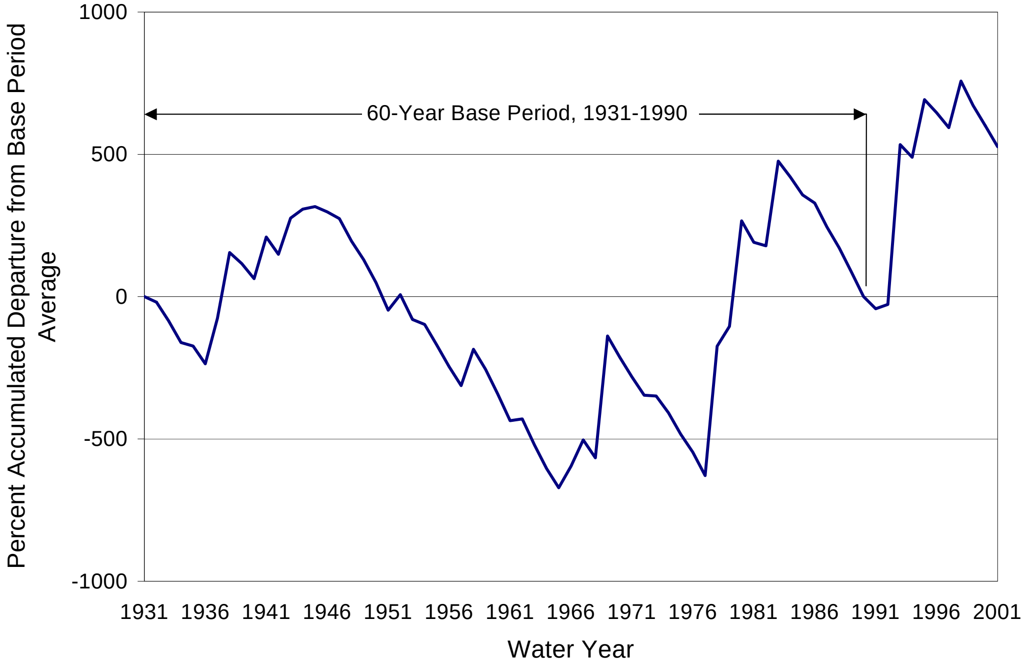


Figure 4-3: Accumulated Departure from Base Period (1931-1990) Average for Seasonal Discharge at the Forks

Extreme variations in streamflow have occurred at the Forks during the period of record. Annual values have ranged from 6,380 acre-feet to 428,700 acre-feet between 1931 and 2001. The extreme variations in streamflow at the Forks result in large annual fluctuations in available groundwater recharge.

Figure 4-4 displays a plot of exceedence probabilities for discharge at the Forks. The exceedence probability plot illustrates how often an annual flow of a certain magnitude isexpected to occur. As an example, the average annual flow at the Forks is 71,300 acre-feet for 1931-2001. As shown on Figure 4-4, this average is weighted by the larger events that occur sporadically. Approximately 68% of the annual recorded flows have been below this average and 32% have been above this average. This should be considered for planning periods of five years or less because annual inflows less than the average volume are likely to occur in two out of three years. Statistically, three to five-year periods will occur where inflows to the basin will be well below the average total inflow. The basin is more likely to receive annual inflows closer to the median inflow of 27,200 acre-feet per year based on the period of record from 1931-2001. This means that half of the time the basin will receive more than 27,200 acre-feet per year and less than 27,200 acre-feet per year the rest of the time. Water supply planning alternatives should consider the effect that variations from the average supply might have on any proposed alternatives.

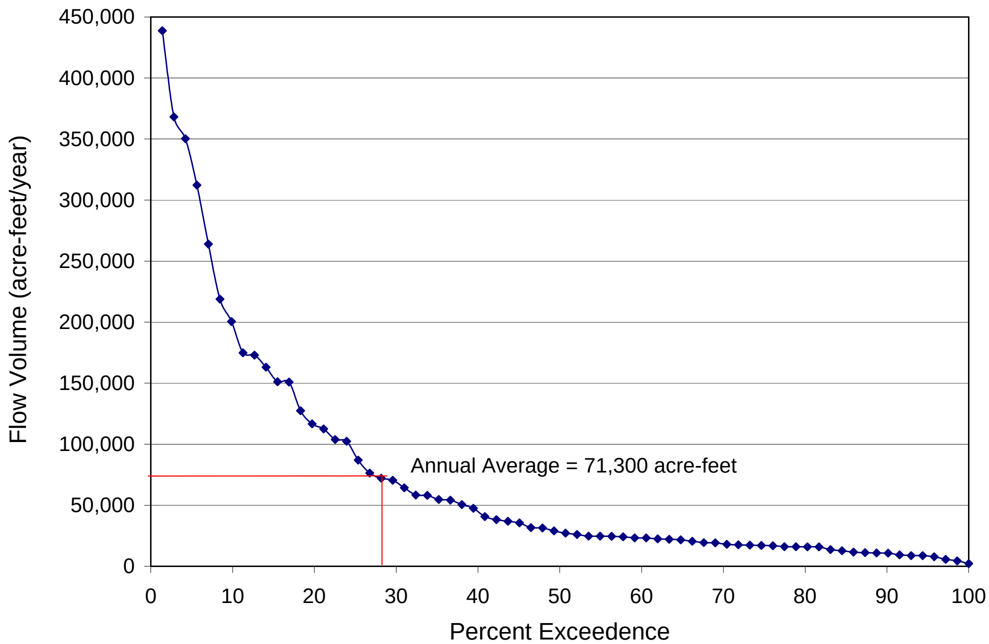


Figure 4-4: Percent Exceedence at the Forks (1931-2001)

Ungaged Surface Inflow and Outflow

Table 4-2 shows that an estimated 7,200 acre-feet of ungaged water flows annually into the Este, Oeste, Alto, and Baja subareas of the Mojave Basin Area (Webb 2000). The only surface water outflow in the Mojave Basin Area is gaged through Afton Canyon.

Table 4-2: Mojave Basin Area - Net Average Annual Water Supply

	Este	Oeste	Alto	Centro	Baja	Entire Basin
WATER SUPPLY						
Surface Water Inflow						
Gaged	0	0	71,300 [a]	0	0	71,300
Ungaged	1,700	1,500	3,600	34,700 [1]	14,400 [2]	7,200 [3]
Subsurface Inflow	0	0	1,200	2,000	1,200	0 [4]
Deep Percolation of Precipitation	0	0	3,500	0	100	3,600 [5]
Import Wastewater						
Lake Arrowhead CSD	0	0	1,900	0	0	1,900 [6]
Big Bear ARWWA	2,600	0	0	0	0	2,600 [6]
Crestline Sanitation District	0	0	900	0	0	900 [6]
Total:	**4,300**	**1,500**	**82,400**	**36,700**	**15,700**	**87,500**
OUTFLOW AND LOSSES						
Surface Water Outflow						
Gaged	0	0	0	0	8,100 [b]	8,100
Ungaged	0	0	34,700 [1]	14,000 [7]	0	0 [4]
Subsurface Outflow	800	400	2,000	1,200	0	0 [4]
Phreatophyte Consumption	0	0	11,000 [8]	3,000 [8]	2,000 [8]	16,000
Total:	**800**	**400**	**47,700**	**18,200**	**10,100**	**24,100**
NET AVERAGE ANNUAL WATER SUPPLY:						**63,400**

[1]Estimates taken from Webb 2000

[2]Includes 14,000 ac.ft. of Mojave River flow from Centro and 400 ac.ft. of inflow from Kane Wash and Boom Creek; estimates taken from Webb 2000

[3]Sum of ungaged surface water inflows less ungaged surface water outflows; estimates taken from Webb 2000

[4]All subsurface flow is assumed to exchange within subareas (no external inflows or outflows). No external ungaged surface water outflow

[5]Estimates taken from Webb 2000

[6]Mojave Basin Area Watermaster 2001

[7]From reported flows at USGS gaging station, Mojave River at Barstow

[8]Phreatophyte consumption taken from Lines and Bilhorn (1996)

a Period of record from 1931-2001

b Period of record from 1931-2001; 1931-1952 are estimated values

Subsurface Flow

Table 4-2 summarizes the subsurface inflow for the subareas within the Mojave Basin Area. No significant amount of groundwater is exchanged with areas outside the Mojave Basin Area. However, subsurface exchange does occur between subareas within the Basin (Webb 2000).

Approximately 1,200 acre-feet of groundwater combined annually flows from Este and Oeste to Alto; 2,000 acre-feet flows from Alto to Centro; and 1,200 acre-feet per year flows from Centro to Baja.

Deep Percolation of Precipitation

An estimated 3,600 acre-feet of deep percolation of precipitation occurs annually in the Mojave Basin Area as shown on Table 4-2 (Webb 2000). The majority of the deep percolation of precipitation takes place in the Alto Subarea (3,500 acre-feet per year) and a minor component takes place in the Baja Subarea (100 acre-feet per year).

Wastewater Imports

Wastewater is imported to the Mojave Basin Area from the Lake Arrowhead Community Services District, Big Bear Area Regional Wastewater Agency, and Crestline Sanitation District (Mojave Basin Area Watermaster 2001). In 2000, the Alto Subarea received 1,941 acre-feet from the Lake Arrowhead CSD, discharged into the Mojave River about 2 miles downstream of the Forks near the City of Hesperia. The Crestline Sanitation District discharged 863 acre-feet into Alto upstream of the West Fork gage at the Los Flores Ranch. In 2000, the Este Subarea received 2,600 acre-feet from Big Bear ARWWA, discharged near Camp Rock Road and Highway 247 in the Lucerne Valley.

Phreatophyte Consumption

The most recent estimate of annual phreatophyte consumption is 16,000 acre-feet for 10,000 acres of riparian vegetation. The data is derived from analysis prepared in 1995 in a cooperative effort between the USGS, California Department of Fish and Game and the MWA (Lines and Bilhorn 1996). The analysis determined that 1995 was considered an average year of water consumption for the existing riparian vegetation, and noted that annual water use by riparian vegetation will vary by up to 50% from the average. Variation would depend on available water supply, with up to 50% more water than the average consumed during wet years and up to 50% less consumed during dry years. As shown in Table 4-2, the average consumption by riparian vegetation within Alto is 11,000 acre-feet per year, 3,000 acre-feet per year in Centro, and 2,000 acre-feet per year in Baja. The analysis found that of the 11,000 acre-feet average in Alto, 5,000 acre-feet is consumed above the Lower Narrows and 6,000 acre-feet is consumed between the Lower Narrows and the boundary with Centro (an area referred to as the "Transition Zone"). Another 600 acre-feet of average annual water consumption by riparian vegetation were also identified in the Afton Canyon area, outside of the MWA.

Groundwater

Essentially all of the water used within the MWA is supplied by pumping groundwater. The Physical Solution to the Mojave Basin Area Judgment set limits on the amount of groundwater production that can occur in each subarea without incurring an obligation to buy imported water. Subareas upstream have an annual obligation to subareas downstream based on long-term averages between 1931 and 1990. Each major producer has an established Free Production Allowance (FPA) that is currently 80% of its Base Annual Production (BAP), which is defined as the producer's highest annual use verified for the 5-year base period from 1986-90, for all uses other than municipal and industrial use in Alto. FPA for Alto municipal and industrial use has been reduced to 70% of BAP for the 2003-04 water year, with an additional reduction to 65% of BAP scheduled for the 2004-05 water year. The allocated FPA represents each producer's share of the water supply available for that subarea. The Judgment requires that reductions in FPA occur in increments of 5% per year until the available FPA in each subarea is in balance with the available water supply. Producers are required to replace any water pumped above their FPA determined for that year. Replacement can occur either by paying the Mojave Basin Area Watermaster to purchase supplemental water from MWA or by transferring unused production rights within that subarea from another party to the Judgment.

Essentially all of the water used within the MWA is supplied by pumping groundwater.

As described in the previous chapter, the Alto, Centro and Baja subareas contain two interconnected aquifers referred to as the Floodplain Aquifer and the Regional Aquifer; Oeste and Este subareas only contain the Regional Aquifer. The Floodplain Aquifer is located along the path of the Mojave River and is directly recharged by the river. The Regional Aquifer underlies and surrounds the Floodplain Aquifer, encompassing the remainder of the Mojave River Groundwater Basin. Prior to development in the area, groundwater flowed primarily from the Regional Aquifer to the Floodplain Aquifer. However, the groundwater flows have reversed in recent years, and the groundwater flow from the Floodplain Aquifer is currently the primary recharge component for the Regional Aquifer (Stamos et al. 2001b). The Regional Aquifer is also recharged to a lesser degree by deep percolation of precipitation and storm runoff from ungaged tributaries.

Groundwater production was initially developed along the Mojave River in the early 1900s. By the mid-1950's, when long-term overdraft is recognized to have commenced, groundwater production was about 190,000 acre-feet, with the majority occurring along the Mojave River. By 1994, about half of the pumping came from wells located away from the River in the Regional Aquifer (Stamos et al. 2001b). As noted in Chapter 3, the increase in water production in the basin has significantly influenced the interaction between the Floodplain and Regional Aquifers. The changes in location of production indicate that Plan alternatives will need to recharge heavily pumped areas within the Regional Aquifer.

Figures 4-5 through 4-7 show historical water level data for wells within the Regional Aquifer. The decline in groundwater levels range from 50 feet to 100 feet for the three wells displayed. These figures illustrate the steady decline in water levels over the past 50 years, and that the Regional Aquifer is generally in a state of overdraft.

Figures 4-8 and 4-9 display historical water level data for wells within the Floodplain Aquifer. These figures illustrate the direct affect the Mojave River has on groundwater levels within the Floodplain Aquifer. During the 1980s, annual flows in the Mojave River were below average and groundwater levels within the Floodplain Aquifer declined. Conversely, the 1990s were a much wetter period and groundwater levels within the Floodplain Aquifer increased. It is important to note that while groundwater levels in the Floodplain Aquifer respond relatively rapidly to hydrologic conditions as compared to the Regional Aquifer, the long-term average water level in the Floodplain Aquifer is also declining.

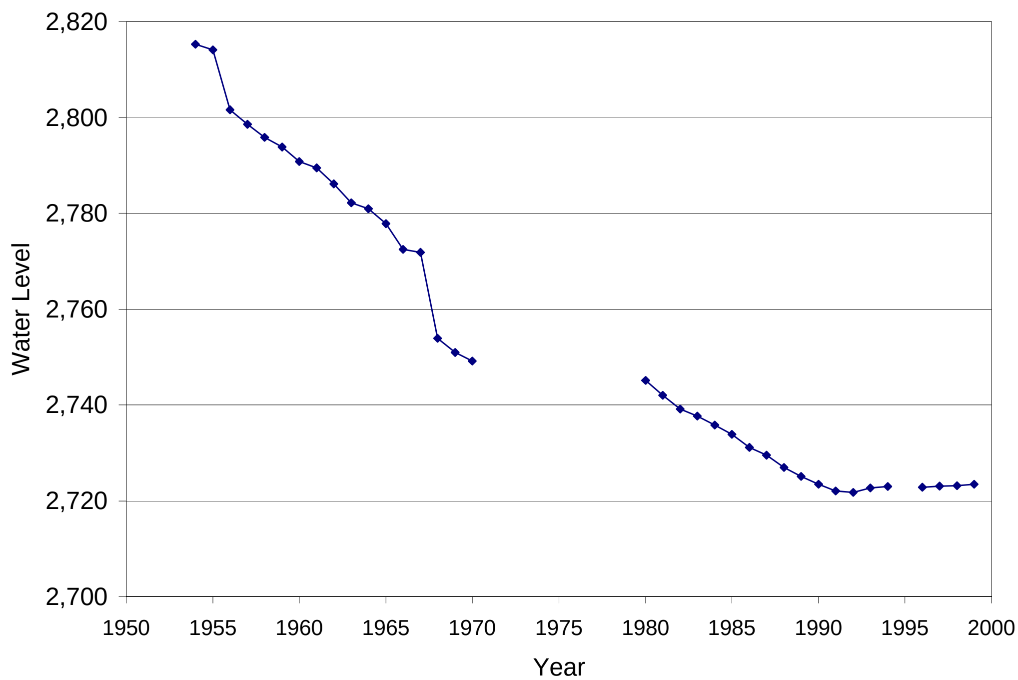


Figure 4-5: Historical Groundwater Levels for State Well Number 05N01E17D01, located in the Regional Aquifer in the Este Subarea

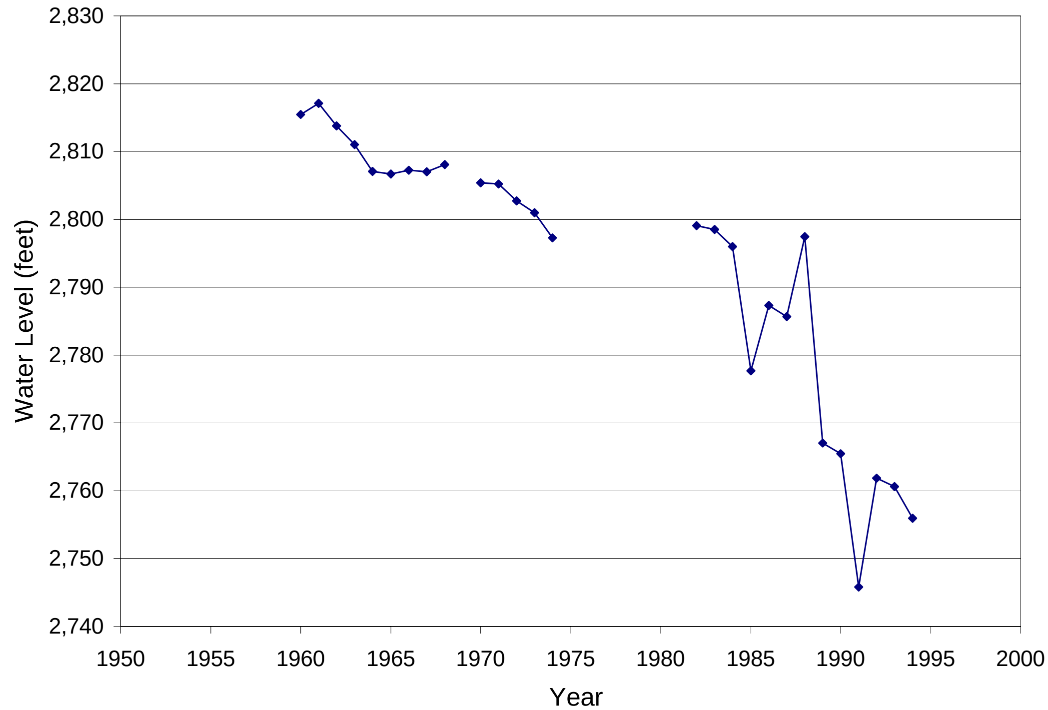


Figure 4-6: Historical Groundwater Levels for State Well Number 05N05W22E02, located in the Regional Aquifer in the Alto Subarea

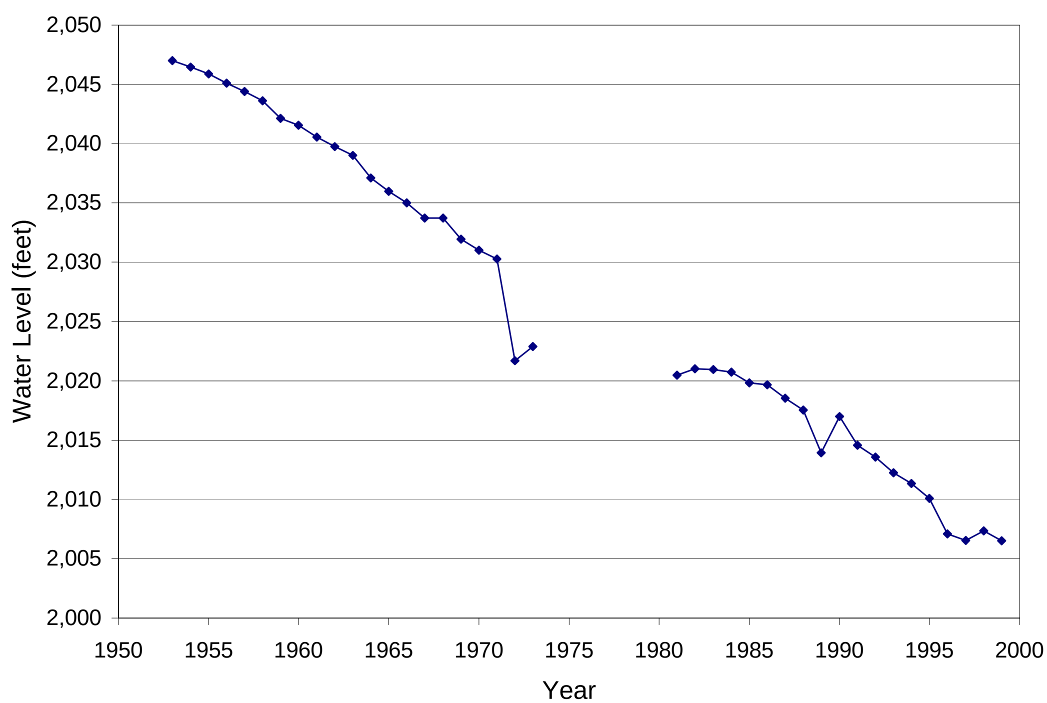


Figure 4-7: Historical Groundwater Levels for State Well Number 11N03W28R02, located in the Regional Aquifer in the Centro Subarea

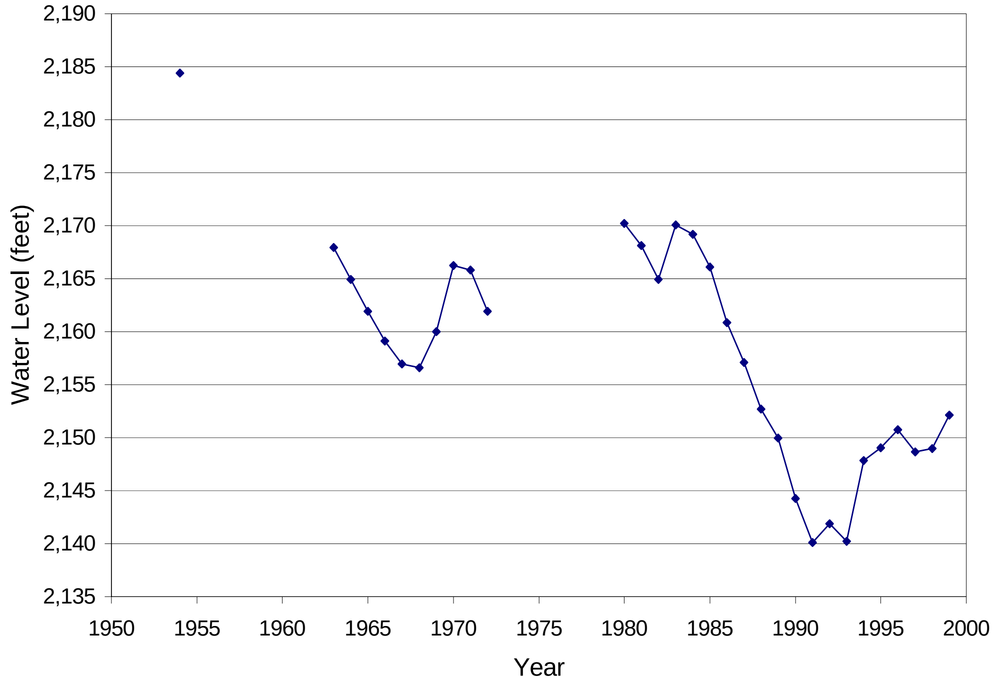


Figure 4-8: Historical Groundwater Levels for State Well Number 5N04W11P03, located in the Floodplain Aquifer in the Alto Subarea

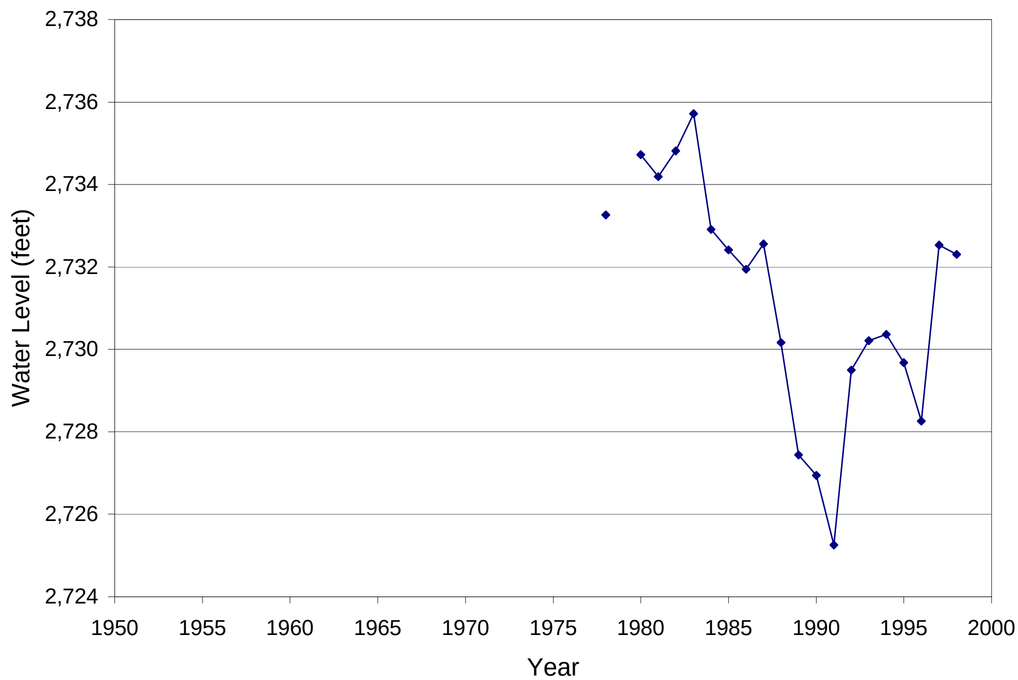


Figure 4-9: Historical Groundwater Levels for State Well Number 09N03W13R01, located in the Floodplain Aquifer in the Centro Subarea

The average annual net water supply for the Mojave Basin Area is estimated in Table 4-2. The volume of water available to meet water supply needs averages 63,400 acre-feet annually for the period 1931-2001. The Alto Subarea has the largest water supply, primarily due to proximity to the headwaters of the Mojave River. The Centro and Baja subareas are dependent upon infrequent, very large storm events for groundwater recharge. The Este and Oeste subareas have the least amount of supply, most of which originates from ungaged surface water. The Este Subarea receives the majority of its current water supply from wastewater imports. Table 4-2 reflects averaged values and does not take into account the annual variation in water supply.

The average annual water supply estimates in Table 4-2 are higher than estimates from the 1994 RWMP for the period 1931-90. This analysis averages USGS stream gage data from 1931 to 2001. The increase is attributed to above average streamflow and increased wastewater imports since 1990. 1993 was the highest year of record for inflow at the Forks. The inflow of about 428,700 acre-feet was 660% of the 1931-90 average of 65,000 acre-feet. 1995 and 1998 were also substantially wetter than average. The period 1931-2001 was about 10% wetter than the period 1931-1990. Generally, the previous 35 years have been considerably wetter than average when compared to the 1931-1990 period; conversely, the period 1945-1965 was considerably drier than average. This illustrates the extreme variation in annual water supply.

Dry Year and Multiple Dry Year Water Supply

An estimate of the average annual dry year water supply for each subarea within the Mojave Basin Area is shown on Table 4-3. Dry year water supplies are assumed to be equal to the median water supply values on the Mojave River. By this definition, half of all years would be considered dry, or less than 22,100 acre-feet per year. Median values for gaged surface flow cover the period of record, 1931-2001. Median values for ungaged surface flows are adjusted from the average values found in Table 4-2, to median values based on the percent difference (62%) between average and median flow at the Forks. This assumption was made based on the correlation that over 90% of ungaged surface flow entering the Basin originates in the same mountains as the gaged surface flow measured at the Forks. Thus, it is assumed that the difference between the average and median flow at the Forks provides a reasonable correlation to the difference between the average and median flow of ungaged surface water entering the Mojave Basin.

An estimate of the average annual multiple dry year water supply for each subarea within the Mojave Basin Area is shown on Table 4-4. Multiple dry year estimates represent the average Mojave River flow during the period 1988-1990. Values for ungaged surface flows are reduced from the average values found in Table 4-2 by the same method described above.

While the annual average net water supply is 63,400 acre-feet per year, average annual dry year water supply is only 22,100 acre-feet and average annual multiple dry year water supply is only 3,900 acre-feet. This demonstrates the area's dependence on large, infrequent storm events to provide the majority of groundwater recharge. Dry year water supply probabilities should be taken into consideration when evaluating the near-term implications of water supply alternatives. Decreases in groundwater levels caused by temporary declines in annual water supply may not harm the long-term water supply of a basin but can have adverse impacts. Evaluating the dry year water supply for near-term implications may be important for a number of reasons. Temporary declines in groundwater can increase pumping costs, diminish groundwater quality, and harm riparian habitat by decreasing the amount of water available in the root zone. Management issues concerned with near-term implications should consider the dry year water supply of the Mojave River Basin since it is a better representation of the expected annual water supply for any three- to five-year period. When evaluating long-term water supply management issues, the average values summarized in Table 4-2 are appropriate.

Morongo Basin/Johnson Valley Area

The groundwater basins within the Morongo Basin/Johnson Valley Area are bounded by the Ord and Granite Mountains to the north; the Bullion Mountains to the east; the San Bernardino Mountains to the Southwest; and the Pinto and Little San Bernardino Mountains to the south. Different investigations have divided the region's groundwater basins into 17 subbasins, but not all of them are contained within MWA (Smith and Pimentel 2000). The water supply estimates prepared for the 1994 Regional Water Management Plan compiled water supply data for the region into 4 subbasins. Table 4-5 summarizes the net average annual water supply estimates for each of the groundwater basins that comprise the Morongo Basin/Johnson Valley Area.

Table 4-3: Mojave Basin Area - Average Annual Dry Year Water Supply

	Este	Oeste	Alto	Centro	Baja	Entire Basin
WATER SUPPLY						
Surface Water Inflow						
Gaged	0	0	27,200 [a]	0	0	27,200
Ungaged	650 [1]	550 [1]	1,400 [1]	13,200 [1]	200 [1]	2,800 [2]
Subsurface Inflow	0	0	1,200	2,000	1,200	0 [3]
Deep Percolation of Precipitation	0	0	1,750	0	50	1,800 [4]
Import Wastewater						
Lake Arrowhead CSD	0	0	1,900	0	0	1,900
Big Bear ARWWA	2,600	0	0	0	0	2,600
Crestline Sanitation District	0	0	900	0	0	900
Total:	**3,250**	**550**	**34,350**	**15,200**	**1,450**	**37,200**
OUTFLOW AND LOSSES						
Surface Water Outflow						
Gaged	0	0	0	0	900 [b]	900
Ungaged	0	0	13,200 [1]	0	0	0
Subsurface Outflow	800	400	2,000	1,200	0	0
Phreatophyte Consumption	0	0	5,500 [5]	1,500 [5]	1,000 [5]	8,000
Total:	**800**	**400**	**20,700**	**2,700**	**1,900**	**8,900**
					NET MEDIAN ANNUAL WATER SUPPLY:	**28,300**

[1]Estimates based on ratio of dry year inflow to average inflow

[2]Sum of Este (700 ac.ft.), Oeste (600 ac.ft.), Alto (1,400 ac.ft.) and Baja (200 ac.ft from Kane Wash and Boom Creek).

[3]All subsurface flow is assumed to exchange within subareas (no external inflows or outflows)

[4]Because historical precipitation during dry years has been approximately 50% of the long-term average, deep percolation of precipitation during dry years is assumed to be equal to 50% of the long-term average deep percolation

[5]Phreatophyte consumption taken from Lines and Bilhorn (1996)

a Period of record from 1931-2001

b Period of record from 1931-2001; 1931-1952 are estimated values

Table 4-4: Mojave Basin Area
Average Annual Multiple Dry Year Water Supply

	Este	Oeste	Alto	Centro	Baja	Entire Basin
WATER SUPPLY						
Surface Water Inflow						
Gaged	0	0	10,800 [a]	0	0	10,800
Ungaged	100 [1]	100 [1]	200 [1]	2,000 [1]	0 [1]	400 [2]
Subsurface Inflow	0	0	1,200	2,000	1,200	0 [3]
Deep Percolation of Precipitation	0	0	1,750	0	50	1,800 [4]
Import Wastewater						
Lake Arrowhead CSD	0	0	1,900	0	0	1,900
Big Bear ARWWA	2,600	0	0	0	0	2,600
Crestline Sanitation District	0	0	900	0	0	900
Total:	**2,700**	**100**	**16,750**	**4,000**	**1,250**	**18,400**
OUTFLOW AND LOSSES						
Surface Water Outflow						
Gaged	0	0	0	0	300 [a]	300
Ungaged	0	0	2,000 [1]	0 [1]	0	0
Subsurface Outflow	800	400	2,000	1,200	0	0
Phreatophyte Consumption	0	0	5,500 [5]	1,500 [5]	1,000 [5]	8,000
Total:	**800**	**400**	**9,500**	**2,700**	**1,300**	**8,300**
MULTIPLE DRY YEAR NET ANNUAL WATER SUPPLY:						**10,100**

[1]Estimates based on ratio of multiple dry year inflow to average inflow
[2]Sum of Este (100 ac.ft.), Oeste (100 ac.ft.), and Alto (200 ac.ft.)
[3]All subsurface flow is assumed to exchange within subareas (no external inflows or outflows)
[4]Because historical precipitation during dry years has been approximately 50% of the long-term average, deep percolation of precipitation during dry years is assumed to be equal to 50% of the long-term average deep percolation
[5]Phreatophyte consumption taken from Lines and Bilhorn (1996)
a Period of record from 1988-1990

Table 4-5: Morongo Basin/Johnson Valley Area Net Average Annual Water Supply

Basin	Net Average Annual Supply (Acre-feet per Year)
Means/Ames Valley	600
Copper Mountain Valley	600
Johnson Valley	2,300
Warren Valley	900*

Source: Boyle Engineering Corporation 1993 (for Copper Mountain 550 was rounded to 600)

* Hi–Desert Water District reports unpublished USGS estimates of 200 acre-feet per year net average annual supply in Warren Valley.

The net average water yield of the entire Morongo Basin/Johnson Valley Area is about 4,400 acre-feet per year. However, the net average water supply for the relatively uninhabited Johnson Valley is relatively undeveloped and has water quality constraints in some areas. The 1994 RWMP estimated that the Johnson Valley Basin net average annual water supply is about 2,300 acre-feet per year. The Johnson Valley supply was not considered in the net water supply balance, resulting in a net average water supply of 2,100 acre-feet per year for the developed groundwater basins.

The water supply is derived primarily from precipitation in the tributary areas within the Little San Bernardino and San Bernardino Mountains. Major ephemeral streams in the area include the Pipes Wash and Yucca Creek.

A great portion of water water supply needs relies on MWA's ability to provide State Water Project water through the Morongo Basin Pipeline. Without that water or a different source of supplemental water, overdraft of the Warren Valley Basin is likely to occur once again. In 1995 the Morongo Basin Pipeline was completed from the California Aqueduct near the City of Hesperia to the Town of Yucca Valley. Two recharge sites have been developed to take water from this facility and are receiving imported State Water Project water. The quantities of water imported to date for the Hi-Desert Water District are presented in Table 4-5. The imported water supplies recharge the previously overdrafted Warren Valley Basin. The Pipeline has capacity to also deliver water to the benefit of the Big Horn-Desert View Water Agency, the Joshua Basin Water District and the County of San Bernardino.

Dry Year and Multiple Dry Year Water Supply

The dry year and multiple dry year water supplies in the Morongo Basin/Johnson Valley area are assumed to be reduced proportionally to the reduction in surface water flows at the Forks. These values are shown for each subbasin in Table 4-6. Excluding the Johnson Valley subbasin, the net annual dry year water supply is 800 acre-feet/year during an average dry year and 110 acre-feet/year during a multiple dry year period.

Table 4-6: Morongo Basin/Johnson Valley Area Average Annual Dry Year Water Supply

Basin	Dry Year Average Annual Supply (Acre-feet per Year)	Multiple Dry Year Average Annual Supply (Acre-feet per Year)
Means/Ames Valley	230	30
Copper Mountain Valley	230	30
Johnson Valley	880	130
Warren Valley	340	50

Well Data

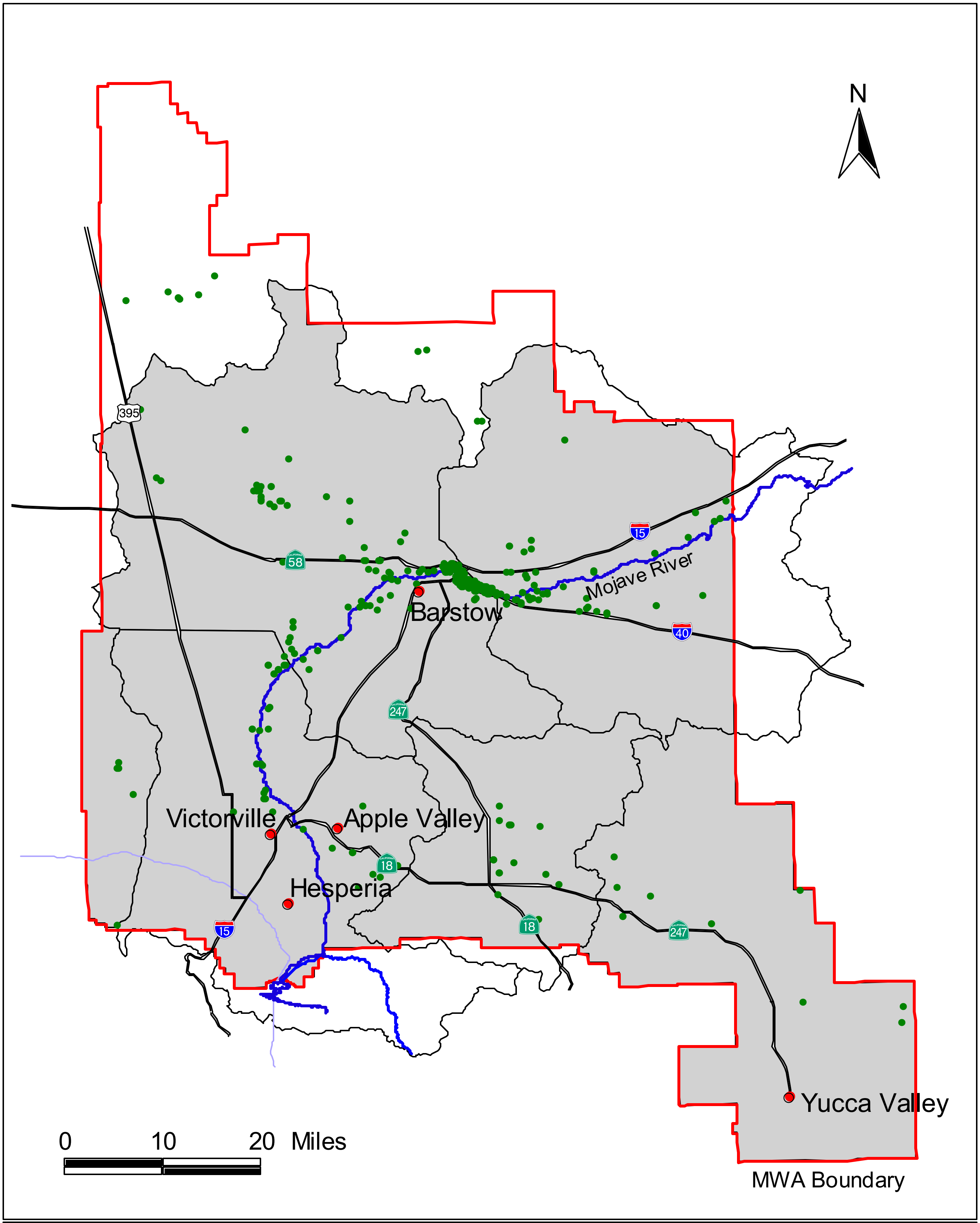
Digital well data provided by MWA was compiled in a database for data query and analysis. Data attributes in the database include water quality, water levels, well production, and GPS locations. The GPS well locations supplied by MWA were compared to the water quality, water level, and water production data to assess data spatial distribution within the MWA. A database query that contains well number, well depth, perforated interval, well type and status is included as Appendix I.

Samples of spatial and temporal analyses utilizing the database and a geographic information system (GIS) are provided on Figures 4-10 and 4-11. A complete analysis of water quality within the Basin is extremely labor intensive and beyond the scope of this Plan, but the Agency anticipates undertaking this effort in the near future.

Figure 4-10 displays the wells within the current database that have at least one historical measurement for total dissolved solids (TDS) above 500 mg/L. Using GIS to analyze water quality is beneficial for locating areas with particular water quality concerns. As seen on the plot the densest concentration of wells with TDS measurements above 500 mg/L is in the Barstow area. It is important to note that the majority of monitoring wells are concentrated in the Floodplain Aquifer and thus the majority of water quality measurements are taken from the Floodplain Aquifer.

Additional monitoring wells in the Regional Aquifer would help evaluate differences in water quality between the two aquifers. Besides spatial analysis, a temporal analysis can be done to evaluate how water level fluctuations affect water quality. Figure 4-11 displays the water level and TDS measurements for State Well 08N03W05J01.

As part of future efforts, the entire database could be linked to a GIS to provide spatial analyses of water level data and all water quality parameters within the Basin. Additional work could also focus on collecting, filtering, and adding supplementary water quality data available from the Department of Health Services and local agencies within the MWA service area.



Schlumberger Water Services

Groundwater Wells Measuring Above 500 mg/L Total Dissolved Solids

Mojave Water Agency
Regional Water Management Plan Update

Figure 4-10

Date: January 2004

Prepared By: KTW

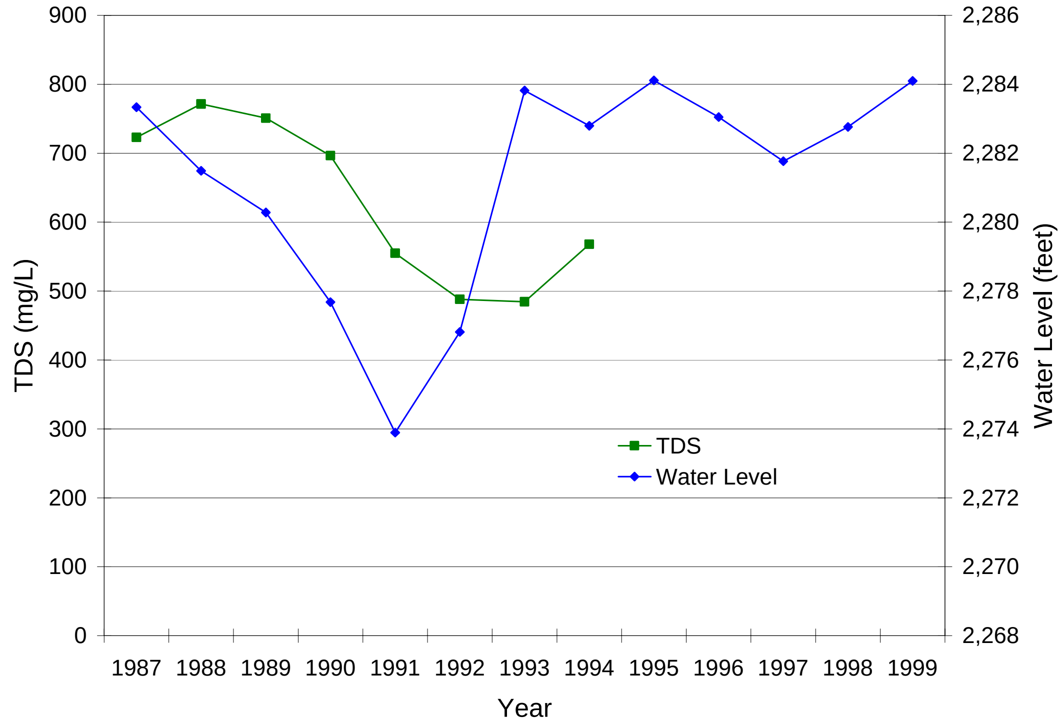


Figure 4-11: Total Dissolved Solids (TDS) with Water Level (feet above mean sea level) for State Well 08N03WO5JO1

State Water Project

MWA is entitled to 75,800 acre-feet of State Water Project (SWP) water per year. This includes the addition of 25,000 acre-feet of entitlement that was purchased from the Berrenda-Mesa Water District in 1998. Imported SWP water has historically been supplied to the MWA through the Mojave Basin and Morongo Basin pipelines and releases from Silverwood Lake. The State Water Project has delivered approximately 150,000 acre-feet of water to MWA from 1972 through 2001 (DWR 2001, and MWA). Table 4-7 summarizes the imported State Water Project water delivered to MWA.

Table 4-7: Deliveries of State Water Project Water to the MWA, 1978-2001

Year	Lake Silverwood[1]	Rock Springs[2]	Kramer Junction (AVEK)[3]	Hodge[4]	Lenwood[5]	Hi-Desert Pipeline[6]	Total
1978	22,500	0	0	0	0	0	22,500
1979	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	24,489	0	0	0	0	0	24,489
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	2,032	0	1,391	0	0	0	3,423
1992	9,334	30	1,310	0	0	0	10,674
1993	9,973	0	1,514	0	0	0	11,487
1994	819	15,434	1,399	0	0	0	17,652
1995	0	4,503	1,227	0	0	3,010	8,740
1996	0	2,134	1,316	0	0	3,977	7,427
1997	0	7,134	1,405	0	0	5,501	14,040
1998	0	2,190	1,345	0	0	2,357	5,892
1999	0	283	1,439	994	2,673	2,682	8,071
2000	0	2,451	1,361	2,144	1,476	3,930	11,362
2001	0	57	1,385	0	0	2,878	4,320
TOTAL	**69,147**	**34,216**	**15,092**	**3,138**	**4,149**	**24,335**	**150,077**

[1]Lake Silverwood releases do not include releases made by DWR for purposes other than delivery to MWA. Prior to construction of the Morongo Basin Pipeline, the only means to deliver SWP water to MWA was through releases at Cedar Springs Dam at Silverwood Lake, upstream of the West Fork Gage in the Alto Subarea. The 1978 releases were part of a conjunctive use demonstration project with the DWR. The 1983 releases were non-entitlement water purchased from the Central Valley and delivered by SWP facilities.

[2]The Rock Springs Outlet was constructed on the Morongo Basin Pipeline in 1994 to release SWP water into the Mojave River in the Alto Subarea near the City of Hesperia at Rock Springs Road approximately 5 miles downstream of the Forks. All subsequent deliveries to Alto have been made here.

[3]The MWA has an agreement with the Antelope Valley-East Kern Water Agency (AVEK) to transfer MWA entitlement to AVEK each year sufficient to allow AVEK to transport the MWA entitlement to a power plant in the Kramer Junction area within the MWA boundary (Centro Subarea).

[4]The Hodge recharge facility, located about 40 miles downstream of the Forks, was constructed in 1999 to deliver SWP water to the Centro Subarea from the Mojave River Pipeline.

[5]The Lenwood recharge facility, located about 48 miles downstream of the Forks, was constructed in 1999 to deliver SWP water to the Centro Subarea from the Mojave River Pipeline.

[6]The Morongo Basin Pipeline was completed to Landers in the Morongo Basin/Johnson Valley Area in 1994, and the Hi-Desert Pipeline extension was completed to the Town of Yucca Valley in 1995.

The only internal allocations of SWP water within MWA is for a maximum of 7,257 acre-feet to Improvement District M (IDM) located in the Morongo Basin/Johnson Valley Area. These allocation deliveries may be limited to the same percentage of total entitlement that MWA is approved to receive from the State Water Project by the State Department of Water Resources. Limitations have not occurred to date because neither MWA nor the IDM member entities have approached maximum delivery capability. MWA also has an existing agreement to transfer up to 2,250 acre-feet per year to the Antelope Valley-East Kern Water Agency (AVEK). The water is transported by AVEK to a power plant located near Kramer Junction within the MWA. One of the major issues raised by stakeholders in the basin is how the remaining SWP entitlement will be distributed in the basin.

Figure 4-12 displays historical deliveries of SWP water for the years 1978 to 2001 to all State Water Project Contractors (DWR 2001b). The figure shows the percent of water requested by the Contractors that was delivered. The SWP Contractors have received the entire amount of water requested 75% of the time. On average, Contractors received 88% of the water requested. There were six years during the early 90's, 2000 and 2001 when deliveries were less than 100 percent of request. The allocation of entitlement for 2001 was 39%. At this level of allocation, MWA would have been able to receive 29,600 acre-feet of water.

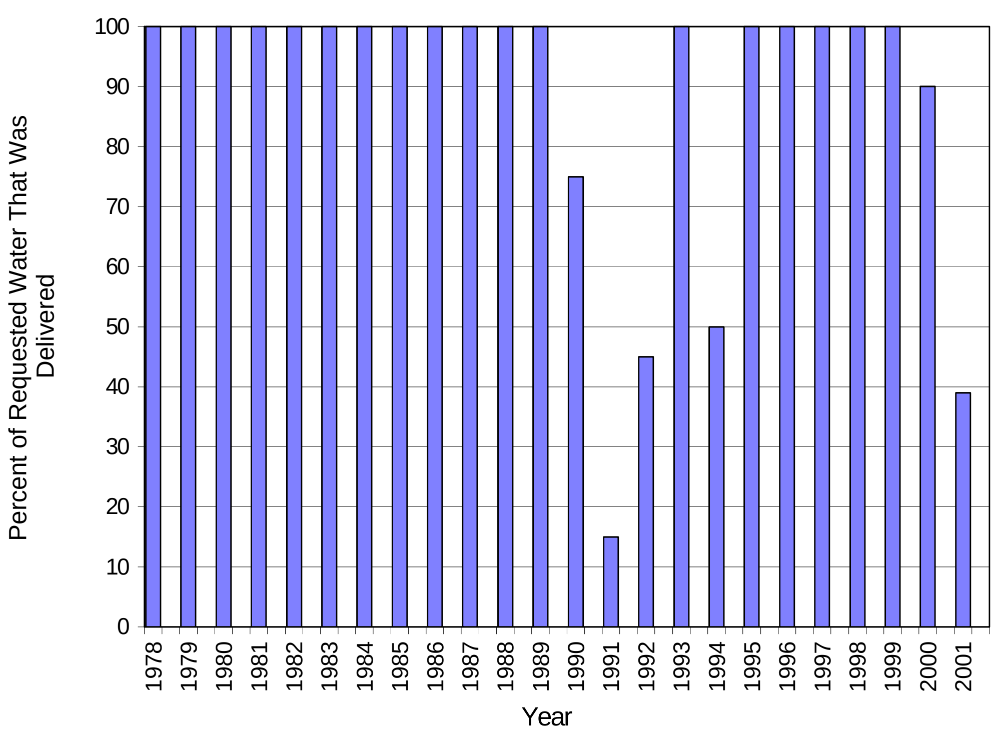


Figure 4-12: Historical SWP Percent of Deliveries Requested by Contractors

The variability of SWP deliveries is expected to increase in the future as Contractors request larger amounts of their maximum entitlement. System constraints such as Delta export restrictions and competition for the available water supply will increase management challenges. Even if MWA chooses to purchase its full entitlement of 75,800 acre-feet annually, its full entitlement will not be available every year. According to the State Water Project Reliability Report (DWR 2002), MWA can expect to receive an average of 58,400 acre-feet of its SWP supply under 2020 conditions. This estimate is based on 2020 demand projections with the current facilities in place. During a dry or critical year as defined by the Sacramento River Index, the SWP will be able to supply an average of 43,200 acre-feet. During a multiple dry year period (1988-1990), MWA's SWP supply will be about 22,900 acre-feet/year. Table 4-8 shows the average annual SWP supply available during all years, dry years, and in a multiple dry-year period. Figure 4-13 shows the projected probability of exceedance of SWP deliveries to MWA in 2020.

Table 4-8: Average Annual State Water Project Supplies

Year Type	State Water Project Supply (Acre-feet per Year)
Average	58,400
Dry Year	43,200
Multiple Dry Year	22,900

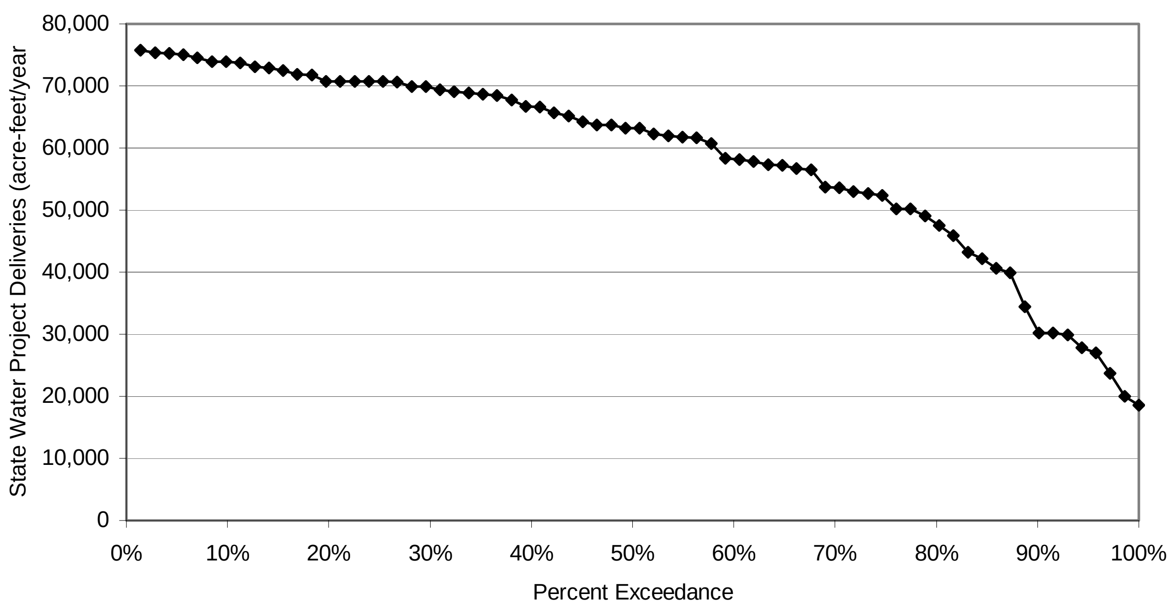


Figure 4-13: Percent Exceedence of SWP Deliveries in 2020

The recent history of deliveries and current efforts to improve system flexibility and reliability indicate that deliveries from the SWP will continue to be variable for the next ten to fifteen years. Efforts to meet water supply delivery objectives continue to be developed by the Department of Water Resources and the State Water Contractors. For example, contract provisions allow for the delivery of "interruptible" water supplies to Contractors during periods of abundant water supply after other SWP water supply and storage objectives have been met. The Contractors and the Department also continue to develop programs allowing transfers of entitlement between Contractors to maximize storage of Project water supplies when available.

MWA currently has an entitlement exchange program in place with the Solano County Water Agency (SCWA). This Agreement allows MWA to receive entitlement deliveries from the SCWA during hydrologic periods when the SCWA has approved entitlement in excess of their needs. MWA will subsequently allow the SCWA to utilize some of their approved entitlement during periods of drought, but not more than half of the quantity of SCWA entitlement that has previously been delivered to MWA. It is possible that in some years MWA could receive more than its full entitlement due to these programs. Therefore basin recharge alternatives designed to use SWP water should consider the effects of a variable water supply.

Water Quality

MWA's groundwater basins contain numerous areas with water quality issues. These issues are described in Chapter 8. Key contaminants include arsenic, nitrates, iron, manganese, Chromium VI, total dissolved solids (TDS), total petroleum hydrocarbons (TPH), and volatile organic compounds (VOC's). Measurements in excess of drinking water standards have been found for many of these constituents within each subarea in the Mojave Basin Area and each subbasin within the Morongo Basin/Johnson Valley area. Groundwater in these areas will have to be treated or replaced.

Another potential water quality issue facing MWA is the accumulation of salt in the groundwater basins. Because the Mojave River Basin and Morongo Basin/Johnson Valley areas are closed basins, salt contained in imported reclaimed wastewater and State Water Project (SWP) supplies are mostly not removed from the basin. An average of about 5,400 acre-feet of reclaimed wastewater is discharged into the MWA from outside its boundary and about 8,400 acre-feet of State Water Project water are currently imported each year. MWA is planning to increase its SWP utilization to 58,000 acre-feet per year, which will further increase the introduction of salts into the system.

MWA has initiated efforts to develop a groundwater quality analysis system for the entire MWA service area. The project will include an evaluation of existing groundwater data and identification of data needs, the development of an information management system that will allow MWA to collect, reconcile, analyze, and access water quality information, and the development of a water quality and analysis system to meet MWA's long-term water quality objectives.

Digital well data provided by MWA was compiled in a Microsoft® Access 2000 Database for data query and analysis. Data attributes in the database include water quality, water levels, well production, and GPS locations. The GPS well locations supplied by MWA were compared to the water quality, water level, and water production data to assess data spatial distribution within the MWA. Groundwater quality for a number of constituents and for each subarea are presented in Figures 4–3 through 4–9.

Inconsistent Water Sources

Because water use within the MWA service area is supplied entirely by groundwater, MWA does not have any inconsistent water sources that cause reduced deliveries to users within the service area. A potential exception is areas where water quality could limit use as a potable supply. Wellhead treatment or provision of an alternative supply is planned for these areas. While many of the sources that recharge the groundwater basin have high annual variability, including flows on the Mojave River and supplies from the State Water Project, the groundwater basins used within the MWA service area are sufficiently large to allow for continued water use during dry periods with only a temporary decline in groundwater levels.

Planned Water Supply Sources Through 2020 in Five-year Increments

The amount of available water supply to the Mojave Water Agency is not expected to change between now and 2020. In addition to its net average annual supply of 63,400 acre-feet per year, MWA has an average annual SWP supply of 58,400 acre-feet per year, for a total supply of 121,800 acre-feet per year. Table 4-9 shows the availability of each of these types of water in five-year increments through 2020.

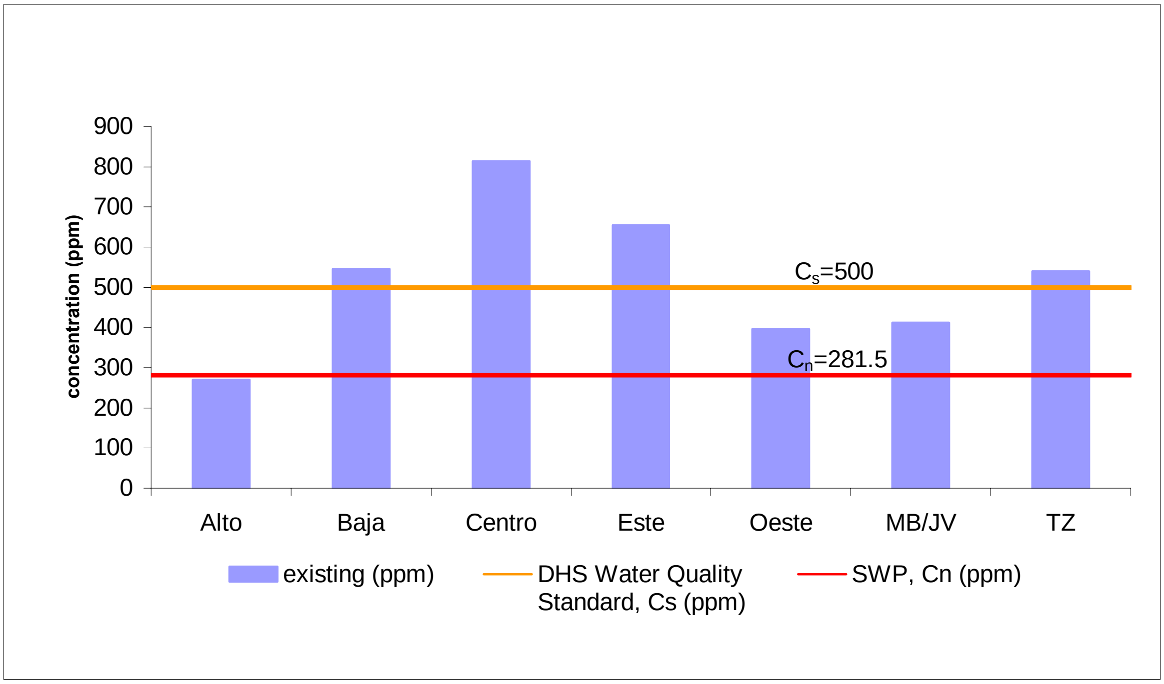


Figure 4-14: Total Dissolved Solids

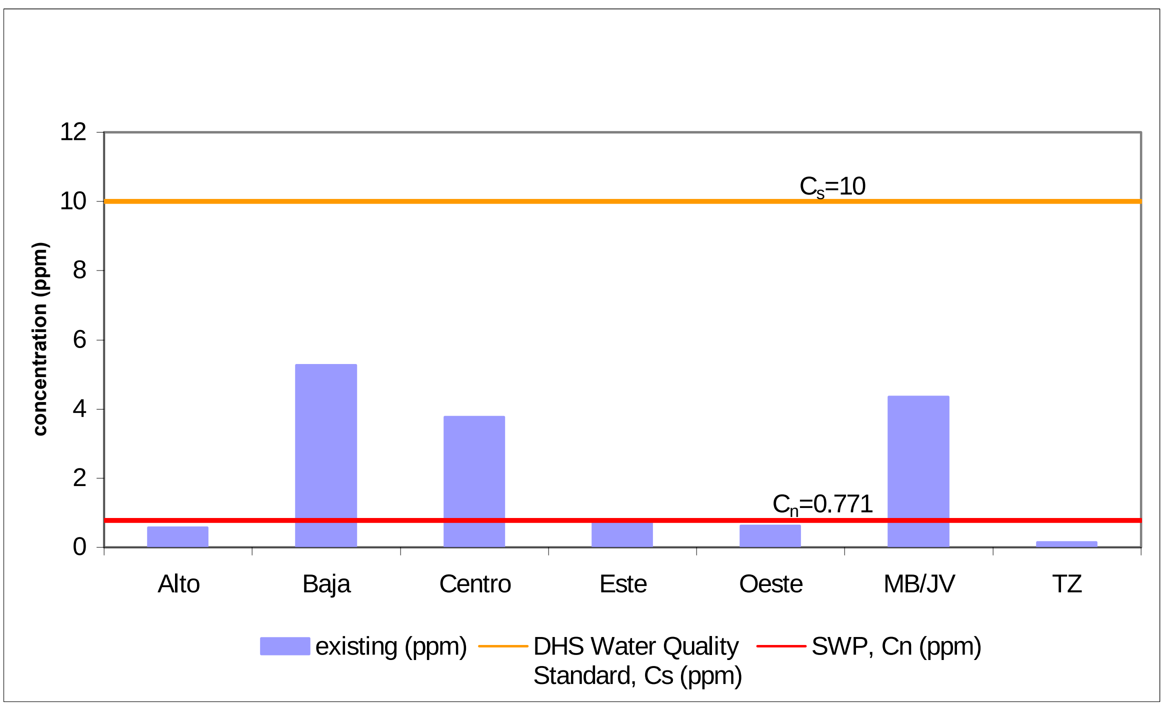


Figure 4-15: Nitrates

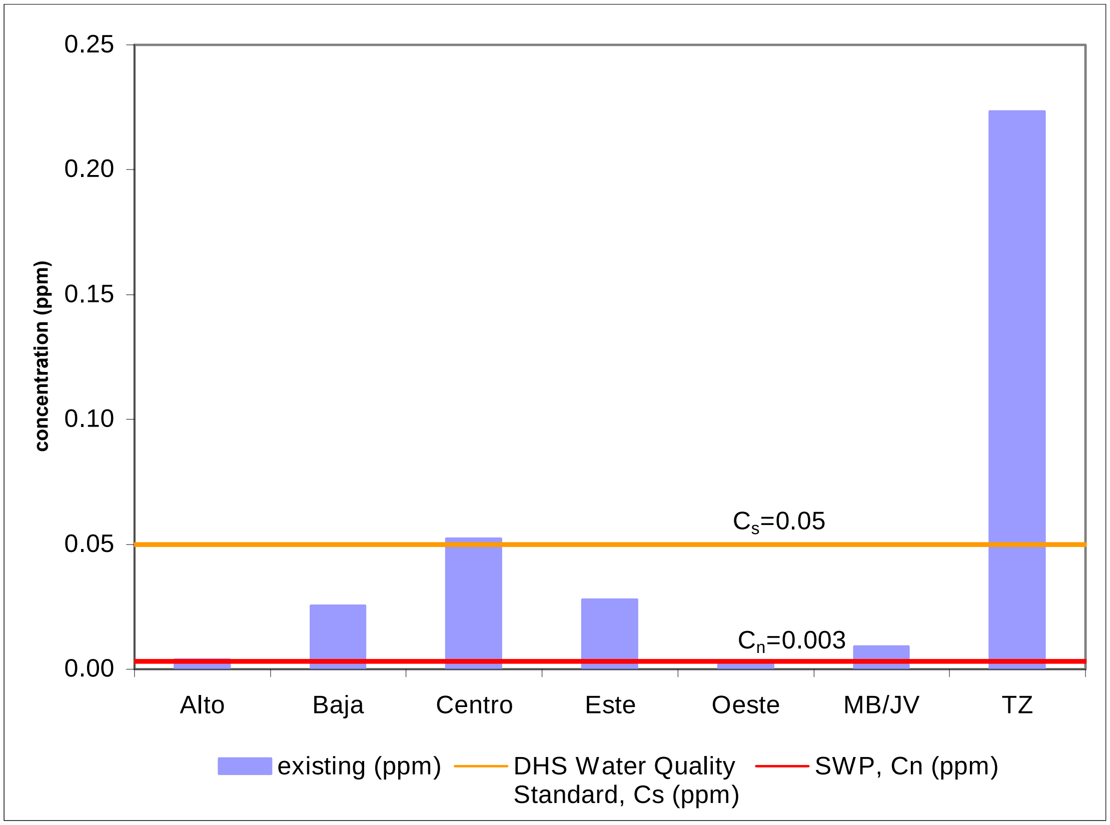


Figure 4-16: Manganese

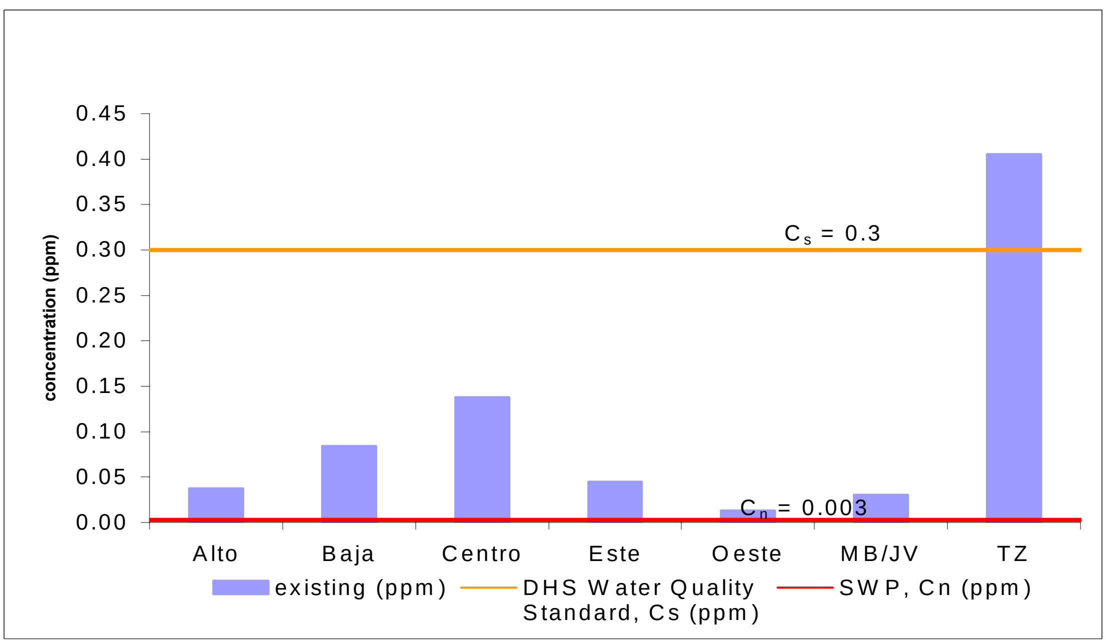


Figure 4-17: Iron

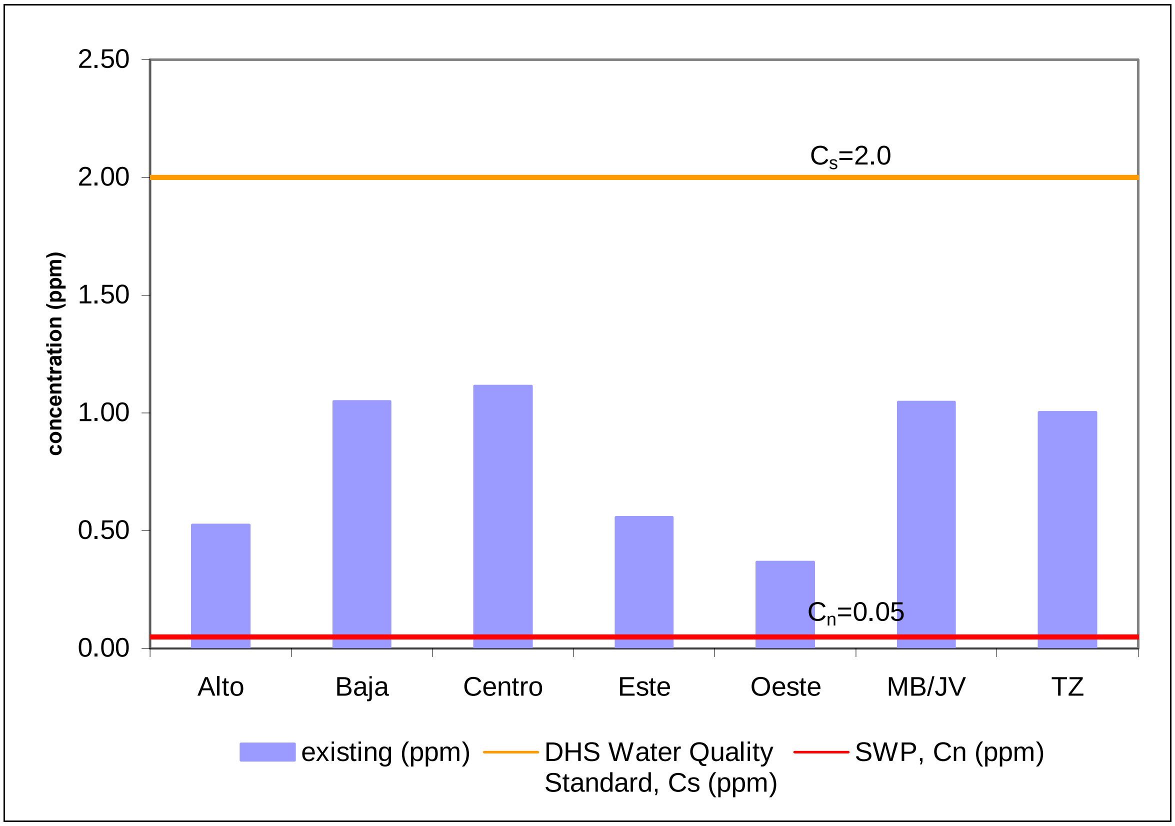


Figure 4-18: Fluoride

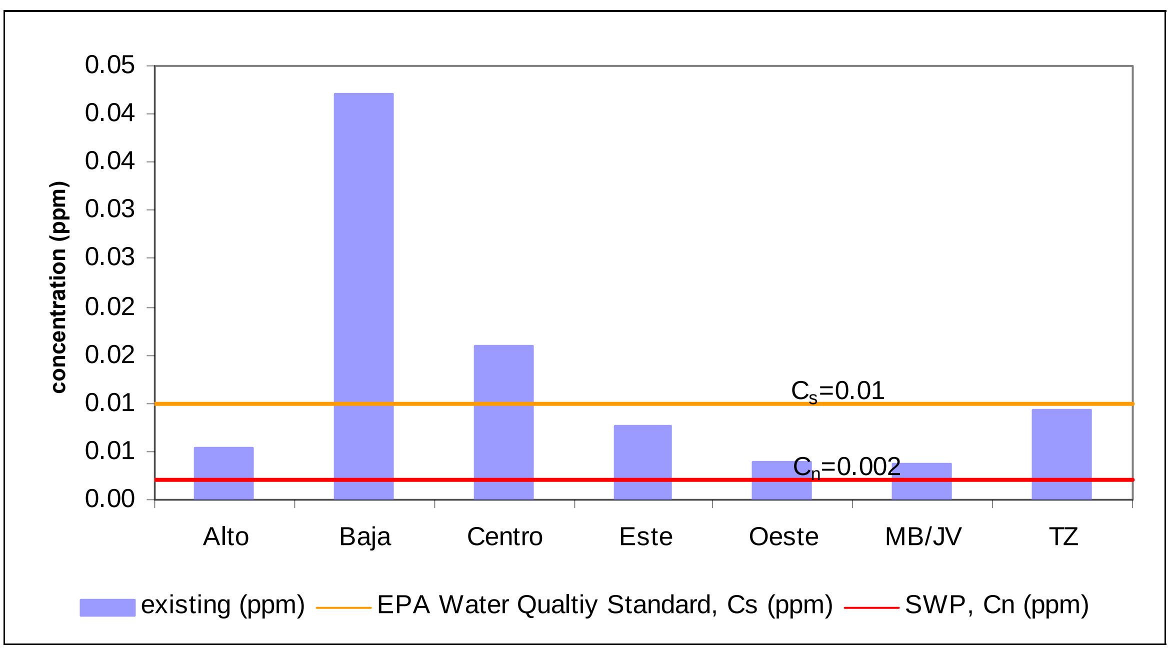


Figure 4-9: Arsenic

Water Quality and Management Strategies

The quality of water dictates numerous management strategies a water purveyor will implement, including, but not limited to, the selection of raw water sources, treatment alternatives, blending options, and modifications to existing treatment facilities. Maintaining and utilizing high quality sources of water simplifies management strategies by increasing water supply alternatives, water supply reliability, and decreasing the cost of treatment. The source water supplies are of good quality. Maintaining high quality source water allows for efficiently management of water resources by minimizing costs while distributing high quality water.

Water Quality and Supply Reliability

Maintaining the quality of water supplies increases the reliability of each source by ensuring that deliveries are not interrupted due to water quality concerns. A direct result from the degradation of a water supply source is increased treatment cost before consumption. The poorer the quality of the source water, the greater the treatment cost. Groundwater may degrade in quality to the point that is not economically feasible for treatment. In this scenario the degraded source water is taken off-line. This in turn decreases water supply reliability by decreasing the total supply and increasing demands on alternative water supplies.

Currently, water quality does not affect water supply reliability. Maintaining the current level of quality is vital to maintaining a reliable water supply.

Table 4-9: Available Water Supply Sources Through 2020

Supply Type	2000	2005	2010	2015	2020
Natural*	63,400	63,400	63,400	63,400	63,400
SWP	58,400	58,400	58,400	58,400	58,400
Total	121,800	121,800	121,800	121,800	121,800

*Average annual natural water supply data as shown in Table 4-2

Opportunities for Short and Long-Term Transfers

MWA is expected to have an estimated 400,000 acre-feet of unused State Water Project supply between now and 2020. One option for utilizing this supply would be to transfer a portion of it to another party as part of a storage agreement or exchange program. MWA and the Metropolitan Water District of Southern California (Metropolitan) recently agreed on a Water Exchange Pilot Program with the goals of facilitating a water exchange in the short term and helping to determine the feasibility of a similar long-term exchange program between the two parties. Under the terms of the Pilot Program, Metropolitan will deliver to Mojave up to 75,000 acre-feet of its SWP deliveries or other water. In exchange, in years when Metropolitan requests water, MWA will provide Metropolitan water through exchange of MWA's SWP deliveries for that year.

In addition, the rules of the Mojave Basin Area Adjudication allow for the possibility of in-basin transfers. Under the rules of the Judgment producers are allowed to sell unused Base Annual Production (BAP) and Free Production Allowance (FPA) to other parties within the same subarea. This mechanism allows industrial and municipal users to purchase BAP from agricultural or other users to augment their ability to pump water. Table 4-10 summarizes the amount of transfers that have occurred in each subarea through 2002.

Table 4-10: Permanent Transfers of Base Annual Production by Subarea WY94-02

Year Type	BAP Transfers (Acre-feet)
Alto	22,941
Baja	24,928
Centro	28,566
Este	5,248
Oeste	1,247
Total	82,930

Timeline for Implementation of Proposed Projects

As part of the RWMP Update, 19 projects and management actions were identified to address the water supply and water quality issues that MWA must address to provide a sustainable water supply through 2020. These projects and management actions can be found in Appendix B. This list includes both MWA and non-MWA projects, as well as projects and actions that might be developed in partnership with MWA. The following projects have been identified as having the highest priority:

- implementing 10% municipal conservation in the Mojave Basin and 5% in Morango Basin/Johnson Valley
- wastewater reclamation in Alto
- wellhead treatment in Alto
- recharge in the Alto Floodplain and Regional and Warren Valley aquifers
- providing a new water supply for Pioneertown

Each of these projects will begin implementation within the next 3-5 years.

The following projects have lower priority, but are being evaluated for possible implementation by 2020:

- a regional treatment plant in Alto
- recharge in the Alto Transition Zone, Baja, Centro, Este, Oeste, Copper Mountain Valley, and Means/Ames Valley
- providing a new water supply for Hinkley

5

WATER DEMAND

Introduction

As discussed in Chapter 3, the Mojave Water Agency (MWA) consists of two distinct hydrologic planning areas referred to as the Mojave Basin Area and the Morongo Basin/Johnson Valley Area. The Mojave Basin Area is further sub-divided into five subareas (hydrologic subbasins) known as Alto, Baja, Centro, Este, and Oeste. The Morongo Basin/Johnson Valley Area also contains four hydrologic subbasins referred to as Johnson Valley, Means/Ames Valley, Copper Mountain Valley and Warren Valley Basins. These subareas are used for planning purposes to determine safe yield and to report groundwater well production.

Since 1994, MWA has tabulated production in these planning subareas organized by demand sector. The demand sectors include agriculture, municipal, industrial, golf courses and parks, and recreational lakes. These data are used to characterize the current water demand within each subarea and also to project possible future water production within each sector in each subarea.

Groundwater production is an accurate measure of the water demand within each subarea, but it cannot be compared directly with the water supply estimates presented in Chapter 4. A portion of the water pumped is returned to the groundwater aquifer and becomes part of the available water supply. For example, much of the water applied to agriculture, golf courses, and parks percolates back to the groundwater aquifer. The portion of the groundwater pumped that does not return to the aquifer is referred to as consumptive use. In this chapter, consumptive use totals are presented rather than groundwater production to allow for a direct comparison with the estimated water supply in each subarea. The consumptive use rates used in this report are derived from Webb (2000), which performed a detailed analysis of the production and consumptive use for each subarea within the Mojave Basin Area.

Production and consumptive use are two important concepts. Consumptive use values are presented in this chapter.

This chapter presents the current and projected future consumptive use for each subarea. All of the data contained in this chapter is presented by water year. For a detailed discussion of the data available and of the methods used to generate the numbers presented in this chapter, please refer to Appendix C.

Current Water Demand

Demographics

Table 5-1 shows the 1990 and 2000 estimated populations for each subarea in the Mojave Basin Area and for each subbasin in the Morongo Basin/Johnson Valley Area in 1990 and 2000. The population increased in every subarea in the Mojave.

Table 5-1: Comparison of Actual and Projected 2000 Population

	1990 Actual[1]	2000 Actual	Annual Pct Change	2000 Projected[1]	Percent Difference
Mojave Basin Area					
Alto	180,700	236,600	+2.7%	259,200	-8.7%
Baja	8,800	5,100	-5.3%	12,600	-59.5%
Centro	33,000	33,700	+0.2%	47,300	-28.8%
Este	5,300	6,000	+1.2%	7,600	-21.1%
Oeste	5,800	7,400	+2.5%	8,300	-10.8%
Subtotal Mojave	233,600	288,800	+2.1%	335,000	-13.8%
MB/JV Area[2]					
Copper Mtn. Valley	10,200	9,600	-0.6%	11,500	-27.5%
Johnson Valley	N/A	400	N/A	N/A	N/A
Means/Ames Valley	4,700	7,500	+4.8%	5,900	+27.0%
Warren Valley	24,300	14,700	-4.9%	32,700	-55.0%
Subtotal MB/JV	39,200	32,200	-1.9%	51,900	-37.9%
Total	**272,800**	**321,000**	**+1.6%**	**386,900**	**-17.0%**

[1]1990 actual and 2000 projected population estimates from 1994 RWMP.
[2]Morongo Basin/Johnson Valley subbasin populations represent the population served by each subbasin, not the population that overlies the subbasin. This assumption is consistent with the 1994 RWMP.

Basin Area except for Baja. The largest increase was in Alto, which experienced an annual percent growth rate of 2.7% per year between 1990 and 2000. Baja showed a population reduction of 5.3% per year between 1990 and 2000. The overall population of the Mojave Basin Area increased from about 234,000 to about 289,000 between 1990 and 2000.

The 2000 population of the Morongo Basin/Johnson Valley area is estimated to be about 32,000 in 2000, which is about 7,000 less that the estimate for 1990 in the 1994 RWMP. However, many people in the area suspect that the 1990 population was overestimated. The population estimates shown in Table 5-1 represent the population served by the production in each groundwater basin. These estimates do not therefore necessarily represent the population living in any particular geographic area. This assumption is consistent with the 1994 RWMP. For example, the Hi-Desert Water District (HDWD) operates production wells that draw from both the Means/Ames Valley and Warren Valley subbasins. Between 1990 and 2000, the quantity of water that was extracted by HDWD in the Means/Ames Valley subbasin was greatly increased due to the operation of the newly drilled Well #24, and the extractions from the Warren Valley subbasin were correspondingly reduced. This shift in production is the reason why the Means/Ames subbasin shows a 4.8% average annual increase in population and the Warren Valley subbasin shows a 4.9% decrease in population between 1990 and 2000. If HDWD had continued to pump primarily from the Warren Valley subbasin in 2000 as it had in 1990, the population served by both the Means/Ames and Warren Valley subbasins would have been less in 2000 than it was in 1990.

Table 5-1 also shows the projected 2000 populations from the 1994 Regional Water Management Plan (RWMP). Every subarea and subbasin in the Mojave Water Agency except for the Means/Ames subbasin experienced less growth than was projected in the 1994 RWMP. The increase in population shown for the Means/Ames Valley subbasin does not represent an increase in actual population, but a shift in service for a portion of HDWD from the Warren Valley subbasin.

The overall population of the Mojave Water Agency increased from about 273,000 in 1990 to about 321,000 in 2000, which represents an average annual growth rate of 1.6% per year. The year 2000 population was 17% less than what was projected in the 1994 RWMP.

Table 5-2 shows year 2000 estimates of population, housing units, average household size, land area and population per acre for individual cities within the Mojave Water Agency.

Table 5-2: Year 2000 Demographic Data for Selected Cities

City	Subarea	Population*	Housing Units*	Average Household Size*	Land Area (sq. miles)	Population per acre
Adelanto	Alto	18,130	5,547	3.53	63	0.45
Apple Valley	Alto	54,239	20,163	2.90	73	1.16
Barstow	Centro	21,119	9,153	2.71	33	1.00
Hesperia	Alto	62,582	21,348	3.12	67	1.45
Victorville	Alto	64,029	22,498	3.03	74	1.35
Yucca Valley	MB/JV Area	16,865	7,952	2.38	40	0.66

*Population, Housing Unit and Household Size data from 2000 U.S. Census

Consumptive Use

Table 5-3 summarizes the difference between the projected consumptive use estimates for 1995 and 2000 by the 1994 RWMP and actual consumptive use estimates for those two years. Figures 5-1, 5-2 and 5-3 graphically present the Mojave Basin Area data from Table 5-3. The actual urban consumptive use in the Mojave Basin Area was 7% higher than the projected amount for 1995 while agricultural consumptive use was 23% less than the projected amount. The Mojave Basin Area urban consumptive use for year 2000 was 14% greater than projected and the agricultural consumptive use was about 44% less than projected. In the Morongo Basin/Johnson Valley area, the actual consumptive use was 17% less than the projected consumptive use in 1995 and 32% less in 2000.

Table 5-3: 1995 and 2000 Projected and Actual Consumptive Use (Acre-feet/year)

	1995 Projected	1995 Actual	Difference	Percent Difference
Mojave Basin Area				
Urban Uses*	53,800	57,500	3,700	7%
Agricultural Uses	70,500	54,400	-16,100	-23%
Subtotal Mojave	124,300	111,900	-12,400	-10%
MB/JV Area				
Urban Uses*	3,270	2,700	-570	-17%
Total	**127,600**	**114,600**	**-13,000**	**-10%**

	2000 Projected	2000 Actual	Difference	Percent Difference
Mojave Basin Area				
Urban Uses*	61,700	70,300	8,600	14%
Agricultural Uses	62,600	34,900	-27,700	-44%
Subtotal Mojave	124,300	105,200	-19,100	-15%
MB/JV Area				
Urban Uses*	3,810	2,600	-1,210	-32%
Total	**128,100**	**107,800**	**-20,300**	**-16%**

*Urban uses include municipal, industrial, golf course, and recreational water uses

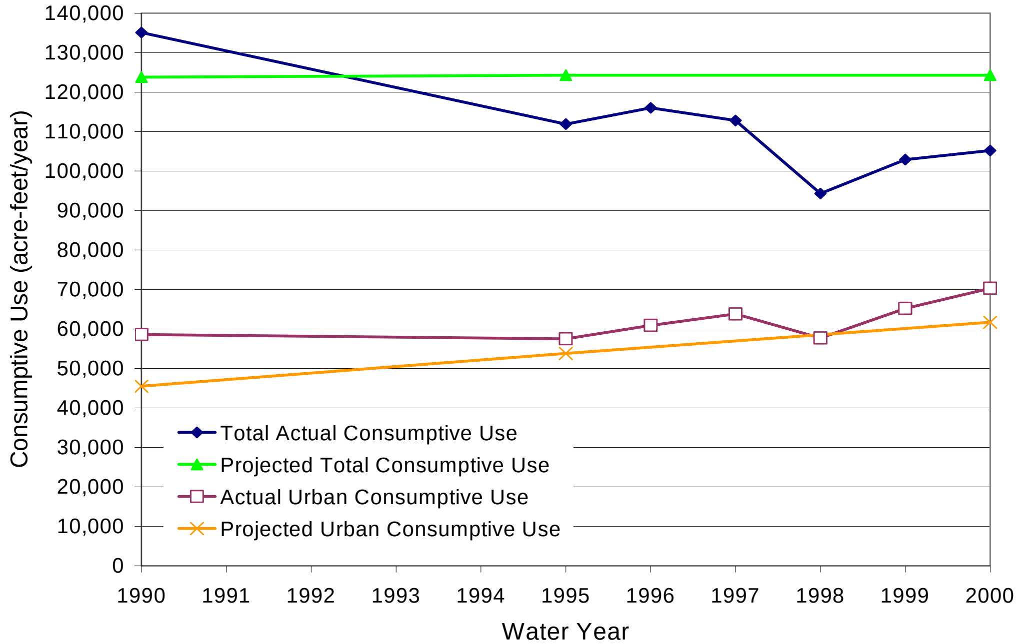


Figure 5-1: Mojave Basin Area Actual Total and Urban Consumptive Use for1990 - 2000 and 1994 RWMP Projected Use

The 1994 RWMP projected a 1.1% total increase in total Mojave Water Agency consumptive use between 1990 and 2000. The actual consumptive use during this period decreased by 14.9%, which represents a decline of about 18,700 acre-feet.

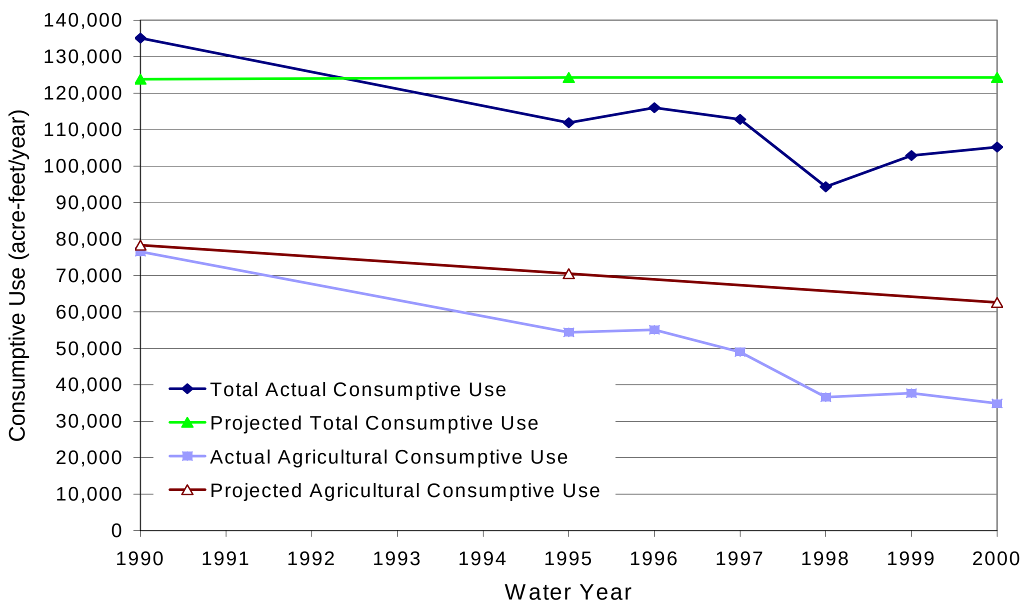


Figure 5-2: Mojave Basin Area Actual Total and Agricultural Consumptive Use for 1990-2000 and 1994 RWMP Projected Use

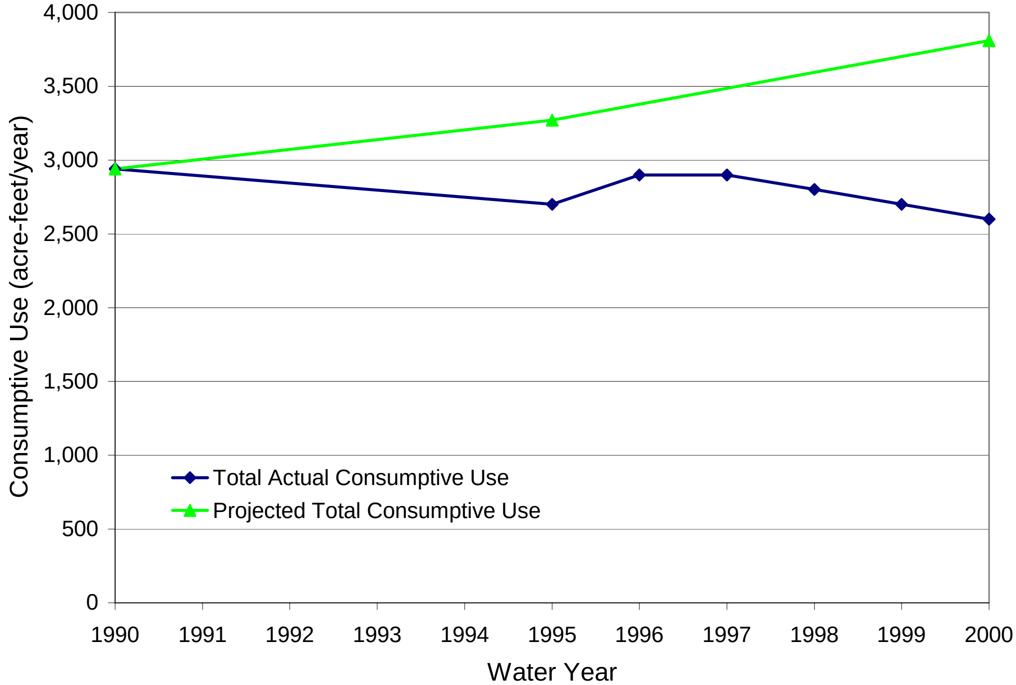


Figure 5-3: Morongo Basin/Johnson Valley Area Actual Total Consumptive Use for 1990-2000 and 1994 RWMP Projected Use

Mojave Basin Area

The urban consumptive use amounts cited above include all of the non-agricultural uses such as industrial, municipal, golf courses and parks, and recreational lakes. MWA has more recently estimated production for each of these uses separately. Table 5-4 shows estimates of historical consumptive use from 1995 to 2001 for each subarea in the Mojave Basin Area for the various water uses identified above. Figure 5-4 shows the total Mojave Basin Area consumptive use estimates during this time period. The municipal consumptive use estimates in Alto and Oeste have been adjusted to account for the operation of County Service Area (CSA) 70L. While the population of CSA 70L is almost evenly split between Alto and Oeste, about 80% of the production is in Oeste. As a result, the municipal consumptive use estimates in Oeste are greater than 50% of production while the estimates for Alto are less than 50% of production.

Agricultural consumptive use has been declining in all subareas in the Mojave Basin Area since about 1990 while other consumptive uses have remained fairly constant since 1995. The additional decrease in consumptive use of applied water during 1998 as shown on Figure 5-4 was possibly the result of an unusually large amount of local precipitation during that year.

Figures 5-5 through 5-9 show the consumptive use in Alto, Baja, Centro, Este, and Oeste for the various types of use from 1995 through 2001. The recent trends within each subarea are discussed briefly below.

Alto (Figure 5-5)

Since 1995, municipal consumptive use has increased 16.5% from 28,400 acre-feet to 33,100 acre-feet. During the same time period, however, agricultural consumptive use in Alto has decreased by 72.2%, from 9,000 acre-feet to 2,500 acre-feet. As a result, total consumptive use in Alto has remained fairly steady in recent years.

Baja (Figure 5-6)

Agriculture is the primary use of water in the Baja Subarea. Between 1995 and 2001, agricultural consumptive use in Baja declined by 31.4%, from 22,300 acre-feet to 15,300 acre-feet. Industrial consumptive use has increased by 350% since 1995, from 1,400 acre-feet to 6,300 acre-feet in 2001, due mostly to an increase in water use by power generating facilities in the area. Between 1995 and 2001 total consumptive use in the Baja Subarea declined by 1,900 acre-feet.

Centro (Figure 5-7)

In Centro, both agricultural and urban consumptive use has been declining in recent years. Between 1995 and 2001, municipal and industrial use declined by about 11.6% from 8,600 acre-feet to 7,600 acre-feet. Agricultural consumptive use declined by 59.2%, from 16,900 acre-feet to 6,900 acre-feet. Total consumptive use in Centro has declined from 25,700 acre-feet to 14,700 acre-feet between 1995 and 2001.

Este (Figure 5-8)

Agricultural water use has been decreasing in recent years in Este. Between 1995 and 2001 agricultural consumptive use decreased by 29.3%, from 4,100 acre-feet to 2,900 acre-feet. Urban consumptive use remained fairly constant during these years. Total consumptive use in Este was about 4,600 acre-feet in 2001, compared to 6,300 acre-feet in 1995.

Oeste (Figure 5-9)

Oeste agricultural consumptive use in 2001 was 1,000 acre-feet, compared to 2,100 acre-feet in 1995. Municipal consumptive use has increased between 1995 and 2001 from 1,500 acre-feet to 1,900 acre-feet. Because the decrease in agricultural consumptive use has been greater than the increase in urban use, total consumptive use in Oeste decreased by 700 acre-feet between 1995 and 2001.

Table 5-4: Mojave Basin Area Historical Consumptive Use (Acre-feet/year)

Alto	1995	1996	1997	1998	1999	2000	2001
Agricultural	9,000	8,200	9,100	4,800	4,500	3,800	2,500
Industrial	5,300	4,000	3,700	3,100	4,000	4,200	3,900
Municipal	28,400	32,000	31,900	28,800	31,300	34,400	33,100
Golf Courses	2,500	2,300	2,200	2,300	2,800	2,200	2,400
Recreational	2,800	3,800	4,100	4,900	6,100	6,900	5,800
Total	**48,000**	**50,300**	**51,000**	**43,900**	**48,700**	**51,500**	**47,700**
Baja	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Agricultural	22,300	24,900	21,000	18,300	18,800	17,700	15,300
Industrial	1,400	1,100	3,300	2,500	4,300	5,500	6,300
Municipal	2,000	2,800	2,200	1,700	2,400	2,500	2,400
Golf Courses	0	0	0	0	0	0	0
Recreational	2,600	2,300	3,200	3,900	2,600	2,500	2,400
Total	**28,300**	**31,100**	**29,700**	**26,400**	**28,100**	**28,200**	**26,400**
Centro	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Agricultural	16,900	14,900	12,600	8,400	9,800	8,900	6,900
Industrial	2,500	2,500	2,700	1,600	1,800	1,900	1,900
Municipal	6,100	6,600	6,500	5,700	5,900	6,300	5,700
Golf Courses	200	200	200	100	200	200	200
Recreational	0	0	0	0	0	0	0
Total	**25,700**	**24,200**	**22,000**	**15,800**	**17,700**	**17,300**	**14,700**
Este	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Agricultural	4,100	4,800	4,000	3,300	3,200	3,200	2,900
Industrial	1,500	800	1,300	800	1,000	900	700
Municipal	700	900	900	900	900	900	1,000
Golf Courses	0	0	0	0	0	0	0
Recreational	0	0	0	0	0	0	0
Total	**6,300**	**6,500**	**6,200**	**5,000**	**5,100**	**5,000**	**4,600**
Oeste	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Agricultural	2,100	2,300	2,300	1,800	1,400	1,300	1,000
Industrial	0	0	0	0	0	0	0
Municipal	1,500	1,600	1,600	1,400	1,900	1,900	1,900
Golf Courses	0	0	0	0	0	0	0
Recreational	0	0	0	0	0	0	0
Total	**3,600**	**3,900**	**3,900**	**3,200**	**3,300**	**3,200**	**2,900**
Total Mojave Basin Area	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Agricultural	54,400	55,100	49,000	36,600	37,700	34,900	28,600
Industrial	10,700	8,400	11,000	8,000	11,100	12,500	12,800
Municipal	38,700	43,900	43,100	38,500	42,400	46,000	44,100
Golf Courses	2,700	2,500	2,400	2,400	3,000	2,400	2,600
Recreational	5,400	6,100	7,300	8,800	8,700	9,400	8,200
Total	**111,900**	**116,000**	**112,800**	**94,300**	**102,900**	**105,200**	**96,300**

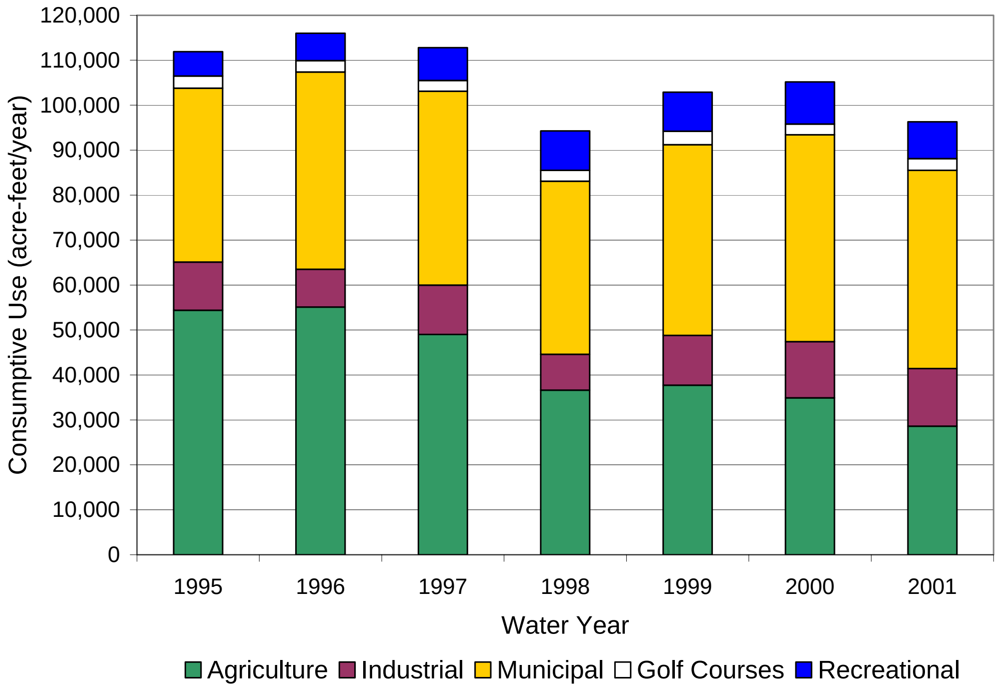


Figure 5-4: Mojave Basin Area Total Consumptive Use by Sector for 1995-2001

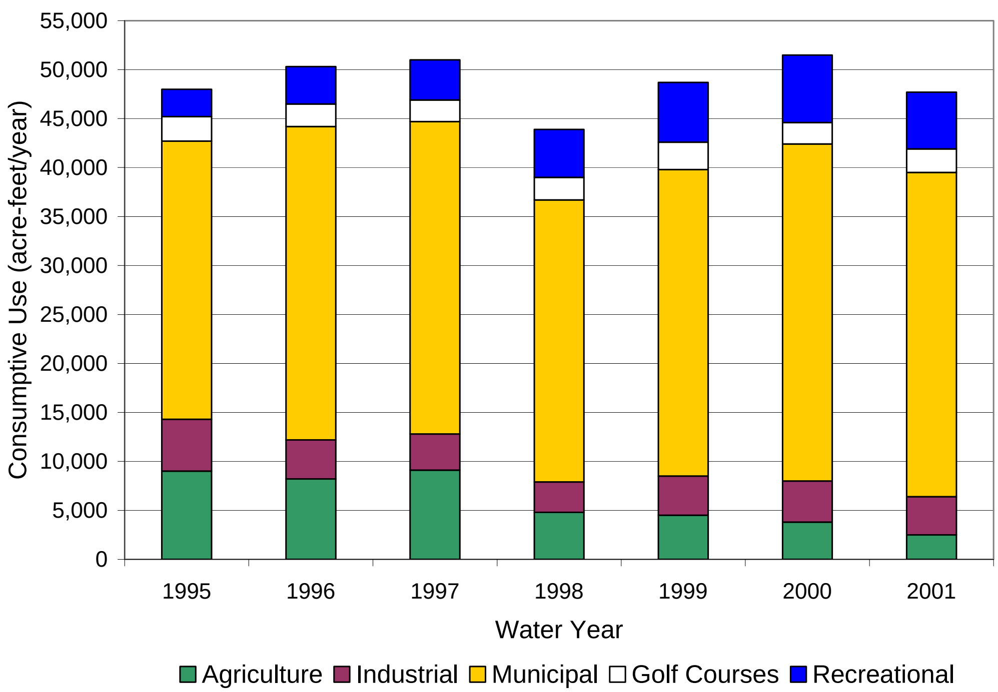


Figure 5-5: Alto Subarea Consumptive Use by Sector for 1995-2001

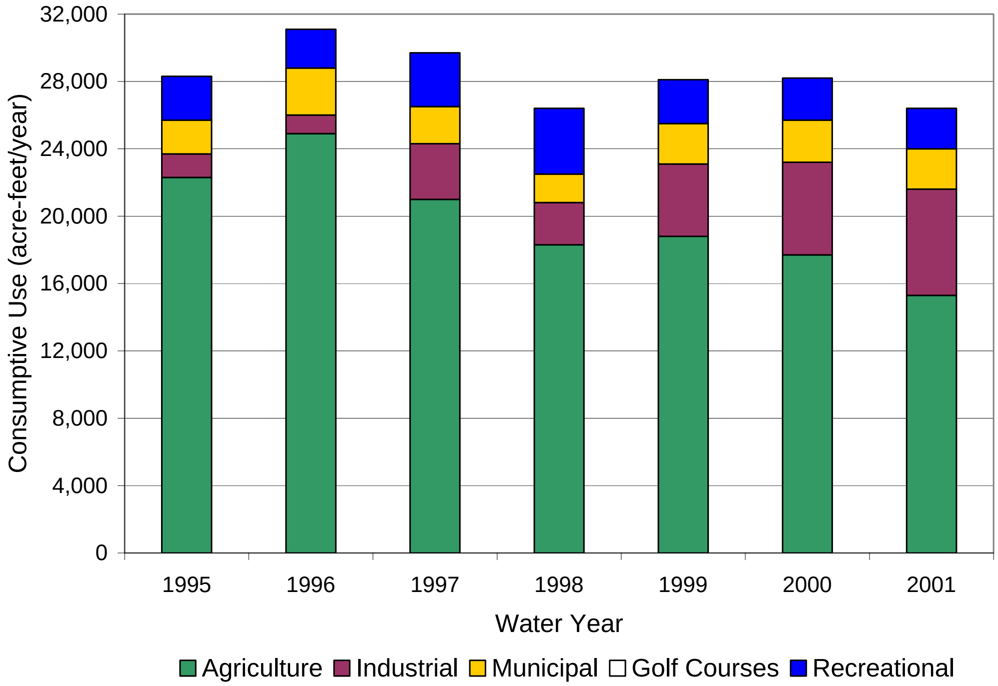


Figure 5-6: Baja Subarea Consumptive Use by Sector for 1995-2001

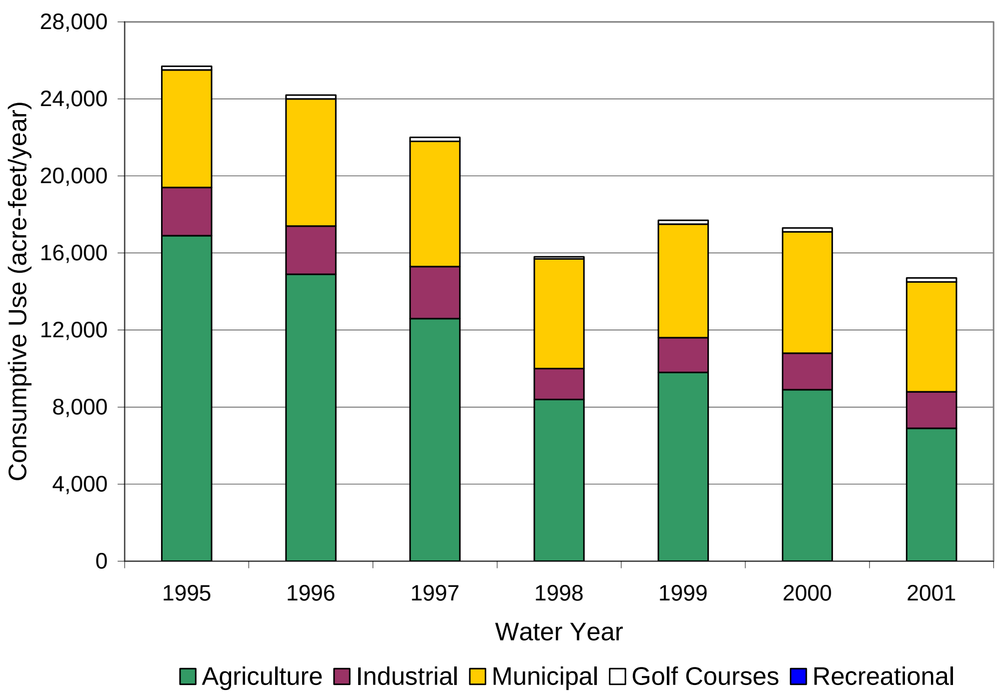


Figure 5-7: Centro Subarea Consumptive Use by Sector for 1995-2001

Figure 5-8: Este Subarea Consumptive Use by Sector for 1995-2001

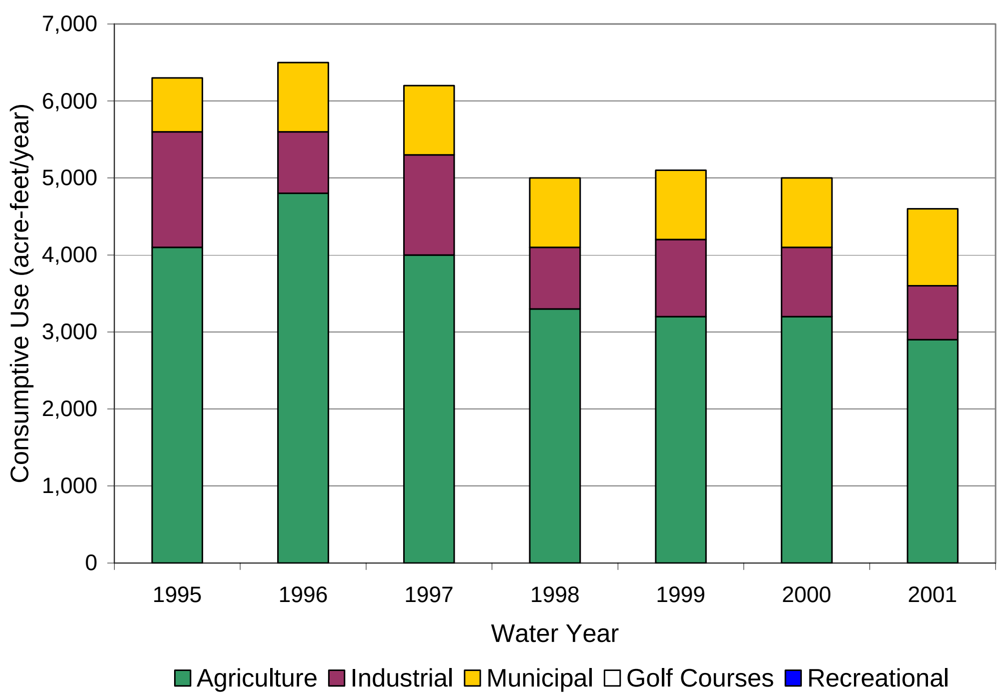


Figure 5-9: Oeste Subarea Consumptive Use by Sector for 1995-2001

Morongo Basin/Johnson Valley Area

Table 5-5 shows consumptive use estimates for each demand sector within each subbasin in the Morongo Basin/Johnson Valley Area. Because production estimates were not available in the Morongo Basin/Johnson Valley Area for 2001, Table 5-5 shows consumptive use estimates from 1995-2000. Production data is not available for the Johnson Valley subbasin. The consumptive use estimate for the Johnson Valley Area for 2000 was determined using the 2000 population estimate shown in Table 5-1 and assuming that the per capita use was the same as the remainder of the Morongo Basin/Johnson Valley Area.

The municipal consumptive use in the Means/Ames Valley and Warren Valley subbasins has not necessarily been proportional to the production in each of those subbasins. This is due to: (1) the pumping operation of the HDWD, which overlies both subbasins and has production wells in each subbasin, and (2) the operation of the Bighorn Desert View Intertie, through which water pumped outside of HDWD in the Means/Ames Valley subbasin was transferred to HDWD in 1995, 1996 and 2000. In 2000, 81% of the population of HDWD resided on top of the Warren Valley subbasin, with the remainder residing on top of the Means/Ames Valley subbasin. It is therefore assumed that the 81% of the return flow from total HDWD production would return to the Warren Valley subbasin. However, the proportion of HDWD's production that was extracted from each subbasin has been variable, with as little as 61% being extracted from the Warren Valley subbasin in 1996 and as much as 79% in 2000. Because a higher proportion of population than production in the HDWD service area has been in the Warren Valley subbasin, the consumptive use as a percent of production has been higher in the Means/Ames Valley subbasin than in the Warren Valley subbasin. The Bighorn Desert View Intertie operation had the further effect of increasing the consumptive use in the Means/Ames subbasin and reducing it in the Warren Valley subbasin because all of the production passing through the Intertie occurred in the Means/Ames Valley subbasin but 81% of the return flow went to the Warren Valley subbasin.

Table 5-5: Morongo Basin/Johnson Valley Area Historical Consumptive Use (Acre-feet/year)

Copper Mountain Valley						
	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Agricultural	0	0	0	0	0	0
Industrial	0	0	0	0	0	0
Municipal	700	800	800	700	800	800
Golf Courses	0	0	0	0	0	0
Recreational	0	0	0	0	0	0
Total	**700**	**800**	**800**	**700**	**800**	**800**

Johnson Valley						
	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Agricultural	N/A	N/A	N/A	N/A	N/A	0
Industrial	N/A	N/A	N/A	N/A	N/A	0
Municipal	N/A	N/A	N/A	N/A	N/A	30
Golf Courses	N/A	N/A	N/A	N/A	N/A	0
Recreational	N/A	N/A	N/A	N/A	N/A	0
Total	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**

Means/Ames Valley						
	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Agricultural	0	0	0	0	0	0
Industrial	0	0	0	0	0	0
Municipal	1,200	1,700	900	1,200	900	600
Golf Courses	0	0	0	0	0	0
Recreational	0	0	0	0	0	0
Total	**1,200**	**1,700**	**900**	**1,200**	**900**	**600**

Warren Valley						
	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Agricultural	0	0	0	0	0	0
Industrial	0	0	0	0	0	0
Municipal	600	200	1,000	700	800	1,100
Golf Courses	200	200	200	200	200	100
Recreational	0	0	0	0	0	0
Total	**800**	**400**	**1,200**	**900**	**1,000**	**1,200**

Total Morongo Basin/Johnson Valley Area*						
	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Agricultural	0	0	0	0	0	0
Industrial	0	0	0	0	0	0
Municipal	2,500	2,700	2,700	2,600	2,500	2,500
Golf Courses	200	200	200	200	200	100
Recreational	0	0	0	0	0	0
Total	**2,700**	**2,900**	**2,900**	**2,800**	**2,700**	**2,600**

*Johnson Valley is not included in the Morongo Basin/Johnson Valley Area totals because the supply is not included as noted in Chapter 4.

Figure 5-10 shows the total Morongo Basin/Johnson Valley Area consumptive use estimates during this time period. Consumptive use in the Morongo Basin/Johnson Valley area has stayed fairly constant in these years, fluctuating between about 2,600 acre-feet and about 2,900 acre-feet. About 95% of the consumptive use in the Morongo Basin/Johnson Valley area is municipal use, with the remainder being used for a golf course in the Warren Valley. The area contains only minimal agricultural, industrial, or recreational lakes uses.

Figures 5-11 through 5-13 show the consumptive use in the Copper Mountain Valley, Means/Ames Valley, and Warren Valley subbasins for each type of use from 1995 through 2000. The recent trends within each subbasin are discussed briefly below.

Copper Mountain Valley (Figure 5-11)

All of the production from the Copper Mountain Valley subbasin is for municipal uses. The consumptive use in the Copper Mountain Valley subbasin has been fairly stable in recent years, ranging from a low of 700 acre-feet in 1998 to a high of 800 acre-feet in 1996.

Means/Ames Valley (Figure 5-12)

Consumptive use in the Means/Ames Valley has been highly variable because of fluctuations in the production ratio of HDWD and the operation of the Bighorn Desert View Intertie. In 1996, the Means/Ames Valley consumptive use was very high because 39% of the HDWD pumping was out of the Means/Ames Valley subbasin and an additional 700 acre-feet was pumped from the subbasin and transferred to HDWD. However, from 1997-1999 the Bighorn Desert View Intertie did not operate and only 27 acre-feet were transferred in 2000. Furthermore, in 1997, 1999, and 2000 less than 30% of HDWD's production was out of the Means/Ames Valley subbasin. As a result of these differences in operation, the consumptive use in the Means/Ames Valley subbasin was 1,700 acre-feet in 1996 but 900 acre-feet or less in 1997, 1999, and 2000.

Warren Valley (Figure 5-13)

Consumptive use in the Warren Valley has been highly variable for the same reasons as in the Means/Ames Valley. The effects of these changes in operation have been the opposite in the Warren Valley than those in the Means/Ames Valley. In 1996, for example, while the Means/Ames Valley had a very high consumptive use, the Warren Valley subbasin had only about 400 acre-feet of consumptive use. In 1997, 1999 and 2000, by contrast, the Warren Valley had at least 1,000 acre-feet of consumptive use each year.

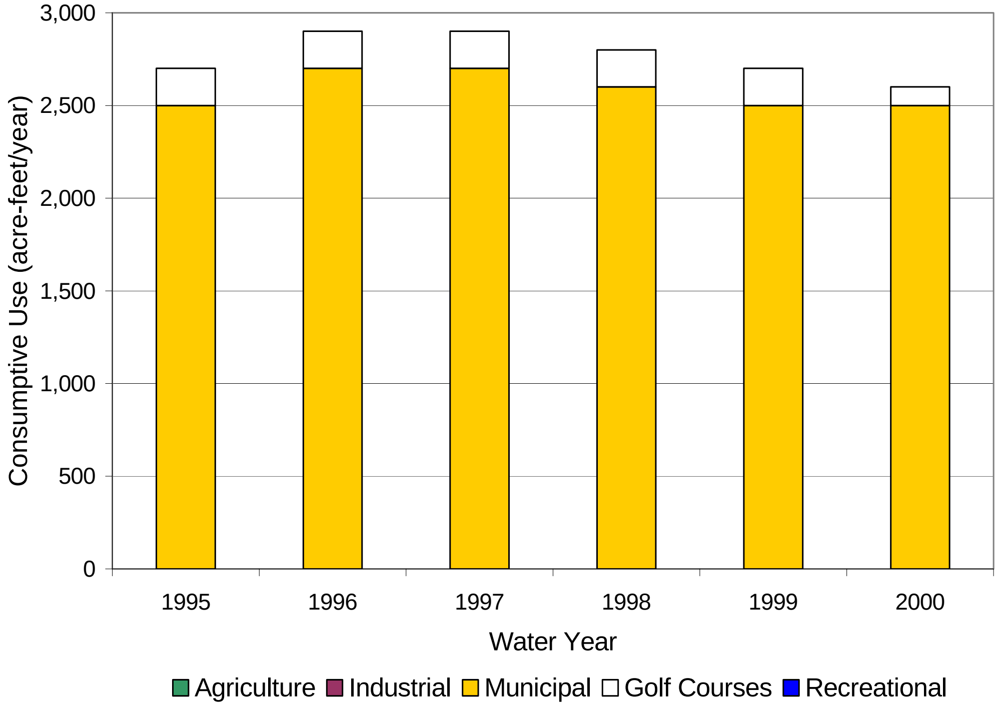


Figure 5-10: Morongo Basin/Johnson Valley Area Total Consumptive Use by Sector for 1995-2000

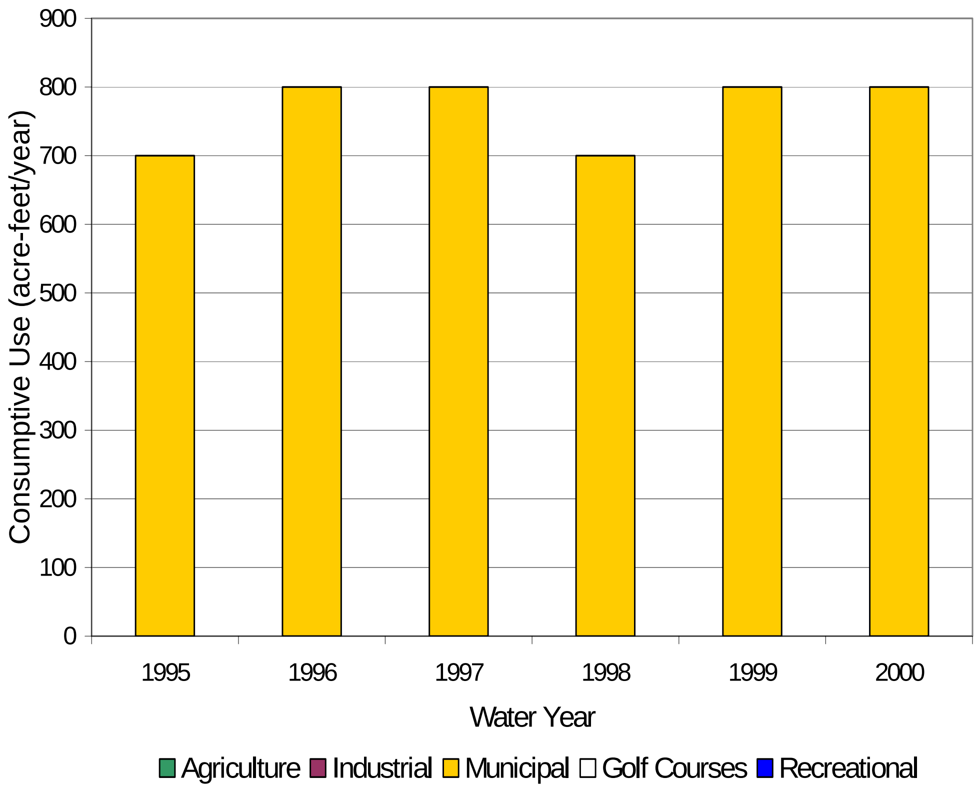


Figure 5-11: Copper Mountain Valley Subbasin Consumptive Use by Sector for 1995-2000

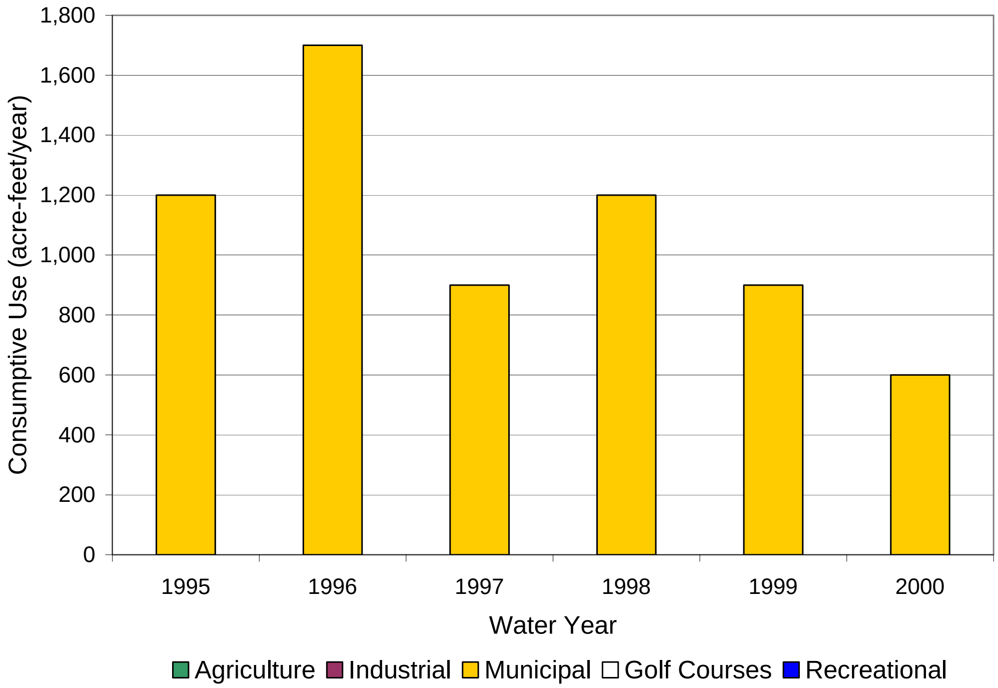


Figure 5-12: Means/Ames Valley Subbasin Consumptive Use by Sector for 1995-2000

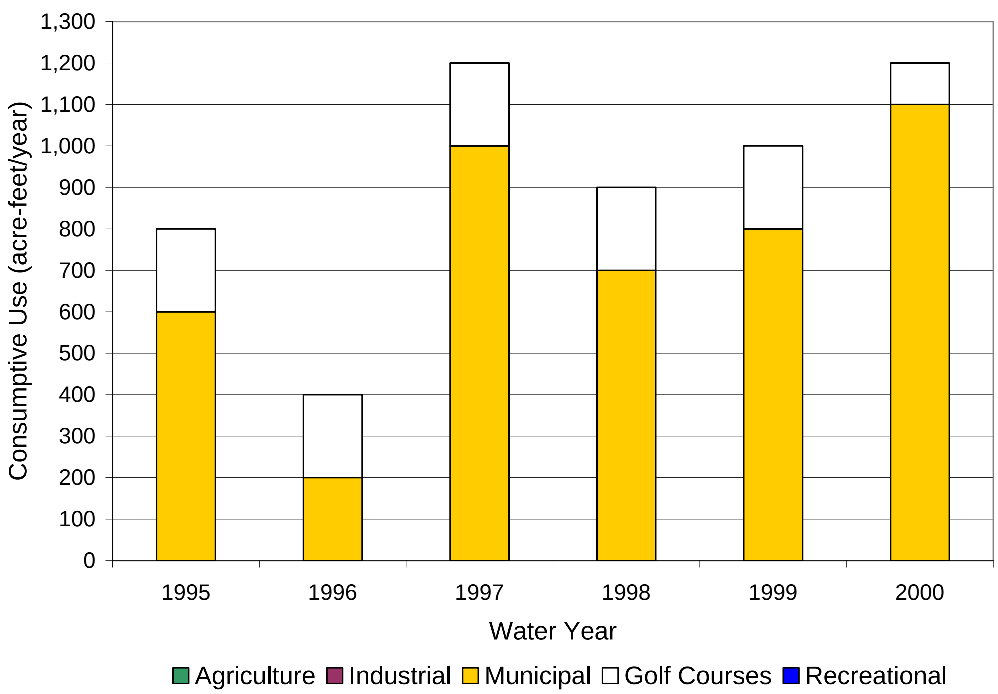


Figure 5-13: Warren Valley Subbasin Consumptive Use by Sector for 1995-2000

Current Water Balance

MWA's current water demand, as discussed above, is compared with the average annual water supply discussed in Chapter 4 to develop the water balance shown in Table 5-6.

Table 5-6: Year 2000 Average Annual Water Balance (Acre-feet/year)

	Net Average Annual Water Supply[1]	Consumptive Use Agricultural	Consumptive Use Urban[2]	Total	Surplus/ Deficit
Mojave Basin Area					
Alto	34,700	3,800	47,700	51,500	-16,800
Baja	5,600	17,700	10,500	28,200	-22,600
Centro	18,500	8,900	8,400	17,300	+1,200
Este	3,500	3,200	1,800	5,000	-1,500
Oeste	1,100	1,300	1,900	3,200	-2,100
Subtotal Mojave	63,400	34,900	70,300	105,200	-41,800
MB/JV Area					
Copper Mtn. Valley	600	0	800	800	-200
Johnson Valley	2,300	0	30	30	+2,270
Means/Ames Valley	600	0	600	600	0
Warren Valley	900[3]	0	1,200	1,200	-300
Subtotal MB/JV[4]	2,100	0	2,600	2,600	-500
Total	**65,500**	**34,900**	**72,900**	**107,800**	**-42,300**
				Average Annual SWP Supply:	**8,000**
				Surplus/Deficit with SWP Supply:	**-34,300**

[1]Net average annual water supply data as shown in Tables 4-2 and 4-5 of Chapter 4.
[2]Urban uses include municipal, industrial, golf course, and recreational water uses.
[3]Hi-Desert Water District reports unpublished USGS estimates of 200 acre-feet per year net average annual supply in the Warren Valley subbasin.
[4]Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

As shown in Table 5-6, the average water deficit in the Mojave Basin Area without State Water Project (SWP) supply for the year 2000 is approximately 41,800 acre-feet per year. Baja, with a deficit of 22,600 acre-feet, and Alto, at 16,800 acre-feet, constitute most of the current water deficit. Centro currently has slightly more water supply than demand. Este has a water deficit of approximately 1,500 acre-feet per year and Oeste has a deficit of approximately 2,100 acre-feet per year.

Outside of the Johnson Valley, the Morongo Basin/Johnson Valley Area has an average water deficit of approximately 500 acre-feet per year without SWP supply. The Warren Valley subbasin has the largest deficit, at about 300 acre-feet per year.

Since 1999, an average of about 8,000 acre-feet per year of SWP water has been imported into the Mojave Water Agency. Of this amount, about 3,500 acre-feet has been purchased by the Hi-Desert Water District and delivered to the Warren Valley subbasin by the Morongo Basin Pipeline to offset the deficit and to add to groundwater in storage.

When the current average annual SWP delivery is included, the Mojave Water Agency currently has a long-term average annual water deficit of approximately 34,300 acre-feet per year.

Future Water Demand

Demographics

Table 5-7 shows the estimated 2000 population and projected future population for each subarea and the average annual percent increase between 2000 and 2020. These population estimates were determined using data provided by the Southern California Association of Governments and data contained in stakeholder surveys.

Table 5-7: Current and Projected Population Estimates

	2000	2005	2010	2015	2020	Annual Percent Change
Mojave Basin Area						
Alto	236,600	266,700	303,700	348,900	407,700	+2.8%
Baja	5,100	5,300	5,600	5,900	6,200	+1.0%
Centro	33,700	36,100	41,500	47,100	54,100	+2.4%
Este	6,000	6,800	8,100	9,400	11,300	+3.2%
Oeste	7,400	8,300	9,400	11,300	13,600	+3.1%
Subtotal Mojave	288,800	323,200	368,300	422,600	492,900	+2.7%
MB/JV Area*						
Copper Mtn. Valley	9,600	10,300	11,000	11,800	12,700	+1.4%
Johnson Valley	400	400	500	500	600	+2.0%
Means/Ames Valley	7,500	8,300	9,300	10,400	11,700	+2.2%
Warren Valley	14,700	16,600	18,600	21,000	23,600	+2.4%
Subtotal MB/JV	32,200	35,600	39,400	43,700	48,600	+2.1%
Total	**321,000**	**358,800**	**407,700**	**466,300**	**541,500**	**+2.6%**

*Morongo Basin/Johnson Valley Area subbasin populations represent the population served by each subbasin, not the population that overlies the subbasin. This assumption is consistent with the 1994 RWMP.

Consumptive Use

The following assumptions were used to estimate the future consumptive use through 2020 for various water uses:

- Industrial and recreational lakes water uses were assumed to remain constant at year 2000 levels. The one exception was industrial use in Alto, which was assumed to increase by 4,000 acre-feet due to the expected operation of the new Hi-Desert Power Project.
- Municipal water use was assumed to change in direct proportion to the population in each subarea. The population estimates used are shown in Table 5-6. Total water use was determined by multiplying these population estimates by per capita water use rates calculated for the year 2000.
- Golf course consumptive use was assumed to change in direct proportion with the change in municipal consumptive use.
- Agricultural consumptive use was estimated under two possible scenarios intended to provide a maximum and minimum estimate of future agricultural demand.

  Agriculture Scenario 1: assumes that agricultural water use does not change from the year 2000 estimates through 2020. Under this assumption, any current non-agricultural water deficit within the subarea and all increases in non-agricultural water uses would have to be supplied by imported water.

  Agriculture Scenario 2: assumes that rampdown under the Mojave Basin Area Judgment (1996) resumes in 2002 at 5% per year until balance is achieved between production rights and available supply as required by the Judgment. Non-agricultural water use was assumed to be met by existing non-agricultural Free Production Allowances and through voluntary transfers of agricultural free production allowance. It was assumed, however, that at least 1,300 acre-feet of agricultural consumptive use (2,100 acre-feet of production) would remain in Alto, 300 acre-feet of consumptive use (500 acre-feet of production) would remain in Oeste, and 600 acre feet of consumptive use (900 acre-feet of production) would remain in Baja.

These two scenarios result in significantly different estimates of future agricultural consumptive use, especially in Baja. Projected agricultural consumptive uses can be seen for each scenario in Table 5-8. Under Agriculture Scenario 1, the year 2000 values remain unchanged through the year 2020. Under Agriculture Scenario 2, there are significant decreases in agricultural consumptive use because of the assumption that agriculture will voluntarily transfer its free production allowance to non-agricultural uses in-lieu of purchasing replacement water. Figure 5-

14 graphically shows the projected future agricultural consumptive use in each subarea under Scenario 2.

Table 5-8: Projected Agricultural Consumptive Use (Acre-feet/year)

	Ag Scenario 1	Ag Scenario 2				
	All years	**2000**	**2005**	**2010**	**2015**	**2020**
Mojave Basin Area						
Alto	3,800	3,800	1,300	1,300	1,300	1,300
Baja	17,700	17,700	17,700	6,700	600	600
Centro	8,900	8,900	8,900	8,900	8,900	8,900
Este	3,200	3,200	3,200	3,200	3,200	1,400
Oeste	1,300	1,300	1,300	1,300	1,300	300
Subtotal Mojave	34,900	34,900	34,900	32,400	15,300	12,500
MB/JV Area						
Copper Mtn. Valley	0	0	0	0	0	0
Johnson Valley	0	0	0	0	0	0
Means/Ames Valley	0	0	0	0	0	0
Warren Valley	0	0	0	0	0	0
Subtotal MB/JV	0	0	0	0	0	0
TOTAL	**34,900**	**34,900**	**32,400**	**21,400**	**15,300**	**12,500**

It should be noted that agricultural use has already declined in every subarea relative to year 2000 levels. However, these data are still considered to be valid for planning purposes because Agriculture Scenarios 1 and 2 are intended to provide low and high estimates of future agricultural use. The Technical Advisory Committee for the RWMP Update has determined that Agriculture Scenario 2 is the most appropriate to be used as the basis for the Plan.

Mojave Basin Area

As a result of the differences in agricultural use, the two scenarios show very different pictures of future consumptive use in the Mojave Basin Area. Table 5-9 shows the projected consumptive use for the non-agricultural demand sectors in each subarea in the Mojave Basin Area. Table 5-8 also shows the total consumptive use for each subarea under each scenario when the agricultural estimates from Table 5-8 are added to the totals. The projected total consumptive use in the Mojave Basin Area can also be seen for each scenario in Figures 5-15 and 5-16. Between 2000 and 2020, municipal consumptive use is projected to increase by about 31,600 acre-feet, an increase of 2.6% per year. In addition, golf course and park use is projected to increase by about 1,700 acre-feet, and industrial use is projected to increase by about 4,000 acre-feet. Therefore, when agricultural consumptive use is held constant as in Agriculture

Scenario 1, the overall water demand would increase by about 37,300 acre-feet. Under Agricultural Scenario 2, however, much of the increase in municipal consumptive use is offset by reductions in agricultural use, resulting in a total increase of only about 14,900 acre-feet between 2000 and 2020.

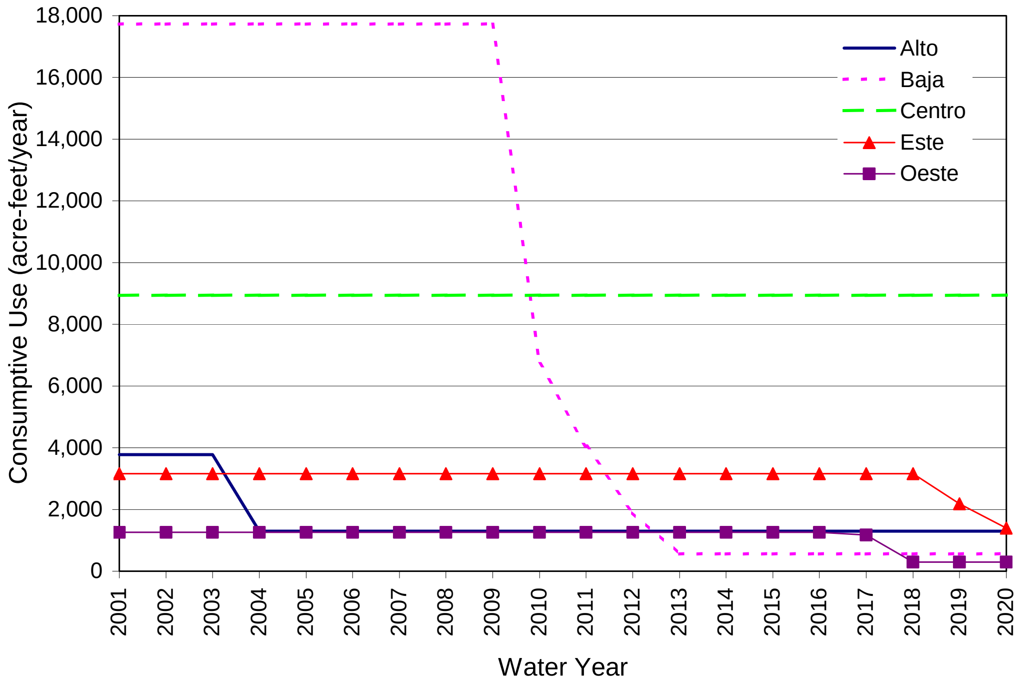


Figure 5-14: Agricultural Consumptive Use From 2001 Through 2020 Under Agriculture Scenario 2 Assumptions

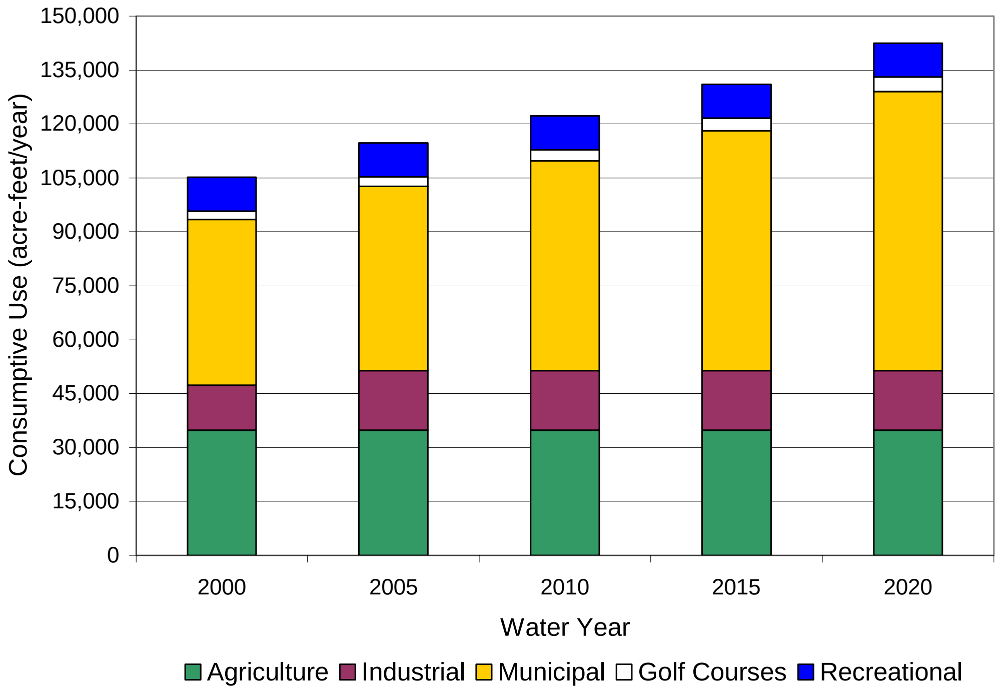


Figure 5-15: Mojave Basin Area Total Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 1

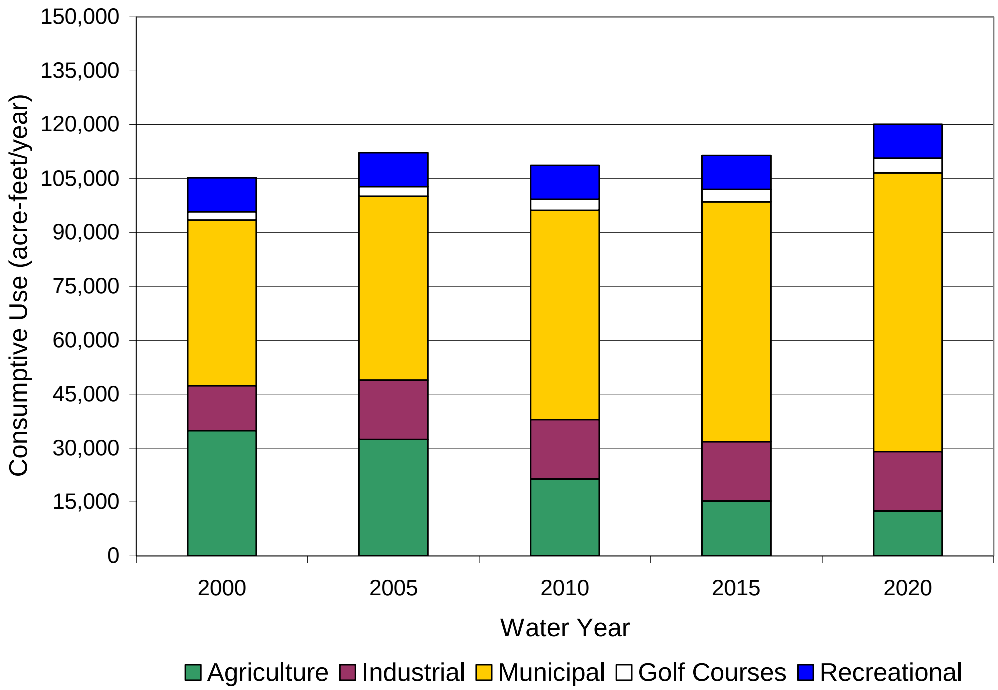


Figure 5-16: Mojave Basin Area Total Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 2

Table 5-9: Mojave Basin Area Current and Projected Consumptive Use (Acre-feet/year)

Alto	2000	2005	2010	2015	2020
Industrial	4,200	8,200	8,200	8,200	8,200
Municipal	34,400	38,700	44,100	50,700	59,200
Golf Courses	2,200	2,500	2,900	3,300	3,800
Recreational	6,900	6,900	6,900	6,900	6,900
Total: Including Ag Scenario 1	**51,500**	**60,100**	**65,900**	**72,900**	**81,900**
Total: Including Ag Scenario 2	**51,500**	**57,600**	**63,400**	**70,400**	**79,400**

Baja	2000	2005	2010	2015	2020
Industrial	5,500	5,500	5,500	5,500	5,500
Municipal	2,500	2,600	2,800	2,900	3,100
Golf Courses	0	0	0	0	0
Recreational	2,500	2,500	2,500	2,500	2,500
Total: Including Ag Scenario 1	**28,200**	**28,300**	**28,500**	**28,600**	**28,800**
Total: Including Ag Scenario 2	**28,200**	**28,300**	**17,500**	**11,500**	**11,700**

Centro	2000	2005	2010	2015	2020
Industrial	1,900	1,900	1,900	1,900	1,900
Municipal	6,300	6,700	7,700	8,800	10,100
Golf Courses	200	200	200	200	300
Recreational	0	0	0	0	0
Total: Including Ag Scenario 1	**17,300**	**17,700**	**18,700**	**19,800**	**21,200**
Total: Including Ag Scenario 2	**17,300**	**17,700**	**18,700**	**19,800**	**21,200**

Este	2000	2005	2010	2015	2020
Industrial	900	900	900	900	900
Municipal	900	1,000	1,200	1,400	1,700
Golf Courses	0	0	0	0	0
Recreational	0	0	0	0	0
Total: Including Ag Scenario 1	**5,000**	**5,100**	**5,300**	**5,500**	**5,800**
Total: Including Ag Scenario 2	**5,000**	**5,100**	**5,300**	**5,500**	**4,000**

Oeste	2000	2005	2010	2015	2020
Industrial	0	0	0	0	0
Municipal	1,900	2,200	2,500	2,900	3,500
Golf Courses	0	0	0	0	0
Recreational	0	0	0	0	0
Total: Including Ag Scenario 1	**3,200**	**3,500**	**3,800**	**4,200**	**4,800**
Total: Including Ag Scenario 2	**3,200**	**3,500**	**3,800**	**4,200**	**3,800**

Total Mojave Basin Area	2000	2005	2010	2015	2020
Industrial	12,500	16,500	16,500	16,500	16,500
Municipal	46,000	51,200	58,300	66,700	77,600
Golf Courses	2,400	2,700	3,100	3,500	4,100
Recreational	9,400	9,400	9,400	9,400	9,400
Total: Including Ag Scenario 1	**105,200**	**114,700**	**122,200**	**131,000**	**142,500**
Total: Including Ag Scenario 2	**105,200**	**112,200**	**108,700**	**111,400**	**120,100**

In the following sections, projected changes in consumptive use are discussed for each subarea.

Alto (Figures 5-17 and 5-18)

Figures 5-17 and 5-18 show projected consumptive use in Alto under each scenario. Municipal use is projected to increase by about 24,800 acre-feet between 2000 and 2020. This represents a growth rate of 2.8% per year on average. Consumptive use by golf courses and parks is projected to increase by about 1,600 acre-feet and industrial use is projected to increase by about 4,000 acre-feet. Therefore, total consumptive use would increase by approximately 30,400 acre-feet if agricultural use were to remain constant at its current total of about 3,800 acre-feet. If agricultural consumptive use were reduced to about 1,300 acre-feet, as it would be under Agriculture Scenario 2, total consumptive use in Alto would still increase by approximately 27,900 acre-feet.

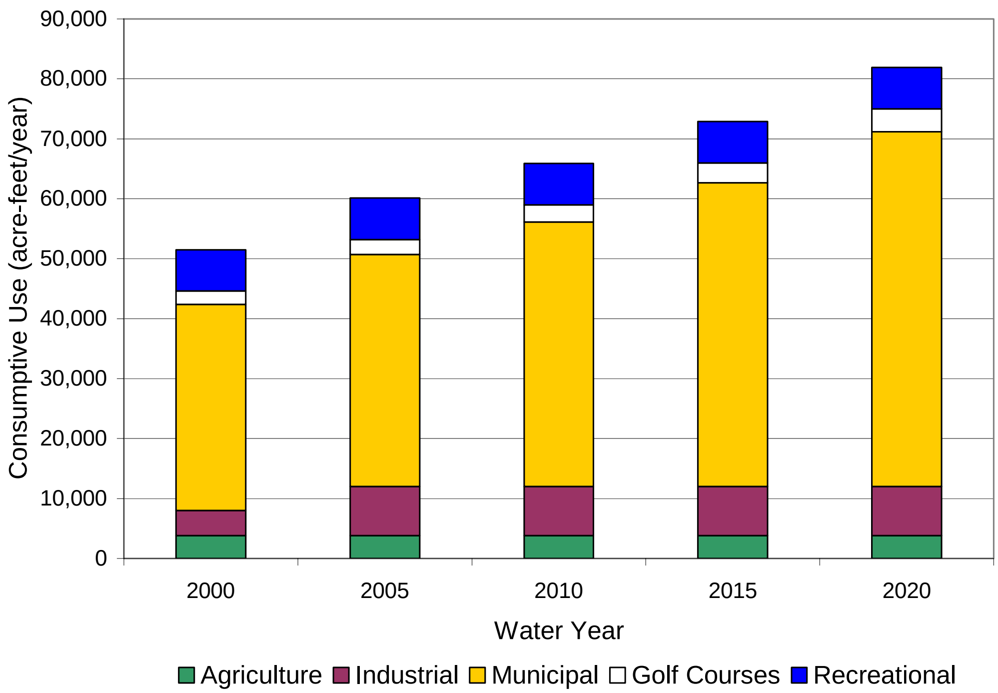


Figure 5-17: Alto Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 1

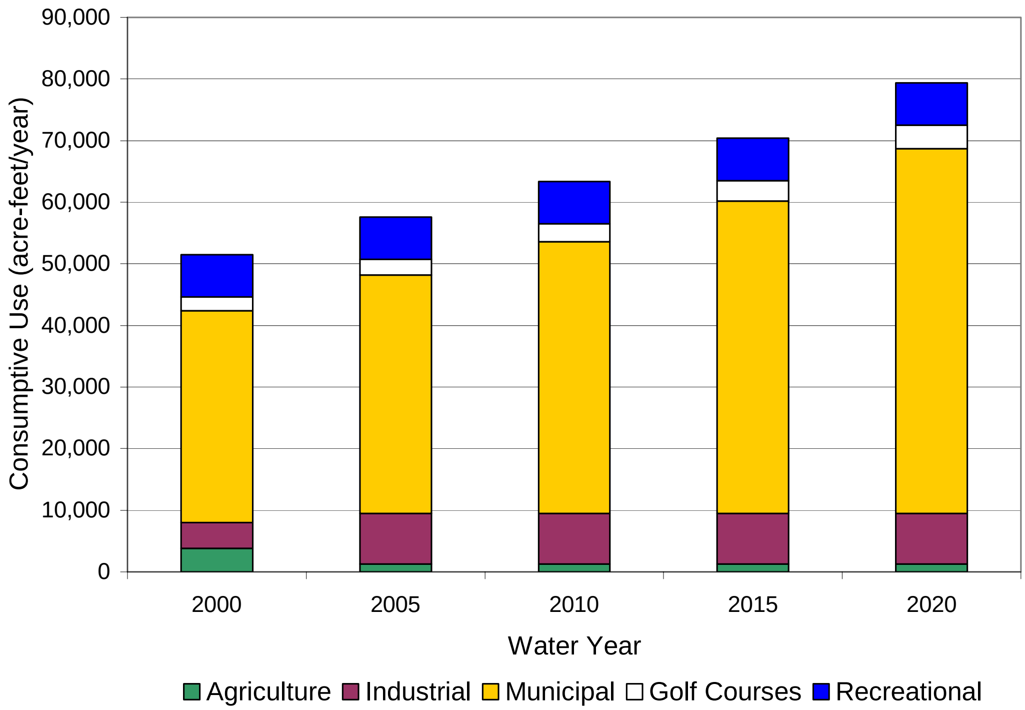


Figure 5-18: Alto Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 2

Baja (Figures 5-19 and 5-20)

Figures 5-19 and 5-20 show future consumptive use in Baja under each scenario. If agricultural consumptive use remains constant, as in Figure 5-18, total consumptive use is projected to increase by about 600 acre-feet due to a small increase in municipal water use, which is projected to increase at an annual average of 1.0%. Under Agriculture Scenario 2, as shown on Figure 5-20, agricultural consumptive use would be reduced to about 600 acre-feet by 2015 and remain constant at that level through 2020. This would cause the total consumptive use in the subarea to decline from about 28,200 to 11,700 acre-feet between 2000 and 2020.

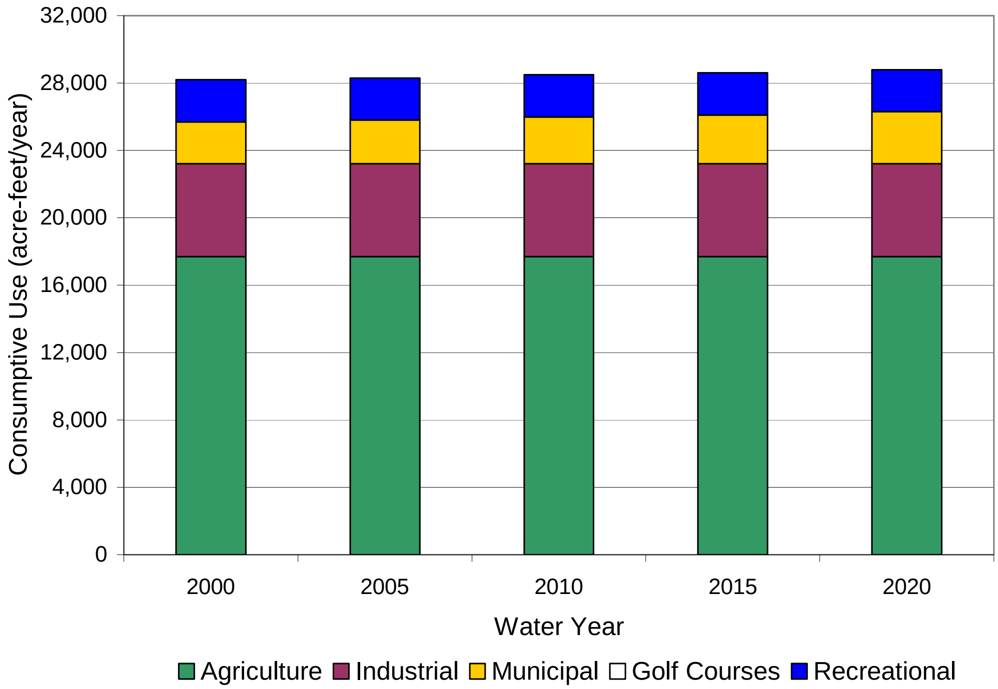


Figure 5-19: Baja Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 1

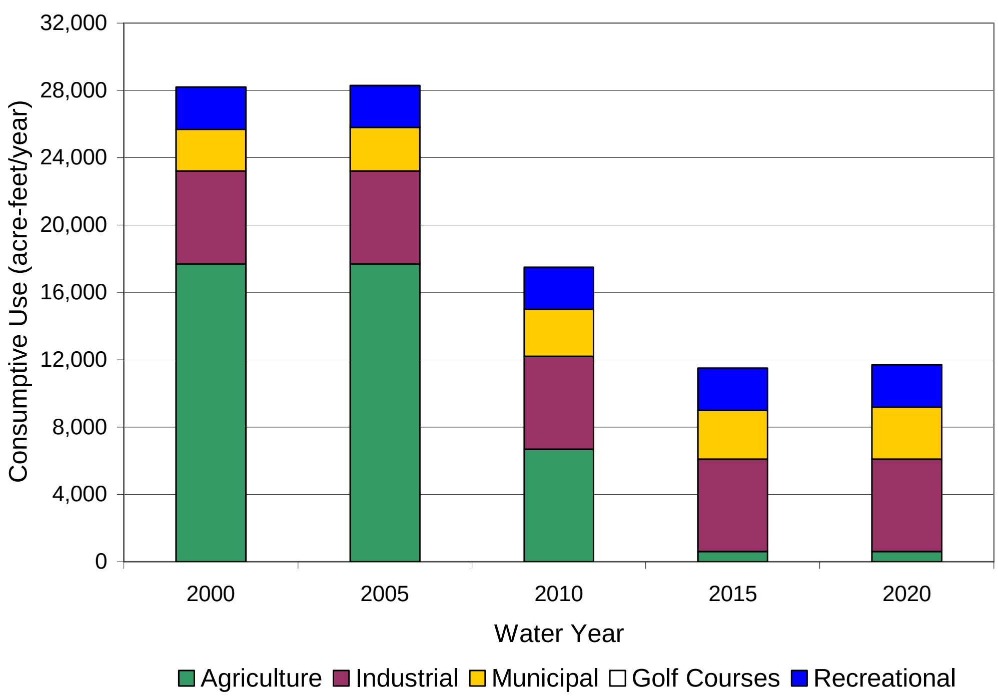


Figure 5-20: Baja Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 2

Centro (Figure 5-21)

No reduction in agricultural use is expected in Centro under either scenario. Figure 5-21 shows that municipal consumptive use for Centro is projected to increase by about 3,800 acre-feet and that golf course use is projected to increase by about 100 acre-feet between 2000 and 2020, assuming an average annual growth rate of 2.4%.

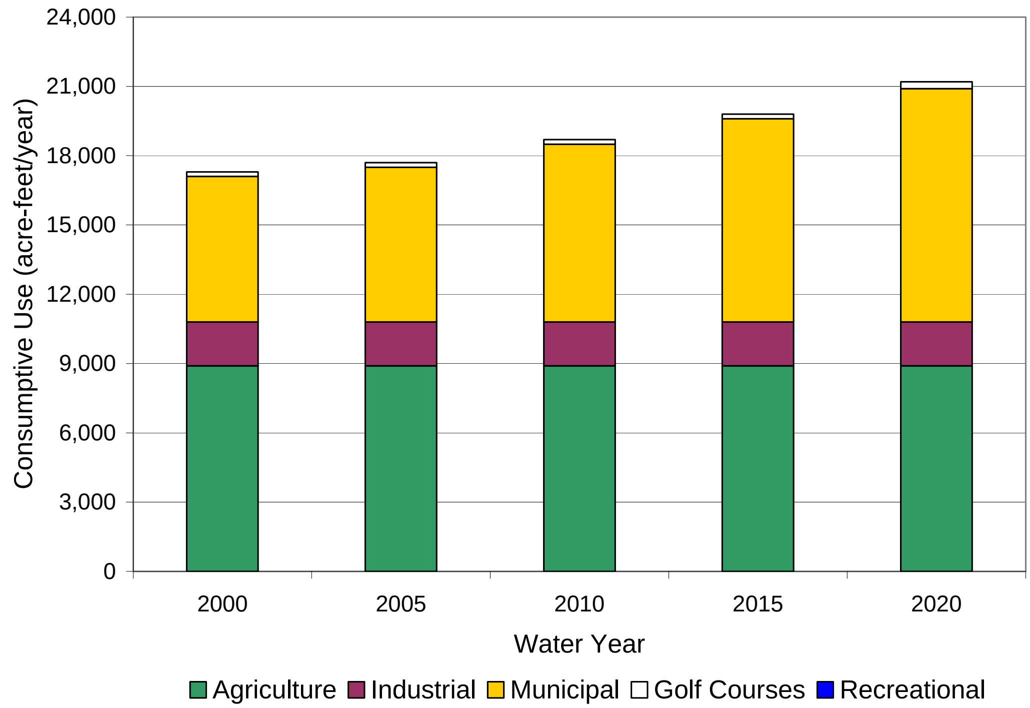


Figure 5-21: Centro Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenarios 1and 2

Este (Figures 5-22 and 5-23)

Figures 5-22 and 5-23 show projected consumptive use in Este under each scenario. Municipal consumptive use is projected to increase in Este by about 800 acre-feet between 2000 and 2020, assuming an annual average growth rate of 3.2%. Under Agriculture Scenario 2, agricultural consumptive use is projected to decrease by about 1,800 acre-feet, which would result in a net reduction in Este consumptive use of about 1,000 acre-feet between 2000 and 2020.

Oeste (Figures 5-24 and 5-25)

Figures 5-24 and 5-25 show the projected consumptive use in Oeste under each scenario. Municipal consumptive use is expected to increase by about 1,600 acre-feet between 2000 and 2020, assuming an annual average growth rate of 3.1%. Under Scenario 2, agricultural consumptive use would decline from about 1,300 acre-feet to approximately 300 acre-feet, resulting in a net increase in total annual consumptive use of about 600 acre-feet.

Morongo Basin/Johnson Valley Area

The Morongo Basin/Johnson Valley area contains very little agriculture. Table 5-10 shows the projected consumptive use for each subbasin in the Morongo Basin and Johnson Valley. Figure 5-26 shows the total projected Morongo Basin/Johnson Valley consumptive use projections. Between 2000 and 2020, municipal consumptive use is projected to increase from about 2,500 acre-feet to about 3,700 acre-feet (an increase of 2.1% per year). Golf course consumptive use is projected to increase by about 100 acre-feet. The total projected increase for the entire area is about 1,300 acre-feet between 2000 and 2020.

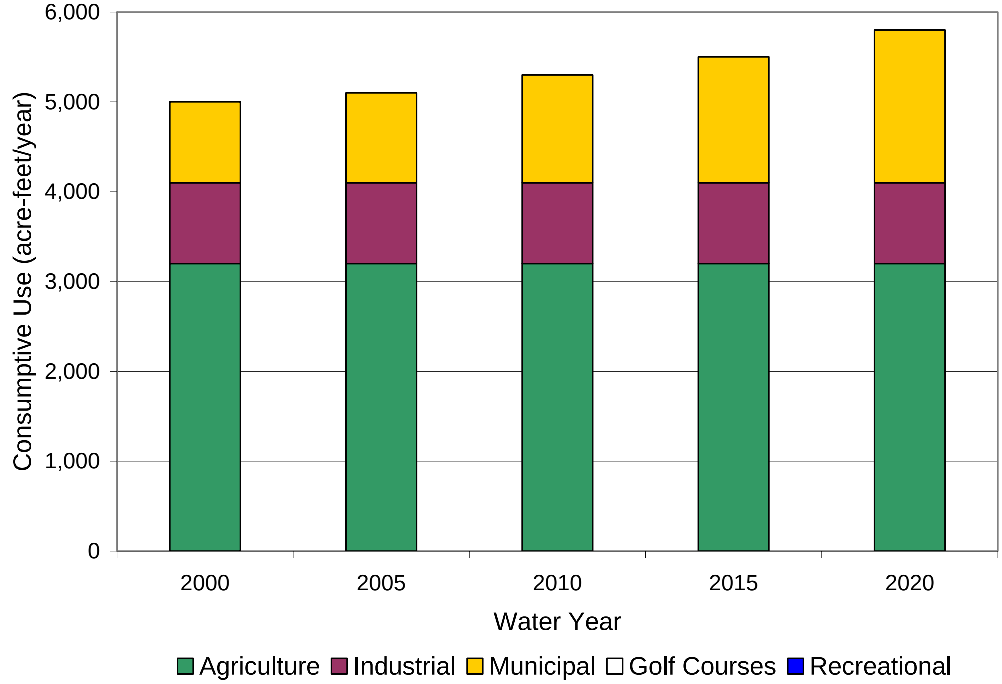


Figure 5-22: Este Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 1

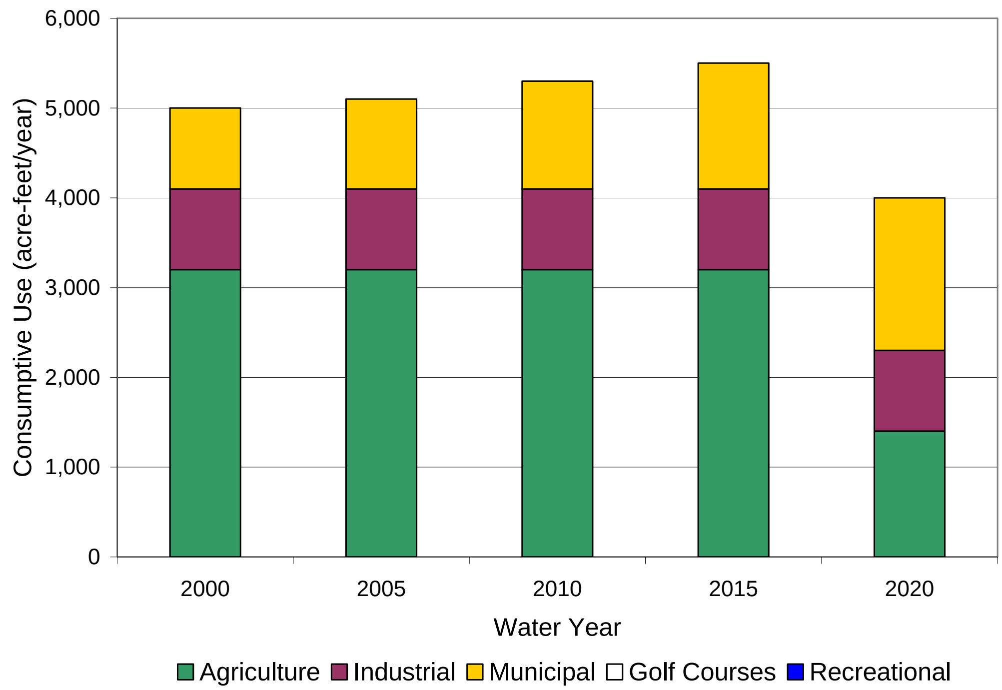


Figure 5-23: Este Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 2

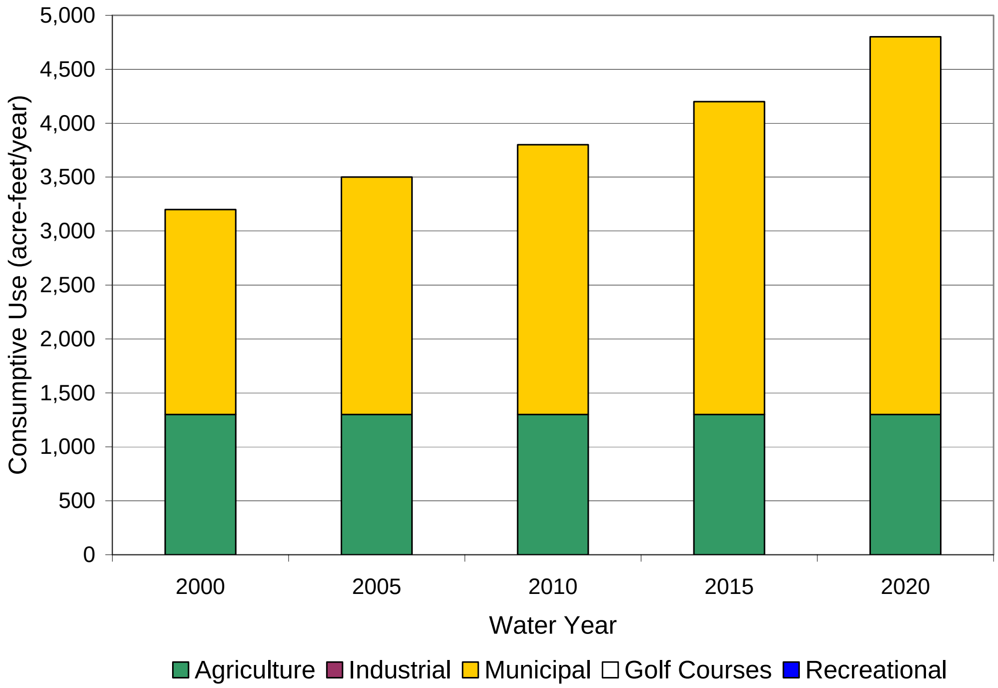


Figure 5-24: Oeste Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 1

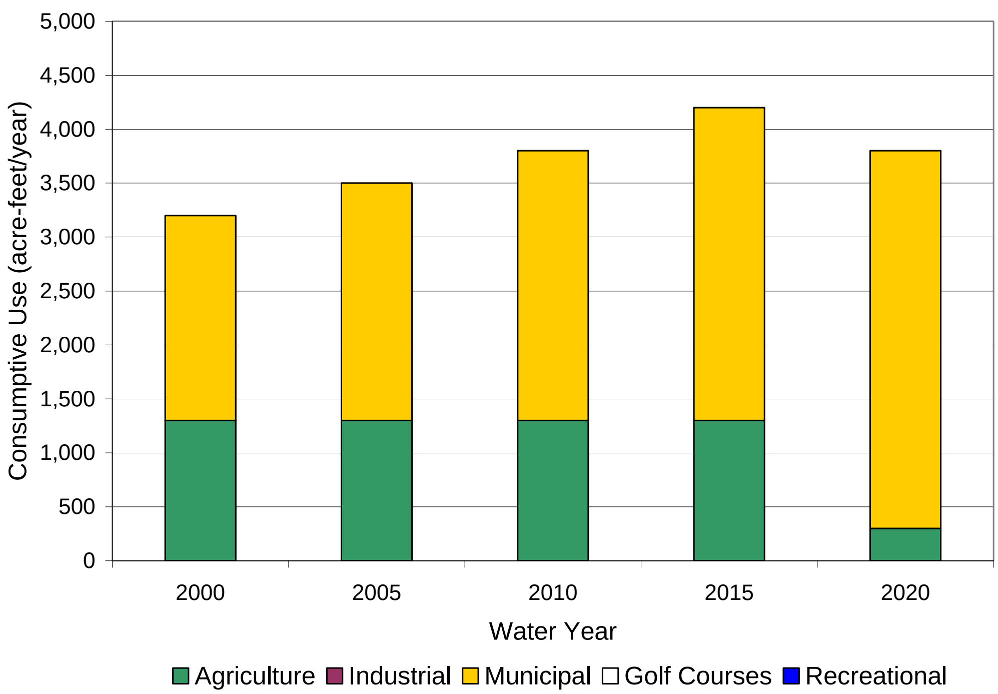


Figure 5-25: Oeste Subarea Consumptive Use for the Year 2000 and Projections Through Year 2020 Under Agriculture Scenario 2

Table 5-10: Morongo Basin/Johnson Valley Area Projected Consumptive Use (Acre-feet/year)

Copper Mountain Valley					
	2000	**2005**	**2010**	**2015**	**2020**
Agricultural	0	0	0	0	0
Industrial	0	0	0	0	0
Municipal	800	900	900	1,000	1,000
Golf Courses	0	0	0	0	0
Recreational	0	0	0	0	0
Total	**800**	**900**	**900**	**1,000**	**1,000**
Johnson Valley					
	2000	**2005**	**2010**	**2015**	**2020**
Agricultural	0	0	0	0	0
Industrial	0	0	0	0	0
Municipal	30	30	40	40	50
Golf Courses	0	0	0	0	0
Recreational	0	0	0	0	0
Total	**30**	**N/A**	**N/A**	**N/A**	**N/A**
Means/Ames Valley					
	2000	**2005**	**2010**	**2015**	**2020**
Agricultural	0	0	0	0	0
Industrial	0	0	0	0	0
Municipal	600	700	700	800	900
Golf Courses	0	0	0	0	0
Recreational	0	0	0	0	0
Total	600	700	700	800	900
Warren Valley					
	2000	**2005**	**2010**	**2015**	**2020**
Agricultural	0	0	0	0	0
Industrial	0	0	0	0	0
Municipal	1,100	1,300	1,400	1,600	1,800
Golf Courses	200[1]	200	200	300	300
Recreational	0	0	0	0	0
Total	**1,200**	**1,500**	**1,600**	**1,900**	**2,100**
Total Morongo Basin/Johnson Valley Area[2]					
	2000	**2005**	**2010**	**2015**	**2020**
Agricultural	0	0	0	0	0
Industrial	0	0	0	0	0
Municipal	2,500	2,900	3,000	3,400	3,700
Golf Courses	200	200	200	300	300
Recreational	0	0	0	0	0
Total	**2,700**	**3,100**	**3,200**	**3,700**	**4,000**

[1]For the purpose of projecting consumptive use, year 2000 golf course use in the Warren Valley is set at 200 acre-feet (the average from 1995-99), due to a temporary reduction in pumping during 2000 caused by mechanical problems with the well.
[2]Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

Figures 5-27 through 5-29 show the projected future consumptive use in the Copper Mountain Valley, Means/Ames Valley, and Warren Valley subbasins.

Copper Mountain Valley (Figure 5-27)

Municipal consumptive use in the Copper Mountain Valley subbasin is projected to increase from about 800 acre-feet in 2000 to about 1,000 acre-feet in 2020, which represents a growth rate of 1.4% per year.

Means/Ames Valley (Figure 5-28)

Municipal consumptive use in the Means/Ames Valley subbasin is projected to increase by about 300 acre-feet between 2000 and 2020, from 600 to 900 acre-feet. This represents a growth rate of about 2.2% per year.

Warren Valley (Figure 5-29)

Municipal consumptive use in the Warren Valley subbasin is projected to increase at a rate of 2.4% per year, from about 1,100 acre-feet in 2000 to about 1,800 acre-feet in 2020. Golf course use is projected to increase by 100 acre-feet. The total projected increase in consumptive use is approximately 800 acre-feet.

Year 2020 Water Balance

Agriculture Scenario 1

Table 5-11 shows the projected total consumptive use under Agriculture Scenario 1 using the average annual water supply values presented in Chapter 4.

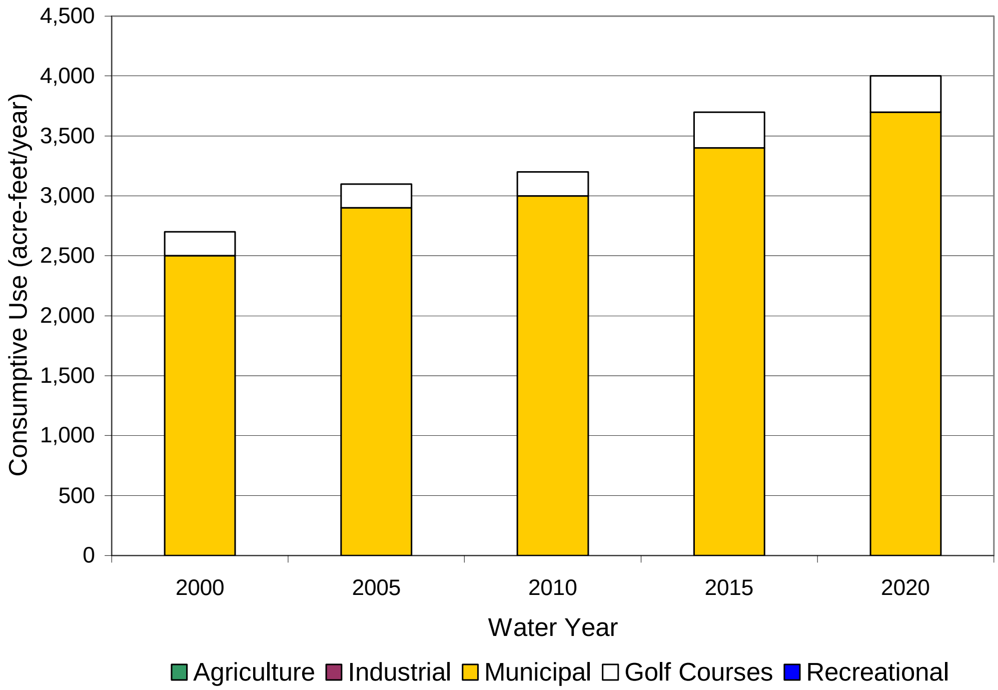


Figure 5-26: Morongo Basin/Johnson Valley Area Total Consumptive Use for the Year 2000 and Projections Through Year 2020

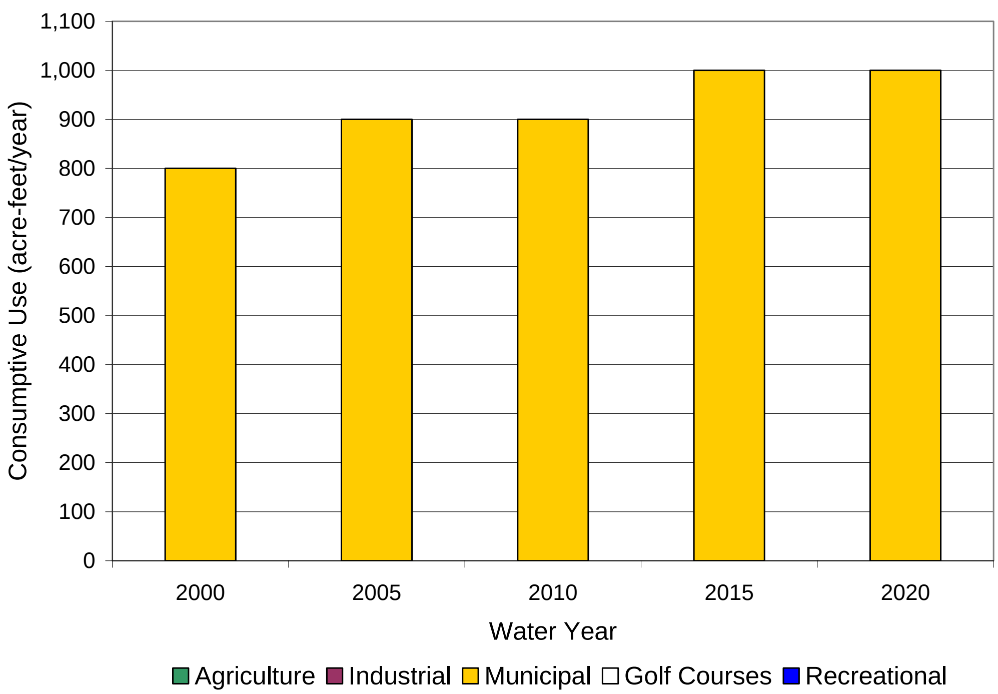


Figure 5-27: Copper Mountain Valley Subbasin Consumptive Use for the Year 2000 and Projections Through Year 2020

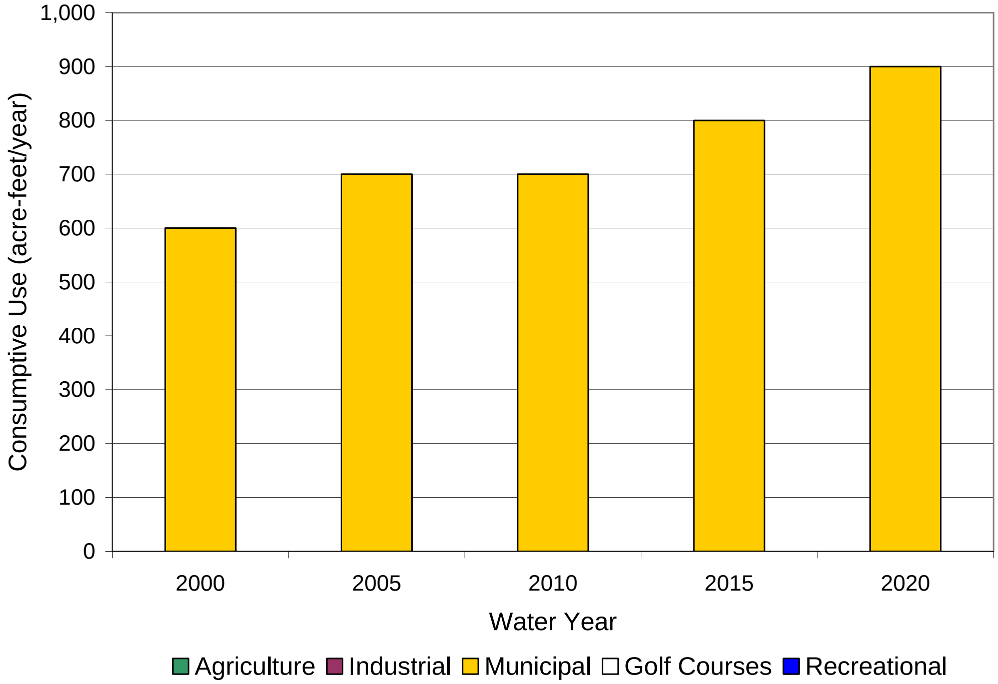


Figure 5-28: Means/Ames Valley Subbasin Consumptive Use for the Year 2000 and Projections Through Year 2020

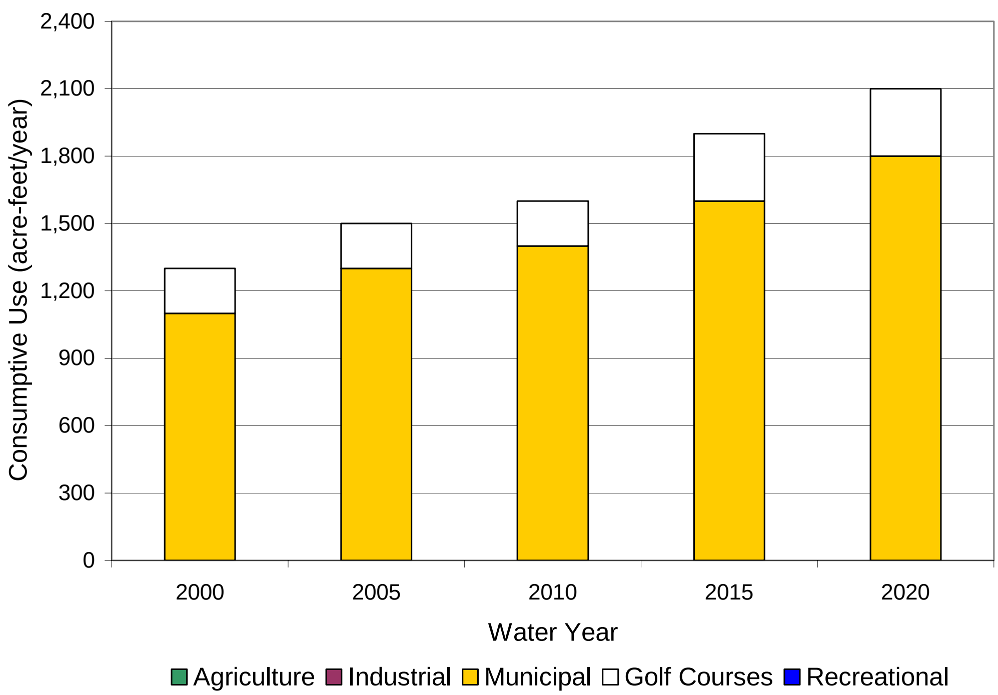


Figure 5-29: Warren Valley Subbasin Consumptive Use for the Year 2000 and Projections Through Year 2020

Table 5-11
Year 2020 Average Annual Water Balance Under Agriculture Scenario 1
(Acre-feet/year)

	Net Average Annual Water Supply[1]	Agricultural	Water Use Urban[2]	Total	Surplus/ Deficit
Mojave Basin Area					
Alto	34,700	3,800	78,100	81,900	-47,200
Baja	5,600	17,700	11,100	28,800	-23,200
Centro	18,500	8,900	12,300	21,200	-2,700
Este	3,500	3,200	2,600	5,800	-2,300
Oeste	1,100	1,300	3,500	4,800	-2,900
Subtotal Mojave	63,400	34,900	107,600	142,500	-79,100
MB/JV Area					
Copper Mtn. Valley	600	0	1,000	1,000	-400
Johnson Valley	2,300	0	50	50	+2,250
Means/Ames Valley	600	0	900	900	-300
Warren Valley	900[3]	0	2,100	2,100	-1,200
Subtotal MB/JV[4]	2,100	0	4,000	4,000	-1,900
Total	**65,500**	**34,900**	**111,600**	**146,500**	**-81,000**
			Average Annual SWP Supply:		**58,400**
			Surplus/Deficit with SWP Supply:		**-22,600**

[1]Net average annual water supply data as shown in Tables 4-2 and 4-5 of Chapter 4.
[2]Urban uses include municipal, industrial, golf course, and recreational water uses.
[3]Hi-Desert Water District reports unpublished USGS estimates of 200 acre-feet per year net average annual supply in the Warren Valley subbasin.
[4]Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

All of the regions are projected to have larger water deficits in 2020 than they had in 2000. The largest difference occurs in Alto, where the average annual water deficit is projected to increase from 16,800 acre-feet in 2000 to 47,200 acre-feet in 2020. In Centro, the water demand is projected to exceed the average annual supply in 2020, causing the year 2000 water surplus to be replaced with a water deficit of about 2,700 acre-feet. Overall, under Agriculture Scenario 1, the Mojave Basin Area is projected to have a water deficit of 79,100 acre-feet per year on average in 2020.

In the Morongo Basin/Johnson Valley Area, all of the subbasins except for Johnson Valley are projected to have water deficits in 2020. The largest of these is in the Warren Valley, where an average annual deficit of about 1,200 acre-feet is projected. Excluding the Johnson Valley, the Morongo Basin/Johnson Valley Area is projected to have a total average annual deficit of about 1,900 acre-feet per year in 2020.

Including the water deficit expected in the Morongo Basin/Johnson Valley area, the Mojave Water Agency is projected to face an average annual water deficit of about 81,000 acre-feet per year under Agriculture Scenario 1. If MWA were to fully utilize its average annual SWP supply of 58,400 acre-feet per year, the total deficit would be approximately 22,600 acre-feet per year.

Agriculture Scenario 2

Table 5-12 compares the projected total consumptive use under Agriculture Scenario 2 with the average annual water supply.

Table 5-12
Year 2020 Average Annual Water Balance under Agriculture Scenario 2
(Acre-feet/year)

	Net Average Annual Water Supply[1]	Water Use Agricultural	Water Use Urban[2]	Water Use Total	Surplus/ Deficit
Mojave Basin Area					
Alto	34,700	1,300	78,100	79,400	-44,700
Baja	5,600	600	11,100	11,700	-6,100
Centro	18,500	8,900	12,300	21,200	-2,700
Este	3,500	1,400	2,600	4,000	-500
Oeste	1,100	300	3,500	3,800	-2,700
Subtotal Mojave	63,400	12,500	107,600	120,100	-56,700
MB/JV Area					
Copper Mtn. Valley	600	0	1,000	1,000	-400
Johnson Valley	2,300	0	50	50	+2,250
Means/Ames Valley	600	0	600	600	0
Warren Valley	900	0	2,100	2,100	-1,200
Subtotal MB/JV[3]	2,100	0	4,000	4,000	-1,900
Total	**65,500**	**12,500**	**111,600**	**124,100**	**-58,600**
				Average Annual SWP Supply:	**58,400**
				Surplus/Deficit with SWP Supply:	**-200**

[1]Net average annual water supply data as shown in Tables 4-2 and 4-5 of Chapter 4.
[2]Urban uses include municipal, industrial, golf course, and recreational water uses.
[3]Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

In the Mojave Basin Area, Alto, Baja, Este and Oeste would all have smaller water deficits in 2020 under Agriculture Scenario 2 than they would under Agriculture Scenario 1. The largest difference is in Baja, which would have an average annual water deficit of only about 6,100 acre-feet. In Centro the projected average annual water deficits are the same under Agriculture Scenario 2 as in Agriculture Scenario 1. Because the Morongo Basin/Johnson Valley area has very little agriculture, the projected consumptive uses for all subbasins under Agriculture Scenario 2 are the same as for Agriculture Scenario 1.

Overall under Agriculture Scenario 2, the Mojave Basin Area would have an average annual water deficit of about 56,700 acre-feet per year in 2020. The Mojave Water Agency as a whole has a projected average annual water deficit of about 59,000 acre-feet per year. If MWA were to fully utilize its average annual SWP supply of 58,400 acre-feet per year, under the assumptions outlined above, the total deficit would be approximately 200 acre-feet per year.

Summary

Agriculture Scenarios 1 and 2 represent the low and high estimates of consumptive use in the Mojave Water Agency. Under Agriculture Scenario 1, the projected long-term average annual water deficit in the Mojave Water Agency in 2020 is about 22,600 acre-feet per year with full utilization of MWA’s current SWP supply. Under Agriculture Scenario 2, the projected long-term average annual water deficit in 2020 is about 200 acre-feet per year. The Technical Advisory Committee for the RWMP Update has determined that Agriculture Scenario 2 is the most appropriate to be used as the basis for the Plan.

Dry Year and Multiple Dry Year Water Balance in 2020

Table 5-13 shows the projected total consumptive use under Agricultural Scenario 2 with the average annual dry year water supply values presented in Chapter 4. With the net natural water supply reduced to 22,900 acre-feet per year and the average State Water Project supply reduced to 43,200 acre-feet per year, the total MWA deficit during dry years is projected to be 58,000 acre-feet per year in an average dry year.

Table 5-13: Year 2020 Average Annual Dry Year Water Balance under Agriculture Scenario 2 (Acre-feet/year)

	Net Average Annual Dry Year Water Supply[1]	Agricultural	Water Use Urban [2]	Total	Surplus/ Deficit
Mojave Basin Area					
Alto	9,900	1,300	78,100	79,400	-69,500
Baja	-1,400	600	11,100	11,700	-13,100
Centro	11,000	8,900	12,300	21,200	-10,200
Este	2,450	1,400	2,600	4,000	-1,550
Oeste	150	300	3,500	3,800	-3,650
Subtotal Mojave	22,100	12,500	107,600	120,100	-98,000
MB/JV Area					
Copper Mtn. Valley	230	0	1,000	1,000	-770
Johnson Valley	880	0	50	50	+830
Means/Ames Valley	230	0	900	900	-670
Warren Valley	340	0	2,100	2,100	-1,760
Subtotal MB/JV[3]	800	0	4,000	4,000	-3,200
Total	**22,900**	**12,500**	**111,600**	**124,100**	**-101,200**
			Average Annual SWP Supply:		**43,200**
			Surplus/Deficit with SWP Supply:		**-58,000**

[1]Net average annual dry year water supply data as shown in Tables 4-3 and 4-6 of Chapter 4.
[2]Urban uses include municipal, industrial, golf course, and recreational water uses.
[3]Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

Table 5-14 shows the projected total consumptive use under Agricultural Scenario 2 and average annual water supply during a multiple dry-year period (1988-1990) using values presented in Chapter 4. With the net natural water supply reduced to 4,010 acre-feet per year and the average State Water Project supply reduced to 22,900 acre-feet per year, the total MWA deficit during dry years is projected to be 97,190 acre-feet per year during the multiple dry-year period.

Table 5-14: Year 2020 Multiple Dry Year Average Annual Water Balance under Agriculture Scenario 2 (Acre-feet/year)

	Net Annual Multiple Dry Year Water Supply[1]	Water Use Agricultural	Water Use Urban [2]	Water Use Total	Surplus/ Deficit
Mojave Basin Area					
Alto	3,500	1,300	78,100	79,400	-75,900
Baja	-1,000	600	11,100	11,700	-12,700
Centro	-200	8,900	12,300	21,200	-21,400
Este	1,900	1,400	2,600	4,000	-2,100
Oeste	-300	300	3,500	3,800	-4,100
Subtotal Mojave	3,900	12,500	107,600	120,100	-116,200
MB/JV Area					
Copper Mtn. Valley	30	0	1,000	1,000	-970
Johnson Valley	130	0	50	50	+80
Means/Ames Valley	30	0	900	900	-870
Warren Valley	50	0	2,100	2,100	-2,050
Subtotal MB/JV[3]	110	0	4,000	4,000	-3,890
Total	**4,010**	**12,500**	**111,600**	**124,100**	**-120,090**
			Average Annual SWP Supply:		**22,900**
			Surplus/Deficit with SWP Supply:		**-97,190**

[1]Net average annual dry year water supply data as shown in Tables 4-4 and 4-6 of Chapter 4.
[2]Urban uses include municipal, industrial, golf course, and recreational water uses.
[3]Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

These deficits represent the amount of groundwater overdraft that MWA can expect during a dry year and during a multiple dry-year period. However, because MWA overlies a very large groundwater basin, the Agency should be able to weather such dry periods with only a temporary decline in groundwater levels. If the supply and demand are in approximate long-term balance, as they are under Agriculture Scenario 2 with full utilization of MWA's projected 2020 SWP supply, groundwater levels could be maintained at relative long-term balance with no reduction in the ability to supply MWA water users.

Future Supply Versus Demand in 5-Year Increments

Table 5-15 shows the average annual surplus or deficit for each for each subarea in the Mojave Basin Area and subbasin in the Morongo Basin/Johnson Valley area in five-year increments through 2020. Tables 5-16 and 5-17 show the same data for an average annual dry year and an average annual multiple dry year. The data shown in these tables are equal to the supply values shown in Chapter 4 minus the incremental demand values shown in Tables 5-9 and 5-10.

Table 5-15: Average Annual Surplus or Deficit under Agriculture Scenario 2 in 5-Year Increments (Acre-feet/year)

	2000	2005	2010	2015	2020
Mojave Basin Area					
Alto	-16,800	-22,900	-28,700	-35,700	-44,700
Baja	-22,600	-22,700	-11,900	-5,900	-6,100
Centro	+1,200	+800	-200	-1,300	-2,700
Este	-1,500	-1,600	-1,800	-2,000	-500
Oeste	-2,100	-2,400	-2,700	-3,100	-2,700
Subtotal Mojave	-41,800	-48,800	-45,300	-48,000	-56,700
MB/JV Area					
Copper Mtn. Valley	-200	-300	-300	-400	-400
Johnson Valley	+2,270	+2,270	+2,260	+2,260	+2,250
Means/Ames Valley	0	-100	-100	-200	-300
Warren Valley	-400	-600	-700	-1,000	-1,200
Subtotal MB/JV*	-600	-1,000	-1,100	-1,600	-1,900
Total	**-42,400**	**-49,800**	**-46,400**	**-49,600**	**-58,600**
Average Annual SWP Supply:	**58,400**	**58,400**	**58,400**	**58,400**	**58,400**
Surplus/Deficit with SWP Supply:	**+16,000**	**+8,600**	**+12,000**	**+8,800**	**-200**

*Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

Table 5-16: Average Annual Dry Year Surplus or Deficit under Agriculture Scenario 2 in 5-Year Increments (Acre-feet/year)

	2000	2005	2010	2015	2020
Mojave Basin Area					
Alto	-41,600	-47,700	-53,500	-60,500	-69,500
Baja	-29,600	-29,700	-18,900	-12,900	-13,100
Centro	-6,300	-6,700	-7,700	-8,800	-10,200
Este	-2,550	-2,650	-2,850	-3,050	-1,550
Oeste	-3,050	-3,350	-3,650	-4,050	-3,650
Subtotal Mojave	-83,100	-90,100	-86,600	-89,300	-98,000
MB/JV Area					
Copper Mtn. Valley	-570	-670	-670	-770	-770
Johnson Valley	+850	+850	+840	+840	+830
Means/Ames Valley	-370	-470	-470	-570	-670
Warren Valley	-960	-1,160	-1,260	-1,560	-1,760
Subtotal MB/JV*	-1,900	-2,300	-2,400	-2,900	-3,200
Total	**-85,000**	**-92,400**	**-89,000**	**-92,200**	**-101,200**
Average Annual SWP Supply:	**43,200**	**43,200**	**43,200**	**43,200**	**43,200**
Surplus/Deficit with SWP Supply:	**-41,800**	**-49,200**	**-45,800**	**-49,000**	**-58,000**

*Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

Table 5-17: Average Annual Multiple Dry Year Surplus or Deficit under Agriculture Scenario 2 in 5-Year Increments (Acre-feet/year)

	2000	2005	2010	2015	2020
Mojave Basin Area					
Alto	-48,000	-54,100	-59,900	-66,900	-75,900
Baja	-29,200	-29,300	-18,500	-12,500	-12,700
Centro	-17,500	-17,900	-18,900	-20,000	-21,400
Este	-3,100	-3,200	-3,400	-3,600	-2,100
Oeste	-3,500	-3,800	-4,100	-4,500	-4,100
Subtotal Mojave	-101,300	-108,300	-104,800	-107,500	-116,200
MB/JV Area					
Copper Mtn. Valley	-770	-870	-870	-970	-970
Johnson Valley	+100	+100	+90	+90	+80
Means/Ames Valley	-570	-670	-670	-770	-870
Warren Valley	-1,250	-1,450	-1,550	-1,850	-2,050
Subtotal MB/JV*	-2,590	-2,990	-3,090	-3,590	-3,890
Total	**-103,890**	**-111,290**	**-107,890**	**-111,090**	**-120,090**
Average Annual SWP Supply:	**22,900**	**22,900**	**22,900**	**22,900**	**22,900**
Surplus/Deficit with SWP Supply:	**-80,990**	**-88,390**	**-84,990**	**-88,190**	**-97,190**

*Johnson Valley is not included in the Morongo Basin/Johnson Valley totals because the supply is not included as noted in Chapter 4.

6

WATER SHORTAGE CONTINGENCY PLANNING

This chapter describes water shortage planning efforts of the Mojave Water Agency and summarizes water shortage planning efforts of individual water purveyors in the MWA service area.

Cities and water agencies within MWA rely on large groundwater reserves to meet potable water supply needs. During previous drought periods, municipal water suppliers continued to draft from these reserves to meet customer needs without imposing restrictions on water use, but at rates exceeding natural replenishment in most areas. The large groundwater basin in the area serves as a reservoir and buffers the impacts of seasonal and year-to-year variations in precipitation and surface water deliveries. By 2020 when this Plan is fully implemented, the area aquifers are expected to be in balance due to the combination of water imports and/or production rampdown. During multiple-year droughts or State Water Project outages, the basin will continue to be pumped to meet demands. Actions of the MWA to address water shortages are summarized below.

Mojave Water Agency

The Mojave Water Agency was formed to manage declining groundwater levels within the Agency's service area. In this capacity, MWA has been planning and implementing projects to increase water supply reliability and prevent future water shortages. MWA became a State Water Project (SWP) contractor and has an annual entitlement of 75,800 acre-feet. This water is diverted from the California Aqueduct and distributed to recharge sites throughout the area (see Chapter 2) in order to replace groundwater withdrawn by producers. Deliveries from the SWP are variable and MWA's full entitlement is not available every year. During dry and multiple dry years, it is expected that SWP deliveries will be significantly reduced.

The Mojave Basin Judgment calls for charging producers for use above their production allowance and using these funds to import water so that over time extractions come into balance with available supplies. Production allowances may also be reduced to achieve this balance. Similar principles are employed in the Warren Valley Basin to achieve long-term balance of supply and demand. Once the basin is in balance it will be less impacted by fluctuations in deliveries of water from the SWP.

As part of this Plan, MWA will construct facilities to utilize the full SWP contract supplies. This will enable the MWA to recharge the groundwater basins in wetter years and therefore enable water purveyors to meet demands during dry years without exceeding safe yield. This Plan includes an estimate of the reliability of deliveries of water from the SWP. The volume of SWP water recharged to the basin is computed based on this reliability.

MWA is not a direct purveyor of municipal water supplies and does not have the authority to implement water shortage plans within its boundaries but relies instead on efforts of the individual cities and water agencies.

Cities and Water Agencies

To meet the requirements of the Urban Water Management Planning Act, plans must address a number of topics including current and future water supply availability, projected demands for the next 20 years, reliability of supplies, supply and demand comparisons, the potential for recycling, implementation of Demand Management (water conservation) Measures, and water shortage contingency planning.

Cities and water agencies within the MWA service area that have developed and adopted Urban Water Management Plans are listed below:

- Adelanto Water Authority (serving Adelanto)
- Apple Valley Ranchos Water Company (serving Apple Valley)
- Hesperia Water District (serving Hesperia)
- Hi-Desert Water District (serving Yucca Valley)
- Joshua Basin Water District (serving Joshua Tree)
- Southern California Water Company (serving Barstow, parts of Apple Valley and Lucerne Valley
- Victor Valley Water District (serving Victorville)

All of these entities have Water Shortage Contingency Plans included in their Urban Water Management Plans.

Water Shortage Contingency Plans of these entities utilize a variety of methods to reduce water demand including mandatory prohibitions on water wasting, voluntary water conservation measures, mandatory water conservation measures and prohibitions on certain uses of water during severe shortages, specific triggering mechanisms for determining the appropriate stage of alert, and water supply allotments for each stage of alert. The plans are summarized below.

Adelanto Water Authority

The Adelanto Water Authority (Authority) has adopted, via resolution, a four-stage plan of action to address a long-term drought condition or loss of supply. Stage 1 becomes effective when the Authority declares a water shortage exists and involves increased public outreach and education to seek a 10% reduction in water use through voluntary measures. Stage 2 is entered into when the Stage 1 reduction goal has not been met for two consecutive years of a drought. Public awareness efforts will continue and a survey will be conducted on Stage 1 efforts. The Authority will establish a water conservation advisory committee comprised of officials from the Authority and the City of Adelanto. Stage 3 goes into effect if the water shortage continues for four consecutive years; this stage recommends 10% mandatory and 20% voluntary reductions. A plan and ordinance to enforce penalties for excessive water use will be developed as part of Stage 3. The Authority will examine the impact conservation has on revenue and expenditures and propose corrective measures as necessary. In addition to the water conservation efforts of the Authority, the City of Adelanto has a water conservation ordinance (adopted in 1984) designed to achieve a 10% reduction in water use.

Apple Valley Ranchos Water Company

During a declared water shortage, Apple Valley Ranchos Water Company (AVR) would base individual customer allotments on a recorded base year. According to their plan, AVR, as a private water utility, is unable to enforce conservation stages, adopt ordinances or administer penalties or charges for excessive use. Their plan includes rules from the California Public Utilities Commission (CPUC) related to water conservation and discontinuation and restoration of service. The Town of Apple Valley adopted, via ordinance, a Water Conservation Plan that includes water regulations prohibiting wasteful water use practices including excessive runoff of landscape irrigation water and washing driveways and walkways with water. Penalties have been established for violation of water regulations. In accordance with CPUC rules, AVR has established a conservation memorandum account to offset loss of revenues due to conservation.

Hesperia Water District

The Hesperia Water District (HWD) and the City of Hesperia developed and adopted, via ordinances, a three-stage drought-related water shortage plan. Stage 1 is in effect during normal conditions and involves voluntary wise water use practices and mandatory timed irrigation systems and drought tolerant plants for new developments. Stage 2 is triggered in the event of a water supply shortage that threatens HWD's ability to provide water. During this stage, conservation measures will include at least the following: prohibiting runoff from irrigated landscapes, use of the most efficient agricultural irrigation practices, development of conservation plans by commercial facilities, irrigation of parks, golf courses and school grounds only between the hours of 11:00 p.m. and 5:00 a.m., requiring covers for swimming pools and prohibiting washing driveways, sidewalks and other hard surfaces with water. In the event of a disaster or other disruption in the water supply, Stage 3 will be in effect and mandatory conservation measures will be implemented. Measures include prohibiting landscape irrigation or filling of swimming pools, and suspension of issuance of new construction permits. The HWD Board of Directors will determine the appropriate stages of alert during noticed public hearings. Violations of mandatory water conservation measures may result in criminal penalties, monetary fines and discontinuation of service. To make up for decreased revenues associated with conservation, HWD will consider reducing operating and maintenance costs, deferring certain capital improvement projects until revenues increase, deferring certain purchases and utilizing facility replacement reserve funds.

Hi-Desert Water District

The Urban Water Management Plan for the Hi-Desert Water District is comprised of the Warren Valley Basin Management Plan and associated addenda. The plan contains a description of their Emergency Stage Response Plan (ESRP) to implement more stringent water conservation measures during times when water demand exceeds supply. The initial, although undefined, provisions of the ESRP are implemented when the water supply system reaches 80 percent of capacity for three consecutive days. When demand increases further, Stage 2 becomes effective and places increasing, yet undefined, restrictions on water use, particularly outdoor water use. If delivery capacity continues to be inadequate, Stage 3 becomes effective and requests unspecified, voluntary conservation measures until such time as delivery problems can be mitigated.

Joshua Basin Water District

The Joshua Basin Water District (District) has developed a four-stage plan for responding to water shortages. The plan was a component of their Urban Water Management Plan, adopted via ordinance. The plan includes voluntary and mandatory stages to address a reduction in water supply that exceeds 60%. The Stage 1 reduction goal of 10% is triggered when water supplies are 60-75% of normal. The Stage 2 reduction goal of 15% is triggered when water supplies are 45-60% of normal. The Stage 3 reduction goal of 20% is triggered when supplies are 40-50% of normal and Stage 4 reduction goal of 25% is triggered when supplies are 40% of normal. Stages of alert may be triggered by groundwater shortages, equipment failures or catastrophes. The

District has developed an allocation method that will be used by the General Manager to determine consumption limits by customer type in the event of a water supply shortage. During all declared water shortage emergencies, customers who exceed their established allotment will be required to pay a surcharge of two times the highest rate for excess water used during the first or second billing cycle and a surcharge of four times the highest rate for subsequent billing periods. Approximately 47% of the District's annual water revenues are from meter charges with water sales making up the remainder. The plan indicates annual water system revenue declines due to conservation during the 4 stages of alert range from 3% to 9%. Financial reserves of the District are adequate to offset these modest decreases in revenue.

Southern California Water Company

The Southern California Water Company (SCWC) has developed a water shortage contingency plan with four stages of action to address up to a 50% water supply shortage. Stage 1 is a voluntary effort to reduce demand by 10% through increased community outreach. Stage 2 addresses shortages of 10 to 20% and involves voluntary and mandatory water conservation efforts such as prohibitions on cleaning sidewalks and other hard surfaces with water, washing cars, irrigating non-permanent agriculture, uncorrected plumbing leaks, gutter flooding and filling swimming pools. SCWC is an investor-owned utility and is subject to regulation by the California Public Utilities Commission (CPUC) and must gain approval from CPUC prior to imposing water consumption regulations and restrictions. During stages when water shortages require restricting water use, SCWC will first obtain permission from the CPUC. Stage 3 consists of water allotments and mandatory conservation rules. Stage 4 intensifies all previous conservation efforts and monitors daily compliance with required reductions. The SCWC District Manager will determine the appropriate stage of alert during water supply shortages. Their plan includes Mandatory Water Conservation, Restrictions and Rationing Program rules from the CPUC. The CPUC authorizes utilities to establish memorandum accounts for revenues and expenses due to water conservation. A surcharge may be implemented to cover revenue reductions due to conservation.

Victor Valley Water District

The Victor Valley Water District's (VVWD) water shortage contingency plan has four stages of action to address up to a 50% water supply shortage. The Stage 1 demand reduction goal of 10% is triggered when water shortages are 10% or less. The Stage 2A demand reduction goal of 20% is triggered when water shortages are 11-20%. The Stage 2B reduction goal of 30% is triggered when water shortages are 21-35% and Stage 3 demand reduction goal of 50% and greater is triggered when water shortages are 36-50%. VVWD would address water supply shortages with voluntary and mandatory conservation efforts targeting specific water allocations associated with each of the stages of alert. Penalties have been set for non-compliance with the allocations set in each of the stages of alert. The plan was adopted via ordinance.

The District does not anticipate adverse financial impacts due to conservation during water supply shortages. Fixed monthly service charges account for approximately 30% of total revenue. Reduced pumping expenses would offset decreased revenues from water consumption charges. Penalties for exceeding water allotments in Stages 3 and 4 would provide additional revenues that would help offset revenues lost through conservation.

7

WATER CONSERVATION AND DEMAND MANAGEMENT MEASURES

This chapter describes the water conservation practices of the Mojave Water Agency, individual cities and water agencies, and groups of entities in the basin.

Coordinated Water Conservation Efforts

In addition to the water conservation efforts of individual water agencies and cities, there are a number of cooperative efforts underway in the basin. These efforts include cooperative partnerships between MWA and a number of individual entities and groups of entities such as water agencies, cities, colleges, other educational institutions, and the Mojave Desert Resource Conservation District. These partnerships, formed through Memoranda of Understanding (MOUs), are described below.

Alliance for Water Awareness and Conservation

Based on findings in Phase 2 of this Regional Water Management Plan in 2003, local stakeholders decided that a united regional water conservation program was needed to improve water use efficiency. To this end, the Alliance for Water Awareness and Conservation (AWAC) was formed in August of 2003. According to the enabling MOU, the purpose of the AWAC is to "provide a vehicle to attract support for a regional water conservation program and coordinate implementation of activities by forming partnerships to obtain common measurable goals."

Goals of the Alliance, as provided in the MOU, are listed below:

- Educate the local communities on the importance of water conservation.
- Provide the local communities with the tools to effectively reduce per capita consumption to targeted goals.
- Reduce regional water use by 10 percent gross per capita by 2010 and 15 percent gross per capita by 2015 (5 percent in the Morongo Basin by 2015) to achieve a sustainable, reliable supply to meet regional water demands.

The AWAC will determine the appropriate mix, market penetration, budget and schedule for implementation of demand management measures in order to achieve the desired water reduction goals. Initially the AWAC is targeting outdoor irrigation where there is the greatest potential for significant reduction in water use. The primary targeted audiences are:

- New and existing home owners
- Commercial, industrial and institutional water users
- Landscape suppliers
- Professional and commercial landscapers
- Retail water providers and cities
- Developers

Cities and water agencies, through the AWAC, will determine actual reductions in water use. This can be accomplished by establishing baseline annual per capita water use in the cities and comparing this to annual per capita water use data as programs are implemented.

Participants

Current participants in the Alliance for Water Awareness and Conservation are listed in the sidebar table.

Alliance for Water Awareness and Conservation Participants

City of Adelanto
Apple Valley Country Club
Town of Apple Valley
Apple Valley Ranchos Water Company
Baldy Mesa Water District
City of Barstow
Barstow College
Bighorn-Desert View Water Agency
Bureau of Land Management
Bureau of Reclamation
Copper Mountain College
City of Hesperia
Hi-Desert Water District
Mojave Desert & Mountain Waste Management JPA
Mojave Desert Resource Conservation District
Mojave Water Agency
Mojave Weed Management Area
San Bernardino County Special Districts, Water/Sanitation Division
Southern California Water Company
Victor Valley College
Victor Valley Wastewater Reclamation Authority
Victor Valley Water District
City of Victorville
Town of Yucca Valley

MWA and Lewis Center for Education and Research MOU

The MWA and the Lewis Center for Education and Research (LCER) have entered into an MOU for raising water awareness of the High Desert community. According to the MOU, topics include improving understanding of:

- the role water resources play in supporting beneficial uses by all consumers within the High Desert
- sensitive biotic components of the High Desert ecosystem that are dependant on surface and near surface water
- concerns and consequences related to a declining water table

- best resource conservation practices for reducing consumptive uses of water
- how land use activities can impact water supply, water quality and biotic resources

According to the MOU, the two entities are working together in order to:

- coordinate an educational program that will expose students and citizens throughout the region to the value and benefit natural water resources provide to the community, thereby increasing the community's understanding of the importance of long-term management of the region's water resources
- provide a learning environment for LCER students in an attempt to further understanding of the region's water resources and their role in the management of those resources
- establish specific time schedules prior to program development and implementation in order to carry out the objectives of the MOU

MWA and Mojave Desert Resource Conservation District MOU

The MWA and the Mojave Desert Resource Conservation District have entered into an MOU to heighten the public's awareness of ways to conserve water and convert high water use landscaping to low-maintenance trees and scrubs. This will be accomplished through at least the following:

- conducting a desert adaptive plant sale
- publishing educational materials
- developing demonstration projects

MWA and Mojave Weed Management Area MOU

The MWA, the Mojave Desert Resource Conservation District, and seventeen other entities have entered into an MOU to work to prevent and control weeds throughout the Mojave Desert in California. Invasive weed species can crowd out native species and increase evapotranspiration of water supplies. Weed control and prevention will be accomplished in many ways, but specifically the MWA has agreed to:

- participate in seeking grants to fund weed management efforts in cooperation with the Mojave Weed Management Area partners and other organizations attempting to manage weeds
- promote the control and treatment of weeds on MWA property
- support efforts to educate the public about weeds, their identification, prevention, and methods of control

MWA has provided funding to MDRCD for removal of invasive plants from the Mojave River riparian habitat.

MWA and Copper Mountain College MOU

The MWA and the Copper Mountain College have entered into an MOU to increase awareness about the need to manage and conserve the water resources of the Morongo Basin and to provide practical solutions to conserve water. The partners will work to achieve these goals through at least the following efforts:

- developing a college curriculum that will provide educational opportunities in the area of natural plant vegetation and conservation programs
- developing demonstration gardens

MWA and Barstow Community College MOU

Similar to the Copper Mountain College MOU, MWA and the Barstow Community College have entered into an MOU to increase awareness about the need to manage and conserve High Desert water resources and to provide practical solutions regarding water-wise habits. The partners will work to achieve these goals through at least the following efforts:

- developing a college curriculum and present workshops that advance public education related to water availability, quality, use, conservation-based best management practices, and the management practices that directly encourage High Desert water consumers to support a sustainable approach to water resource management
- developing a plan to expand the current demonstration garden

MWA and Victor Valley College MOU

Similar to the Copper Mountain College and Barstow Community College MOUs, MWA and the Victor Valley College have entered into a MOU to create a greater awareness about the need to manage and conserve High Desert water resources and to provide practical solutions that will promote efficient use of water. The partners will work to achieve these goals through at least the following efforts:

- developing a water conservation curriculum that will culminate in students receiving a Water Conservation Technician certificate
- developing a Conservation Outreach Day for the public with workshops on drip irrigation design and the use of adaptive plants
- expanding the GIS curriculum to facilitate water conservation mapping and other natural resource management projects

MWA Mojave Desert Resource Conservation District Demonstration Project

MWA, the Mojave Desert Resource Conservation District, and the Apple Valley Country Club are working cooperatively on a demonstration project to evaluate and reduce turf water use at a golf course. The project will replace two acres of turf with native and other drought-tolerant plants and monitor plant growth and water use over a one-year period. The project is intended to provide a tool to document, display and promote effective methods to save water, reduce costs and develop attractive desert adaptive landscapes.

Urban Water Management Plans

"The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level." California Water Code

In 1983, the California Urban Water Management Planning Act was added to the California Water Code (Division 6 Part 2.6) with the signing of Assembly Bill 797. The Act has been amended several times. The Act requires water suppliers with over 3,000 customers or that supply over 3,000 acre-feet of water annually to prepare Urban Water Management Plans (UWMP) and submit the plans to the California Department of Water Resources (DWR). The plans must be updated at least every five years in years that end in 0 or 5.

Changes made in late 2001 (Senate Bill 610) now require Urban Water Management Plans to include additional information. If updated plans were not submitted by December 31, 2001 or if plans submitted after January 1, 2002 do not contain the required additional information, the urban water supplier will be prohibited from receiving specified bond funds administered by DWR.

Cities and water agencies within the MWA boundaries have developed and adopted Urban Water Management Plans to comply with the Urban Water Management Planning Act in the California Water Code. Entities with adopted UWMPs are listed below:

- Adelanto Water Authority (serving Adelanto)
- Apple Valley Ranchos Water Company (serving Apple Valley)
- Hesperia Water District (serving Hesperia)
- Hi-Desert Water District (serving Yucca Valley)
- Joshua Basin Water District (serving Joshua Tree)
- Southern California Water Company (serving Barstow and parts of Apple Valley and Lucerne Valley)
- Victor Valley Water District (serving Victorville)

To meet the requirements of the Urban Water Management Planning Act, plans must address a number of topics including current and future water supply availability, projected demands for the next 20 years, reliability of supplies, supply and demand comparisons, the potential for recycling, penalties for wasting water, analysis of impacts on revenues from reductions in water deliveries, measures to overcome revenue impacts, Demand Management (water conservation) Measures and water shortage contingency plans. The following section describes the Demand Management Measures described in the Act.

Demand Management Measures

The Mojave Water Agency Act authorized MWA "to pursue all necessary water conservation measures," and "reduce the waste of water."

Fourteen Demand Management Measures (DMMs) are identified in Table 7 - 1. These measures represent the Best Management Practices that the California Department of Water Resources requires to be addressed in Urban Water Management Plans. The DMMs are intended to reduce current and future water demands through more efficient water use. Additional programs may be necessary during periodic water supply shortages. The DMM descriptions, methods to evaluate effectiveness and estimated water savings associated with the DMMs are taken from the "Memorandum of Understanding Regarding Urban Water Conservation in California" produced by the California Urban Water Conservation Council (CUWCC, 2002). Two agencies in the basin are members of the Council: the Hi-Desert Water District and the Southern California Water Company (which supplies water to the City of Barstow and parts of Apple Valley and Lucerne Valley). MWA adopted the DMMs in 1997.[37]

Table 7-1: Demand Management Measures

DMM	DMM Description
1	Water survey programs for single-family and multi-family customers
2	Residential plumbing retrofit
3	System water audits, leak detection, and repair
4	Metering and commodity rates for new connections and retrofit of existing connections
5	Large landscape conservation programs and incentives
6	High-efficiency washing machine rebate programs
7	Public information programs
8	School education programs
9	Conservation programs
10	Wholesale agency programs
11	Conservation pricing
12	Water conservation
13	Water waste prohibition
14	Residential ultra-low-flush toilet replacement programs

[37] Resolution 630-97, January 28, 1997

MWA is not a direct purveyor of drinking water and therefore is not required to implement the DMMs. In addition, MWA does not have the authority to implement programs in cities where water users are supplied water by their city or water agency. MWA is implementing some of the DMMs and is working with water agencies and cities both individually and collectively through the AWAC to promote the efficient use of water. Table 7-2 shows the implementation status of the DMMs for some of the drinking water purveyors in the basin.

Table 7-2: Implementation Status for DMMs

Demand Management Measures	1 Water survey programs for single-family and multi-family customers	2 Residential plumbing retrofit	3 System water audits, leak detection, and repair	4 Metering and commodity rates for new connections and retrofit of existing connections	5 Large landscape conservation programs and incentives	6 High-efficiency washing machine rebate programs	7 Public information programs	8 School education programs	9 Conservation programs for commercial, industrial, and institutional accounts	10 Wholesale agency programs	11 Conservation pricing	12 Water conservation coordinator	13 Water waste prohibition	14 Residential ultra-low-flush toilet replacement programs
Entity														
Adelanto WA	--	*	Y	Y	*	N	*	*	N	N/A	Y	*	Y	N
Apple Valley WC	Y	Y	Y	Y	Y	N	Y	Y	Y	N/A	Y	Y	Y	N
Hesperia WD	Y	Y	Y	Y	N	N	Y	Y	N	N/A	Y	Y	Y	N
Hi Desert WD	Y	Y	Y	Y	Y	N	Y	Y	N	N/A	Y	Y	Y	Y
Joshua Basin WD	+	Y	Y	Y	N	N	Y	N	N	N/A	Y	Y	Y	N
MWA	NA	N/A	N/A	N/A	N/A	N/A	Y	Y	N/A	Y	N/A	Y	N/A	N/A
Southern CA WC	+	N	Y	Y	+	N	Y	Y	+	N/A	Y	Y	Y	+
VVWD	--	N	Y	Y	N	N	Y	Y	N	N/A	Y	Y	N	Y

* Recommneded in 1997 UWMP
\+ Recommneded in 2000 UWMP
N/A - Not applicable

Additional information from the Urban Water Management Plans is included in Table 7-3. Adelanto Water District, Joshua Basin Water District and the Southern California Water Company included schedules for implementation of additional DMMs.

Table 7-3: Summary of Conservation Planning

Entity	City Served	Document	Date	Number of DMMs Implemented	Number of DMMs Planned
Adelanto WA	Adelanto	UWMP	1997	4	5
Apple Valley WC	Apple Valley	UWMP	2000	10	
Hesperia WD	Hesperia	UWMP	2000	9	
Hi Desert WD	Yucca Valley	UWMP	2000	11	
Joshua Basin WD	Joshua Tree	UWMP	2000	7	1
MWA	N/A	RWMP	2004	4	
Southern CA WC	Barstow	UWMP	2000	7	4
VVWD	Victorville	UWMP	2000	7	

Listed below are descriptions of the 14 DMMs, implementation status, and an estimate of water savings.

DMM 1. Water Survey Programs for Single-Family and Multi-Family Customers

Residential surveys, carried out by agency staff or contractors, can identify some of the more common residential water wasting practices. A typical survey includes checking for leaking faucets and toilets, identifying older fixtures that do not meet current water conserving plumbing standards, checking irrigation systems for leaks and proper coverage, reviewing or developing irrigation schedules and setting irrigation controllers accordingly, and checking the water meter.

Implementation Status

This DMM is being implemented to some degree in 5 of the 7 water service areas.

Conservation Savings

A potential for water savings exists if the surveys identify water-wasting practices that can be changed. Water savings vary depending on the water fixture and the type of repair or retrofit. Estimates of anticipated water savings are given in Table 7-4 (CUWCC, 2002).

Table 7-4: Conservation Savings for DMM 1

Device	Pre-1980 Construction	Post-1980 Construction
Low-flow showerhead retrofit	7.2 gcd*	2.9 gcd
Toilet retrofit (five year life)	1.3 gcd	0.0 gcd
Leak repair	0.5 gcd	0.0 gcd
Landscape survey	10%	10%

*gcd = gallons per capita per day

DMM 2. Residential Plumbing Retrofit

Retrofitting residences with water efficient plumbing fixtures can be cost effective and reduce per capita indoor water use, particularly in residences constructed prior to 1992. Typical retrofit programs involve replacing old fixtures with low-flow showerheads and faucet aerators and installing toilet displacement devices or retrofitting with water conserving toilets (as needed).

Implementation Status

Plumbing fixture standards are being enforced throughout the basin. Retrofit programs are being implemented in 5 of the 7 water service areas.

Conservation Savings

Water savings vary depending on the water fixture replaced. Estimates of anticipated water savings are given in Table 7-5 (CUWCC, 2002).

Table 7-5: Conservation Savings for DMM 2

Device	Pre-1980 Construction	Post-1980 Construction
Low-flow showerhead retrofit	7.2 gcd*	2.9 gcd
Toilet retrofit	1.3 gcd	0.0 gcd

*gcd = gallons per capita per day

DMM 3. System Water Audits, Leak Detection, and Repair

Full-scale water system audits estimate water lost due to leaks in the supply system. If the audit results indicate a significant quantity of water is not accounted for, a leak detection and repair effort may be warranted. Methodology is described in the American Water Works Association (AWWA) Water Audit and Leak Detection Guidebook (AWWA, 1992). Customers should be advised whenever it appears possible that leaks exist on the customer's side of the meter.

Implementation Status

This DMM is being implemented in all 7 water service areas.

Conservation Savings

Leak detection and repair may result in water and energy savings for cities and water agencies. Customers may benefit from an effective program or may face repair costs if leaks are detected on their side of the water meter.

DMM 4. Metering and Commodity Rates for New Connections and Retrofit of Existing Connections

The most equitable way to charge for water is through rates based on the quantity consumed. This requires metering service connections and billing customers by volume of use. According to current law, all new connections must be metered. Programs can be developed to retrofit existing unmetered connections.

Implementation Status

All of the water service areas are metered and require water meter installation on new construction. Metered connections are billed by volume of use.

Conservation Savings

Metered water service connections save up to 20% compared to unmetered connections (CUWCC, 2002).

DMM 5. Large Landscape Conservation Programs and Incentives

Large irrigated landscapes represent areas where significant water savings may be made. Efforts to improve water use efficiency of large landscapes include designing and using evapotranspiration-based water use budgets, providing notices each billing cycle showing the relationship between the budget and actual consumption, providing notices at the start and end of the irrigation season alerting customers to check their irrigation systems, marketing landscape surveys to existing accounts with large landscapes, and providing information on climate-appropriate landscape design, efficient irrigation equipment to new customers and change-of-service customer accounts.

Surveys of all landscapes at cities and water agencies could be conducted and appropriate adjustments made as indicated from results of the survey. Climate-appropriate water efficient landscaping could be installed at city and water agency facilities, and dual metering where appropriate.

Implementation Status

This DMM is being implemented in 4 of the 7 water service areas.

Conservation Savings

Landscapes and/or irrigation equipment that are modified as a result of water audits could reduce water use by 15% (CUWCC, 2002).

DMM 6. High-Efficiency Washing Machine Rebate Programs

High-efficiency washing machines save water and energy needed to heat water. Energy service providers often offer financial incentive for the purchase of high-efficiency washing machines. Cities and water agencies could also offer a cost-effective financial incentive based on the marginal benefits of the water savings.

Implementation Status

This DMM is not currently being implemented.

Conservation Savings

The estimate of reliable annual water savings per replacement of a low-efficiency washing machine with a high-efficiency washing machine is 5,100 gallons (CUWCC, 2002).

DMM 7. Public Information Programs

Public information programs to promote the wise use of water and the related benefits are in place throughout the MWA service area. Programs include providing speakers to employees, community groups and the media; using paid and public service advertising; using bill inserts; providing information on customers' bills showing use in gallons per day for the last billing period compared to the same period the year before; providing public information to promote wise water use practices; and coordinating with other government agencies, industry groups, public interest groups, and the media.

Implementation Status

MWA, the AWAC and all cities and water agencies have public information programs.

Conservation Savings

There is no method to quantify the savings of this DMM.

DMM 8. School Education Programs

School education programs promote wise water use and related benefits. Programs include working with school districts and private schools in the area to provide instructional assistance, educational materials, and classroom presentations that identify urban, agricultural, and environmental issues and conditions in the local watershed. Education materials should meet the state education framework requirements, and grade appropriate materials should be distributed to grade levels K-3, 4-6, 7-8, and high school.

Implementation Status

This DMM is being implemented in 6 of the 7 water service areas.

Conservation Savings

There is no method to quantify the savings of this DMM.

DMM 9. Conservation Programs for Commercial, Industrial and Institutional Accounts

Water conservation efforts for commercial, industrial and institutional water users include replacement of existing high-water-using toilets with ultra-low-flush (1.6 gallons or less) toilets, water use surveys and customer incentives. Water use surveys include a site visit, an evaluation of all water-using apparatus and processes, and a customer report identifying recommended efficiency measures, their expected payback, and available agency incentives.

Implementation Status

This DMM is being implemented in 2 of the 7 water service areas.

Conservation Savings

Commercial water reduction from DMMs such as interior and landscape water surveys, plumbing codes, and other factors (includes savings accounted for in other DMMs) is estimated as 12% (CUWCC, 2002).

Industrial water reduction results from DMMs such as waste discharge fees, new technologies, water surveys, plumbing codes and other factors (including savings accounted for in other DMMs) is estimated at 15% (CUWCC, 2002). Institutional water reductions vary significantly.

DMM 10. Wholesaler Agency Programs

Implementation Status

MWA is assisting other agencies in the basin with water conservation through a number of cooperative efforts. These are discussed in the *Coordinated Water Conservation Efforts* section of this chapter.

Further water conservation could be achieved by the following means:

Regional Conservation Partnerships

- Develop partnerships where financial incentives or equivalent resources, are made available to advance water conservation efforts and effectiveness

- Explore financial support for all DMMs implemented by cooperating retail water agencies which can be shown to be cost-effective in terms of avoided cost of water from the wholesaler's perspective

Technical Facilitation

MWA can provide conservation-related technical support and information to all retail agencies through facilitation of groups such as the Alliance for Water Awareness and Conservation. Specific cooperative technical facilitation activities could include providing staff to work with retail agencies on DMM implementation, conducting or arranging workshops, and developing guidelines for:

- Calculating program savings, costs and cost-effectiveness
- DMM implementation measurement and reporting procedures
- Issues associated with water conservation activities for ULFT replacement, residential retrofits, surveys of commercial, industrial and institutional uses, residential and large turf irrigation, and conservation-related rates and pricing
- Encouraging and rewarding cost-effective investments in long-term conservation shown to advance regional water supply reliability and sufficiency.

Water Savings Assumptions

There is no method to quantify savings from this DMM.

DMM 11. Conservation Pricing

Conservation pricing provides incentives to customers to reduce average use, peak use, or both. Such pricing includes rates designed to recover the cost of providing service and billing for water and sewer service based on metered water use. Conservation pricing is also characterized by one or more of the following components: rates in which the unit rate increases as the quantity used increases (increasing block rates); seasonal rates or excess-use surcharges to reduce peak demands during summer months; or rates based on the long-term marginal cost or the cost of adding the next unit of capacity to the system.

Implementation Status

All of the cities and water agencies currently bill for water based on conservation priced commodity rates.

Conservation Savings

There is no method to quantify the savings of this DMM.

DMM 12. Water Conservation Coordinator

Water conservation coordinators and support staff (if necessary) perform a number of functions including coordination and oversight of conservation programs and DMM implementation, preparation of reports, promotion of water conservation issues to the city or water agency senior management, coordination of agency conservation programs with operations and planning staff, preparation of annual conservation budgets, and preparation of the conservation elements of the agency's Urban Water Management Plan.

Implementation Status

MWA and all of the cities and water agencies have staff that is dedicated to serving in this capacity.

Conservation Savings

There is no method to quantify the savings of this DMM.

DMM 13. Water Waste Prohibition

Water waste prohibitions involve enacted and enforced measures prohibiting gutter flooding, single pass cooling systems in new connections, nonrecirculating systems in all new conveyer car wash and commercial laundry systems, and nonrecycling decorative water fountains.

Implementation Status

Ordinances prohibiting water waste have been adopted in all of the water service areas.

Conservation Savings

There is no method to quantify the savings of this DMM.

DMM 14. Residential Ultra-Low-Flush Toilet Replacement Programs

Ultra-low-flush toilet replacement programs replace existing high-water-using toilets with ultra-low-flush (1.6 gallons or less) toilets in single-family and multi-family residences. Some programs involve requiring toilet replacement at time of resale.

Implementation Status

This DMM is currently being implemented in 3 of the water service areas.

Conservation Savings

Water savings depend on the type and number of toilets replaced.

8

STAKEHOLDER ASSESSMENT AND PUBLIC OUTREACH

Significant public outreach efforts were made during development of this Regional Water Management Plan. These efforts involved meetings with individuals, groups, a Technical Advisory Committee and evaluation of questionnaires. Outreach efforts were directed at stakeholders from local water agencies, state and federal agencies, municipalities, San Bernardino County, and 13 local community groups. Lists of stakeholders are included in Chapter 2 of this Plan. The assessment of stakeholders' concerns is described in the following section.

Assessment Approach

Stakeholders in the Mojave Water Agency (MWA) have a variety of issues related to potential water management activities. In an effort to identify those issues, several actions were taken as part of this planning process. Those actions included the following:

- review of existing data and reports provided by MWA and some stakeholders
- meetings with the MWA Technical Advisory Committee (TAC)
- individual and group meetings with stakeholders
- preparation and distribution of a written questionnaire; collection and review of responses

MWA arranged meetings with individual stakeholders or groups of related stakeholders. MWA selected those agencies thought to have critical issues that would benefit from individual discussions. The agencies that participated are as follows:

1. Victor Valley Wastewater Reclamation Authority
2. Baldy Mesa Water District
3. City of Barstow & Southern California Water Company
4. Joint Subarea Advisory Committee
5. City of Adelanto

6. City of Hesperia
7. Victor Valley Water District
8. Lahontan Regional Water Quality Control Board (Lahontan RWQCB)
9. Morongo Basin/Johnson Valley Area
   a. Joshua Basin Water District
   b. Hi-Desert Water District
   c. Bighorn-Desert View Water Agency
   d. San Bernardino County Special Districts
10. California Department of Fish and Game
11. San Bernardino County Special Districts

The written questionnaire was developed to provide an opportunity for all agencies and a greater number of individuals in MWA to provide input to the Regional Water Management Plan (RWMP) Update. The TAC provided review comments on the draft questionnaire and was instrumental in the development of the final version (Appendix D). The questionnaires were distributed in July 2001 in several ways: MWA mailed questionnaires directly to 26 entities, TAC members distributed copies to their constituent groups, and copies were distributed at other MWA meetings.

The following nineteen agencies and individuals submitted completed questionnaires:

Regional/Multiple Subareas

1. California Department of Fish and Game
2. County of San Bernardino Special Districts
3. Lahontan Regional Water Quality Control Board (RWQCB)
4. Southern California Water Company
5. Unknown (respondent's name was not provided)

Morongo Basin/Johnson Valley Area

1. Bighorn-Desert View Water Agency
2. Hi-Desert Water District
3. Joshua Basin Water District

Alto Subarea

1. City of Adelanto
2. City of Hesperia
3. City of Victorville

4. Jess Ranch
5. Joe Monroe
6. Victor Valley Water District
7. Victor Valley Wastewater Reclamation Authority

Este Subarea

1. Chuck Bell / Este Subcommittee
2. Norman Nichols

Oeste Subarea

1. Paul Davis

Centro Subarea

1. City of Barstow

Baja Subarea

None submitted (several attempts were made to solicit a response)

The responses to the questionnaire varied, but they included several consistent themes. All of the responses to the questionnaire are summarized by subarea respondent in Appendix D.

Summary of Stakeholder Issues

The following is a summary of the key stakeholder issues, as developed from the individual/group meetings and questionnaires.

Regional/Multiple Subareas

1. California Department of Fish and Game (DFG)
   a. Highest priority for the RWMP Update is increasing and maintaining the flows from Alto to Centro subareas. Replacement water needs to be delivered in the Narrows to benefit the riparian habitat.
   b. RWMP Update should establish short-term actions in addition to long-term actions.
   c. DFG would like Alto Subarea water level raised to create spillover to Lower Narrows.
   d. RWMP Update should evaluate recharge at several locations: Rock Springs, upstream of Rock Springs, Transition Zone, and Silver Lakes area (south of Helendale Fault).
   e. RWMP Update should address the need for additional water quality data.

f. RWMP Update should address the needs of the existing riparian habitat. Minimum water levels for key habitats are included in Appendix H to the Judgment.
g. RWMP Update should address the viability of wastewater reclamation and its impact on riparian habitat.
h. RWMP Update should evaluate the viability of a diversion or dam at the lower end of the Mojave River upstream of Afton Canyon to retain storm water for use in the Baja Subarea.
i. RWMP Update should acknowledge the benefits of removing non-native vegetation in favor of native vegetation in the riparian habitat areas.
j. RWMP Update should evaluate the potential for MWA to assist with the funding of land purchases around sensitive riparian habitat.
k. Water quality concerns associated with the fish hatchery operations include: potential increases in levels of TDS and nutrients, and the potential for translocated pathogens from the State Water Project (SWP) water.

2. County of San Bernardino Special Districts
(See Morongo Basin/Johnson Valley Area, Alto Subarea, and Oeste Subarea)

3. Lahontan RWQCB
a. Highest priority for the RWMP Update is to address the long-term impacts of the increased salt levels associated with the delivery of SWP water.
b. Next year [2002], Lahontan RWQCB anticipates starting the process to revise the Basin Plan Objectives.
c. Would like a basin-wide water quality model to be used to evaluate alternative projects.
d. Would like the water quality model used to evaluate any proposed recycled water project.
e. Water conservation should be an integral part of the RWMP Update. MWA should take a leadership role in promoting water conservation.

4. Southern California Water Company
a. Southern California Water Company (SCWC) operates systems in Alto Subarea (Apple Valley), Centro Subarea (Barstow), and Este Subarea (Lucerne Valley).
b. RWMP Update should include provisions to provide adequate supplies of water to each area of the region.
c. RWMP Update should evaluate all the competing interests for water and develop a plan for the greatest good of the group.

d. Local soil conditions should be considered when selecting a recharge site to make sure recharge would not mobilize local contaminants that have been previously "locked" in the soil.
e. The quality of SWP water, as compared to existing and emerging contaminant standards, should be considered as part of the RWMP Update.
f. The storage capacity of a local basin should be utilized first for the benefit of local basin users. Once local needs are met, use of the storage capacity for others should be considered and this use should provide some benefit to the local users.

5. Unknown (respondent's name was not provided)
   a. The overdraft must be stopped.
   b. Projects and policies developed in the RWMP Update should be fair to all.

Morongo Basin/Johnson Valley Area

1. Bighorn-Desert View Water Agency
   a. District would like assistance with obtaining grant funding for system upgrades and replacements.

2. County of San Bernardino Special Districts
   a. County operates 2 service areas in this subarea.
      i. Zone 70 W-4 (Pioneertown)
      ii. Zone 70 W-1 (Landers)
   b. County would like assistance with obtaining grant funding for system upgrades and replacements.
   c. High levels of uranium and arsenic (Zone 70 W-4) are concerns.
   d. RWMP Update should address the issues of all regions within MWA.

3. Hi-Desert Water District
   a. Highest priority for RWMP Update is the extension of the Morongo Basin Pipeline and the construction of an additional recharge facility.
   b. Nitrate levels are a concern.
   c. Would like an evaluation of the potential for a conjunctive use project in the Mesa area included in the RWMP Update.
   d. RWMP Update should include a policy on how the SWP entitlement is to be allocated or shared.

e. RWMP Update should include an evaluation of a treatment facility at the terminal reservoir for the Morongo Basin Pipeline.

4. Joshua Basin Water District
   a. Highest priority for RWMP Update is the extension of the Morongo Basin Pipeline to the District and the construction of a recharge facility.
   b. District would like MWA assistance with obtaining grant funding for the pipeline extension and recharge facilities.
   c. Fluoride and salt levels are a minor concern.
   d. RWMP Update should address the need for additional SWP entitlement for the Morongo Basin/Johnson Valley Area.
   e. RWMP Update should include an evaluation of a treatment facility at the terminal reservoir for the Morongo Basin Pipeline.

Alto Subarea

1. Baldy Mesa Water District
   a. Significant urban growth and increased water demand are anticipated.
   b. Water quality issues should be addressed. Arsenic levels are above 10 ppb.
   c. How various stakeholders will gain access to MWA's SWP entitlement should be addressed.
   d. How treatment of SWP water can fit into the regional plan and how reliable it will be should be addressed.
   e. Would like MWA to jointly work with them to evaluate injection well feasibility and percolation basin feasibility. Oro Grande Wash and No Name Wash are identified recharge sites.
   f. Would like the potential of moving their production to the Mojave River area East of Hesperia to be evaluated. A transmission system from the River to the District would be required.

2. City of Adelanto
   a. Significant urban growth and increased water demand are anticipated.
   b. Highest priority for RWMP Update is to evaluate ways to recharge the Transition Zone to increase the reliability of the City's wells.
   c. Water quality issues should be addressed. The City's wells on the Mesa have high TDS and fluoride levels.
   d. How treatment of SWP water can fit into the regional plan and how reliable it will be should be addressed.
   e. Would like the potential for injection in the Mesa area to be evaluated.

3. City of Hesperia
   a. Significant urban growth and increased water demand are anticipated.
   b. Water levels have dropped an average of 8 feet over the past 2 years due to 2 years of dry weather and minimal Mojave River flows.
   c. Welcome the evaluation of a project to move Baldy Mesa Water District production to the Mojave River area East of the City. Feel such a project could be beneficial to the entire region.
   d. City has no water quality concerns.
   e. RWMP Update should be a regional plan, not a series of individual plans.
   f. A treatment facility for SWP water should be evaluated as a regional project.
   g. Direct use of SWP water for irrigation should be evaluated as an in-lieu project.
   h. Existing and proposed local stormwater retention/detention basins should be evaluated for their potential dual use as recharge facilities.
   i. Water conservation should be an integral part of the RWMP Update.
   j. RWMP Update should mention the Army Corps of Engineers proposal to make the Mojave River Forks Dam a retention basin.

4. City of Victorville
   a. RWMP Update needs to include alternatives for recharging the regional aquifer close to points of withdrawal.
   b. The need for a water treatment facility for SWP water needs to be evaluated in the RWMP Update.
   c. The RWMP Update process needs to be coupled with an aggressive public information program to educate the general public on the regional water supply issues.
   d. Recycled water and water conservation should be an integral part of the RWMP Update.

5. County of San Bernardino Special Districts
   a. County operates 5 service areas in this subarea.
      i. Zone 42 (Oro Grande) in Transition Zone
      ii. Zone 70 C (Silver Lakes) in Transition Zone
      iii. Zone 64 (Spring Valley Lake)
      iv. Zone 70 J (Oak Hills)
      v. Zone 70 L (Pinion Hills – Phelan Area) most of production is in Oeste and most of consumption is in Alto

b. Water quality issues: chromium VI (Zone 70 J), iron and magnesium (Zones 42 and 70 C), nitrate (Zone 64), arsenic (Zone 70 C), TDS (Zone 70 C), and fluoride (Zone 70 C).
c. Zone 42 (Oro Grande) would benefit from recharge in the Transition Zone as proposed by City of Adelanto. Wells almost run dry seasonally.
d. RWMP Update should address the issues of all regions within MWA.

6. Jess Ranch
   a. RWMP Update should include the concept of recharging large quantities of water in the Floodplain Aquifer via the Rock Springs facility and extracting that water for distribution to Alto, Este, and Morongo Basin/Johnson Valley users.
   b. RWMP Update should address consumptive use issues.
   c. Farmers need to be treated equitably.
   d. MWA should only be involved in the educational aspects of water conservation. MWA should focus on supplying supplemental water as a wholesaler.
   e. RWMP Update should address the potential of degrading local groundwater quality by recharging the aquifer with SWP water.
   f. RWMP Update should be an update to the existing plan and not a new plan. Any changes to the existing plan should be clearly identified.
   g. RWMP Update should focus on getting supplemental water flowing as soon as possible.
7. Joe Monroe
   a. The time should be taken to prepare an RWMP Update that provides for an adequate, equitable, and reliable water supply.
8. Victor Valley Water District
   a. Significant urban growth and increased water demand are anticipated.
   b. Water quality concerns include arsenic and temperature. 58% of well capacity is over 10 ppb level for arsenic. Are beginning to see some low levels of nitrate.
   c. RWMP Update focus should be on bringing in wet water.
   d. Would like to build treatment facility for SWP water for direct delivery and for injection.
   e. Percolation of SWP water is considered an option, but there is concern over where the water goes once it is recharged.

f. Relying on projects that would pump additional water from around the Mojave River may be problematic for two reasons: water quality may not be adequate and increased pumping may have a detrimental affect on riparian habitat.
g. The use of recycled wastewater should be evaluated. The impact on the make-up obligations of Alto producers must be included in the evaluation.
h. RWMP Update should include a policy on how the SWP entitlement is to be allocated or shared.
i. Groundwater banking programs should be addressed in the RWMP Update. Principles must be developed that clearly state how the stakeholders establish benefits from these programs and how the benefits will be equitably shared.
j. RWMP Update should be plan that provides regional guidance while maintaining local control of facilities.

9. Victor Valley Wastewater Reclamation Authority
   a. Highest priority for RWMP Update is to determine and support the highest and best use of recycled wastewater.
   b. Adjudication should recognize the benefits of wastewater reclamation.
   c. Adjustments to the Physical Solution would be helpful.
   d. Some of the Authority's main interceptors are reaching their capacity and/or design life.
   e. Sub-regional wastewater reclamation facilities would eliminate or greatly reduce the need for major interceptor rehabilitation and/or replacement.
   f. Recycled water from sub-regional facilities could be used for urban irrigation and groundwater recharge.
   g. Regional facility would continue to treat solids and could continue to provide flow to the Mojave River.

Este Subarea

1. Chuck Bell / Este Subarea Advisory Committee
   a. A recharge facility for SWP water via the Morongo Basin Pipeline must be a part of the RWMP Update.
   b. RWMP Update should include a wide range of options, recharge locations, financial incentive, etc.
   c. Some concern regarding increasing TDS levels.
2. Norman Nichols
   a. RWMP Update must treat farmers fairly and equitably.
   b. Some concern regarding increasing TDS levels.
   c. RWMP Update should include evaluation of groundwater storage programs in Este.

Oeste Subarea

1. County of San Bernardino Special Districts
    a. County operates 1 service area in this subarea
        i. Zone 70 L (Pinion Hills – Phelan Area) most of production is in Oeste and most of consumption is in Alto
    b. Water quality issues: MTBE
    c. RWMP Update should evaluate the potential to recharge SWP water in Sheep Creek.
    d. RWMP Update should address the issues of all regions within MWA.

2. Paul Davis
    a. RWMP Update must fully address the needs of the outlying areas such as Este and Oeste.
    b. Conservation needs to be a very important part of the RWMP Update.
    c. Minimal users should pay their fair share of costs for regional programs and improvements.

Centro Subarea

1. City of Barstow
    a. Centro is close to being in balance, but there is a significant amount of FPA not currently being used.
    b. TDS levels are a concern. Fourteen wells have TDS levels over 500 mg/l.
    c. Want to make sure that Alto Subarea users are doing their part to get Alto in balance.
    d. RWMP Update should focus on stopping the overdraft and reversing it if necessary.
    e. RWMP Update should clearly state how MWA allocates SWP entitlement and how much it will cost so that developers will be able to evaluate the viability of new development.
    f. RWMP Update should include Best Management Practices for each subarea.
    g. Concerned that water introduced at the Transition Zone is not reaching Barstow.
    h. RWMP Update should acknowledge the benefits of removing non-native vegetation in favor of native vegetation in the riparian habitat areas.
    i. Want to have assurances that the requirement for 23,000 acre-feet per year to pass through the Narrows is being met.
    j. SWP water delivered through the Mojave River Pipeline should be paid for on a postage stamp basis, not a railroad ticket basis.
    k. Recognize that VVWRA discharge is currently the primary recharge mechanism for Barstow. Are willing to have alternatives that would make use of SWP water for

Transition Zone flow and allow some upstream wastewater reclamation. Centro and Barstow must not be negatively impacted.

Baja Subarea

A formal response to the questionnaire was not received, but the following comments were among several received in discussions with TAC members.

1. RWMP Update needs to treat Baja interests fairly.
2. Concerned about the lack of water reaching Baja.
3. Concerned that increased development upstream will negatively impact local water supplies.
4. Concerned about a drop in local property values due to concerns about the water supply.
5. Would like to see support for obtaining grant funds to assist local farmers with water conserving improvements.
6. Would like to see MWA and USGS confirm that the aquifer in the Newberry Springs area is recharged from the Mojave River system.

Issues Common to All Stakeholders

The assessment and evaluation of the meetings and questionnaires point to several issues that are common to virtually all stakeholders. These issues, as articulated below, helped to develop the suite of project alternatives evaluated in detail during Phase 2 of the RWMP Update.

1. Groundwater overdraft needs to be stopped and local water levels recovered if it is financially viable to do so.
2. Purchase of additional SWP entitlement should be pursued, if it makes financial sense to do so.
3. Groundwater banking with agencies outside and inside MWA should be considered as long as they provide benefit to the local basin.
4. The RWMP Update should strive to maximize the use of recycled water while meeting the obligations of the Adjudication.
5. Water conservation should be a key component in the long-term water supply.
6. The RWMP Update should treat all water users fairly and equitably.
7. Continued open dialog and stakeholder involvement is critical to the development of an effective RWMP Update.

Key Water Management Issues

Identifying the key water management issues facing the Mojave Water Agency (MWA) service area is an important step in the Agency's planning process. Clearly articulating these issues helped define the water management actions and projects presented in the next chapter of this report.

The identification of the area's key water management issues stemmed from our evaluation of recent hydrogeologic data, our update of supply and demand estimates, and our stakeholder assessment process. The following six key water management issues emerged from this process:

1) **Demand Exceeds Supply**

   The projected year 2020 water balance shows a water deficit in the Mojave Basin area ranging from 57,200 acre-feet to 79,600 acre-feet. The projected 2020 deficit in the Morongo Basin/Johnson Valley Area is 1,900 acre-feet.

2) **Water Quality**

   Water quality problems affect drinking water supplies throughout the MWA service area. The key contaminants of concern include arsenic, nitrates, iron, manganese, chromium VI and TDS.

3) **Overdraft of the Groundwater Basins**

   Declining groundwater levels occur in all subareas of the Mojave Basin Area and in the Morongo Basin/Johnson Valley Area.

4) **Riparian Ecosystem Maintenance**
   All but two of the subareas (Oeste and Morongo Basin/Johnson Valley) have potential riparian maintenance issues to consider, such as invasive species and habitat preservation.

5) **Wastewater Infrastructure**

   Wastewater infrastructure issues affect the two subareas with the largest urban water demands within the Mojave Basin Area (Alto and Centro).

6) **Subarea Interaction**

   Many subareas within the MWA service area are impacted by activities in other subareas. These impacts include water supply and water quality issues.

Each subarea has a unique set of these key issues. To help identify the issues that are specific to each subarea, the following series of tables were developed. The tables also show the locations affected within the subarea and the aquifer(s) potentially impacted.

Table 8-1: Baja Subarea Water Management Issues

Issue	Specification	Location	Aquifer(s)
Demand Exceeds Supply	2020 deficit: 6,100 to 23,200 af/yr	Overall subarea	Floodplain & Regional
Water Quality	Arsenic > 10 ppb	• Military Base • Individual Homeowner Wells	Floodplain & Regional
	Local Organics	Same as above	Floodplain
	Boron	Same as above	Floodplain
	Chromium VI	Newberry Springs area	Floodplain
	Fluoride	Isolated areas	Floodplain & Regional
	High TDS	Isolated areas	Floodplain & Regional
Overdraft	• Largest historical decline of Mojave R. Basin subareas • Causing wells to run dry • Potentially causing degradation in water quality • Potential ground subsidence NE of Newberry Springs	Overall subarea	Floodplain & Regional
Riparian Ecosystem Maintenance	• Declining water levels have caused harm to riparian growth and sustainability • Issue – Keeping groundwater levels in appropriate root zone • Listed species negatively effected	Camp Cady	Floodplain
	Blowsand conditions and vegetation loss due to lowered water levels	Calico-Newberry Fault zone	Floodplain & Regional
Wastewater Infrastructure	Not an issue		
Subarea Interaction	Judgment requiring: - Minimum subsurface flow from Centro - Minimum subsurface flow toward Afton	Overall subarea	Floodplain

Table 8-2: Centro Subarea Water Management Issues

Issue	Specification	Location	Aquifer(s)
Demand Exceeds Supply	2020 deficit: 2,700 af/yr	Overall subarea	Floodplain & Regional
Water Quality	Arsenic > 10 ppb	Barstow and Harper Dry Lake areas	Floodplain & Regional
	TDS	Same as above. 14 wells have TDS levels over 500 mg/l.	Floodplain & Regional
	Fluoride	Barstow	Regional
	Nitrates	Barstow and isolated areas	Floodplain & Regional
Overdraft	• Causing wells to run dry • Potentially causing degradation in water quality • Potential ground subsidence near Harper Dry Lake	Harper Lake area	Regional
Riparian Ecosystem Maintenance	• Habitat health based on groundwater level • Per Judgment, gw levels for riparian have been set, but two of the monitoring wells have not been drilled. • Invasive species – eradicate phreatophytes because of their consumption.	Along Mojave River and Harper Lake Habitat Preserve	Floodplain & Regional
Wastewater Infrastructure	• ~9,000 af/yr • Alto discharges provide supply to Centro. • Several entities protesting change of point of discharge. DFG wants 8,500 af/yr plus 37% of additional water treated to continue to be discharged at present location.	Victorville area	Floodplain & Regional
Subarea Interaction	• Judgment requiring minimum subsurface flow from Alto and to Baja • VVWRA wastewater point of discharge issue related to meeting downstream flow requirements.	Overall subarea	Floodplain

Table 8-3: Alto Subarea Water Management Issues

Issue	Specification	Location	Aquifer(s)
Demand Exceeds Supply	2020 deficit: 46,000 to 48,500 af/yr	Overall subarea	Floodplain & Regional
Water Quality	Arsenic > 10 ppb	• Various locations. • 58% of Victor Valley WD well capacity > 10 ppb Arsenic.	Mostly Regional, but also some in Floodplain
	High TDS	Adelanto	Regional
		Silver Lakes	Floodplain
	Fluoride	Adelanto, Silver Lakes, and isolated areas	Regional
	Nitrates (low priority, below MCLs)	Victorville	Floodplain & Regional
	Manganese, Iron	North of SCLA, Oro Grande, and isolated areas	Floodplain & Regional
	Chromium VI, Iron, Manganese, Arsenic, others	Upper Part of Mojave Watershed	Regional
	Organics	SCLA	Regional
	High Temperature	Victorville	Regional
Overdraft	Causing wells to run dry	Apple Valley	Regional
	Potentially causing degradation in water quality	Victorville	Floodplain & Regional
		Adelanto	Floodplain & Regional
		Baldy Mesa	Regional
		Hesperia	Floodplain & Regional
Riparian Ecosystem Maintenance	• Habitat health based on groundwater level and Mojave River flows • Water level needs to be raised to return to and maintain habitat	Along Mojave River – 24-mile corridor from Spring Valley Lakes to the Helendale fault area	Floodplain
Wastewater Infrastructure	• Return flow policy • Need for additional infrastructure • Satellite treatment and recycle	Overall subarea	Floodplain & Regional
Subarea Interaction	• Judgment requiring minimum subsurface flow from Este and Oeste and subsurface and surface flow to Centro • Tied to VVWRA wastewater point of discharge issue	Overall subarea	Floodplain & Regional

Table 8-4: Oeste Subarea Water Management Issues

Issue	Specification	Location	Aquifer(s)
Demand Exceeds Supply	2020 deficit: 1,900 to 2,900 af/yr	Overall subarea	Regional
Water Quality	Arsenic > 10 ppb	Localized	Regional
	MTBE	Southern region	Regional
	Moderately high TDS Chromium VI	Near El Mirage Dry Lake	Regional
	Fluoride	Isolated areas	Regional
Overdraft	• Causing wells to run dry • Potentially causing degradation in water quality • Potential ground subsidence	Depression beneath El Mirage Dry Lake	Regional
Riparian Ecosystem Maintenance	None identified		
Wastewater Infrastructure	Not an issue		
Subarea Interaction	Judgment requiring subsurface flow from Oeste to Alto	Overall subarea	Regional

Table 8-5: Este Subarea Water Management Issues

Issue	Specification	Location	Aquifer(s)
Demand Exceeds Supply	2020 deficit: 500 to 2,300 af/yr	Overall subarea	Regional & Lucerne
Water Quality	High TDS	Near Rabbit Dry Lake	Regional
		Near Lucerne Dry Lake	Lucerne
	Fluoride	Isolated areas	Lucerne
	Arsenic > 10 ppb	Isolated areas	Lucerne
	Nitrate concentrations near BBARWA discharge	Near Hwy 247 and Camp Rock Road	Lucerne
Overdraft	• Causing wells to run dry • Potentially causing degradation in water quality • Potential ground subsidence near Lucerne Dry Lake	Overall Subarea	Lucerne
Riparian Ecosystem Maintenance	Springs along Helendale Fault support habitat (Rabbit Spring, Cushenberry Spring, & several unnamed springs)	Overall subarea	Regional & Lucerne
Wastewater Infrastructure	Not an issue		
Subarea Interaction	Judgment requiring subsurface flow from Este to Alto	Overall subarea	Regional

Table 8-6: Morongo Basin/Johnson Valley Water Management Issues

Issue	Specification	Location	Aquifer(s)
Demand Exceeds Supply	2020 deficit: 1,900 af/yr (Not including imported supply and Johnson Valley)	Overall subarea	Morongo Regional
Water Quality	Nitrates (septic contamination of recharged water)	Warren Valley Basin	Morongo Regional
	Arsenic > 10 ppb	Pioneertown	Morongo Regional
	Uranium	Pioneertown	Morongo Regional
	Iron & manganese	Pioneertown	Morongo Regional
	Fluoride	Isolated areas	Morongo Regional
	Moderate TDS	Warren Valley Basin	Morongo Regional
Overdraft		• Joshua Tree Subbasin – some decline • Warren Basin is now stabilized with imported water	Morongo Regional
Riparian Ecosystem Maintenance	None		
Wastewater Infrastructure	Treatment Plant being pursued for Warren Valley Basin	Warren Valley Basin	Morongo Regional
Subarea Interaction	Warren Valley Basin Judgment	Warren Valley Basin	Morongo Regional

A review of the tables above shows that the impacts caused by the six key issues are widespread in the MWA service area. This compilation of water management issues provides a tool for identifying linkages between specific issues and subareas. These linkages can be used to craft project alternatives and water management strategies that address the issues in an integrated manner.

Coordination of IWMP, GMP and UWMP with Other Agencies

In the development of this Integrated Water Management Plan, input was sought from other agencies in the Mojave Basin through the Technical Advisory Committee. The committee discussed the content of the plan and provided input during its development. Agendas and minutes from TAC meetings are included in Appendix E.

Method for Public Participation

MWA utilized numerous methods for informing the public about the development of its IWMP and describing means by which the public could have input into development of the plan. The methods are described below.

Technical Advisory Committee

MWA formed a Technical Advisory Committee (TAC) comprised of local stakeholders with an interest in the areas groundwater. The TAC met regularly during development of the Regional Water Management Plan, reviewing and providing comments and suggestions on the Plan. The following entities comprise the Technical Advisory Committee:

Apple Valley Ranchos
Baldy Mesa Water District
Bar-H Mutual Water Company
Bighorn Desert View Water Agency
California Department of Fish & Game
Citizens for a Better Community
City of Barstow
City of Hesperia
City of Victorville
County of San Bernardino Special Districts
Department of Water Resources
Hi-Desert Water District
Jess Ranch
Joshua Basin Water District
Jubilee Mutual Water Company
Lahontan Regional Water Quality Control Board
Mariana Ranchos County Water District
Mojave Basin Area Judgment Subarea Advisory Committees
Newberry Springs-Harvard Property Owners Association
Palisades Ranch
Rancho Los Flores
Silver Lakes Association
Southern California Water Company
Spring Valley Lakes Association
Town of Apple Valley
Victor Valley Wastewater Reclamation Authority
Victor Valley Water District

In addition, approximately 20 individuals participated. Other stakeholders in the Regional Water Management Plan Update process are listed in Chapter 2.

Newsletter

The Panorama, the newsletter of the MWA is published regularly and mailed to those on its growing distribution list. Regular updates on the development of the Regional Water Management Plan have been included. A copy of Volume 3, Issue 1 published in the winter of 2003 is included in Appendix F.

Website

MWA's web site (http://www.mojavewater.org/) contains information on MWA projects, water supplies and resources, water education, Watermaster, Agency publications, a calendar of events and general information about MWA. MWA will continue to provide this service.

Annual Symposia

MWA organized and held water symposia in Victorville in Spring 2003 and in Joshua Tree in Fall 2003. Water leaders and regulators participated in discussion and information sessions. The Agency plans to make the symposia an annual event.

Alliance for Water Awareness and Conservation

MWA is a member of the Alliance for Water Awareness and Conservation, a group of local water purveyors who are collaborating on demand management measures.

Speakers Bureau

MWA provides speakers to a variety of local and community groups on MWA's plans and projects.

MWA Community Liaison Officer

MWA will continue its outreach and education efforts through the position of the Community Liaison Officer.

Subarea Advisory Committees

The 1996 Mojave Basin Area Judgment stipulated formation of Subarea Advisory Committees for each of the five Subareas. The Committee for each area acts in an advisory capacity and studies, reviews and makes recommendations on all discretionary determinations made by the Watermaster which may affect that Subarea.

Written statement to the public

A copy of the statement (MWA Newsletter) on how interested agencies and other stakeholders could participate in the development of this Plan is included in

Appendix F. Additional written statements include agendas for the TAC meetings that were mailed to the TAC members (Appendix E).

9

BASIN MANAGEMENT OBJECTIVES AND ALTERNATIVES

Mojave Water Agency

Basin Management Objectives (BMOs) and performance measures were developed as part of this Regional Water Management Plan (RWMP) Update using input from the Technical Advisory Committee (TAC) during two workshops in July and August 2002. Water supply projects and management actions were identified to provide a means to achieve these BMOs. Various combinations of these water supply projects and management actions were assembled into alternatives which were then evaluated for their ability to achieve the BMOs. This process is described in detail in this chapter.

Steps in Screening Process using Systems Approach

1. ***Define Problem***
   - ***Articulate Fundamental Objectives***
   - ***Establish Performance Measures***
2. ***Generate Alternatives***
3. ***Evaluate Alternatives***
4. ***Select Alternatives to Implement***

During Phase 2 of the RWMP Update the TAC screened and selected the best combinations of projects and management actions that address key MWA water issues using a four-step systems approach. The first step was to clearly articulate what MWA wants to accomplish through the update of the RWMP. The intended accomplishments are specified as Basin Management Objectives and performance measures. The BMOs spell out what MWA wants to accomplish, and the performance measures provide a tool to compare the relative success of alternative solutions in producing the desired results. Steps 2 through 4 are employed to generate alternative solutions, evaluate those alternatives, and ultimately select the best alternatives to implement.

The first step in this process was articulation of Basin Management Objectives and establishment of performance measures. The BMOs listed here were adopted by the TAC as a representative statement of what should be accomplished through the RWMP Update. The performance measures provide a set of indicators that can be used to help decide how effectively possible alternatives solutions provide the desired outcomes.

Basin Management Objectives

The Fundamental Basin Management Objectives developed with the TAC are presented below. The objectives established for the Mojave Water Agency Regional Water Management Plan (MWA RWMP) through 2020 are to:

Balance future water demands with available supplies recognizing the need to:

- stabilize the groundwater basin storage balance over long-term hydrologic cycles
- protect and restore riparian habitat areas as identified in Exhibit H of the Mojave Basin Area Judgment and the Department of Fish & Game management plan required by Exhibit H
- limit the potential for well dewatering, land subsidence, and migration of poor quality water
- maintain a sustainable water supply through extended drought periods; and
- select projects with the highest likelihood of being implemented.

Maximize the overall beneficial use of water throughout MWA by:

- supplying water in quantity and of quality suitable to the various beneficial uses
- addressing at a minimum Table 7-1 issues throughout the MWA service area recognizing the interconnection and interaction between different areas
- distributing benefits that can be provided by MWA in an equitable and fair manner
- ensuring that costs incurred to meet beneficial uses provide the greatest potential return to beneficiaries of the project(s)
- avoiding redirected impacts; and
- identifying sustainable funding sources including consideration of affordability.

Balancing future water demands with available supplies will increase water supply reliability by preventing continued overdraft of the groundwater. With groundwater storage stabilized, there will be groundwater available during surface water supply shortages and delivery interruptions. With a balanced basin, groundwater elevations will be relatively stable and be kept above historic low. This will reduce the potential for land subsidence and associated aquifer compaction. By limiting migration of poor quality water, available supplies will be of sufficient quality to meet drinking water objectives, thereby increasing long-term water supply reliability.

Performance Measures

For each part of the Basin Management Objectives, performance measures were proposed and discussed at the August TAC workshop. Input from this discussion is included below. The resulting performance measures can be grouped into six broad categories, as follows:

- Storage levels – relating to groundwater accessibility, environmental groundwater elevations, and subsidence potential
- Supply-demand balance – relating to water supply sustainability, mismatch between supply and demand, water supply operations and contingency plans
- Economics – relating to project costs, benefits related to water supply, mitigation requirements, and funding sources
- Water quality – relating to the suitability of water for a particular use, and expected changes in water quality
- Equity – relating to the fair and equitable distribution of benefits and costs
- Implementability – relating to the institutional complexity, potential redirected impacts, and environmental impact of proposed projects

A discussion of the Performance Measures proposed for use for the MWA Regional Water Management Plan Update is presented in Appendix B.

Projects and Management Actions

Phase 1 of the Regional Water Management Plan Update (RWMP Update) provided an array of projects and management actions that can both mitigate groundwater overdraft and meet the water supply needs of the MWA service area for the next two decades. Proposed projects and management actions were tailored to address at least one key water management issue in the basin, as well as help satisfy the Basin Management Objectives.

The purpose of this evaluation is to reasonably estimate specific parameters for **Supply Enhancement Projects** and **Management Actions** identified for the RWMP Update. These parameters were used to develop and evaluate **Alternatives** designed to address the key water management issues summarized above.

The following terms defined below are used throughout this document:

Supply Enhancement Project (Project) - A project providing water supply enhancement through groundwater recharge or an increase in groundwater recharge efficiency.

Management Action - An action improving water quality or environmental habitat. Additionally, an action increasing net water supply by implementing conservation, storage agreements, or water transfers.

Alternative - A combination of projects and/or management actions focused on addressing water management issues.

Methodology

To evaluate the relative impacts and benefits of an alternative, key parameters for the projects and management actions that compose an alternative are necessary. The following is a list of key parameters defined or estimated for each project and most management actions:

1. Project Location - by aquifer unit in the STELLA screening model presented below under the "MWA Screening Model" heading.
2. Recharge Capacity - acre-feet per year
3. Capital Cost - total cost in current (2003) dollars
4. Operation and Maintenance (O&M) Cost – dollars per year
5. Specific Issues - any known issues specific to that project
6. Facilities Required - new and existing facilities needed

The majority of the numbers presented in this document for cost and capacity are derived from a normalized unit cost analysis and should be considered rough estimates of actual design conditions. The costs reported in this document are for nominally-sized facilities and in many cases the projects were resized to match water supply needs in the screening model. The model evaluated multiple sizes and capacities of projects and management actions to spatially optimize recharge in the MWA service area for every alternative.

Normalized Project Cost Methodology

A large number of projects and management actions included in this document have not been studied in detail. Consequently, comparable cost estimates were not available. While further refinement of each potential project and management action is needed, a detailed analysis was beyond the scope of this Plan. To provide a reasonable estimate of capital and operating cost for comparing all projects, a normalized cost table was developed and applied to projects and management actions lacking detailed information.

The normalized cost table was created to provide a unit cost for varying recharge capacities, pipeline diameters, recharge areas, pumping requirements, etc. Unit costs were developed from data provided by MWA composed of contract bids, previous engineering estimates, design documents, and previous reports. Table 9-1 shows an abbreviated version of the normalized cost table with major cost categories shown. These estimates are reflective of relative costs of the various projects based on known parameters. Actual costs may differ once site specific information is developed.

Capital costs were developed based on estimates of pipeline diameters, pipeline lengths, capacity, and various factors specific to a project. In discussions with MWA, the overall project cost is usually 30 percent greater than the construction cost. Therefore, 30 percent was added to the estimated construction cost. This expenditure is associated with project implementation cost and includes geotechnical analysis, right of way, permitting, environmental mitigation, consulting services, and other associated costs.

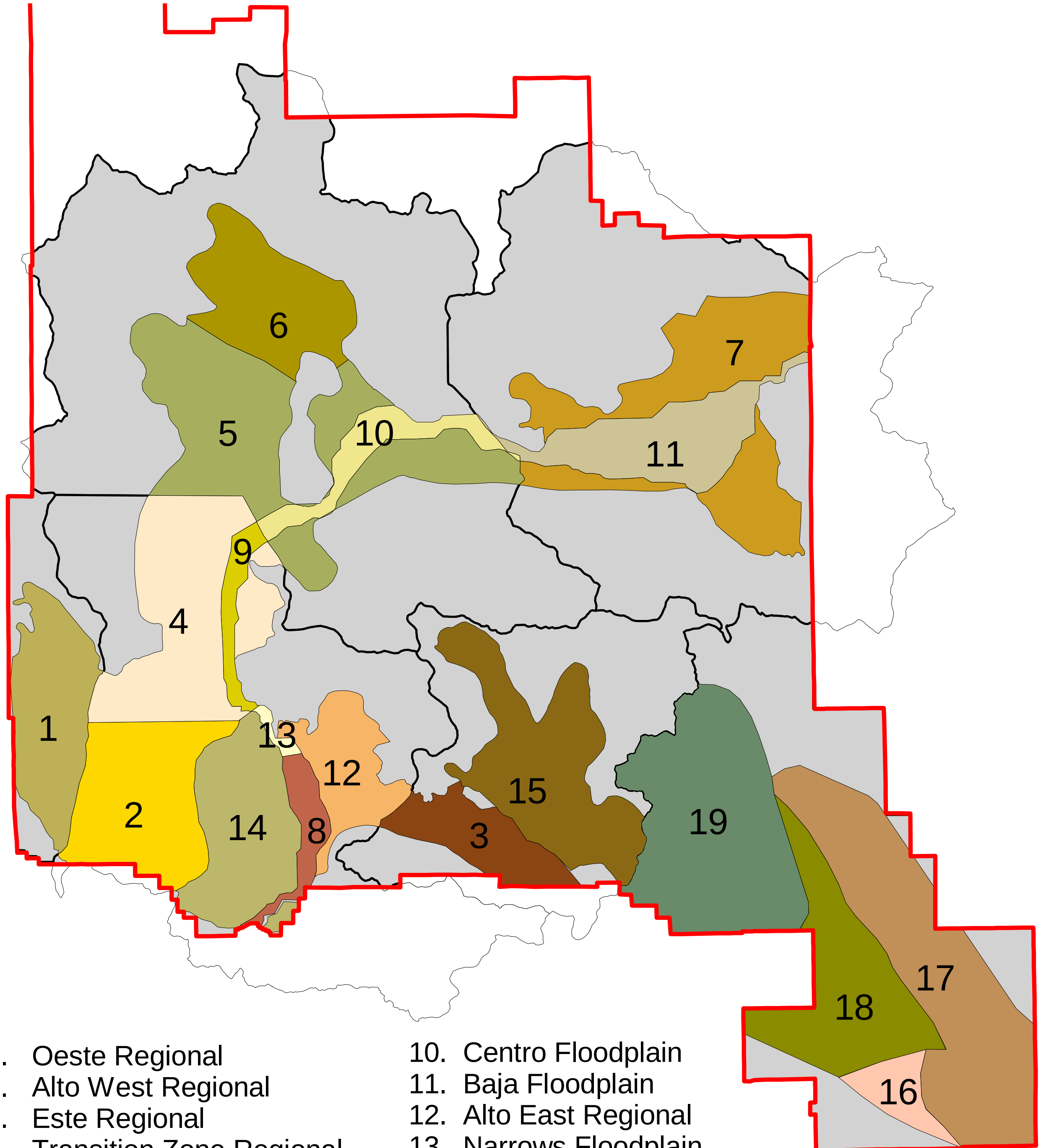
Operating and maintenance costs were developed from energy requirements, standard costs for maintenance of recharge areas and pipeline lengths, SWP water purchases, and various factors specific to a project.

Supply Enhancement Projects and Management Action Groupings

Specific groups of projects and management actions have been developed to facilitate discussions of alternatives and to provide organization. Table 9-2 presents supply enhancement projects and Table 9-3 presents management actions. Both tables list the specific **aquifer unit** each project or management action overlays. To model the water system, the Mojave River Basin floodplain and regional aquifers have been subdivided into 19 distinct but inter-connected aquifer units, as illustrated in Figure 9-1.

Supply enhancement projects are divided between projects that recharge groundwater utilizing State Water Project (SWP) water and projects that utilize other sources of water (Non-SWP). The SWP section is further divided by projects that recharge the floodplain aquifer and those that recharge areas other than the floodplain aquifer. The Non-SWP section is further divided by projects that increase recharge efficiencies within the MWA service area and projects that change a source of groundwater supply.

Management actions are divided into three groups: actions that treat or blend water supplies, actions that improve riparian health, and actions focused on conservation and storage agreements.



1. Oeste Regional
2. Alto West Regional
3. Este Regional
4. Transition Zone Regional
5. Centro Regional
6. Harper Lake Regional
7. Baja Regional
8. Alto Floodplain
9. Transition Zone Floodplain
10. Centro Floodplain
11. Baja Floodplain
12. Alto East Regional
13. Narrows Floodplain
14. Alto Mid Regional
15. Lucerne Basin
16. Warren Valley Subbasin
17. Copper Mountain Valley Subbasin
18. Means/Ames Valley Subbasin
19. Johnson Valley Subbasin

Schlumberger Water Services

Screening Model Aquifer Units

Mojave Water Agency
2004 Regional Water Management Plan

Figure 9-1

Date: February 2004

Prepared By: KTW

Table 9 - 1

Abbreviated Normalized Cost Table

(2003 dollars)

Description	Design Capacity	Peaking Factor	Operation Frequency	Recharge Pond Cost	Pipeline Length	Pipeline Cost	Capital Cost Estimate	Annual O&M Estimate	SWP Water Purchase	Cost Summary: Capital Cost with 30% Contingency	Cost Summary: Annual O&M and SWP Cost
	(acre-feet/ year)			($)	(ft)	($)	($)	($)	($)	($)	($)
Kane Wash/ Newberry Springs Recharge Ponds	6,000	2.0	70%	$660,000	53,400	$3,500,000	$4,200,000	$50,000	$1,200,000	$5,500,000	$1,300,000
El Mirage Dry Lake Recharge Ponds	2,500	2.0	70%	$270,000	21,000	$1,300,000	$1,600,000	$30,000	$500,000	$2,100,000	$500,000
Sheep Creek Recharge Ponds	2,500	2.0	70%	$270,000	10,000	$600,000	$1,000,000	$140,000	$500,000	$1,300,000	$700,000
Oro Grande Recharge Ponds	8,000	2.0	70%	$880,000	0	$0	$1,600,000	$60,000	$1,600,000	$2,100,000	$1,700,000
Cedar Street Detention Basin	3,500	2.0	70%	$1,000,000	0	$0	$1,500,000	$70,000	$700,000	$2,000,000	$800,000
Antelope Valley Wash Recharge Ponds	3,500	2.0	70%	$780,000	0	$0	$1,300,000	$60,000	$700,000	$1,700,000	$800,000
Recharge Facilities South of Apple Valley	1,000	2.0	70%	$110,000	10,000	$600,000	$700,000	$130,000	$200,000	$900,000	$300,000
Lucerne Valley Recharge Ponds	5,000	2.0	70%	$550,000	5,000	$300,000	$900,000	$530,000	$1,000,000	$1,200,000	$1,600,000
Recharge Ponds West of Hellendale Fault	5,000	2.0	70%	$550,000	5,000	$300,000	$900,000	$530,000	$1,000,000	$1,200,000	$1,600,000
Means/Ames Recharge Ponds	2,500	2.0	70%	$270,000	10,000	$600,000	$900,000	$30,000	$500,000	$1,200,000	$500,000
Hi-Desert Water District Recharge Basin #3	6,400	2.0	70%	$700,000	7,500	$500,000	$1,200,000	$60,000	$1,280,000	$1,600,000	$1,300,000
Joshua Basin District Recharge and Pipeline	1,000	2.0	70%	$110,000	10,000	$600,000	$700,000	$30,000	$200,000	$900,000	$200,000
Minneola Recharge Ponds	3,600	2.0	70%	$390,000	22,000	$1,300,000	$1,700,000	$40,000	$720,000	$2,200,000	$800,000
Daggett Recharge Ponds	16,800	2.0	70%	$1,840,000	34,000	$2,700,000	$4,500,000	$110,000	$3,360,000	$5,900,000	$3,500,000
Recharge North of Helendale Fault	5,000	2.0	70%	$550,000	7,500	$500,000	$1,100,000	$50,000	$1,000,000	$1,400,000	$1,100,000
In-Lieu Supply to Silver Lakes	5,000	2.0	70%	$0	7,500	$500,000	$500,000	$20,000	$1,000,000	$700,000	$1,000,000
Mojave River Pipeline Extension - Transition Zone	2,500	2.0	70%	$270,000	26,000	$1,600,000	$1,900,000	$30,000	$500,000	$2,500,000	$500,000
Hesperia Lakes Recharge	3,000	2.0	70%	$330,000	16,000	$1,000,000	$1,300,000	$40,000	$600,000	$1,700,000	$600,000
Recharge Facilities South of Rock Springs Turnout	8,000	2.0	70%	$880,000	21,000	$1,700,000	$2,600,000	$60,000	$1,600,000	$3,400,000	$1,700,000

Table 9-2: Supply Enhancement Project

SWP	
Non-Floodplain Aquifer Recharge (14)	*Aquifer Unit*
Kane Wash Recharge Ponds	Baja Regional
El Mirage Recharge Ponds	Oeste Regional
Sheep Creek Recharge Ponds	Oeste Regional
AVEK	Centro Regional
Oro Grande Wash Recharge Ponds	Alto West Regional
Cedar Street Detention Basin	Alto Mid Regional
Antelope Valley Wash Recharge Ponds	Alto Mid Regional
Recharge Facilities South of Apple Valley	Alto East Regional
Recharge Ponds West of Helendale Fault	Este Regional
Lucerne Valley Recharge Ponds	Lucerne Valley
Means/Ames Valley Recharge Ponds	Means/Ames Valley
Hi-Desert Water District: Warren Valley Recharge	Warren Valley
Hi-Desert Water District Recharge Basin #3	Warren Valley
Joshua Basin District Recharge & Pipeline	Copper Mountain Valley
Floodplain Aquifer Recharge (12)	*Aquifer Unit*
Newberry Springs Recharge Ponds	Baja Floodplain
Minneola Recharge Ponds	Baja Floodplain
Daggett Recharge Ponds	Baja Floodplain
Lenwood Recharge Ponds	Centro Floodplain
Hodge Recharge Ponds	Centro Floodplain
Recharge Ponds North of Helendale Fault	Centro Floodplain
In-Lieu Supply to Silver Lakes	Transition Zone Floodplain
Mojave River Pipeline Extension - Transition Zone	Transition Zone Floodplain
Rock Springs Release	Alto Floodplain
Hesperia Lakes Recharge	Alto Floodplain
Recharge Facilities South of Rock Springs Turnout	Alto Floodplain
Release SWP from Silverwood Lake	Alto Floodplain
Non-SWP	
Increase Recharge Efficiency (5)	*Aquifer Unit*
Baja Storm Flow Retention - 2 locations	Baja Floodplain
Gates for Mojave River Dam	Alto Floodplain
Cushenbury Flood Detention Basin	Lucerne Valley
Injection Wells in Mesa Area of Adelanto	Alto Mid Regional
Injection Wells in Victorville Area	Alto Mid Regional
Change Source of Groundwater Supply (5)	*Aquifer Unit*
SCWC Moving Wells to Serve Barstow	Centro Floodplain
Hinkley Water Supply Augmentation by SCWC	Centro Floodplain
JBWD Wells	Copper Mountain Valley
New Supply for Pioneertown	Means/Ames Valley
Old Woman Springs Ranch Supply	Lucerne Valley

Table 9-3: Management Actions

Water Treatment and Blending (9)	*Aquifer Unit*
Regional Surface Water Treatment Plant	Alto West Regional
Blending local water with treated SWP	Alto Mid Regional
Blending local water with Floodplain Aquifer	Alto Mid Regional
Local Wastewater Treatment Plants (Alto)	Alto Mid Regional
VVWRA Reclamation	Alto Regional
HDWD Nitrate Removal Plant	Warren Valley
Yucca Valley Wastewater Treatment	Warren Valley
Local Wastewater Treatment Plant (Lucerne)	Lucerne Valley
Individual Wellhead Treatment	Entire MWA
Improve Riparian Health (2)	*Aquifer Unit*
Land Purchase to Protect Riparian Habitat	Baja Floodplain
Eradication of Non-native Plant Species	MWA Floodplain
Conservation and Storage Agreements (6)	*Aquifer Unit*
Agricultural Conservation Programs	Entire MWA
Urban Conservation Programs	Entire MWA
Storage agreements with agencies within MWA	Entire MWA
Banking water agreements with outside agencies	Entire MWA
Pre-delivering SWP Water	Entire MWA
Water (entitlement) exchanges	Entire MWA

Supply Enhancement Projects

This section provides a technical summary of specific parameters estimated for supply enhancement projects listed in Table 9 - 2. Supply enhancement projects have the potential to address the following key water management issues as discussed in Chapter 8.

- Demand exceeds supply
- Overdraft of the groundwater basins
- Localized water quality issues
- Subarea interactions

SWP/Non-Floodplain Aquifer Recharge

Kane Wash Recharge Ponds represents a proposed terminal point in the Mojave River Pipeline where water would percolate into ponds adjacent to Kane Wash in the lower Baja Subarea. This recharge facility has been discussed as a possible alternative or addition to the Minneola or Newberry Springs recharge facilities. Currently, the pipeline is constructed to a location northeast of Barstow.

Kane Wash/Newberry Springs Recharge Ponds

Location of Project:	Baja Regional Aquifer
Recharge Capacity:	6,000 acre-feet/year
Recharge Assumptions:	Technical Document No. 2 MWA Steady State Hydraulic Analysis of Mo River Pipeline, July 1999
Capital Cost:	$5,400,000
O&M and SWP Cost:	$1,300,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Appropriate location; Recharge potential of site
Facilities Required:	Mojave River Pipeline; New pipeline extension

El Mirage Dry Lake Recharge Ponds could address the significant drop in groundwater levels in this area of the Oeste Subarea. Perched groundwater, return flow from local daries, and other naturally-occuring contaminant are issues, and selecting an appropriate location that would accommodate recharge will require additional technical evaluation.

El Mirage Dry Lake Recharge Ponds

Location of Project:	Oeste Regional Aquifer
Recharge Capacity:	2,500 acre-feet/year
Recharge Assumptions:	Based on capacity for 18" pipe with a design flow rate of 5 cfs and peaking of 2; 70% of design flow assumed on annual basis
Capital Cost:	$2,000,000
O&M and SWP Cost:	$500,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Appropriate Location; Perched groundwater conditions
Facilities Required:	California Aqueduct Turnout #1; El Mirage Pipeline

Sheep Creek Recharge Ponds is the preferred project for recharging the regional aquifer in the Oeste Subarea. The 1994 RWMP identified three potential sites for recharge along Sheep Creek. Two of the sites are located south of the California Aqueduct and one is to the north. The site farthest south (upstream) is anticipated to have the greatest beneficial impact to the Phelan area (San Bernardino County Service Area 70L). Due to the relatively low permeability of soils in the region, distributing the recharge over a large area would be beneficial (Stamos et al. 2001).

Sheep Creek Recharge Ponds

Location of Project:	Oeste Regional Aquifer
Recharge Capacity:	2,500 acre-feet/year
Recharge Assumptions:	Based on capacity for 18" pipe with a design flow rate of 5 cfs and peaking factor of 2; 70% of design flow assumed on annual basis
Capital Cost:	$1,300,000
O&M and SWP Cost:	$700,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Appropriate Location; Water quality (MTBE)
Facilities Required:	California Aqueduct Turnout #1; El Mirage Pipeline; Pump station

Antelope Valley-East Kern Water Agency (AVEK) has taken an average of 1,372 acre-feet of water from 1991 to the present to supply a powerplant located in the Centro Subarea. It is assumed that this use remains constant through 2020.

Antelope Valley-East Kern Water Agency (AVEK)

Location of Project:	Centro Regional Aquifer
Recharge Capacity:	1,372 acre-feet/year
Recharge Assumptions:	Average water use from 1991 to the present; Table 4-5 RWMP Update
Capital Cost:	Not applicable
O&M and SWP Cost:	$270,000 per year
Cost Assumptions:	$200 acre-foot SWP water cost
Specific Issues:	Not applicable
Facilities Required:	Supply to existing powerplant

Oro Grande Wash Recharge Ponds are advantageous because the site is located upgradient from Baldy Mesa Water District (BMWD) and Victor Valley Water District (VVWD). MWA and USGS, working with VVWD and BMWD, initiated two pilot recharge projects along the Oro Grande Wash. The *Victorville Master Plan of Drainage* identifies the reach of the Wash just upstream of the California Aqueduct as a potential storm water detention basin. The Wash may be able to serve the dual purpose of a storm water detention basin and a recharge facility. VVWD has also recently selected a site further downstream on the Oro Grande Wash near the Green Tree Golf Course as a potential recharge location.

Oro Grande Wash Recharge Ponds

Location of Project:	Alto Regional Aquifer – West
Recharge Capacity:	8,000 acre-feet/year
Recharge Assumptions:	USGS is currently conducting a pilot project to determine the recharge capacity of the wash; 8,000 acre-feet/year is assumed from USGS Model Run Dated 6/19/2002. MWA has conducted a separate demonstration recharge project approximately two miles upstream of the USGS site. VVWD has also recently selected a site further downstream on the Oro Grande Wash near the Green Tree Golf Course as a potential recharge location.
Capital Cost:	$2,100,000
O&M and SWP Cost:	$1,700,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Location relative to California Aqueduct
Facilities Required:	California Aqueduct (new turnout)

Cedar Street Detention Basin may provide the opportunity for recharge upgradient from City of Hesperia wells. The Hesperia Master Plan of Drainage identifies a potential site for a storm water detention basin at the east end of Cedar Street and southwesterly of the California Aqueduct. In addition to storm water detention, the 120-acre site might be able to accommodate groundwater recharge. The California Aqueduct would be the source of recharge water.

Cedar Street Detention Basin

Location of Project:	Alto Mid Regional
Recharge Capacity:	3,500 acre-feet/year
Recharge Assumptions:	Assumed recharge capacity
Capital Cost:	$2,000,000
O&M and SWP Cost:	$800,000
Cost Assumptions:	Cost Normalization Table
Facilities Required:	California Aqueduct (new turnout)

Antelope Valley Wash Recharge Ponds could provide groundwater recharge upgradient from City of Hesperia wells. The Hesperia Master Plan of Drainage identifies a 65-acre site for a storm water detention basin in the Antelope Valley Wash south of Ranchero Road. In addition to storm water detention, the site might be able to accommodate groundwater recharge. The Morongo Basin Pipeline passes by this area and would be the source of recharge water.

Antelope Valley Wash Recharge Ponds

Location of Project:	Alto Mid Regional
Recharge Capacity:	3,500 acre-feet/year
Recharge Assumptions:	Assumed recharge capacity
Capital Cost:	$1,700,000
O&M and SWP Cost:	$800,000
Cost Assumptions:	Cost Normalization Table
Facilities Required:	California Aqueduct (new turnout)

Recharge Facilities South of Apple Valley may provide opportunities for limited recharge utilizing the stream channels located south of Apple Valley that are crossed by the Morongo Basin Pipeline. If technically possible, these sites might provide some needed recharge to the Apple Valley area.

Recharge Facilities South of Apple Valley

Location of Project:	Alto Regional Aquifer – East
Recharge Capacity:	1,000 acre-feet/year
Recharge Assumptions:	Assumed recharge capacity; RWMP Update states this site may have the potential for limited recharge
Capital Cost:	$900,000
O&M and SWP Cost:	$300,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Recharge potential of site
Facilities Required:	Morongo Basin Pipeline

Lucerne Valley Recharge Ponds (East of Helendale Fault) provides an opportunity for recharge in the Este Subarea. Recharge sites have been contemplated both east and west of the Helendale Fault. The 1994 RWMP recommended constructing a facility east of the fault because the majority of groundwater pumping occurs east of the fault. MWA has purchased the land for a recharge facility, prepared preliminary construction plans, and performed the necessary environmental reviews.

Lucerne Valley Recharge Ponds (East of Helendale Fault)

Location of Project:	Lucerne Valley Subbasin
Recharge Capacity:	5,000 acre-feet/year
Recharge Assumptions:	From RWMP Update – MWA estimate
Capital Cost:	$1,200,000
O&M and SWP Cost:	$1,600,000 per year
Cost Assumptions:	Normalized Cost Table; includes annual O&M cost of $500,000 for using the Morongo Basin Pipeline under a joint-use agreement with MBP participants (estimate RWMP 1994); MWA has purchased land
Facilities Required:	Morongo Basin Pipeline; Potential recharge site purchased

Recharge Ponds West of Helendale Fault were evaluated to compare the relative effects of recharging in Este on each side of Helendale Fault.

Recharge Ponds West of Helendale Fault

Location of Project:	Este Regional Aquifer
Recharge Capacity:	5,000 acre-feet/year
Recharge Assumptions:	From RWMP Update – MWA estimate
Capital Cost:	$1,200,000
O&M and SWP Cost:	$1,600,000 per year
Cost Assumptions:	Normalized Cost Table; includes annual O&M cost of $500,000 for using the Morongo Basin Pipeline under a joint-use agreement with MBP participants (estimate RWMP 1994)
Facilities Required:	Morongo Basin Pipeline

Means/Ames Valley Recharge Ponds would serve Bighorn-Desert View, Hi-Desert, County Service Area 70 W-1, with potential benefit to Pioneertown.[38] Further study will determine benefits to the Joshua Basin Water District. The project consists of a feasibility study, extension of the Morongo Basin Pipeline between one and one and a half miles, recharge to the Pipes Wash, installation of monitoring wells, and installation of production wells.

Means/Ames Valley Recharge Ponds

Location of Project:	Means/Ames Valley Subbasin
Recharge Capacity:	2,500 acre-feet/year
Recharge Assumptions:	Based on capacity for 18" pipe with a design flow rate of 5 cfs and a peaking factor of 2; 70% of design flow assumed on annual basis
Capital Cost:	$1,100,000
O&M and SWP Cost:	$500,000 per year plus possible supplemental pumping cost
Cost Assumptions:	$200 acre-foot SWP cost
Facilities Required:	Morongo Basin Pipeline

Hi-Desert Water District: Warren Valley Recharge has been occurring since 1995. The average amount of SWP water Hi-Desert has utilized from 1995 to 2001 is 3,475 acre-feet/year.

Hi-Desert Water District: Warren Valley Recharge

Location of Project:	Warren Valley Subbasin
Historic Recharge:	3,475 acre-feet/year
Recharge Assumptions:	Average water use from 1995 to the present; Table 4-5 RWMP Update
Capital Cost:	Completed
O&M and SWP Cost:	$720,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Nitrate Leaching
Facilities Required:	Morongo Basin Pipeline

Hi-Desert Water District (HDWD) Recharge Basin #3 would extend the existing Morongo Basin Pipeline 7500 feet and provide recharge capability in Hydrogeologic Unit 1 of the HDWD. The project would provide the HDWD the ability to slightly lower the water levels in Hydrogeologic Unit 2 to reduce the impacts of contaminants (nitrate) that leach into the water from the upper zones of the aquifer.

Hi-Desert Water District (HDWD) Recharge Basin #3

Location of Project:	Warren Valley Subbasin
Recharge Capacity:	6,400 acre-feet/year
Recharge Assumptions:	RWMP Update
Capital Cost:	$1,600,000
O&M and SWP Cost:	$1,300,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Nitrate Leaching
Facilities Required:	Morongo Basin Pipeline; Pipeline extension

[38] E-mail correspondence with Hi-Desert Water District 1-3-03

Joshua Basin District Recharge & Pipeline would create a mechanism for the Joshua Basin Water District (JBWD) to make use of SWP water via the Morongo Basin Pipeline. The JBWD is a part of Improvement District M and therefore is paying a share of the debt associated with the construction of the Morongo Pipeline facilities. The project would provide needed recharge into the Copper Mountain Valley Subbasin.

Joshua Basin District Recharge & Pipeline

Location of Project:	Copper Mountain Valley Subbasin
Recharge Capacity:	1,000 acre-feet/year
Recharge Assumptions:	Assumed recharge capacity
Capital Cost:	$900,000
O&M and SWP Cost:	$200,000 per year plus possible supplemental pumping cost
Cost Assumptions:	Normalized Cost Table
Facilities Required:	Morongo Basin Pipeline; Pipeline extension

SWP/Floodplain Aquifer Recharge

Newberry Springs Recharge Ponds represents a proposed terminal point in the Mojave River Pipeline where water would percolate into ponds central to the lower Baja Subarea. This recharge facility has been discussed as a possible alternative or addition to the Minneola or Kane Wash recharge facilities. Currently, the pipeline is constructed to a location northeast of Barstow.

Newberry Springs Recharge Ponds

Location of Project:	Baja Regional Aquifer
Recharge Capacity:	6,000 acre-feet/year
Recharge Assumptions:	Technical Document No. 2 MWA Steady State Hydraulic Analysis of Mojave River Pipeline, July 1999
Capital Cost:	$5,400,000
O&M and SWP Cost:	$1,300,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Appropriate location; Recharge potential of site
Facilities Required:	Mojave River Pipeline; New pipeline extension

Minneola Recharge Ponds represents a potential terminal point in the Mojave River Pipeline supplying recharge to the Baja Floodplain Aquifer. The project would require construction of the Mojave River Pipeline from Daggett to this location.

Minneola Recharge Ponds

Location of Project:	Baja Floodplain Aquifer
Recharge Capacity:	3,600 acre-feet/year
Recharge Assumptions:	Technical Document No. 2 MWA Steady State Hydraulic Analysis of Mojave River Pipeline, July 1999
Capital Cost:	$2,200,000
O&M and SWP Cost:	$800,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Recharge potential of site
Facilities Required:	Mojave River Pipeline; Pipeline extension

Daggett Recharge Ponds are a current recharge option. The Mojave River Pipeline is currently being constructed beyond this location in the Baja Floodplain Aquifer.

Daggett Recharge Ponds

Location of Project:	Baja Floodplain Aquifer
Recharge Capacity:	16,800 acre-feet/year
Recharge Assumptions:	Technical Document No. 2 MWA Steady State Hydraulic Analysis of Mojave River Pipeline, July 1999
Capital Cost:	$227,400
O&M and SWP Cost:	$3,500,000 per year
Cost Assumptions:	Actual construction cost for completed facility
Specific Issues:	Facility completed
Facilities Required:	Mojave River Pipeline

Lenwood Recharge Ponds have been used for the delivery of Replacement Water, and for Makeup Water from the Alto Subarea, in compliance with the Judgment.

Lenwood Recharge Ponds

Location of Project:	Centro Floodplain Aquifer
Recharge Capacity:	9,000 acre-feet/year
Recharge Assumptions:	Technical Document No. 2 MWA Steady State Hydraulic Analysis of Mojave River Pipeline, July 1999
Capital Cost:	Completed
O&M and SWP Cost:	$1,900,000 per year
Cost Assumptions:	$200 acre-foot SWP water
Facilities Required:	Mojave River Pipeline

Hodge Recharge Ponds have been used for the delivery of Replacement Water, and for Makeup Water from the Alto Subarea, in compliance with the Judgment.

Hodge Recharge Ponds

Location of Project:	Centro Floodplain Aquifer
Recharge Capacity:	9,000 acre-feet/year
Recharge Assumptions:	Technical Document No. 2 MWA Steady State Hydraulic Analysis of Mojave River Pipeline, July 1999
Capital Cost:	Completed
O&M and SWP Cost:	$1,900,000 per year
Cost Assumptions:	$200 acre-foot SWP water
Specific Issues:	
Facilities Required:	Mojave River Pipeline

Recharge North of Helendale Fault was suggested as a potential project. To date, this project has not been modeled because the Centro Floodplain Aquifer is relatively balanced and existing recharge facilities (Hodge and Lenwood) are already operating.

Recharge North of Helendale Fault

Location of Project:	Centro Floodplain Aquifer
Recharge Capacity:	5,000 acre-feet/year
Recharge Assumptions:	Based on capacity for 24" pipe with a design flow rate of 10 cfs and a peaking factor of 2; 70% of design flow assumed on annual basis
Capital Cost:	$1,400,000
O&M and SWP Cost:	$1,100,000 per year
Cost Assumptions:	Normalized Cost Table
Facilities Required:	Mojave River Pipeline

In-Lieu Supply to Silver Lakes would augment current groundwater pumping with SWP supply to fill recreational lakes to be used in-lieu of the production of some or all of Silver Lakes' Base Annual Production (BAP), thereby leaving that amount of groundwater in storage. The proposal would swap up to 4,987 acre-feet of BAP for SWP supply. BAP currently allows extraction of 0.70 acre-feet for each acre-foot of BAP. Additional SWP supply would be stored in the existing Silver Lakes until released to percolate in the natural channel of Fremont Wash in the Transition Zone Floodplain Aquifer. This project would exist almost entirely on the private property of a willing participant, which may expedite implementation and minimize constraints and costs. Project would provide water in a location suitable for maintaining the TZ "water bridge", and could be compatible with plans for the reuse of treated water from County Service Area 70B.

In-Lieu Supply to Silver Lakes

Location of Project:	Transition Zone Floodplain Aquifer
Recharge Capacity:	5,000 acre-feet/year
Recharge Assumptions:	Correspondence with Silver Lakes Association
Capital Cost:	$700,000
O&M and SWP Cost:	$1,100,000 per year
Cost Assumptions:	Normalized Cost Table
Facilities Required:	Mojave River Pipeline

Mojave River Pipeline Extension - Transition Zone Recharge has the potential to benefit the riparian habitat in the Transition Zone as well as enhance the groundwater production reliability. Water for this recharge operation would be conveyed to the recharge site(s) in a new pipeline that would be an extension of the existing Mojave River Pipeline.

Mojave River Pipeline Extension - Transition Zone Recharge

Location of Project:	Transition Zone Floodplain Aquifer
Recharge Capacity:	2,500 acre-feet/year
Recharge Assumptions:	Based on capacity for 18" pipe with a design flow rate of 5 cfs and a peaking factor of 2; 70% of design flow assumed on annual basis
Capital Cost:	$2,500,000
O&M and SWP Cost:	$500,000 per year
Cost Assumptions:	Normalized Cost Table
Facilities Required:	Mojave River Pipeline

Rock Springs Release can discharge large volumes of SWP water from the Rock Springs Outlet to percolate into the Floodplain Aquifer. The construction of extraction wells and transmission pipelines would allow this stored water to be used where needed throughout MWA. Transmission facilities could be constructed to deliver the water to the City of Hesperia, Baldy Mesa WD, Victor Valley WD, and the Centro and Baja subbasins via the Mojave River Pipeline. The water could be used directly, blended with local waters to meet quality objectives, or recharged into local groundwater basins for future use.

Rock Springs Release

Location of Project:	Alto Floodplain Aquifer
Recharge Capacity:	40,000 acre-feet/year
Recharge Assumptions:	MWA – capacity of Rock Springs Outlet
Capital Cost:	None assumed
O&M and SWP Cost:	$8,100,000
Cost Assumptions:	Cost Normalization Table; Current modeling effort does not include a distribution system downstream of the Rocks Spring Outlet (no capital cost)
Specific Issues:	Affecting ability to recharge with flood flows
Facilities Required:	Rock Springs Outlet

Hesperia Lakes Recharge would provide recharge south of the MWA's Rock Springs Turnout. The City of Hesperia operates fishing lakes at its park complex adjacent to Lake Arrowhead Road. Recharge of SWP water in the Mojave River channel near the site has been suggested as a possible project.

Hesperia Lakes Recharge

Location of Project:	Alto Floodplain Aquifer
Recharge Capacity:	3,000 acre-feet/year
Recharge Assumptions:	USGS Model Run Dated 6/19/2002
Capital Cost:	$1,700,000
O&M and SWP Cost:	$600,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Morongo Basin Pipeline; Pipeline extension
Facilities Required:	Rock Springs Outlet; Wellfield; Distribution System

Recharge Facilities South of Rock Springs Turnout is similar in concept and location to the Hesperia Lakes Recharge. In order to maximize the use of the available storage in the Floodplain Aquifer, a pipeline would be constructed from the Morongo Basin Pipeline to a turnout located as far south (upstream) in the river channel as possible. The hydraulic pressure head available in the Morongo Basin Pipeline, approximately 400 feet, would limit the length of the pipeline to about four miles.

Recharge Facilities South of Rock Springs Turnout

Location of Project:	Alto Floodplain Aquifer
Recharge Capacity:	8,000 acre-feet/year
Recharge Assumptions:	Based on capacity for 30" pipe with a design flow rate of 15 cfs and peaking factor of 2; 70% of design flow assumed on annual basis
Capital Cost:	$3,400,000
O&M and SWP Cost:	$1,700,000 per year
Cost Assumptions:	Normalized Cost Table
Facilities Required:	Morongo Basin Pipeline; Pipeline extension; temporary levees in Mojave River Channel

Release SWP water from Silverwood Lake can introduce SWP water to areas upstream of the Rock Springs Outlet through Cedar Springs Dam. This alternative would require evaluation of the potential for impacts to/from land uses at the Los Flores ranch and the institutional arrangements necessary with the Department of Water Resources under their contract with the MWA. Large flows to the Mojave River can be accomplished through Cedar Springs Dam, which has a maximum discharge of 5,000 cfs.[39]

Release SWP water from Silverwood Lake

Location of Project:	Alto Floodplain Aquifer
Recharge Capacity:	25,000 acre-feet/year
Recharge Assumptions:	Max annual release (1983) from Table 4-5 of RWMP Update
Capital Cost:	None assumed
O&M and SWP Cost:	$5,200,000 per year
Cost Assumptions:	RWMP 1994 states there is a $9.25 per acre-foot SWP cost of using the California Aqueduct from MWA Turnout #3 to Silverwood Lake
Specific Issues:	Land use impacts (Los Flores Ranch); DWR operations; Affecting ability to recharge with flood flows; Federally-designated endanged Arroyo Toad
Facilities Required:	Cedar Springs Dam; temporary levees in Mojave River Channel

Baja Storm Flow Non-SWP\Increase Recharge Efficiency

Retention would construct seasonal (temporary) sand dams, dikes, or other facilities in the Mojave River channel that could enhance the natural recharge of the Floodplain Aquifer. Stakeholders have suggested that there are two or more locations in the vicinity of Daggett and Minneola that should be evaluated.

[39] Water Resources Analysis of the Upper Mojave River Basin - Alto Subarea, Todd 1993

Baja Storm Flow Retention

Location of Project:	Baja Floodplain Aquifer
Recharge Capacity:	2,000 acre-feet/year
Recharge Assumptions:	Assuming capture of 25% of average annual flow at Afton; average flow is heavily weighted by very large infrequent flow, which may quickly erode earthen detention barriers
Capital Cost:	None assumed
O&M Cost:	$130,000 per year
Cost Assumptions:	RWMP 1994
Specific Issues:	Environmental review; Streambed alteration agreement and 401/404 permits; Mojave Basin Area Judgment
Facilities Required:	None assumed

Gates for Mojave River Dam was studied in 1986 by the U.S. Army Corps of Engineers (USACE) to evaluate the feasibility of installing gates at the Mojave River (Forks) Dam to store up to approximately 62,700 acre-feet of storm water behind the dam for controlled release. USACE found that the modifications were technically and economically feasible at the time. However, they also noted that there was potential for adverse impacts to Federal listed endangered species downstream, and that significant opposition was expressed by several environmental organizations. Due to these concerns and because the County of San Bernardino and the Mojave Water Agency did not support the plan due to the cost of the project, USACE recommended that no action be taken to modify the Dam. The project is also inconsistent with current prohibitions in the Mojave Basin Area Judgement against interference with stormflows.

Gates for Mojave River Dam

Location of Project:	Alto Floodplain Aquifer
Recharge Capacity:	3,760 acre-feet/year
Recharge Assumptions:	USACE 1986
Capital Cost:	$9,000,000 – $30,000,000
O&M Cost:	$500,000 per year
Cost Assumptions:	USACE 1986
Specific Issues:	Environmental opposition; Endangered species; High cost; Adjudication restrictions
Facilities Required:	Mojave River Dam

Cushenbury Flood Detention Basin is proposed to capture runoff from the San Bernardino Mountains in the Lucerne Valley Subbasin. Currently, large storm flows drain to dry lake beds in the area that have low percolation rates. Consequently, the majority of water that drains to the lake beds is lost to evaporation and never enters the basin. The project would divert storm flows to detention basins with high rates of percolation to decrease losses from evaporation.

Cushenbury Flood Detention Basin

Location of Project:	Lucerne Valley Subbasin
Recharge Capacity:	400 acre-feet/year
Recharge Assumptions:	Assumed capacity from discussion with MWA staff
Capital Cost:	$200,000
O&M Cost:	$80,000 per year
Cost Assumptions:	Normalized Cost Table
Specific Issues:	Environmental review; potential dust from dry lakes; potential Adjudication restrictions
Facilities Required:	Stormflow Diversion and Detention Basin

Injection Wells in the Mesa Area of Adelanto are proposed because the geology in the Mesa area is not conducive to surface recharge facilities. The technical and financial feasibility of using injection wells to recharge the aquifer in this location needs to be investigated.

Injection Wells in the Mesa Area of Adelanto

Location of Project:	Alto Regional Aquifer – West
Recharge Capacity:	1,000 acre-feet/year
Recharge Assumptions:	USGS Model Run Dated 6/19/2002
Capital Cost:	$500,000
O&M and SWP Cost:	$350,000 per year
Cost Assumptions:	Initial assumption of one injection well; technical feasibility of project needs better quantification to determine financial aspects of operation
Specific Issues:	New wells
Facilities Required:	Injection Well, Distribution System

Injection Wells in the Victorville Area is under consideration by Victor Valley WD to inject treated SWP water in their wells to recharge the aquifer. This blending of SWP water with native groundwater is intended to lower some native constituent levels such as arsenic.

Injection Wells in the Victorville Area

Location of Project:	Alto Regional Aquifer – West
Recharge Capacity:	1,000 acre-feet/year
Recharge Assumptions:	USGS Model Run Dated 6/19/2002
Capital Cost:	$500,000
O&M Cost:	$350,000 per year
Cost Assumptions:	Initial assumption of one injection well; technical feasibility of project needs better quantification to determine financial aspects of operation
Specific Issues:	New wells
Facilities Required:	Injection Well, Distribution System

Non-SWP\Change Source of Groundwater Supply

Southern California Water Company Moving Wells to Serve Barstow will improve the quality of the water it delivers to the City of Barstow. More such alternative supplies are planned. The new wells will be located up-river from the city and down-river from the Lenwood Recharge Facility.

Southern California Water Company Moving Wells to Serve Barstow

Location of Project:	Centro Floodplain Aquifer
Capacity:	Not applicable
Assumptions:	SCWC Project
Capital Cost:	Not applicable
O&M Cost:	Not applicable
Cost Assumptions:	SCWC Project
Facilities Required:	SCWC Wells

Hinkley Water Supply Augmentation by Southern California Water Company: Hinkley is overdrafted locally, and the school well has recently gone dry. SCWC already serves most of Barstow, Lenwood, and much of the surrounding area in Centro. MWA has been studying the area, and has budgeted funds for further analysis.

Hinkley Water Supply Augmentation by Southern California Water Company

Location of Project:	Centro Floodplain Aquifer to Regional Aquifer
Capacity:	To be determined
Assumptions:	To be determined
Capital Cost:	To be determined
O&M Cost:	To be determined
Cost Assumptions:	To be determined
Specific Issues:	To be determined
Facilities Required:	New wells; Distribution System

Joshua Basin Water District Wells will move some of the JBWD groundwater production to the Copper Mountain Valley Subbasin. Pumping from new wells in the underutilized Copper Mountain Valley Subbasin will allow the District to reduce pumping in the Joshua Tree Subbasin to the recognized safe yield.

Joshua Basin Water District Wells

Location of Project:	Copper Mountain Valley Subbasin
Capacity:	Not applicable
Assumptions:	JBWD Project
Capital Cost:	Not applicable
O&M Cost:	Not applicable
Cost Assumptions:	JBWD Project
Facilities Required:	*New wells; Distribution system*

New Supply for Pioneertown to replace the San Bernardino County Service Area W-4's water supply that does not meet health standards for several constituents including arsenic, uranium, iron, and manganese. One possible way for the community to receive water of acceptable quality would be for CSA W-4 to obtain its water from either HDWD or BDVWA.

New Supply for Pioneertown

Location of Project:	Means/Ames Valley Subbasin
Capacity:	To be determined
Assumptions:	To be determined
Capital Cost:	To be determined
O&M Cost:	To be determined
Cost Assumptions:	Unknown
Specific Issues:	Source of supply; identification of servicing entity
Facilities Required:	Distribution System

Old Woman Springs Ranch Supply is being evaluated by MWA as a potential source of water. MWA is discussing the purchase of Old Woman Springs Ranch in Johnson Valley for rights to its water basin for future groundwater production.

Old Woman Springs Ranch Supply

Location of Project:	Johnson Valley
Recharge Capacity:	To be determined
Recharge Assumptions:	To be determined
Capital Cost:	To be determined
O&M Cost:	To be determined
Cost Assumptions:	To be determined
Specific Issues:	To be determined
Facilities Required:	New wells; distribution System; possible wellhead treatment

Management Actions

This section provides a technical summary of specific parameters estimated for management actions listed in Table 9-3. Management actions have the potential to address the following key water management issues:

- demand exceeds supply
- riparian ecosystem maintenance issues
- localized water quality issues
- overdraft of the groundwater basins
- wastewater infrastructure issues

Water Treatment and Blending

Regional Surface Water Treatment Plant options were studied by Parsons, 2001. The proposed project would treat SWP water from the California Aqueduct for delivery to four agencies in Alto, which include Baldy Mesa Water District, Victor Valley Water District, Adelanto Water Authority and San Bernardino County Special Districts. The delivery would be considered an in-lieu groundwater recharge project by curtailing groundwater production in the Alto Basin.

Regional Surface Water Treatment Plant

Location of Project:	Alto Regional Aquifer - West
Treatment Capacity:	up to 56,000 acre-feet/year
Treatment Assumptions:	Assumes recommended alternative (50 MGD Treatment Plant) constructed as stated in Alternatives for Water Supply from the California Aqueduct (Parsons 2001)
Capital Cost:	$107,000,000 (proportional cost assumed for smaller plants)
O&M Cost:	$3,300,000 per year
Cost Assumptions:	Data from recommended alternative (Parsons 2001), does not include injection or Silverwood options
Specific Issues:	High cost; would require internal SWP allocation
Facilities Required:	California Aqueduct (new turnout); Treatment plant

Blending Local Water with Treated SWP Water may be able to address some of the water quality concerns of Baldy Mesa WD, Victor Valley WD, and others.

Blending Local Water with Treated SWP Water

Location of Project:	Alto Regional Aquifer - West
Capacity:	To be determined
Assumptions:	To be determined
Capital Cost:	To be determined
O&M Cost:	To be determined
Cost Assumptions:	To be determined
Specific Issues:	To be determined
Facilities Required:	Surface water treatment plant; Pipeline infrastructure

Blending Local Water with Floodplain Aquifer Water may be able to address some of the water quality and quantity concerns of Baldy Mesa WD, Victor Valley WD, and others.

Blending Local Water with Floodplain Aquifer Water

Location of Project:	Alto Regional Aquifer - West
Capacity:	To be determined
Assumptions:	To be determined
Capital Cost:	To be determined
O&M Cost:	To be determined
Cost Assumptions:	To be determined
Specific Issues:	To be determined
Facilities Required:	Pipeline infrastructure

Local Wastewater Treatment Plant (Alto) is being considered for several communities in the Alto Subarea. This sub-regional treatment plant concept is an alternative to the large-scale expansion of the VVWRA treatment plant. VVWRA is encouraging this concept for several reasons: (1) several large diameter pipelines are reaching their expected service lives and will need to be replaced soon, (2) flow volumes will soon exceed the capacity of several existing pipelines, and (3) local treatment of the liquid portion of the wastewater flow would be cost-effective as long as VVWRA is allowed to sell the recycled water to the local purveyors.

Local Wastewater Treatment Plant (Alto)

Location of Project:	Alto Regional Aquifer
Treatment Capacity:	1,100 acre-feet/year (up to 11,000 acre-feet per year may be required)
Treatment Assumptions:	Based on plant capacity of 1.0 MGD (up to 10 MGD may be required)
Capital Cost:	$13,000,000
O&M Cost:	$1,000,000 per year
Cost Assumptions:	VVWRA Sewerage Facilities Update Year 2000 Amendment
Specific Issues:	Several locations proposed
Facilities Required:	Current sewer infrastructure; New treatment plants; Distribution system

VVWRA Reclamation will likely remain in the Alto Subarea as a supply to urban, recreational, and agricultural interests. Approximately 9.8 MGD is treated at the VVWRA regional treatment facility, which has a capacity of 11.0 MGD. The reclaimed water is then discharged directly into the Mojave River channel or percolated into the Mojave River Floodplain Aquifer. VVWRA and the Department of Fish and Game entered into a Memorandum of Understanding to provide discharge of approximately 9,000 acre-feet per year (24.7 acre-feet per day) to the Mojave River Channel to support riparian vegetation and habitat. VVWRA estimates that its capacity to collect and treat wastewater with the existing facilities will be surpassed by wastewater production in approximately 2006.[40] VVWRA estimates that the wastewater flow by 2020 will be approximately 18.62 MGD. This expansion of the current treatment plant is an alternative to the current plan for dealing with wastewater treatment requirements by constructing two sub-regional recycled water facilities by the year 2005, and another two by 2010. These facilities will provide additional wastewater treatment and at the same time, produce recycled water for the surrounding communities. Without the sub-regional treatment facilities, VVWRA will need to expand its collection system and treatment facilities to handle up to 20 MGD.

VVWRA Reclamation

Location of Project:	Alto/Transition Zone Regional Aquifer
Treatment Capacity:	10,000 acre-feet/year
Treatment Assumptions:	VVWRA Sewerage Facilities Update 2000 estimates an increase in wastewater flows of 10 MGD from 2000 to 2020
Capital Cost:	$28,000,000
O&M Cost:	$4,000,000 per year
Cost Assumptions:	VVWRA Sewerage Facilities Update 2000 – 20 MGD expansion estimate without subregional facilities
Specific Issues:	Non-degradation of groundwater quality; increases consumptive use which affects rampdown under the Mojave Basin Area Judgment
Facilities Required:	VVWRA Expansion

[40] Sewerage Facilities Plan Update, Year 2000 Amendment, Adopted by the VVWRA Board of Commissioners October 26, 2000.

Hi-Desert Water District Nitrate Removal Plant was recently constructed to improve the quality of the groundwater HDWD serves.

Hi-Desert Water District Nitrate Removal Plant

Location of Project:	Means/Ames Valley Subbasin
Treatment Capacity:	1,000 acre-feet/year
Treatment Assumptions:	HDWD states the plant allows for two wells to be put back in service, assuming each well produces 300 gpm (rough district average) then the total is approximately 1,000 acre-feet/year
Capital Cost:	Completed
O&M Cost:	
Cost Assumptions:	HDWD has recently constructed the plant
Facilities Required:	HDWD has recently constructed the plant

Local Wastewater Treatment Plant (Lucerne) Wastewater treatment in the region is currently provided by individual septic tank systems. It is likely that at some point in the future, a municipal wastewater treatment facility will have to be built.

Local Wastewater Treatment Plant (Lucerne)

Location of Project:	Lucerne Subbasin
Treatment Capacity:	1,100 acre-feet/year
Treatment Assumptions:	Based on plant capacity of 1.0 MGD
Capital Cost:	$13,000,000
O&M Cost:	$1,000,000 per year
Cost Assumptions:	Cost factors from VVWRA Sewerage Facilities Update Year 2000 Amendment
Facilities Required:	Current sewer infrastructure; New treatment plants; Distribution system

Local Wastewater Treatment Plant (Yucca Valley) Presently, Yucca Valley uses septic systems to process waste. The need for a local wastewater treatment facility is mainly due to the growing number of wells testing high in nitrate, which to some degree can be attributed to septic tanks. Hi-Desert Water District has been discussing the necessity of a wastewater treatment facility with a 20-year time frame for construction of a facility.[41]

Local Wastewater Treatment Plant (Yucca Valley)

Location of Project:	Means/Ames Valley Subbasin
Treatment Capacity:	1,100 acre-feet/year
Treatment Assumptions:	Based on plant capacity of 1.0 MGD
Capital Cost:	$13,000,000
O&M Cost:	$1,000,000 per year
Cost Assumptions:	Cost factors from VVWRA Sewerage Facilities Update Year 2000 Amendment
Facilities Required:	Current sewer infrastructure; New treatment plants; Distribution system

[41] Hi-Desert Water District website, 2003

Individual Wellhead Treatment is an option to address localized water quality issues and has been considered to treat elevated levels of arsenic and nitrate.

Individual Wellhead Treatment

Location of Project:	MWA
Treatment Capacity:	800 acre-feet/year
Treatment Assumptions:	Based on one well pumping continuously at 500 gallons per minute
Capital Cost:	$600,000
O&M Cost:	$40,000 per year
Cost Assumptions:	Estimates based on installation and operation costs of a standard Granular Activated Carbon system
Facilities Required:	Individual treatment devices

Improve Riparian Health

Land Purchase to Protect Riparian Habitat could possibly benefit the remaining riparian habitat in the Camp Cady area through a land purchase program. The general concept of the project is to reduce local pumping near the Mojave River in the Camp Cady area, allowing groundwater levels to increase due to the elimination of local cones of depression (drawdown) from local wells.

Land Purchase to Protect Riparian Habitat

Location of Project:	Baja Floodplain Aquifer
Conservation:	1,200 acre-feet/year
Conservation Assumptions:	Estimate of production of wells in 1997 that are in the vicinity of land purchase
Capital Cost:	$2,000,000
O&M Cost:	None assumed
Cost Assumptions:	Assumes purchase of 400 acres of land at $5,000/acre
Specific Issues:	Benefit from changing location of pumping needs further study
Facilities Required:	None assumed

Eradication of Non-Native Riparian Species in the Mojave River channel has been identified as a way to enhance the health of riparian habitat. Many of the non-native plants consume significant amounts of water. MWA is currently funding part of a cooperative effort to eradicate non-native species spearheaded by the Mojave Desert Resource Conservation District.

Eradication of Non-Native Riparian Species

Location of Project:	MWA Floodplain Aquifer
Conservation:	2,500 acre-feet/year
Conservation Assumptions:	Assumes all non-native species are eradicated and replaced with the same density of native species; consumption values and aerial densities from: Riparian Vegetation and its Water use During 1995 Along the Mojave River (USGS)
Capital Cost:	None Assumed
O&M Cost:	$730,000 per year
Cost Assumptions:	Based on the Pecos River Project in New Mexico; $182 dollars per/acre to remove salt cedars; assumes 4,000 acres in MWA
Specific Issues:	Feasibility of successfully eradicating non-native species; UC Davis studies have shown salt cedar is extremely resilient
Facilities Required:	None Assumed

Conservation and Storage Agreements

Agricultural Conservation Programs including educational programs and monetary support to implement Agricultural Efficient Water Management Practices, as identified by the Agricultural Water Management Council.

Urban Conservation Programs including educational programs and monetary support to implement Best Management Practices, as identified by the California Urban Water Conservation Council.

Storage Agreements with Agencies within MWA: Parties to the Judgment (including the MWA) can enter into storage agreements with the Mojave Basin Area Watermaster. The rules under which these types of agreements are possible are contained in the Rules and Regulations of the Mojave Basin Area Watermaster. These types of agreements provide parties to the Judgment the opportunity to store water for their future use or to meet future obligations under the Judgment.

Banking water agreements with outside agencies can provide benefits by cooperatively using available storage space in aquifers within the MWA service area. Groundwater banking typically involves importing surface water provided by a project partner (or partners) and storing the surface water in the groundwater basins underlying MWA. Typically, the partner banks their water during times of surplus for a right to take a portion of their water during a time of need. The potential benefits to MWA and area stakeholders from groundwater banking could be significant, including financial assistance to construct capital facilities, reduced pumping lifts and water supply for mitigation of overdraft conditions.

Currently, MWA and Metropolitan Water District of Southern California (MWD) are participating in a pilot study to bank MWD entitlement water from the California Aqueduct in the Mojave Water Agency during wet years in exchange for MWA entitlement during dry years. If this proves successful, the MWD and MWA might enter into longer-term agreements to bank water. Many details would need to be worked out by both agencies including the method to return water to MWD, infrastructure, accounting, and mitigation or avoidance of any negative affects.

Pre-delivering SWP water could be accomplished if MWA banks SWP water in subareas for future purchase and use by local pumpers. This would in essence be pre-delivering water to local pumpers for their use when needed.

Water (entitlement) exchanges are currently in place with the Solano County Water Agency (SCWA), another SWP contractor. Similar agreements could be pursued. The SCWA agreement allows MWA to receive entitlement deliveries from SCWA during hydrologic periods when SCWA has approved entitlement in excess of their needs. MWA will subsequently allow SCWA to utilize some of their approved entitlement during periods of drought, but not more than half of the quantity of SCWA entitlement that has previously been delivered to MWA.

The MWA Screening Model

The projects and management actions were grouped into alternatives that were evaluated to determine how well they mitigated the key management issues identified above. This evaluation was performed using a simulation model developed for this Plan. Using the results of the evaluation, two recommended alternatives have been selected and the projects and management actions included in those alternatives that have the highest priority for implementation have been identified.

The MWA Screening Model simulates the changes to groundwater hydrology, Mojave River flows, and pumping and return flow patterns that would result from implementation of the projects and management actions identified in the Phase 1 Report. The model was developed using the Stella 7.0 software, a simulation modeling package that allows model parameters to be changed and new results obtained quickly and easily.

To model the water system, the Mojave River Basin floodplain and regional aquifers have been subdivided into 14 distinct but inter-connected aquifer units. The Lucerne Valley, Copper Mountain Valley, Means/Ames Valley, and Warren Valley aquifers are modeled independently. The modeled aquifer units are shown in Figure 9 - 1. The model simulates groundwater storage and levels within each aquifer unit, groundwater flow between aquifer units, and leakance from the Mojave River into the aquifer units for the hydrologic period 1931-2001 using equations derived from the output of the USGS Modflow model of the Mojave River Basin.[42]

For each alternative, pumping and return flow quantities are determined for each sector within each subarea based on the amount of State Water Project (SWP) import and the Mojave Basin Area Judgment rules. These quantities are disaggregated among the subarea's aquifer units based on current pumping patterns and year 2020 population projections. The computed consumptive use is subtracted from the storage within each aquifer. MWA's SWP supplies are distributed to the alternative's SWP projects according to an algorithm that takes into account each project's demand and capacity and the capacities of the Mojave River and Morongo Pipelines. The model imposes projected 2020 demands on the historical hydrologic sequence. The model thus assumes that historical hydrology is a reasonable estimate of future hydrologic conditions.

[42] Stamos et al. 2001

The model is flexible enough to simulate a wide variety of proposed projects and management actions. For each new alternative, the input data can be modified and the model run in an hour or less, allowing for the easy evaluation of new alternatives.

Alternatives Overview

A total of 18 alternatives were evaluated in the course of this study. These include eight initial alternatives presented at the Technical Advisory Committee (TAC) meeting on February 19, 2003, eight revised alternatives presented at the TAC meeting on March 19, 2003, and two final alternatives developed based on the recommendations made at the March 19 meeting. The initial alternatives are labeled 'A' and 'B', and the revised and final alternatives are labeled 'C' and 'D.' The alternatives are further described below.

The following assumptions were common to each of these alternatives:

- 2020 demand assumptions from the Phase 1 report
- Implementation of the Mojave Basin Area Judgment (1996)
- Delivery of SWP water to the Antelope Valley-East Kern Water Agency (AVEK), to the Warren Valley subbasin for use by the Hi-Desert Water District (HDWD), and to the Hodge and Lenwood recharge ponds to meet Alto makeup obligations to Centro under the Judgment

The following seven additional primary factors can be used to distinguish between the alternatives:

- Representation of the Transition Zone
- Level of Judgment Implementation
- Agricultural demand (Scenario 1 or Scenario 2 from the Phase 1 Report)
- Amount of municipal conservation
- Presence and size of a regional water treatment plant in Alto
- Amount of Victor Valley Water Reclamation Authority (VVWRA) discharge that is used for reclamation
- Amount of SWP discharge into the Mojave River at Rock Springs

The 'A' and 'C' alternatives assume Agricultural Scenario 1 while the 'B' and 'D' Alternatives assume Agricultural Scenario 2. Alternatives A0, B0, C0, and D0 are year 2020 No Action alternatives, in which the only SWP imports are those that go to AVEK, HDWD, or to the Hodge and Lenwood recharge ponds for Alto Makeup to Centro.

Initial Alternatives

The initial alternatives include A0, A1, A2, B0, B1, B2, B3, and B4. Table 9 - 4 shows the principal characteristics that define each alternative. All of these alternatives assume full implementation of the Judgment by 2020, with consumptive use set to equal natural supply plus imports.

Alternatives A0 and B0 are No Action alternatives, which do not utilize any projects or management actions other than those in current use. Alternatives A1 and B1 attempt to meet each subarea's demands with SWP imports, including a large Rock Springs release. Alternatives A2 and B2 include a 56,000 AF/year capacity treatment plant in Alto. Alternatives B3 and B4 are similar to Alternative B1 except that they include 5% municipal conservation as well. All of the alternatives other than B4 assume that the first 9,700 acre-feet of VVWRA's discharge is released to the Mojave River, with the remaining being allocated to reclamation to golf course and municipal users. In Alternative B4 it is assumed that all VVWRA discharge is released to the Mojave River.

Table 9 - 4 shows the demands met under each alternative. Alternative A0 meets only 45% and Alternative B0 meets only 51% of the total MWA demand. In each of these No Action Alternatives, the Alto Baja, and Oeste subareas have less than 40% of their demands met.

Table 9-4: Initial Alternative Assumptions and Results

Alternative:	A			B				
	A0	A1	A2	B0	B1	B2	B3	B4
Common	AVEK, Hodge, Lenwood, Warren Valley							
Judgement Implementation	Full			Full				
Ag demand scenario	Ag Scenario 1			Ag Scenario 2				
Municipal Conservation	0%						5%	
Regional WTP			56K			56K		
Alto Reclamation		5.7K	11.0K		9.3K	11.0K	9.3K	
Rock Springs release		40K			40K		40K	40K
Demands Met (KAF/yr)								
Total	113	207	209	110	206	202	205	204
Percent Total	45%	82%	83%	51%	95%	93%	96%	98%
Agricultural	33	52	38	20	20	20	20	20
Municipal	68	129	154	70	153	162	152	152

Because they are trying to meet full municipal and agricultural demands under Agricultural Scenario 1, Alternatives A1 and A2 show significant shortages. Alternative A1 meets only 82% of total MWA demand, while Alternative A2 meets only 83%. Thus, these results indicate that it is impossible to meet full 2020 demands under Agricultural Scenario 1 with no conservation even while importing MWA's entire SWP supply. Conservation of almost 30 percent of municipal consumptive use would be required to avoid significant shortages under this scenario.

Alternatives B1, B2, B3, and B4 all meet at least 93% of total MWA demands. However, because SWP deliveries to the treatment plant in Alto are given priority, Alternative B2 has significant shortages in Baja, Oeste, and Este. Alternatives B3 and B4 have fewer shortages because they assume 5% municipal conservation.

The initial alternatives are formulated to balance supply and demand at the subarea level, but no attempt was made to select recharge projects that would balance each individual aquifer unit. As a result, although each subarea is in balance as a whole, many aquifer units show significant declines. In addition, the Transition Zone floodplain region shows unreasonable increases in elevation because no cap was placed on its available storage in the initial alternatives. This limitation in aquifer unit elevation has been resolved in the revised and final alternatives.

Revised and Final Alternatives

In response to the comments received at the February 19, 2003 TAC meeting, eight new alternatives were developed and presented at the March 19 TAC meeting: C0, C3, D0, D2, D3, D5, D6, and D7. Table 9 - 5 shows the principal characteristics that define these alternatives. All of these alternatives except for C3 assume full implementation of the Judgment by 2020, with consumptive use set to equal natural supply plus imports. Alternative C3 assumes that the rampdown of agricultural producers will remain at 80% in 2020. In Alternative C3, agricultural production is permitted to continue even if it results in drawdowns in the groundwater aquifers.

Table 9-5: Revised and Final Alternative Assumptions and Results

Alternative:	C		D							
	C0	C3	D0	D2	D3	D5	D5r	D6	D6r	D7
Common	AVEK, Hodge, Lenwood, Warren Valley									
Judgement Implementation	Full	80% Ag	Full							
Ag demand scenario	Ag Scenario 1		Ag Scenario 2							
Municipal Conservation	0%		0%	5%		20%*	10%*	20%*	10%*	20%*
Regional WTP				46K		26K	12K			
Alto Reclamation		6.3K		9.9K	8.7K	6.8K	8.7K	6.8K	8.7K	6.8K
Rock Springs release		10K			10K	10K	10K	10K	10K	40K

*Municipal conservation in the Morongo Basin/Johnson Valley Area is 5% in these alternatives

Demands Met (KAF/yr)	C0	C3	D0	D2	D3	D5	D5r	D6	D6r	D7
Total	102	216	101	198	200	182	199	185	198	185
Percent Total	40%	85%	47%	95%	96%	98%	99%	100%	98%	100%
Agricultural	30	56	20	20	20	20	20	20	20	20
Municipal	59	138	63	153	148	131	146	131	145	131

The revised alternatives build off of the initial 'A' and 'B' alternatives. In these alternatives, the problem of unreasonably high elevation increases in the Transition Zone has been resolved by limiting the amount of recharge into the aquifer from the Mojave River such that the aquifer elevation could not exceed 2,510 feet. In addition, an attempt has been made in each alternative to select a combination of recharge projects for SWP water that would result in reasonable balance in each of the aquifers units.

Alternative D2 is a revised version of B2, with a 46,000 acre-foot/year regional water treatment plant in Alto and with 5 percent municipal conservation. Alternative D3 also has 5% municipal conservation but does not include a regional treatment plant. Alternatives D5, D6, and D7 include 20% municipal conservation in the Mojave River Basin. Alternative D5 includes a smaller 26,000 acre-foot/year regional treatment plant. Alternative D7 is the only new alternative with a large Rock Springs release.

After presentation of the results of these alternatives at the TAC meeting, it was decided to create two final alternatives that would be revisions of the D5 and D6 alternatives. D5r is similar to D5 except that it includes only 10% municipal conservation in the Mojave River Basin and the size of the Regional Treatment Plant has been reduced to 12,000 acre-feet/year capacity. D6r is similar to D6 except that the amount of municipal conservation is reduced to 10 percent. Table 9 - 6 shows the projects and management actions that were modeled in each of the revised and final alternatives. The following sections briefly describe each alternative's performance under different performance measures.

Demands Met

Table 9 - 6 shows the demands met under each revised and final alternative. Alternative C0 meets only 40% and Alternative D0 meets only 47% of the total MWA demand. In each of these No Action Alternatives, Alto, Baja, and Oeste have 50% or less of their demands met. The results of Alternative C3 demonstrate that it is not possible to meet 2020 demand levels while keeping agricultural free production allowance at 80% rampdown levels. In this alternative, only 85% of total MWA demands are met, and significant overdraft of the Baja Subarea occurs.

Alternatives D2, D3, D5, D5r, D6, D6r, and D7 all meet at least 95% of total MWA demand. However, Alternative D2 has significant shortages in Baja and Oeste due to the lack of flexibility offered by the inclusion of a large treatment plant in Alto. With 20% municipal conservation, Alternatives D5, D6, and D7 are able to meet very close to 100% of total MWA demand. At the intermediate level of 10% municipal conservation, Alternatives D5r and D6r are each able to meet at least 98% of total MWA demand, with no significant shortage in any subarea.

All action alternatives meet significantly more demand than do the No Action Alternatives. Alternative C3 supplies the most total demand because it is not constrained to achieve balance in the groundwater aquifers. Alternatives D2 and D3 meet more total demand than the other 'D' alternatives because they include less municipal conservation, while Alternatives D5, D6, and D7 meet the least demand of all the non-No Action Alternatives because they include the greatest municipal conservation.

Table 9-6: Representative Projects and Management Actions Included in each Revised and Final Alternatives

Project/Management Action	Subarea	Alternative									
		C0	D0	C3	D2	D3	D5	D5r	D6	D6r	D7
			(volume is in average annual acre-feet)								
Additional Recharge Facilities South of Rock Springs Outlet	Alto				**1,408**	**11,956**	**3,555**		**7,280**		
Alto wellhead treatment	Alto			**0***	**0***	**0***	**0***	**0***	**0***	**0***	**0***
Antelope Valley Wash Recharge Ponds	Alto			**7,702**	**1,665**	**5,231**	**5,688**	**5,640**	**6,471**	**7,157**	**3,458**
Cedar Street Detention Basin Recharge	Alto			**7,702**	**1,665**	**4,857**		**5,640**	**6,471**	**7,157**	
Hesperia Lakes Recharge	Alto					**2,242**		**6,345**		**7,885**	
Mojave River Pipeline Extension - Transition Zone	Alto			**5,602**							**2,527**
Oro Grande Wash Recharge Ponds	Alto			**11,203**	**3,805**	**11,956**	**5,688**	**8,601**	**12,133**	**12,015**	**6,762**
Recharge Ponds South of Apple Valley	Alto			**4,201**		**4,110**	**711**	**2,820**	**4,044**	**3,755**	
Regional Surface Water Treatment Plant	Alto				**40,670**		**24,559**	**11,963**			
Silver Lakes In-Lieu Recharge	Alto								**2,427**	**2,253**	**2,527**
Rock Springs Release	Alto			**7,348**		**7,444**	**7,256**	**7,155**	**8,164**	**7,591**	**31,762**
Baja Stormflow Retention	Baja			**2,000**		**2,000**	**2,000**	**2,000**	**2,000**	**2,000**	**2,000**
Daggett Recharge Ponds	Baja			**6,337**							
Kane Wash/Newberry Springs Recharge Ponds	Baja				**2,671**	**3,449**	**2,510**	**2,604**	**2,855**	**2,800**	**2,984**
Alto Makeup (to Hodge and Lenwood)	Centro	**1,984**	**1,984**	**890**	**1,369**	**915**	**909**	**909**	**909**	**908**	
AVEK	Centro	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**
Hinkley water supply	Centro			**0***	**0***	**0***	**0***	**0***	**0***	**0***	**0***
Cushenbury Wash Stormflow retention	Este			**400**				**400**	**400**	**400**	**400**
Lucerne Valley Recharge Ponds	Este			**1,190**							
Recharge Ponds West of Helendale Fault	Este			**342**	**450**	**708**	**496**	**343**	**241**	**369**	**252**
Hi-Desert WD: Warren Valley	MBJV	**1,557**	**1,557**	**1,557**	**1,450**	**1,450**	**1,450**	**1,450**	**1,450**	**1,450**	**1,450**
Joshua Basin District Recharge and Pipeline	MBJV			**445**	**393**	**393**	**393**	**393**	**393**	**393**	**393**
Means/Ames Recharge Ponds	MBJV						**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
Pioneertown water supply	MBJV			**0***	**0***	**0***	**0***	**0***	**0***	**0***	**0***
Sheep Creek Recharge Ponds	Oeste			**2,485**	**1,459**	**2,293**	**1,881**	**2,109**	**2,140**	**2,260**	**2,236**
SUBTOTAL IMPORTS		**4,913**	**4,913**	**60,777**	**58,377**	**60,374**	**59,467**	**60,744**	**59,750**	**60,762**	**59,122**
Urban Conservation		**0**	**0**	**0**	**8,142**	**8,142**	**31,417**	**15,900**	**31,417**	**15,900**	**31,417**
VVWRA Reclamation		**0**	**0**	**6,335**	**9,925**	**8,841**	**6,826**	**8,656**	**6,826**	**8,437**	**6,826**

*This project does not represent a new water supply

Groundwater Storage

Table 9 - 7 shows the average annual change in groundwater storage in each subarea under each alternative. The Centro Subarea shows a surplus in all alternatives. In Alternative C3 there is a significant reduction in groundwater storage in Baja because there is not enough supply available to meet the agricultural production at 80% of Base Annual Production. Alternative D7 includes a large Rock Springs release, which is not effective in overcoming deficits in the Alto Regional aquifer and causes greater surpluses in Centro and Baja due to increased Mojave River flow downstream.

Alternatives D5 and D6 perform the best under this measure, with total net increases of 15,800 and 13,500 acre-feet/year, respectively and no deficits in any subarea. This occurs because the high 20% municipal conservation reduces the need for SWP supply to meet demand and allows a certain amount of SWP water to be imported for the purpose of replenishing the groundwater basins.

Table 9-7: Average Annual Change in Groundwater Storage

	Morongo	Este	Oeste	Alto	Centro	Baja	Total	Rank
No-Action Alternative C0	0	0	0	0	7,200	0	7,200	7
No-Action Alternative D0	0	100	0	0	6,600	0	6,700	9
C3	0	0	400	2,500	5,800	(10,900)	(2,200)	10
D2	0	100	500	1,100	5,400	(300)	6,800	8
D3	0	0	500	1,500	5,400	100	7,500	6
D5	1,000	600	500	2,600	10,000	1,100	15,800	1
D5r	1,000	100	500	1,300	7,400	200	10,500	3
D6	1,000	200	600	2,400	8,600	700	13,500	2
D6r	1,000	0	500	500	6,700	100	8,800	5
D7	1,000	(200)	400	(10,900)	12,800	6,400	9,500	4

Groundwater Levels

In all of the alternatives following the initial alternatives, an effort has been made to select recharge projects in locations that would achieve relative balance in all subareas in the aquifer. This has been achieved in all alternatives except for Alternatives C3, D2 and D7.

In Alternative C3, the floodplain and regional aquifers in Baja are significantly depleted because agricultural production is allowed to remain at levels that cannot be supported by the available supply. Figure 9 - 2 shows the groundwater levels in the Baja Regional aquifer under each alternative. In Alternative C3, the groundwater elevations drop 24 feet in this alternative, compared to 8 feet or less in each of the other alternatives.

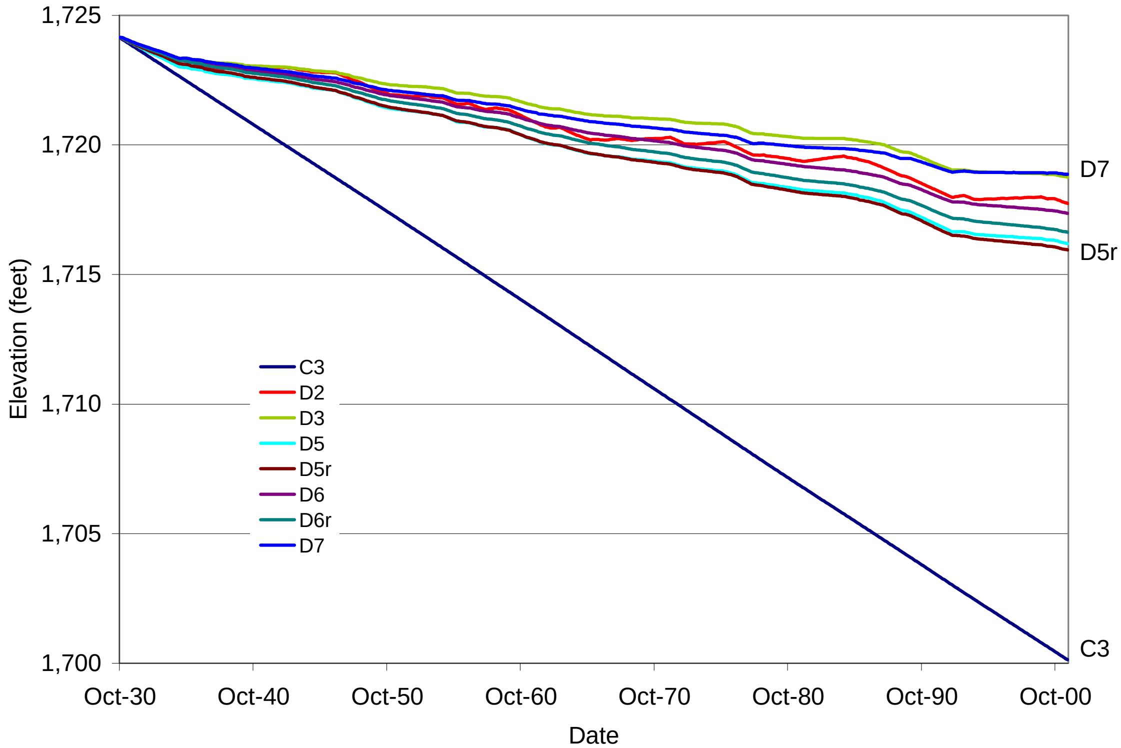


Figure 9-2: Time Series of Elevations in the Baja Regional Aquifer

In Alternative D2, there is not enough flexibility to balance all of the aquifers because such a large portion of the SWP supply is allocated to an Alto Treatment Plant. Figure 9 - 3 shows the groundwater levels in the Alto Floodplain Aquifer under each alternative. The groundwater levels in Alternative D2 drop 18 feet over the course of the model period compared to a decline of less than 8 feet for every alternative other than D7.

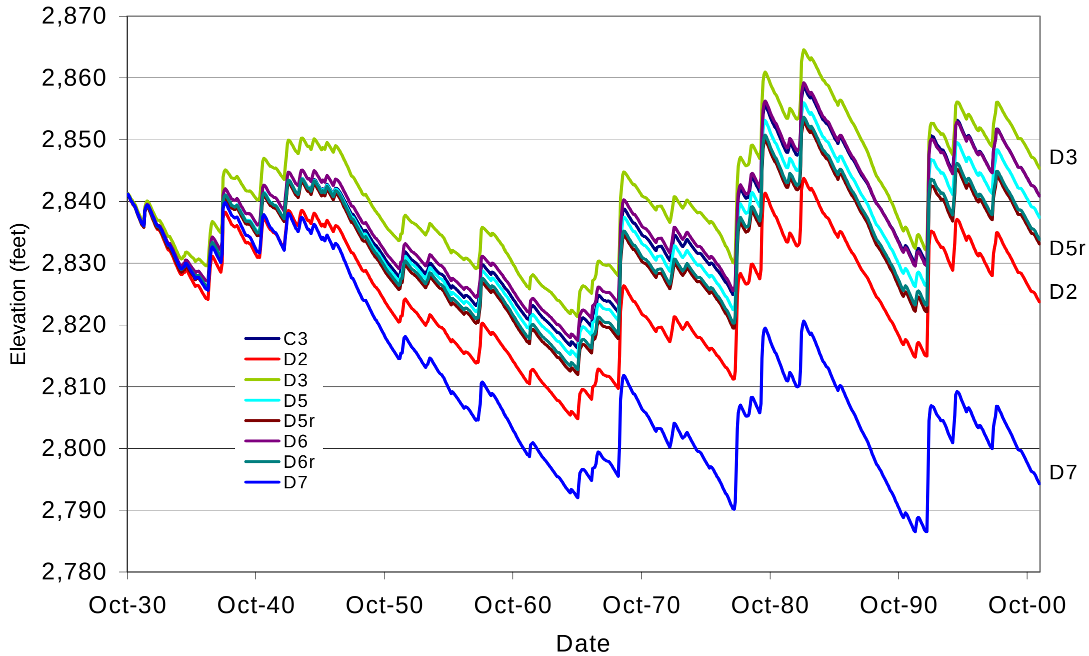


Figure 9-3: Time Series of Elevations in the Alto Floodplain Aquifer

In Alternative D7, the Alto West Regional, Mid-Regional, East Regional, and Floodplain aquifers are significantly depleted. This occurs because of the heavy reliance in this alternative on a Rock Springs release into the Mojave River to meet Alto's supply needs. In Alternative D7, the Alto Floodplain aquifer drops 47 feet in elevation over the course of the modeled period.

Subarea Interaction

Subarea interaction is measured by the amount of Mojave River flow and groundwater flow that passes from one subarea to another. Figure 9 - 4 shows the average annual Mojave River flows in each alternative. Alternative D7 has significantly higher river flows in all river reaches compared to the other alternatives because a large Rock Springs release has been included in the alternative. Several thousand acre-feet of additional outflow from the basin through Afton Canyon would occur annually due to this operation. All of the other alternatives have similar magnitude Mojave River flows on average.

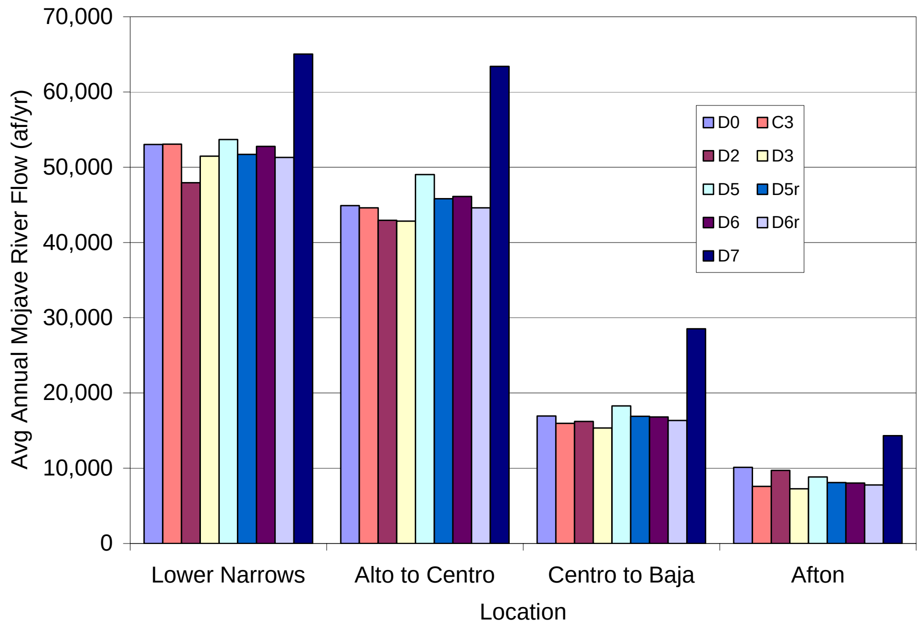


Figure 9-4: Average Annual Mojave River Flows

Figure 9 - 5 shows the average annual groundwater flows between subareas in each alternative. In Alternative D7 there is additional groundwater flow from Este and Oeste into Alto because the Alto regional aquifer has been depleted due to insufficient SWP recharge. Alternative C3 has the highest groundwater flows from Centro to Baja because Baja's aquifers are depleted. The other alternatives have similar magnitude groundwater flows.

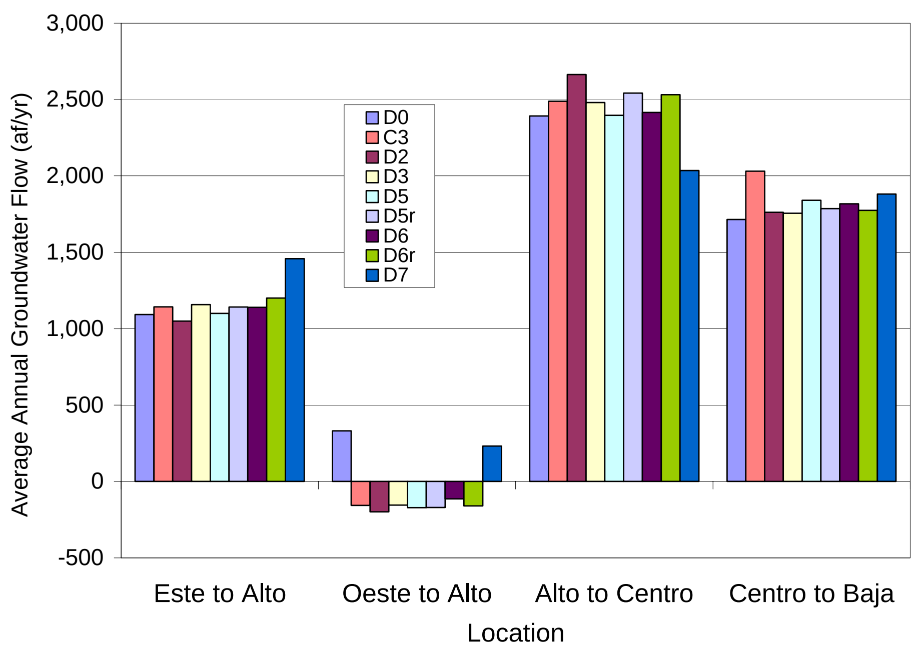


Figure 9-5: Average Annual Groundwater Flows

Water Quality

All of the alternatives were evaluated to estimate the effects that the proposed imports of SWP water would have on the water quality of each subarea. For each constituent, the estimated quality of SWP water was compared to the quality of the existing water and to the constituent's drinking water standard to determine the degree of improvement or detriment caused by the introduction of SWP water. SWP water is of higher quality than drinking water standards for all constituents.

For most constituents and in most subareas, the quality of SWP water was superior to the existing water quality. However, constituent concentrations in the SWP water were slightly higher than the existing concentrations of boron, nitrates, and TDS in Alto and of boron and nitrates in Oeste.

Alternative Cost

Table 9 - 8 shows the total estimated annualized capital and operating cost for each alternative. The alternatives that include an Alto Regional Treatment Plant (D2, D5, and D5r) have the highest costs.

Table 9-8: Annualized Cost of Each Alternative

Alternative	Annualized Cost ($ millions/year)
C3	$14.6
D2	$22.9
D3	$14.1
D5	$21.3
D5r	$20.8
D6	$15.9
D6r	$16.1
D7	$14.6

Recommended Alternatives

Alternatives D5r and D6r were identified as recommended alternatives to be carried forward for evaluation in greater detail in the programmatic environmental documentation. Each of these alternatives provide the following benefits:

- 99% of total MWA demand is met with no significant shortage in any subarea or demand sector
- include an attainable level of 10% municipal conservation
- provide water quality improvements over existing conditions
- all groundwater aquifer units are in balance
- each alternative provides benefits to all subareas without negatively impacting other areas

Common Features

A complete list of projects and management actions included in Alternatives D5r and D6r was shown in Table 9 - 6. These alternatives have many common features, including:

- 10% Municipal conservation in the Mojave River Basin, 5% in the Morongo Basin/Johnson Valley area
- Agricultural Scenario 2
- Reclamation of VVWRA discharge above 9,700 acre-feet/year
- Recharge of SWP water into the Alto Mid-Regional, East Regional, and Floodplain aquifers, and into the Baja Regional, Este Regional, Oeste Regional, Warren Valley, Copper Mountain Valley, and Means/Ames Valley aquifers
- Baja and Cushenberry Canyon stormflow retention or equivalent pond recharge projects
- Water supply augmentation for Hinkley and Pioneertown
- Alto wellhead treatment

The primary difference between the two alternatives is that Alternative D5r includes a 12,000 acre-foot/year capacity regional treatment plant in Alto. Alternative D6r includes in-lieu supply of SWP water to Silver Lakes (or the equivalent pond recharge projects)[43] and larger sized recharge facilities in all Alto aquifers.

Project and Management Action Priorities

An important goal of the RWMP Update was to identify those projects and management actions that would have the highest priority. For this purpose, each project and management action included in Alternatives D5r or D6r has been categorized as having High, Moderate, or Low Priority. The designation of priority for each project or management action was determined using the following criteria:

- whether it is an existing project or is already being pursued by MWA
- the level of current overdraft that the project attempts to mitigate
- expected growth in the subarea where the project will be applied

Table 9 - 9 shows the recommended priority of each project and management action. The projects that have the highest priority include implementing 10% municipal conservation, VVWRA wastewater reclamation, Alto wellhead treatment, a new water supply for Pioneertown, and the recharge of SWP water into the Warren Valley and into the Floodplain, West Regional, and Mid-Regional aquifers in Alto. Municipal conservation is considered to have the highest

[43] Equivalent pond recharge projects would involve additional facilities and easements at higher cost.

priority because measures will need to be initiated immediately in order to achieve 10% conservation by 2020. Recharge of SWP water into the Alto Floodplain, West Regional, and Mid-Regional aquifers will require feasibility studies to determine the optimal locations for building the necessary recharge facilities. Many such projects have been proposed, including projects at Oro Grande Wash, Antelope Valley, and Cedar Street in the West and Mid-Regional aquifers, and an Upper Mojave Wellfield Distribution System utilizing Rock Springs or Hesperia Lakes or other additional recharge facilities South of Rock Springs in the Floodplain aquifer.

Table 9-9: Recommended Priority for each Project or Management Action

Project or Action	Aquifer	Existing or Being Pursued?	Amount of Current Overdraft in Aquifer?	Expected Subarea Growth?	New Projects (not in 1994 plan)	Designed or Complete EIR	Comments	Priority
10% Municipal Conservation	All	No	High	High			5% in Morongo/Johnson ;Needs to start immediately	High
Wastewater Reclamation	All of Alto	Yes	High	High	√		VVWRA is actively pursuing	High
Alto Regional Treatment Plant	All of Alto	No	High	High	√		High expected cost	Moderate
Alto Wellhead Treatment	All of Alto	Yes	N/A	N/A	√		Addresses localized water quality problems; arsenic standard implementation by 2006	High
Recharge	Alto Floodplain	Yes	High	High		√	Rock Springs existing; feasibility studies needed	High
Recharge	Alto Mid-Regional	Yes	High	High	√		Feasibility studies needed	High
Recharge	Alto West-Regional	Yes	High	High	√		Feasibility studies needed; Oro Grande tests proceeding	High
Recharge	Alto East Regional	No	Moderate	High	√		Feasibility studies needed	Moderate
Recharge/ In-lieu Recharge	Transition Zone Floodplain	No	Low	High	√		Recharge not needed; assumes continued VVWRA recharge; limited drought buffer	Moderate
Recharge or Stormflow Retention	Baja Floodplain	No	High	Low	√		Feasibility studies needed	Moderate
Recharge	Baja Regional	Yes	High	Low		√	Feasibility studies needed	Moderate
Hinkley Water Supply	Centro Regional	No	N/A	N/A	√		Addresses water quality and quantity problems	Moderate
Recharge or Stormflow Retention	Este Regional	No	Moderate	Moderate			Feasibility uncertain; Judgment limitations for stormflow retention; listed County flood control project	Moderate
Recharge	Lucerne Valley	No	Low	Moderate		√	Feasibility studies needed; no current demand	Low
Recharge	Oeste Regional	No	Moderate	Moderate			Feasibility studies needed	Moderate
Recharge	Copper Mtn Valley	Yes	Moderate	Moderate			Feasibility studies in progress	Moderate
Pioneertown Water Supply	Means/Ames Valley	No	High	N/A			Addresses water quality and quantity problems; no potable water currently available	High
Recharge	Means/Ames Valley	No	Moderate	Moderate			Feasibility studies needed	Moderate
Recharge	Warren Valley	Yes	Low	Moderate			Existing facility, new facilities being investigated	High

10

MANAGEMENT ACTIONS

This chapter describes the Management Actions for Mojave Water Agency's implementation of the 2004 Regional Water Management Plan. These actions will be taken to help achieve the Basin Management Objectives described in Chapter 9 of this Plan.

The Management Actions neither supercede nor conflict with the Mojave Basin Judgment or the Warren Valley Judgment. All provisions of these Judgments are integral parts of the foundation of this Plan.

Inter-agency coordination and collaboration during development of this Plan took place through the Mojave Technical Advisory Committee (TAC). Committee members had an opportunity to review and comment on elements of the Plan including the Management Actions presented here. More information on the TAC is included in Chapter 8 of this Plan. The Agency is committed to continued inter-agency coordination as Plan elements are put into action both independently and by implementing agencies.

Management Authority

The California State Legislature authorized the formation of the Mojave Water Agency (MWA) in 1959 for the purpose of managing declining groundwater levels in the Mojave Basin Area, El Mirage Basin, and Lucerne Basin. The Legislature's act required the vote of residents within the boundaries of the proposed agency, which would finalize the creation of the agency. With the vote of the people, MWA was formed on July 21, 1960. MWA was expanded by annexation in 1965 to include the Johnson Valley and Morongo Basin areas.

The enabling act authorizes MWA to do "any and every act necessary, so that sufficient water may be available for any present or future beneficial use of the lands and inhabitants within MWA's jurisdiction." To fulfill this objective, the Agency currently performs the following:

- MWA acts as the wholesale administrator of State Water Project water delivered to parties within the MWA service area
- MWA is the current Court-appointed Watermaster for the Mojave Basin Area Judgment
- Monitoring programs and special studies throughout the Mojave Water Agency territory
- MWA has prepared this Regional Water Management Plan to plan water supplies and use in the Agency through 2020

As discussed in this Plan, the management authority of MWA is considerable in scope and areal extent, and extends to areas outside of the Court-administered judgments. The Mojave Basin Area Judgment requires that annual water production records be collected and verified by producers exceeding 10 acre-feet per year of production within each of the five subareas. Production outside the judgments includes groundwater use by several large landowners in the basin who were not parties to the Judgment and producers whose extractions are less than 10 acre-feet per year. More information on Minimal Producers can be found in the *Extraction Sites/Consumption* section later in this Chapter. MWA Ordinance 11 may provide a water charge structure for Minimal Producers. The Court has continuing jurisdiction and could order other controls in the future. The Warren Valley Basin is subject to a Court judgment that is administered by the Hi-Desert Water District acting as the Court-appointed Watermaster. Annual reports are developed by the Watermaster on water levels and matters that may impact safe yield.

Management Actions

The Management Actions consist of 60 specific actions that can be grouped into the following seven elements:

1. Monitoring
2. Improve characterization of the basin
3. Continue long-term planning
4. Groundwater protection
5. Construction and implementation
6. Financing
7. Public participation

The specific actions as grouped into these seven elements are presented below:

1) Monitoring

As regional groundwater manager, MWA has the authority for monitoring regional groundwater quantity and quality, and has implemented programs to accomplish this. The State Water

Resources Control Board is the primary State agency responsible for water quality management issues in California. Much of the responsibility for implementation of the SWRCB's policies is delegated to nine Regional Water Quality Control Boards. The Lahontan RWQCB and Colorado River RWQCB overlie MWA. Court-ordered requirements compel collection of data focused on components of the water balance, which the Agency measures, compiles, and disseminates. Cooperators in monitoring efforts include local water agencies, independent well owners, and the U.S. Geological Survey. Information collected or compiled by the Agency is utilized by local water managers and the Watermasters.

Role of the Mojave Basin Area Watermaster

By order of the Mojave Basin Area Judgment, the Mojave Basin Area Watermaster reports and interprets monitoring data to ensure that the mandates of the Judgment are enforced. The MWA Board acts as the Watermaster. Monitoring requirements are described in the Judgment After Trial (1996) and in the Mojave Basin Area Watermaster Annual Reports. Some components of the water budget called for in the Judgment, such as flows across subarea boundaries, must be estimated from collected data. The Watermaster is currently responsible for reporting the following types of data in the Mojave Basin Area:

- Verification of reported groundwater production
- Mojave River flows
- Precipitation
- Wastewater discharges
- Subsurface flow
- State Water Project and wastewater imports
- Groundwater levels
- Ungaged surface water inflows
- Consumptive use

A more detailed description of the Watermaster's monitoring activities can be found in Appendix H.

Action: MWA and the Watermaster will continue to perform monitoring activities prescribed by the Judgment, and will endeavor to improve methodologies to quantify components of the water budget and to facilitate integration of collected information with the MWA data set.

Groundwater Levels

MWA has several programs for groundwater level monitoring, and has been increasing in-house staff efforts for collection, compilation, and archiving an increasing quantity of collected data. This work is supplemented by efforts of the U.S. Geological Survey (USGS) as part of a cooperative water services program with MWA. There are 121 monitoring wells within the Mojave Basin Area from which water level and water quality samples are taken.

These include 53 wells from which the samples are taken annually and 46 wells from which samples are taken semi-annually. Monitoring wells are concentrated primarily near existing areas of production. Figure 10 - 1 shows the location of 191 wells with known well construction data including depth and perforation intervals collected from USGS and other sources.

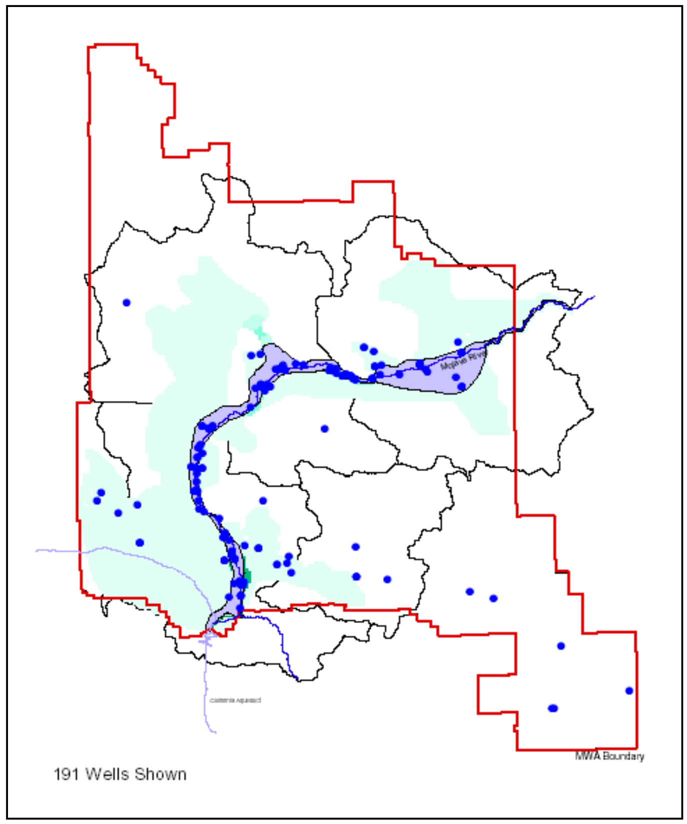


Figure 10-1: Well locations with known construction data

The Riverside County Superior Court Judgment After Trial of January 10, 1996[44] (the Judgment) ordered certain parties in the litigation to undertake certain actions. The Judgment requires the Watermaster to establish a Biological Resources Trust Fund for the benefit of the riparian habitat areas and species identified in the Judgment. The Judgment also refers to a Habitat Water Supply Management Plan (Conservation Plan) to be prepared by the CDFG for the benefit of these riparian habitat areas and species identified in the Judgment. These riparian habitat areas and species are listed in Exhibit H of the Judgment. The Conservation Plan was released in June 2004.

Groundwater levels were established in Exhibit H of the Judgment for key wells in the Mojave River floodplain. These wells, and their associated groundwater level target as measured from the ground surface to standing water are:

[44] City of Barstow et al v. City of Adelanto, Riverside County Superior Court. Case No. 208568

- wells H1-1 and H1-2 in the Victorville/Alto Zone (upper Narrows area) are to be maintained at 7 feet
- well H2-1 in the Lower Narrows/Transition zone is to be maintained at 10 feet
- well H3-1 in the Harvard/Eastern Baja Riparian Forest Habitat (Camp Cady area) is to be maintained at 7 feet. Well H3-2, also in the Camp Cady area, is to be maintained at 1 foot above ground surface to ensure adequate surface water habitat

Of these wells, only H3-1 has been installed; other monitoring is accomplished using surrogate wells or gaging stations.[45] If these water levels are not maintained, funds from the Biological Trust Fund will be expended on mitigation activities. MWA is continuing to coordinate with DFG, to further final well siting and installations.

MWA is working to increase use of water level measurements to better quantify the movement and storage of groundwater, and to effectively increase understanding of the ground water basins. This effort will include improvements to existing data collection programs through improved use of technology, including automated data collection processes and use of spatial database software. These processes should provide consistent data collection, a more geographically representative range of data, and measurements that are more discrete at depth and over time. Current efforts are focused on development of the Agency's Key Well program and a computerized geographic information database system. SCADA telemetry technologies are also being developed to obtain real-time data and control of the Agency's pipeline facilities and to minimize travel time of field staff.

Action: MWA will ensure that sufficient monitoring wells are installed around each recharge site to provide information needed to determine vertical and horizontal groundwater flow conditions and potential groundwater mounding in the vicinity of each site. In general, this means that monitoring points will be established around each recharge site, depending upon local conditions. Sites with complex geology may require multiple completion wells to monitor water levels in all affected strata. Movement of recharged water will be tracked to monitor recharge effectiveness.

Action: Existing monitoring wells will be maintained and gaps in data identified. The need for additional monitoring wells will be assessed and a plan developed for construction of additional wells if necessary. This assessment could lead to the identification and elimination of some superfluous measurement points.

[45] N. Caouette, personal communication, November 26, 2003

Action: MWA will work with the California Department of Fish and Game to continue development of wells needed for monitoring of biological resources at key locations.

Water Quality

MWA has initiated a monitoring effort to greatly enhance the cooperative water services program between MWA and USGS described above, which includes 65 wells from which the water quality samples are taken. Water quality samples are collected once a year from 23 water quality wells located in the floodplain aquifer and once every two years in 42 water quality wells located in the regional aquifer. Individual water purveyors monitor drinking water quality. Water quality enforcement responsibilities reside with the RWQCBs and the State Department of Health Services. MWA has initiated a concerted effort to expand its monitoring efforts in the Este Subarea through its basin conceptual model and Key Well Program. This program includes water level measurement and water quality testing at multiple locations across the subbasin. Such efforts will continue basin by basin throughout the MWA service area over the next several years.

Action: MWA will continue water quality monitoring efforts and will collect and summarize drinking water quality data from cities, coordinating these efforts with other entities including USGS, the State Department of Health Services, the Lahontan and Colorado River Regional Water Quality Control Boards, the State Department of Water Resources, and others. MWA will explore the viability of acting as a regional clearinghouse for this data. Data will be compiled, compared and tracked in a data management system. All data will be made available to area water purveyors. Needs for additional water quality sampling will be determined.

Action: MWA will begin implementation of a regional water quality model to be used as a predictive tool to manage the recharge of imported water. This is envisioned to be a multi-year effort, with the initial phases focused on data compilation, assessment, and conceptual model development.

Several state, regional and county agencies have jurisdiction and responsibility for monitoring water quality and contaminant sites. Programs administered by these agencies include contaminant cleanup, public outreach, and emergency spill response. The agencies include the Department of Toxic Substances, Department of Health Services, Regional Water Quality Control Board, U.S. Environmental Protection Agency and the County Division of Environmental Health. Much of the data is stored in publicly available databases.

MWA has commenced a project to develop a groundwater quality analysis system for the entire MWA service area. The project will include an evaluation of existing groundwater data and identification of data needs, the development of an information management system that will allow MWA to collect, reconcile, analyze, and access water quality information, and the development of a water quality and analysis system to meet MWA's long-term water quality objectives.

Once the system is developed it can be used in conjunction with regulatory agency databases to help identify areas with water quality problems and support efforts to remediate them.

Action: MWA will continue or begin coordination and data exchange with state, regional and county agencies to support efforts to ensure groundwater quality concerns are understood by the agencies and can be appropriately addressed. MWA will compile all reasonably available data including data on areas with known contaminants and/or poor quality groundwater and perform a trend analysis. This data, and the future modeling tool, will be used to site recharge and extraction facilities to maximize protection of water supplies.

Water Supply Measurement

Supply components of the water balance include streamflow, subsurface flow across subarea boundaries, and imported water supplies. As part of the cooperative water services program with MWA, the USGS operates and maintains the following gaging stations on the Mojave River:

- Deep Creek near Hesperia
- Mojave River at Lower Narrows near Victorville
- Mojave River near Barstow
- Mojave River at Afton

Flows from these gaging stations and the West Fork of the Mojave River (cooperatively funded by the U.S. Army Corps of Engineers) are reported to the Mojave Basin Area Watermaster and are used to determine annual water balances within each subarea as described in Chapter 11. Interflow between basins is estimated in this process. Flow from the Transition Zone into the Centro Subarea is a key part of the Watermaster's water balance. At one time, an additional gaging station was placed in the vicinity of the Transition Zone/Centro boundary. However, it was not possible to obtain reliable flow measurement at this station because of a lack of hydraulic control and shifting riverbed conditions. The Watermaster currently assumes the Mojave River flow at this location is equal to the base flow determined at the Lower Narrows plus the amount of reclaimed water discharged into the Mojave River by VVWRA.

Action: Because a reliable gaging station closer to the Alto/Centro boundary would improve the estimates of flow at that location, MWA will work to identify and maintain the most reliable measurement method practicable.

Action: MWA will assess current methods for estimating subsurface flow across subarea boundaries, and will develop additional monitoring points, follow through with plans to automate inventory of water supply components, or take other appropriate measures to improve the accuracy of these estimates.

Action: MWA will continue to account for and report quantities of water imported for groundwater replenishment. A data base application will also be developed to enhance current ability to inventory and value water within MWA storage programs.

Population Growth and Development

As reported in Chapter 5, MWA's population is expected to grow from about 321,000 in 2000 to about 541,500 in 2020. Water to meet the demands of most of this growth will be supplied by existing purveyors, importation of State Water Project water, or through purchase of Free Production Allowance under the terms of the Mojave Area Judgment. According to Mojave Water Agency Ordinance 11, new Minimal Producers who pump less than 10 acre-feet per year and who do not have a Free Production Allowance will be assessed the Replacement Water cost by the Mojave Water Agency for one acre-foot. The Agency would then import State Water Project water to replace the pumped water. However, Ordinance 11 is under review by the Court and has not yet been implemented pending a decision.

MWA will take the following steps to track the expected growth and ensure consistency with projected planned growth:

Action:MWA will work with cities, San Bernardino County, and water agencies to track building permits in order to monitor the pace of growth as compared to that projected in this Plan. This comparison will be made at least every five years. If actual growth varies significantly from the Plan benchmark, the pace of Plan implementainon will be adjusted or revisited.

Action:Under Senate Bills 221 and 610, the developers of new housing developments with 500 or more housing units, or commercial and industrial development with with equivalent demands, must receive written verification from the local water supply agency that a sufficient water supply exists to provide the needs of the new development. The Mojave Water Agency will provide information regarding regional water balances and avilability of supplemental supply to local purveyors to allow them to reach appropriate conclusions regarding the sufficiency of supply.

Action: New developments for which Free Production Allowance rights are acquired will have their production monitored by the Watermaster. Other developments will be assessed the Replacement Water cost by the Watermaster, who will request MWA to import State Water Project water to replace the pumped water.

Action:MWA will work with local planning agencies to ensure that areas that should be set aside to recharge the groundwater basin are reserved for that purpose and are not subject to development.

Alliance for Water Awareness and Conservation Participants

City of Adelanto
Apple Valley Country Club
Town of Apple Valley
Apple Valley Ranchos Water Company
Baldy Mesa Water District
City of Barstow
Barstow College
Bighorn-Desert View Water Agency
Bureau of Land Management
Bureau of Reclamation
Copper Mountain College
City of Hesperia
Hi-Desert Water District
Mojave Desert & Mountain Waste Management JPA
Mohave Desert Resource Conservation District
Mojave Water Agency
Mojave Weed Management Area
San Bernardino County Special Districts, Water/Sanitation Division
Southern California Water Company
Victor Valley College
Victor Valley Wastewater Reclamation Authority
Victor Valley Water District
City of Victorville
Town of Yucca Valley

Effectiveness of Water Conservation Measures

There are numerous reasons for evaluating water conservation measures:

- to provide a review or the program in context of its intended goals
- to allow for modification of programs that are not meeting intended goals
- better projection of water demands
- to document performance of pilot programs and for design of full-scale programs.

The Alliance for Water Awareness and Conservation (AWAC) was formed to help develop and implement a united regional water conservation program to maximize water use efficiency. As discussed in Chapter 7, the Alliance was formed in August 2003 and is composed of 24 local cities, water suppliers, and institutions, as well as regional resource management agencies. Goals of the Alliance are to:

1. Educate the local communities on the importance of water conservation.
2. Provide the local communities with the tools to effectively reduce per capita consumption to targeted goals.

3. Reduce regional water use by 10 percent gross per capita by 2010 and 15 percent gross per capita by 2015 (5 percent in the Morongo Basin by 2015) to achieve a sustainable, reliable supply to meet regional water demands.

Action: MWA will work with the Alliance for Water Awareness and Conservation (AWAC) and serve as a clearinghouse for water conservation measures and performance data. Water conservation programs will be evaluated through the AWAC and actions taken as needed. Evaluation will include at least the following:

- Summarize baseline water usage for water purveyors' 2000 Urban Water Management Plans
- Establish and summarize Demand Management Measures
- Track implementation of Demand Management Measures
- Tabulate per capita water use by member agency and subarea annually or at a reporting interval deemed appropriate by the Alliance

Action: Increased water conservation efforts will be identified and plans developed for implementation of cost effective demand management measures based on the reports on effectiveness.

Evapotranspiration

The Mojave Water Agency maintains a network of 14 weather stations collecting various weather data including temperature and precipitation. Approximately six of these stations have Class A evaporation pans that provide data on evaporation for the entire region. This provides information on both evaporation from open bodies of water and soil surfaces, and transpiration from the soil by plants. These evaporative processes are together referred to as "evapotranspiration", an important component in the overall water balance. MWA is planning to improve and supplement this part of local water use information by utilizing two technologies:

- the California Irrigation Management Information System (CIMIS)
- the Surface Energy Balance Algorithm for Land (SEBAL)

The California Irrigation Management Information System (CIMIS) is a repository of meteorological data collected from an integrated network of over 100 computerized weather stations located in key agricultural and municipal sites throughout the state. The system helps growers and turf managers in determining when to irrigate and how much water to apply.

The Surface Energy Balance Algorithm for Land (SEBAL) is a system that uses data from satellite-based sensors to compute energy balance to provide a refined estimate of evapotranspiration, a key component of the water balance.

Each of these technologies is described in more detail in Appendix H.

Action: MWA will review the adequacy of the existing evapotranspiration network and expand the number of measuring stations as necessary.

Action: MWA will continue to collect data on evapotranspiration and characterize its seasonal and areal distribution.

Action: MWA will work to improve the accuracy of areal evapotranspiration estimates through use of SEBAL or other appropriate technologies.

Action: MWA will make collected data available to agricultural and large urban landscape irrigators to encourage and facilitate the use of evapotranspiration data to increase irrigation efficiency.

Regional Water Level Changes and Land Subsidence

The USGS performed a study of land subsidence in the following four study areas using Interferometric Synthetic Aperture Radar (InSAR) methods[46]:

- El Mirage area (Oeste)
- Lockhart-Harper Lake area (Centro)
- Newberry Springs area (Baja)
- Lucerne Valley area (Este)

The study was performed as part of a cooperative program with the USGS. Results of the study indicate land subsidence has occurred in the area, which generally occurs during initial dewatering of compressible sediments.

Action: MWA will continue its cooperative land subsidence program, expanded to determine the relationship between groundwater levels and land surface elevation changes. Additional scrutiny should be given to areas where subsidence has occurred and where the depth to groundwater decreases below historic low levels.

[46] Sneed et al. 2003

Data Management

MWA has numerous data management systems existing or in development to support its various monitoring programs. It is imperative for the Agency to implement a data management system as a means to store, archive, and access data in a timely, unambiguous way meaningful to decision makers.

In its role as Mojave Basin Area Watermaster, MWA maintains records of producers, production wells, and annual production from stipulating parties' wells within the Mojave Basin Area. The Hi-Desert Water District performs these functions in its role of Warren Basin Watermaster. In cooperation with MWA, the USGS maintains a database to store river flow, water quality and water level data collected by MWA and USGS staff. Significant additional information is anticipated to be collected as part of this Plan to better characterize the groundwater system and the performance of recharge projects.

Action: MWA will continue development of a data management system based on a relational database structure to efficiently compile, store, archive, and access collected data. The system will be designed to provide data for a geographic information system and to accommodate data from additional collection efforts developed through implementation of this Plan.

Action: MWA will begin implementation of a regional water quality model. The project will include development of an information management system that will allow MWA to collect, reconcile, analyze, and access water quality information.

Action: MWA will make compiled data available to local water suppliers.

Extraction Sites/Consumption

In its role as Mojave Basin Area Watermaster, MWA collects and verifies production data within the Mojave Basin Area, with Hi-Desert Water District performing this role as Warren Basin Watermaster. The Judgment requires that annual water production records be collected and verified by producers exceeding 10 acre-feet per year of production within each of the five subareas. These records are used to document water usage and to determine Replacement Water and Makeup Water Obligations.

In addition, the MWA tracks well production as part of the Minimal Producer Program. Minimal Producers are defined as those producers who have an annual production of less than 10 acre-feet and are not subject to the Judgment. MWA estimates total production by Minimal Producers in each subarea of the Mojave Basin Area.

Action: Additional production wells will be constructed in the future to accommodate the expected increase in population. The Watermasters and MWA will collect data and verify the location and production from these new wells in addition to existing well production.

2) Improving Basin Understanding

Infiltration Rates

Numerous groundwater recharge projects will be required to meet the water balance objectives of this Plan. In order to understand the feasibility of, and best locations for, these projects, more data is needed as to the infiltration rates in different areas of the aquifer system. A pilot test project at the Oro Grande recharge site is already underway.

Action: MWA will expand infiltration pilot testing to identify suitable recharge sites capable of recharging groundwater at a rate adequate to meet forecasted needs.

Aquifer Characterization

Recharging the large quantities of water projected in this Plan will require extensive investigation of aquifer properties and storage capacities. Means to effect this aquifer characterization include geophysical testing, aquifer stress tests, and expanded monitoring networks. Methods for geophysical testing include surface geophysical methods such as seismic reflection and refraction, gravity surveys and resistivity imaging, and down-well methods such as electronic logging, pump testing, and other methods. These methods are used to develop a mapping of the aquifer flow system that can be used to optimize the interaction of groundwater recharge and extraction activities. New down-well technologies are available that can provide refined, depth-specific aquifer properties cost-effectively. MWA has employed many of these techniques in its exploration for suitable recharge sites.

Action: MWA will expand its aquifer characterization program to improve understanding of basin conditions, leading to more effective recharge project operations. Geophysical methods will be employed as appropriate to identify the sites most appropriate for groundwater recharge.

Action: MWA will employ new technologies that can develop high resolution, depth-specific aquifer characterization in the most cost-effective manner.

Action: MWA will expand its monitoring well network as appropriate to track aquifer response from pilot and full-scale groundwater recharge and production facilities.

Action: Data collected will be compatible and integrated with regional modeling and data management efforts.

Modeling

To date, three models of MWA's groundwater basins have been developed to aid in management of the water system:

- A groundwater simulation model of the Mojave River Basin developed in Modflow by the USGS[47]
- A groundwater simulation model of a portion of the Warren Basin by the USGS
- A screening model developed in Stella as part of this RWMP Update to estimate the effects of implementation of proposed projects and management actions

Modeling of the groundwater basin can be useful to help determine the best locations for recharge or extraction sites and to help optimize operation of the groundwater basin. The existing models described above provide insight into these questions, but have significant limitations. The existing models are appropriate for conceptual regional planning efforts, but more refined models will be necessary for in-depth analysis of a large-scale recharge system, or for site-specific analysis. The initial focus should be on additional data collection to support the detailed effort.

MWA is considering a multi-year effort to develop a more detailed flow model that incorporates considerations of water quality, in particular the effects of salinity on the groundwater basin.

Action: MWA will begin development of a regional water quality model. The initial efforts of this modeling program will be focused on data compilation, assessment, and conceptual model development. The model will make use of data contained in the existing models, and will be compatible with and integrated with data collected in the geophysical aquifer testing efforts.

[47] Stamos et al. 2001

Update Water Budget

The water budgets prepared annually by the Watermaster include groundwater flow, ungaged surface water inflows, deep percolation of precipitation estimates, and phreatophyte use in the riparian area. Each of these components are fixed estimates which could be improved with new information.

Action: MWA will develop improved estimates of water budget components to provide a refined assessment of subbasin interactions and water supply obligations under the Mojave Basin Area Judgment. A likely initial focus is improvement of evapotranspiration and consumptive use using the technologies discussed above in the Monitoring element. Improved groundwater level monitoring and modeling to provide a better estimate of subsurface flow is another component that might be implemented near-term.

Action: MWA will utilize their data systems to develop and produce annual Agency-wide progress reports on key water budget components including water inflows, outflows, and change in storage by subarea and make recommendations on how these quantities can be better measured.

3) Continue Long-Term Planning

Since its inception in the 1960s, the MWA has been developing and updating plans to guide the Agency as it carries out its mission to ensure sufficient water availability for present or future beneficial uses within the Agency's jurisdiction. The Agency will continue its commitment to long-term planning. The following section describes the planning efforts the Agency is focusing on.

Vulnerability Assessment

The California Department of Health Services has prepared a checklist of security measures for water utilities. According the checklist, recommended actions to better secure water related facilities include the following:

1. At offices, well houses, treatment plants and vaults, make it a rule that doors are locked and alarms set
2. Tell employees to ask questions of strangers at facilities
3. Limit access to facilities. Indicate restricted areas by posting “Employees Only” signs
4. Increase lighting in parking lots, treatment bays and other areas with limited staffing
5. Remove keys for equipment
6. Invite local law enforcement to become familiar with facilities and establish a protocol for reporting and responding to threats

7. Discuss detection, response, and notification issues with public health officials and establish a protocol
8. Establish a chain of command and emergency call list in case of emergencies
9. Provide copies of operational procedures to law enforcement and emergency management personnel
10. Limit access to water supply reservoirs
11. Fence and lock vulnerable areas

Action: MWA will inform and work cooperatively with groundwater purveyors in their efforts to ensure that minimum water security measures are in place. Additional security measures will be identified and implemented as necessary. MWA will implement these measures on its facilities where appropriate.

Review Land Use Plans

Land use plans in the basin are developed by a number of different entities including the county and each of the cities through their General Plans, General Plan Amendments and Public Facilities Element amendments.

Action: MWA will coordinate with local planning agencies to ensure that growth projections, proposed land use changes, and types of proposed developments are consistent with water planning efforts, as required by SB 221 and SB 610. Significant deviations from projected growth and water needs will be noted and corrective action taken. Corrective actions could include securing additional sources of water, or making a finding pursuant to SB221 or SB 610 that an adequate water supply does not exist and notifying the water purveyor.

Identify Post 2020 Water Supply

MWA has a State Water Project water contract for up to 75,800 acre-feet per year. The water supply-demand analysis performed as part of this Plan (Chapter 5) indicates that, assuming municipal conservation of 10 percent, the full available SWP supply will be needed by 2020. Preliminary estimates of future water demand, assuming current trends continue, indicate that an additional 60,000 to 100,000 acre-feet per year will be needed by 2050. MWA has initiated efforts to determine sources where this additional supply might be obtained. Potential options include pre-banking of existing supplies, new appropriations, water banking or exchange arrangements, water transfers, developing water conservation or desalination credits, and aggressive management of existing supplies, including exploring higher levels of conservation. MWA has recently negotiated a short-term groundwater banking arrangement with the

Metropolitan Water District, and discussions for a larger, long-term banking project are underway. The feasibility of the post-2020 options has yet to be examined.

Action: MWA will continue to research options for meeting post-2020 water needs, categorize and prioritize the options, and examine and implement the higher-priority options.

State Water Project

MWA has an annual State Water Project entitlement of 75,800 acre-feet per year. According to the Final State Water Project Reliability Report (DWR 2002), MWA should expect to receive an average of about 58,400 acre-feet per year each year if they request their full entitlement. As indicated in Chapter 5, MWA will need to utilize their entire SWP entitlement in order to bring the groundwater basin into balance in 2020.

Action: MWA will stay actively involved in State Water Project planning processes that are conducted by the Department of Water Resources and other water planning agencies. The expected reliability of State Water Project could be affected by changes in system operation or by modifications in planning models that are used to project SWP deliveries. MWA will advocate for operations that enhance its supply, track changes in SWP reliability, and adjust its plans accordingly.

Transportation Infrastructure

Future transportation facilities will need to be developed to handle the needs of a growing population. As facility needs are identified, their planning should be coordinated with the MWA to ensure that groundwater recharge areas are protected. MWA will work with the Southern California Association of Governments (SCAG) to this end.

SCAG is mandated by the federal government to develop plans for, among other things, transportation and growth management. One of the foremost activities of SCAG is the development of a comprehensive and coordinated Regional Transportation Plan. SCAG's Water Policy Task Force provides planning advice on water supply and water quality on issues affecting the long-term sustainability of communities and industry. Among its duties, the Task Force provides SCAG committees with water quality assessment information for regionally-significant transportation projects planned for future implementation. The Task Force is composed of officials (both elected and appointed) who participate actively in local government and in organizations concerned with water policy, planning and management.[48]

[48] SCAG web site

Action: MWA will work with the Water Policy Task Force to ensure that there is maximum coordination in order to protect high priority recharge sites from impervious surfaces and potential contaminating activities, and to plan for a sustainable water supply to support future development.

Regular Updates

This Regional Water Management Plan contains elements that address several planning procedures, including an Integrated Water Management Plan, an Urban Water Management Plan (UWMP) and Groundwater Management Plan. As required by the Urban Water Management Planning Act, California Water Code, Section 10610 et seq., the UWMP plan must be updated every five years in years ending in zero and five. Additionally, MWA will prepare biennial updates on the status of completion of the various aspects of the Groundwater Management Plan. These summary reports will be coordinated with, and tied to, the Agency's Capital Improvement Plan process. Updates on many of these activities are included in the Annual Reports of the Mojave Basin Area Watermaster.

MWA will produce the biennial updates on the other activities contained in these Management Actions. The information contained in the biennial updates should be used to evaluate how often it will be necessary to update the Groundwater Management Plan.

Action: MWA will produce a biennial report summarizing progress made in achieving Plan Actions for the previous two years, considering monitored performance of the water management system. Minor adjustments to planning assumptions, operations, or Actions will be adopted as necessary. If significant deviations from the Plan are determined to exist, the Plan will be revised in its entirety.

Action: MWA will perform a comprehensive update revision of the Regional Water Management Plan at least every ten years. The performance of implemented projects will be compared to original project objectives to ensure objectives were met.

Action: MWA will supplement the sections of the Regional Water Management Plan required for its Urban Water Management Plan every five years, in years ending in zero or five, consistent with law.

4) Groundwater Protection

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high quality supply. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other agencies that have local or regional authority or programs. MWA currently has no groundwater production wells that it operates, but could in the future. To increase its groundwater protection activities, MWA will take action as presented below.

Recharge Site Management Activities

Management activities for protection of recharge sites include:

- establishing Site Control Zones to protect the area immediately surrounding the site from potentially contaminating activities
- controlling access to recharge zones
- Well and recharge facility contruction standards
- researching and mapping pollution sites to minimize siting and operational conflicts

A more detailed description of recharge site activities is included in Chapter 3 of this Plan.

The Drinking Water Source Assessment and Protection (DWSAP) program was developed by the California Department of Health Services to meet requirements in amendments to the Safe Drinking Water Act. All wells providing public drinking water supplies must comply with this program. The DWSAP program is intended to address assessments and facilitate the development of protection programs for ground and surface waters. The Department of Health Services and larger water utilities perform these assessments for pre-2002 wells. The well owner is generally required to perform the assessment for newer wells. The DWSAP consists of the following:

- delineating the two-, five-, and ten-year time of travel capture zones for wells
- inventorying possible contaminating activities
- determining vulnerability of wells to potential contaminants

Action: For probable recharge locations, MWA will perform an inventory and map potential sources of contamination including toxic investigation sites, industrial sites, gas stations, dairies, and sites investigated by the RWQCBs, and use this information in selecting recharge sites and in planning recharge site operation in order to minimize the potential for water supply contamination. MWA will compile existing DWSAP reports developed for existing wells to aid in mapping potentially contaminating activities.

Action: MWA will coordinate with regional water quality agencies, including the U.S. EPA, California EPA, Lahontan and Colorado River RWQCBs, the California Department of Health Services, and San Bernardino County Health Services to identify potential water quality threats to candidate recharge sites, and compile this information into a data management system for use in selection of recharge sites.

Identification and Destruction of Abandoned Wells

The presence of abandoned groundwater wells represents a potential hazard to the quality of the groundwater basin. Abandoned and improperly destroyed wells can act as conduits for contaminants to reach drinking water supplies. It is vital for the long-term protection of the basin that abandoned wells be located and destroyed. Well records kept by the Agency and the Mojave Basin Area Watermaster can help in the process of identifying existing abandoned wells and in identifying wells that are abandoned (stop production) in the future.

While it is the landowner's responsibility to destroy an abandoned well, local water agencies should be proactive about making sure that abandoned wells are in fact destroyed. The destruction of abandoned groundwater wells should be performed in accordance with state standards. California Water Code Section 13750.5 requires that those responsible for the destruction of water wells possess a C-57 Water Well Contractor's License. Whenever a water well is destroyed, a report of completion must be filed with the California Department of Water Resources within 60 days of the completion of the work. The San Bernardino County Department of Public Health, Division of Environmental Health Services is responsible for permitting and inspecting construction and destruction of wells.

Action: MWA will work with the County to develop a plan to identify and destroy abandoned wells. Federal and State grants will be sought for these purposes, as appropriate. MWA will encourage local water agencies to actively search for existing abandoned wells in their service areas so that they can be destroyed. Consideration will be given to developing ordinances requiring protocols for identification of abandoned wells upon sale or transfer of property.

Hazardous Materials Response

Currently, city and county hazardous materials teams handle responses to hazardous materials incidents. Increased coordination between MWA and hazardous materials teams will allow for assessment of the potential for chemical spills to impact groundwater and recharge sites.

Action: MWA will establish notification protocols with hazardous materials response agencies so that the Agency can be immediately informed of a threat to vulnerable areas, and to delineate any potentially threatened water facilities to the responders.

Protection of Recharge Areas

Only a small portion (approximately 4%) of groundwater recharge in the MWA territory is from direct percolation of rainfall. Over 89 percent is from percolation in the Mojave River channel, ephemeral washes, and mountain fronts. The following efforts will be undertaken to protect recharge areas:

Action: Through review of General Plans and other land use plans, the MWA will identify potential projects that may have a significant impact on the quality or quantity of water supplies entering the basin through recharge sites, establish buffer zones, and provide this information to the planning agency. MWA will identify sites with high potential for recharge and proactively identify them to land use planning agencies. More information on land use planning efforts is provided in the Monitoring section of this chapter.

Action: MWA will continue to coordinate with watershed related entities including the Lahontan and Colorado River Regional Water Quality Control Boards, Mojave Desert Resource Conservation District and the U. S. Bureau of Land Management.

5) Construction and Implementation

Construction of projects by MWA within its service area is necessary to build, operate, maintain and replace the State Water Project facilities to which MWA is contractually obligated. These projects are necessary to fulfill MWA's contractual obligations with the State of California and to insure water availability to all of its residents.

Table 9-9 in the previous chapter shows the recommended priority of each project and management action. The projects that have the highest priority include implementing municipal conservation, VVWRA wastewater reclamation, Alto subarea wellhead treatment, a new water supply for Pioneertown, and the recharge of SWP water into the Warren Valley aquifer and into the Floodplain, West Regional, and Mid-Regional aquifers in the Alto subarea. Municipal conservation is considered to have the highest priority because measures will need to be initiated immediately in order to achieve 10 percent conservation by 2020. Recharge of SWP water into the Alto Floodplain, West Regional, and Mid-Regional aquifers will require feasibility studies to determine the optimal locations for building the necessary recharge facilities.

Projects and management actions with a high priority are those expected to begin implementation within the next five years. Those with a moderate priority are those expected to begin implementation within the next five to ten years, and those with lower priority will be pursued within a ten to twenty year timeframe.

Action: MWA will identify implementing agencies for high priority projects and management actions, and will coordinate with those agencies in putting them into service. High priority projects and management actions are those expected to begin implementation within the next five years, and include:

- Municipal conservation of 10 percent of consumptive use in the Mojave River Basin and 5 percent in Morongo Basin/Johnson Valley
- Wastewater reclamation in the Alto subarea
- Wellhead treatment in the Alto subarea
- Groundwater recharge in the Alto Floodplain aquifer
- Groundwater recharge in the Alto Mid-Regional aquifer
- Groundwater recharge in the Alto West-Regional aquifer
- Developing an alternative supply for Pioneertown
- Groundwater recharge in the Warren Valley
- Continue development of regional water banking arrangements

Action: MWA will identify implementing agencies for moderate priority projects and management actions, and will coordinate with those agencies in putting them into service. Moderate priority projects and management actions are those expected to begin implementation within the next five to ten years, and include:

- continued implementation of high priority projects and actions
- construction of a regional water treatment plant in the Alto subarea
- groundwater recharge in the Alto East-Regional aquifer
- direct or in-lieu groundwater recharge in the Transition Zone Floodplain aquifer

- groundwater recharge and/or stormwater retention in the Baja Floodplain aquifer
- address municipal water supply issues in the Hinkley area of the Centro Regional aquifer
- groundwater recharge and/or stormwater retention in the Este Regional aquifer
- groundwater recharge in the Oeste Regional aquifer
- groundwater recharge in the Copper Mountain Valley
- groundwater recharge in the Means/Ames Valleys

Action: MWA will identify implementing agencies for lower priority projects and management actions, and coordinate in putting them into service. Lower priority projects and management actions are those expected to begin implementation within the next ten to twenty years, and include:

- continued implementation of high and moderate priority projects and actions
- groundwater recharge in the Lucerne Valley

6) Financing

Implementing the Regional Water Management Plan (RWMP) will require an array of financing mechanisms, such as bonds, grants, or low interest loans. The Mojave Basin Area Judgment provides a revenue steam for purchasing imported water. Cost savings may be incurred through implementation of conservation and water reuse projects. In addition, cooperative funding agreements between MWA and other water managers in the MWA service area or cost-share agreements between MWA and local, state, or federal agencies may also provide funding for RWMP projects and management actions.

Action: As project and management actions in the RWMP are defined in more detail, MWA will conduct a review of federal, state, and regional funding sources as well as potential assessments, fees, and charges to develop a financing plan that comprises an array of financing mechanisms appropriate for each RWMP project or management action, including bond funding, low-interest loans and grants, and cooperative cost-share agreements.

Action: MWA will develop a multi-year Capital Improvement Program (CIP) using the RWMP as its basis. The plan will include a schedule, priority and cost for implementation.

Action: MWA will research and pursue grants, with an emphasis on Proposition 50 funds, and identify potential Federal funds to be used for CIP implementation.

Action: MWA will identify local cost-sharing partners among the benefiting entities and determine the best mix of debt, fees and charges for implementing projects and management actions.

7) Public Participation/Community Outreach

MWA formed a Technical Advisory Committee (TAC) comprised of local stakeholders and water purveyors. The TAC met regularly during development of the Regional Water Management Plan, reviewing and providing comments and suggestions on the Plan. TAC members are listed in Chapter 8. MWA will continue to consult with the TAC on project implementation and financing.

MWA is a member of the Alliance for Water Awareness and Conservation, a group of local water purveyors who are collaborating on demand management measures. MWA has also signed seven cooperation agreements or Memoranda of Understanding with local public entities to promote water conservation, as described in Chapter 7.

Action: MWA will continue to coordinate, participate in, and implement recommendations of the Alliance.

MWA has organized and held three water symposia with local water leaders and regulators in Victorville, Morongo Basin, and Lucerne Valley in 2003 and early 2004.

Action: The Agency plans to make the water symposium an annual event.

Action: MWA will continue its outreach and education efforts through continued funding of the Community Liaison Officer.

The Panorama, the newsletter of the MWA is published regularly and mailed to those on its growing distribution list. Regular updates on the development of the Regional Water Management Plan have been included. A copy of Volume 3, Issue 1 published in the winter of 2003 is included in Appendix F.

Action: MWA will continue to develop and publish its newsletter, *The Panorama*.

MWA has an established Speakers Bureau which provides Board members and Agency staff to address water related topics with local audiences.

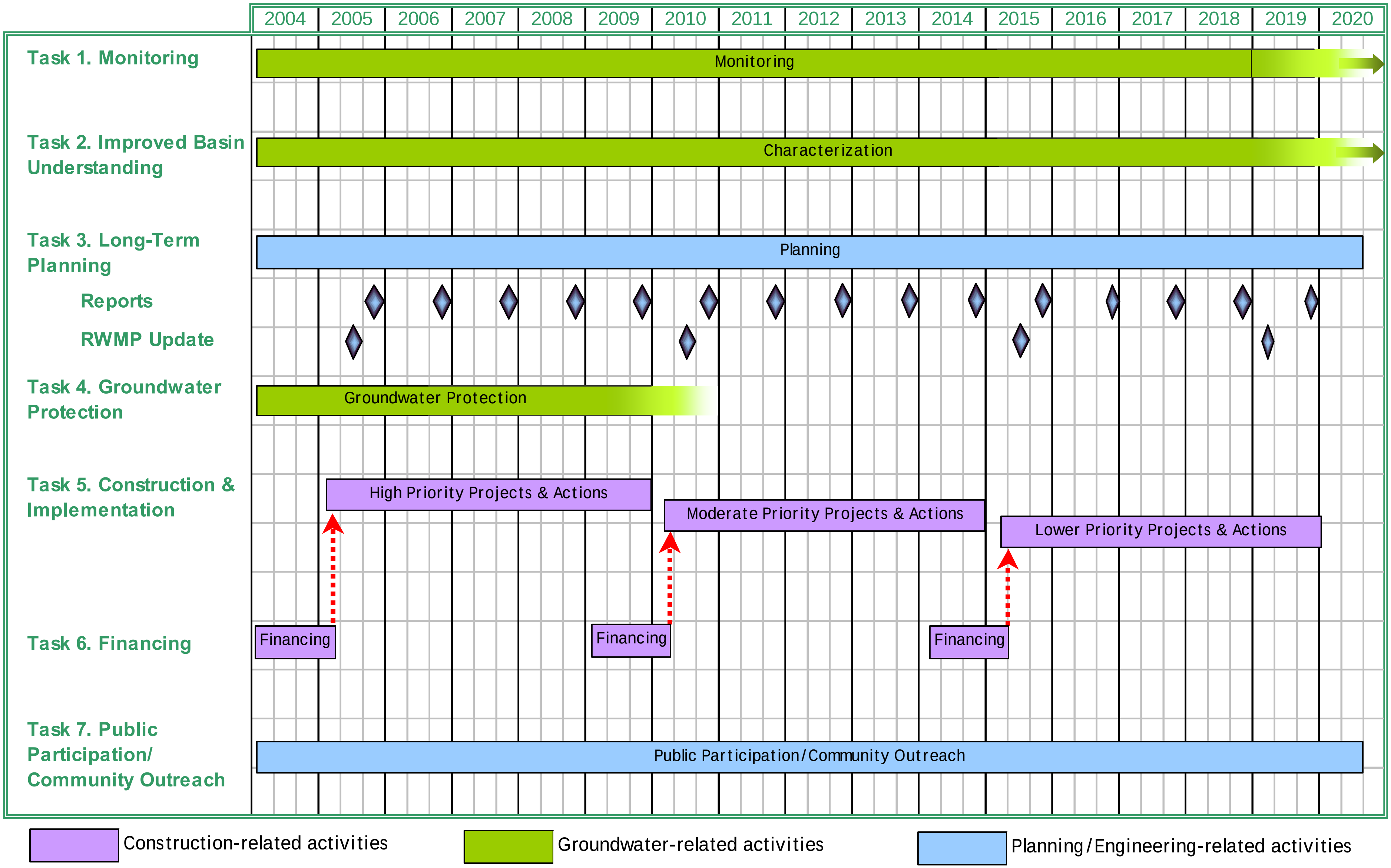
Action:MWA will maintain its Speakers Bureau to provide timely water related information to the public.

Action:MWA's web site (http://www.mojavewater.org/) contains information on MWA projects, water supplies and resources, water education, Watermaster, Agency publications, a calendar of events, meeting agendas, and general information about MWA. MWA will continue to provide this service.

Implementation Schedule

A schedule for implementation of the Management Action Plan is provided in Figure 10-2.

Figure 10 - 2. Master Schedule for MWA Management Action Plan



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Appendix G

MWA Draft 2010 UWMP

MOJAVE WATER AGENCY

2004 REGIONAL WATER MANAGEMENT PLAN

INTEGRATED REGIONAL WATER MANAGEMENT PLAN
GROUNDWATER MANAGEMENT PLAN
URBAN WATER MANAGEMENT PLAN

Mojave Water Agency

VOLUME 2:
APPENDICES

Schlumberger Water Services

September 2004
Adopted February 24, 2005

MOJAVE WATER AGENCY

2004 REGIONAL WATER MANAGEMENT PLAN

APPENDICES

Kennedy/Jenks Consultants

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Draft 2010 Urban Water Management Plan

April 2011

Prepared for

Mojave Water Agency
22450 Headquarters Drive
Apple Valley, CA 92345

K/J Project No. 1089001*00

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Section 1: Introduction

1.1 Overview

This document presents the wholesale Urban Water Management Plan 2010 (Plan) for the Mojave Water Agency (Agency, MWA) service area. This chapter describes the general purpose of the Plan, discusses Plan implementation, and provides general information about MWA, retail water purveyors, and service area characteristics. A list of acronyms and abbreviations is also provided.

1.2 Purpose

An Urban Water Management Plan (UWMP) is a planning tool that generally guides the actions of water management agencies. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan include a Section which “describes the opportunities for exchanges or water transfers on a short-term or long-term basis.” (California Urban Water Management Planning Act, Article 2, Section 10630(d).) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor precludes a water management agency from exploring exchange/transfer opportunities not identified in the plan. When specific projects are chosen to be implemented, detailed project plans are developed, environmental analysis, if required, is prepared, and financial and operational plans are detailed.

In short, this Plan is a management tool, providing a framework for action, but not functioning as a detailed project development or action. It is important that this Plan be viewed as a long-term, general planning document, rather than as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty, and planning projections may change in response to a number of factors. From this perspective, it is appropriate to look at the Plan as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these “framework” questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands. MWA will explore enhancing basic supplies from traditional sources such as the State Water Project (SWP) as well as other options. These include demand management, groundwater extraction, water exchanges, recycling, desalination, and water banking/conjunctive use. Specific planning efforts will be undertaken in regard to each option, involving detailed evaluations of how each option would fit into the overall supply/demand framework, how each option would impact the environment, and how each option would affect customers. The objective of these more detailed evaluations would be to find the optimum mix of conservation and supply programs that ensure that the needs of the customers are met.

The California Urban Water Management Planning Act (Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five year increments. (MWA and the retailers are going beyond the requirements of the Act by developing a plan which spans 25 years.)
- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry, and multiple-dry years.
- Implements conservation and efficient use of urban water supplies. Significant new requirements for quantified demand reductions have been added by the enactment of SBX7-7, which amends the Act.

A checklist to ensure compliance of this Plan with the Act requirements is provided in Appendix A.

In short, the Plan answers the question: *Will there be enough water for the communities within the Mojave Water Agency in future years, and what mix of programs should be explored for making this water available?*

It is the stated goal of MWA to manage water resources through or in conjunction with the State Water Project to meet future demands while maintaining independence during periods of water shortages. Based on conservative water supply and demand assumptions over the next 25 years in combination with conservation of non-essential demand during certain dry years, the Plan successfully achieves this goal. It is important to note that this document has been completed to address regional resource management and does not address the particular conditions of any specific retail water agency or entity within the MWA service area. The retailers within MWA service area are preparing their own separate UWMPs, but MWA has coordinated with the retailers during development of this Plan to ensure a level of consistency with the retailers.

1.3 Implementation of the Plan

The MWA service area includes the service areas of forty-six (46) local retail water agencies, with ten being required to prepare an individual UWMP because they provide water to more than 3,000 service connections or supplies more than 3,000 acre-feet (af) of water annually. The ten retail water purveyors within MWA's service area that are required to prepare their own UWMP are as follows:

- City of Adelanto
- Apple Valley Ranchos Water Company
- San Bernardino County Service Area (CSA) 64
- CSA 70J

- Golden State Water Company (GSWC) – Barstow system (formerly Southern California Water Company)
- Hesperia Water District
- Hi-Desert Water District
- Joshua Basin Water District
- Phelan Pinon Hills Community Service District (PPHCSD) (this Community Service District (CSD) was formed in 2007 and used to be CSA 70L)
- Victorville Water District (formed through the consolidation of the Baldy Mesa Water District and the Victor Valley County Water District into the City of Victorville in 2007)

This subsection provides the cooperative framework within which the Plan will be implemented including agency coordination, public outreach, and resources maximization.

1.3.1 Cooperative Preparation of the Plan

Wholesale water agencies are permitted by the State to either work independently to develop a wholesale UWMP or they can coordinate their planning with retail agencies within their service area to develop a cooperative regional plan. The former approach has been adopted by the MWA; however, the Plan was developed with a high degree of coordination with the retail water agencies within the MWA service area. Water resource specialists with expertise in water resource management were retained to assist the local water agencies in preparing the details of their Plans. Agency coordination for this Plan is summarized in Table 1-1.

TABLE 1-1
AGENCY COORDINATION SUMMARY

	Participated in UWMP Development	Received Copy of Draft	Comment on Draft	Attended Public Meetings	Contacted for Assist	Sent Notice of Intent to Adopt
City of Adelanto	✓	✓				
Apple Valley Ranchos Water Company	✓	✓				
California Department of Water Resources	✓	✓				
County Service Area (CSA) 64	✓	✓				
CSA 70J	✓	✓				
Golden State Water Company	✓	✓				
Hesperia Water District	✓	✓				
Hi-Desert Water District	✓	✓				
Joshua Basin Water District	✓	✓				
Phelan Pinon Hills CSD	✓	✓				
San Bernardino County Planning Department	✓	✓				
Victorville Water District	✓	✓				

1.3.2 Public Outreach

The MWA has encouraged community participation in water planning. For the current Plan, public sessions were held for review and to solicit input on the Draft Plan before its adoption. Interested groups were informed about the development of the Plan along with the schedule of public activities. Notices of the Public Hearing were published in the local press. Copies of the Draft Plan were made available at the water agencies' offices, local public libraries and sent to the County of San Bernardino as well as interested parties.

MWA coordinated the preparation of the Plan with the local community. MWA notified the cities and counties within its service area of the opportunity to provide input regarding the Plan. Monthly Technical Advisory Committee (TAC) meetings were held at MWA between February and August 2010, and bi-monthly TAC meetings from October 2010 thru April 2011, where the retail purveyors and other public entities were invited to hear discussions on the development, status, and progress of MWA's 2010 UWMP. Table 1-2 presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials, including paid advertisements, newsletter covers, website postings, and invitation letters are attached in Appendix B. A transcript of all public comments during the Public Hearing and copies of all comment letters received prior to the hearing are included in Appendix C.

TABLE 1-2
PUBLIC PARTICIPATION TIMELINE

Date	Event	Description
March 3, 2010	Kick-off Community Workshop	Describe UWMP requirements and process
April 7, 2010	General Information	Information about UWMP Development Process
May 12, 2010	Model Review	Demand Forecast Model Described
June 2, 2010	SBX7-7 Calculations	Draft SBX7-7 Calculations for Retailers Provided
July 7, 2010	DMM Workshop	Demand Management Measures Workshop for Retailers
August 4, 2010	General Progress Update	Update to TAC on status of plan writing
October 6, 2010	DWR SBX7-7 Methodologies	Description of DWR 20x2020 calculation methodologies 1 thru 3
December 8, 2010	Preliminary Draft Projections	Preliminary Draft population and water demand projections for MWA and retailers
January 27, 2011	Draft UWMP Workshop	Workshop for MWA Board of Directors
February 2, 2011	General Progress Update	Update to TAC on status of plan writing
February 5, 2011	Notice to Cities and County	Start of 60-day notice
April 5, 2011	Public Notice	Start of 30-day Notice of Public Hearing
April 6, 2011	Draft UWMP Workshop	Workshop for TAC to review Draft UWMP
April 14, 2011	Draft UWMP Workshop	Workshop for MWA Board of Directors
May 5, 2011	First MWA Public Hearing	Review contents of Draft UWMP and take comments at MWA Board Meeting
June 9, 2011	Second MWA Public Hearing	UWMP considered for adoption by the MWA Board

The components of public participation include:

Local Media

- Paid advertisements in local newspapers

Community-based Outreach

- Building Industry Association
- Chambers of Commerce included in MWA Service Area
- Farm Bureau
- Sierra Club
- Various property owners associations
- Victor Valley Museum
- Victor Valley NAACP
- Victorville AARP

Water Agencies Public Participation

- Presentation(s) to MWA Board and Technical Advisory Committee – see Table 1-2
- Notice sent to subarea advisory committee members

City/County & Other Government Outreach

- Meetings with various City Planning and Land Use Agencies – see Table 1-1
- Notice sent to various Local, County, State, and Federal agencies

Public Availability of Documents

- Mojave Water Agency website
- Local libraries

1.3.3 Resources Maximization

Several documents were developed to enable MWA to maximize the use of available resources and minimize use of imported water, including the *Mojave Water Agency 2004 Regional Water Management Plan* (Regional Plan), which included:

- Integrated Regional Water Management Plan
- Groundwater Management Plan
- Urban Water Management Plan

Chapter 3 of this Plan describes in detail the water supply available to MWA and the retail purveyors for the 25-year period covered by this Wholesale Plan. Additional discussion regarding documents developed to maximize resources is included in Section 3.3 and Chapter 6.

1.4 Water Management Within the MWA Service Area

1.4.1 Mojave Water Agency

The MWA was founded July 21, 1960, due to concerns over declining groundwater levels. The Agency was created for the explicit purpose of doing "*any and every act necessary, so that sufficient water may be available for any present or future beneficial use of the lands and inhabitants within the Agency's jurisdiction*."[1] The Mojave Water Agency is one of 29 State Water Project (SWP) contractors that together provide 20 million Californians with drinking water and irrigation water for 750,000 acres of farmland. MWA serves an area of 4,900 square miles of the High Desert in San Bernardino County as shown on the vicinity map on Figure 1-1.

For the management purposes, the Mojave Water Agency generally separates its service area into six management areas, including the five subareas of the adjudicated Mojave Basin Area (Alto, Baja, Centro, Este, and Oeste) and the Morongo Basin/Johnson Valley Area (referred to throughout this document as "Morongo" or the "Morongo Area"). Section 1.4.2 describes the adjudications within the MWA, and Figure 1-2 depicts the management areas and adjudicated areas within the MWA.

[1] MWA Law, Chapter 97-1.5, dated July 21, 1960.

FIGURE 1-1
MWA VICINITY MAP

MWA currently has a contract for up to 82,800 acre-feet per year (afy) of "Table A" (a schedule of the maximum amount of water any SWP contractor can receive annually according to its contract with the state) water from the SWP through 2014, with an additional 3,000 af beginning in 2015 and another 4,000 in 2020, for a total of 89,800 af. Due to reliability issues, actual SWP supply is reduced to an estimated long-term average of 60 percent of total Table A[2] (53,880 afy of long-term supply in 2020), with 61 percent of total Table A (54,778 afy) being available from 2029 and after.

Though the reliability of SWP water is variable due to weather-related issues and environmental factors, SWP water remains an important supplemental water supply source for the Basin in the long-term. An important element to enhancing the long-term water supply reliability of SWP supplies is the effective use of water banking/conjunctive use programs, such as those described in this Plan.

1.4.2 Adjudications within the MWA Service Area

Mojave Basin Area

The Adjudication of the Mojave Basin Area (see Figure 1-2) was the legal process that allocated the right to produce water from the available natural water supply. Until adjudication proceedings were initiated and an independent Court issued the Mojave Basin Area Judgment, water production rights and obligations had never been defined in the Mojave Basin. Triggered by the rapid growth within the Mojave Water Agency service area, particularly in the Victor Valley area (The cities of Adelanto, Apple Valley, Hesperia, Victorville and surrounding communities), the City of Barstow and the Southern California Water Company filed a complaint in 1990 against upstream water users claiming that the increased withdrawals and lowering of groundwater levels reduced the amount of natural water available to downstream users. The complaint requested that 30,000 af of water be made available to the Barstow area annually and that MWA obtain supplemental water for use in other areas of MWA's service area.

About a year later, the Mojave Water Agency filed a cross-complaint which declared that the native waters of the Mojave River and underlying groundwater were insufficient to meet the current and future demands made upon them. The cross-complaint asked the court to determine the water rights of all surface water and groundwater users within the Mojave Basin Area and the Lucerne and El Mirage Basins. During the following two years, negotiations resulted in a proposed Stipulated Judgment that: 1) formed a minimal class of producers using 10 afy or less who were dismissed from the litigation, and 2) offered a physical solution (an equitable remedy designed to alleviate overdrafts in a basin, consistent with the constitutional mandate to prevent waste and unreasonable water use and to maximize the beneficial use of the limited resource) for water production by the remaining producers. The Riverside Superior Court bound the stipulating parties to the Stipulated Judgment in September 1993, and further bound the non-stipulating parties to the terms of the Stipulated Judgment in January 1996 following trial. The Court appointed MWA as Watermaster of the Mojave Basin Area. The text of the Stipulated Judgment can be found in Appendix D.

Some of the non-stipulating parties appealed the Judgment of the Superior Court and the Appellate Court issued a final decision in June 1998. The final decision of the Appellate Court held the stipulating parties to the terms of the Stipulated Judgment, but excluded the appealing

[2] DWR State Water Project Delivery Reliability Report 2009.

parties, with the exception of one appellant who sought a revised water production right under the Judgment. MWA requested the California Supreme Court to review the Appellate Court's decision in July 1998. The Supreme Court affirmed the Appellate Court's decision in August 2000, regarding the Stipulated Judgment and the exclusion of the appealing parties from the Judgment, but over-turned the decision of the Appeals Court as to the one party seeking additional production rights. Since 1996, most of the appealing parties have stipulated to the Judgment.

For management purposes under the Mojave Basin Judgment, MWA split the Mojave River watershed and associated groundwater basins into five separate "subareas." The locations of the five subareas; 1) Oeste, 2) Este, 3) Alto, 4) Centro and 5) Baja are shown on Figure 1-2. The subarea boundaries are generally based on hydrologic divisions defined in previous studies (California Department of Water Resources (DWR) 1967), evolving over time based on a combination of hydrologic, geologic, engineering and political considerations. Also for the purposes of implementing the Judgment, the northern part of the Alto Subarea was defined as a sub-management unit – the Alto Transition Zone; this zone was created to acknowledge local geology and to better address the water flow from Alto to Centro.

The Mojave Basin Judgment assigned Base Annual Production (BAP) rights to each producer using 10 afy or more, based on historical production during the period 1986-1990. Parties to the Judgment are assigned a variable Free Production Allowance (FPA), which is a uniform percentage of BAP set for each subarea each year by the Watermaster. This percentage is reduced or "ramped-down" over time until total FPA comes into balance with available non-SWP supplies. The current FPA for each Subarea is summarized below:

- Alto Subarea - 80 percent of BAP for agriculture and 60 percent of BAP for municipal and industrial
- Baja Subarea - 65 percent of BAP
- Centro Subarea - 80 percent of BAP
- Este Subarea - 80 percent of BAP
- Oeste Subarea - 80 percent of BAP for agriculture and 65 percent of BAP for municipal and industrial

Any water user that pumps more than their FPA must purchase SWP replenishment water from the Watermaster equal to the amount of production in excess of the FPA, or transfer unused FPA from another party within the subarea.

Warren Valley Basin

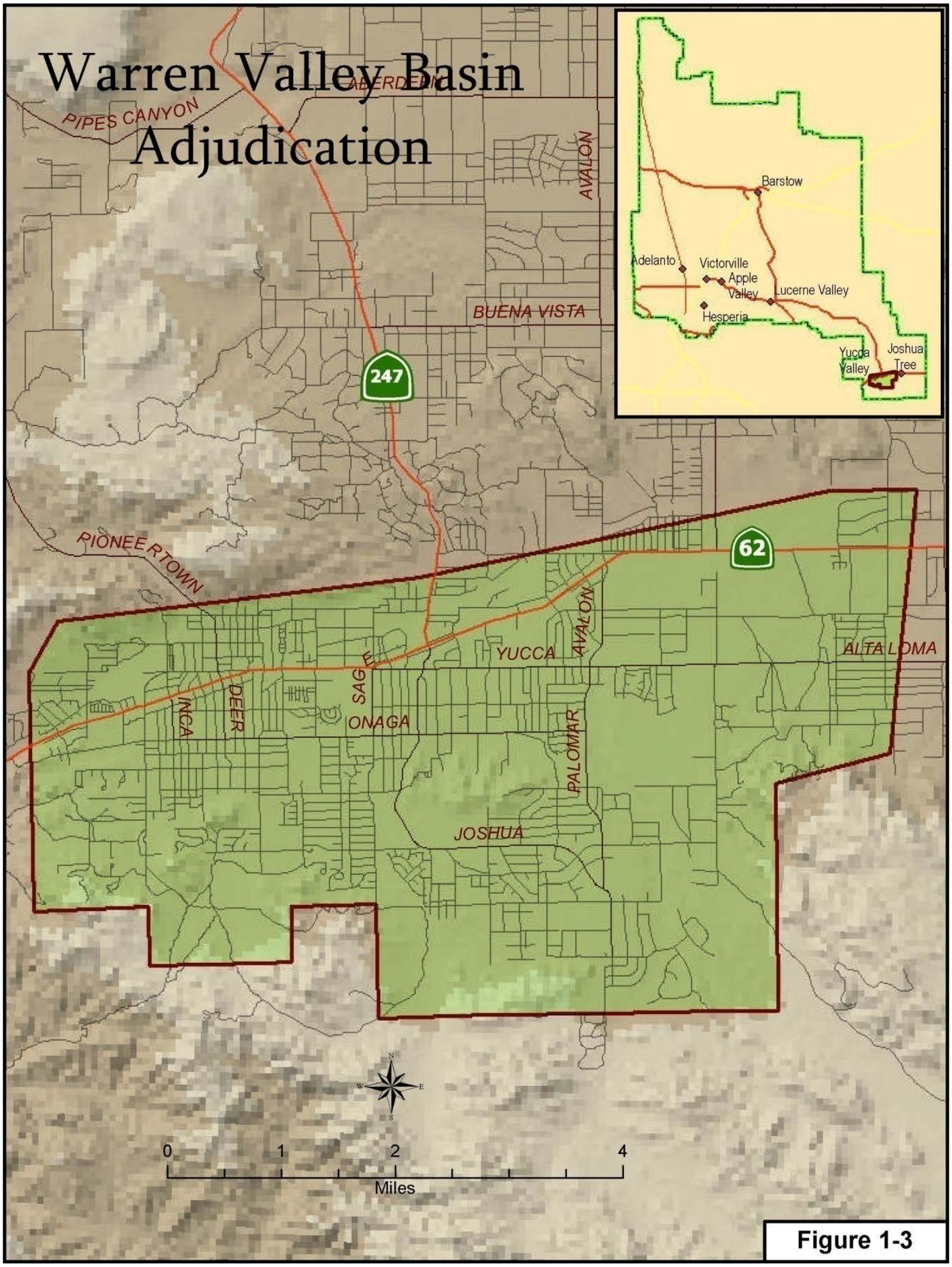
The Warren Valley Basin adjudicated area is located within the Morongo Basin/Johnson Valley Area ("Morongo"). Groundwater from the Warren Valley Basin is used to supply the Town of Yucca Valley and its environs. Extractions from the Warren Valley Basin began exceeding supply in the 1950s. The progressively increasing overdraft led to adjudication of the Warren Valley Basin in 1977. In its Warren Valley Judgment (see Figure 1-3), the court appointed the Hi-Desert Water District (HDWD) as Watermaster and ordered it to develop a physical solution for halting overdraft. Objectives identified by the Watermaster Board included managing extraction, importing water supplies, conserving stormwater, encouragement of conservation and reclamation, and protecting groundwater quality. A Basin Management Plan was adopted that called for importing SWP water from MWA through the then-proposed Morongo Basin Pipeline to balance demand and replenish past overdraft. The text of the Warren Valley Judgment can be found in Appendix E.

Ames Valley Basin

Although not a full adjudication, the court approved Ames Valley Basin Water Agreement is a 1991 Agreement between HDWD and Bighorn-Desert View Water Agency (BDVWA) for the construction and operation of the HDWD Mainstream Well in the Ames Valley basin. At the time the Agreement was entered, the HDWD service area included areas within the Ames Valley basin and the Warren Valley basin. That agreement is currently being expanded to include all pumpers in the Ames Valley including CSA No. 70 and to provide a monitoring and management plan for operation of the basin with the Ames Valley Recharge Project.

FIGURE 1-2
MWA ADJUDICATED BOUNDARY AND SUBAREAS

FIGURE 1-3
WARREN VALLEY BASIN ADJUDICATED BOUNDARY



1.4.3 Retail Water Purveyors

Ten retail purveyors provide water service to most residents of within the MWA service area. All the retailers listed below, except those noted, supply water to their customers from local groundwater, which is replenished by MWA imported water.

- City of Adelanto's Water Department provides water service to the residents of Adelanto.
- Apple Valley Ranchos Water Company's (AVRWC's) service area covers approximately 50 square miles within Apple Valley and portions of the unincorporated area of San Bernardino County.
- CSA 64's service area includes the Spring Valley Lake community.
- CSA 70J's service area includes the Oak Hills community.
- Golden State Water Company's (GSWC) service area includes customers living in and around the city of Barstow.
- Hesperia Water District's service area includes the City of Hesperia.
- Hi-Desert Water District's service area includes the Town of Yucca Valley and portions of the unincorporated area of San Bernardino County.
- Joshua Basin Water District's service area includes portions throughout a 96-square mile area between Yucca Valley, Twentynine Palms, Joshua Tree National Park and the Twentynine Palms Marine Corps Base.
- Phelan Pinon Hills CSD's service area includes approximately 134 square miles of unincorporated area located at the transition between the foothills of the San Gabriel Mountains and southwestern portion of the Mojave Desert. The CSD was formed in 2007 after the dissolution of CSA 70L and all water and capacity rights and interests of the previous CSA were succeeded.
- Victorville Water District was consolidated by action of the Local Agency Formation Commission beginning August 15, 2007, from the Baldy Mesa Water District, Victor Valley Water District and the City of Victorville Water Department. The City of Victorville also has a connection from the MWA Mojave River Pipeline to provide SWP water for cooling a power plant. This same source is used to treat and then inject SWP water into the local groundwater basin for use when supplies for the power plant are not available from SWP.

The service areas of MWA and the retail water purveyors required to complete UWMPs are shown on Figure 1-4.

As of 2009, the ten (10) large retail water purveyors served approximately 121,800 connections, as presented in Table 1-3.

TABLE 1-3
RETAIL WATER PURVEYORS 2009 SERVICE AREA INFORMATION

Retail Water Purveyor	Service Area (sq. miles)	Connections
City of Adelanto	54	7,657
Apple Valley Ranchos Water Company	50	18,805
County Service Area (CSA) 64	3	3,743
CSA 70J	23[a]	3,013[b]
Golden State Water Company - Barstow	33.6	9,302
Hesperia Water District	74	25,838
Hi-Desert Water District	57	9,705
Joshua Basin Water District	96	4,426
Phelan Pinon Hills Community Service District (CSD)	80	6,774
Victorville Water District	85	32,561
	Total	**121,824**

Source is DWR annual Public Water System Statistics records.
Notes:
(a) Estimated from GIS data.
(b) Only 2008 data was available.

1.5 Climate

The Mojave Water Agency maintains a regional network of weather monitoring stations throughout the watershed; some are funded by MWA and others are maintained by various local and federal government agencies and citizen observers programs. The stations collect various weather data on temperature, precipitation, and evaporation. Rain gages are mostly located within the Mojave Basin Area and the surrounding mountains.

Representative precipitation, temperature, and average evapotranspiration (ETo) data are reported in Table 1-4. Runoff in the upper watershed contributes substantially more to the recharge of the basin than precipitation falling in the basin. Average rainfall within the lower lying areas of the Mojave Basin Area and Morongo Area is roughly five to seven inches per year. The large variation in annual rainfall within the surrounding mountains directly affects the annual water supply of the basin.

FIGURE 1-4
MWA SERVICE AREA AND LARGE RETAIL WATER PURVEYORS

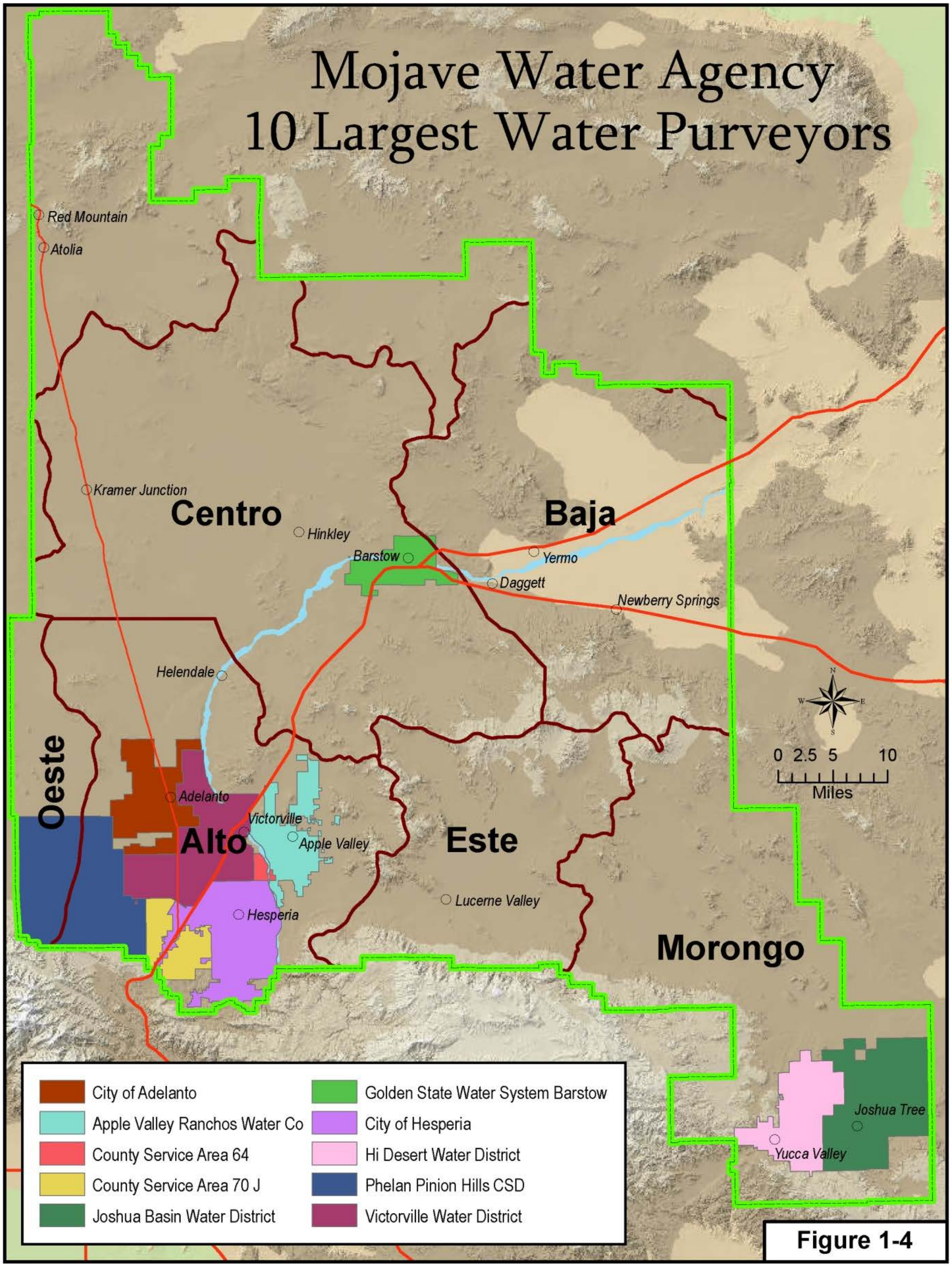


TABLE 1-4
CLIMATE DATA FOR THE MOJAVE WATER AGENCY

Station:	Barstow			Victorville		
	Total ETo (in)	Total Precip (in)	Avg Air Tmp (F)	Total ETo (in)	Total Precip (in)	Avg Air Tmp (F)
1997	73.1	11.6	66.1	68.4	6.4	61.4
1998	66.0	4.7	63.0	62.0	11.4	58.3
1999	74.0	2.6	64.7	67.8	3.2	60.0
2000	74.9	1.5	66.3	68.4	3.4	61.2
2001	74.8	5.7	66.6	67.3	6.9	61.5
2002	74.6	8.3	65.9	69.6	2.4	61.0
2003	71.8	4.5	66.6	66.6	12.4	61.5
2004	71.9	8.8	65.3	66.2	13.6	60.6
2005	66.6	13.2	64.7	64.6	13.2	60.6
2006	70.2	2.1	65.6	68.1	4.1	60.8
2007	70.4	1.6	66.4	71.2	3.3	61.5
2008	73.2	2.7	66.1	68.7	3.7	61.3
2009	71.0	1.5	65.4	66.1	3.0	58.9
Avg	**71.7**	**5.3**	**65.6**	**67.3**	**6.7**	**60.7**

Sources:
http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?cavict+sca
http://wwwcimis.water.ca.gov/cimis/frontMonthlyEToReport.do

1.6 Potential Effects of Global Warming

A topic of growing concern for water planners and managers is global warming and the potential impacts it could have on California's future water supplies. DWR's California Water Plan Update 2009 considers how climate change may affect water availability, water use, water quality, and the ecosystem.[3]

Volume 1, Chapter 5 of the California Water Plan, "Managing an Uncertain Future," evaluated three different scenarios of future water demand based on alternative but plausible assumptions on population growth, land use changes, water conservation and also future climate change might have on future water demands. Future updates will test different response packages, or combinations of resource management strategies, for each future scenario. These response packages help decision-makers, water managers, and planners develop integrated water management plans that provide for resources sustainability and investments in actions with more sustainable outcomes. Further detailed guidance is currently being developed by the State of California and the United States (US) Environmental Protection Agency for use in integrated regional water management planning.

1.7 Other Demographic Factors

Over the past decade the area (along with most of California) experienced significant increases in both single family and multi-family residential construction, as well as in commercial and industrial construction. As the local population has increased, the demand for water has also increased. However, the recent economic downturn, coupled with a three-year dry period

[3] Final California Water Plan Update 2009 Integrated Water Management: Bulletin 160.

during 2007-2010 when water conservation was promoted to consumers, has reduced demand on what may be an interim basis.

1.8 List of Abbreviations and Acronyms

The following abbreviations and acronyms are used in this report.

AB	Assembly Bill
ACOE	US Army Corps of Engineers
Act	California Urban Water Management Planning Act
af	acre-feet
afy	acre-feet per year
Agency	Mojave Water Agency
AVEK	Antelope Valley-East Kern Water Agency
AVRWC	Apple Valley Ranchos Water Company
AWAC	Alliance for Water Awareness and Conservation
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation
BAP	Base Annual Production
Basin	Mojave River Basin
BBARWA	Big Bear Area Regional Wastewater Agency
BDCP	Bay Delta Conservation Plan
BDVWA	Bighorn-Desert View Water Agency
BMOs	Basin Management Objectives
BMPs	Best Management Practices
CCF	One Hundred Cubic Feet
CCR	Consumer Confidence Report
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CII	Commercial Industrial and Institutional
CIMIS	California Irrigation Management Information System
County	San Bernardino County
CSA	County Service Area
CSD	Community Service District
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DBP	Disinfection by-products
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game
DMM	Demand Management Measures
DOF	California Department of Finance
DPSG	Dr. Pepper Snapple Group

DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EC	Electrical conductivity
Edison	Southern California Edison
EDU	Equivalent Dwelling Unit
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ESRI	Environmental Systems Research Institute
ETo	Evapotranspiration
FPA	Free Production Allowance
GIS	Geographic Information System
GPCD	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GSWC	Golden State Water Company
GW	Groundwater
GWMP	Groundwater Management Plan
HDPP	High Desert Power Project
HDWD	Hi-Desert Water District
HECW	high efficiency clothes washers
HET	high efficiency toilet
JBWD	Joshua Basin Water District
MAF	million acre-feet
M&I	Municipal and Industrial
MCL's	Maximum Contaminant Levels
MCLB	Marine Corps Logistics Base
MBAW	Mojave Basin Area Watermaster
MEEC	Mojave Environmental Education Consortium
Metropolitan	Metropolitan Water District of Southern California
MFR	Multi-Family Residential
MGD	million gallons per day
mg/L	milligrams per liter
MP	Minimal Producers
Morongo	Morongo Basin/Johnson Valley Area
MOU	Memorandum of Understanding
MMRP	Mitigation, Monitoring and Reporting Program
MWA, Agency	Mojave Water Agency
NPDES	National Pollutant Discharge Elimination System
PG&E	Pacific Gas & Electric
PID	Public Improvement District
Plan	Urban Water Management Plan 2010
PPHCSD	Phelan Pinon Hills Community Service District
PSY	Production Safe Yield

PUC	California Public Utilities Commission
PWSS	Public Water System Statistics
R^3	Regional Recharge and Recovery Project
RAP	Remedial Action Plan
Regional Board	Lahontan Regional Water Quality Control Board
RO	Reverse Osmosis
RTP	Regional Transportation Plan
Regional Plan, RWMP	2004 Integrated Regional Water Management Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SD	Sanitation District
SCAG	Southern California Association of Governments
SCG	Southern California Gas
SCLA	Southern California Logistics Airport
SCWA	Solano County Water Agency
SDD	Special Districts Department
SFR	Single Family Residential
SWP	State Water Project
TAC	Technical Advisory Committee
TAZ	Traffic Analysis Zones
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
umhos/cm	Micromhos per centimeter
USGS	US Geological Survey
UWMP	Urban Water Management Plan
VVWRA	Victor Valley Wastewater Reclamation Authority
VWD	Victorville Water District
WC	water conservation
WCIP	Water Conservation Incentive Program
WIRP	Water Infrastructure Restoration Program
WRF	Water Reclamation Facility
WRP	Wastewater Reclamation Plant
WWTP	Wastewater Treatment Plant

Section 2: Water Use

2.1 Overview

This chapter describes historic and current water usage and the methodology used to project future demands within Mojave Water Agency's (MWA's) service area. Water usage is divided into sectors such as residential, industrial, institutional, landscape, agricultural, and other purposes. To undertake this evaluation, existing land use data and new housing construction information were compiled from each of the retail water purveyors and projections prepared in the Mojave Water Agency 2004 Regional Water Management Plan (RWMP).[4] The RWMP is the master plan for MWA water management activities through the year 2020. This information was then compared to historical trends for new water service connections and customer water usage information. In addition, weather and water conservation effects on historical water usage were factored into the evaluation.

For the 2010 UWMP, a demand forecast model was developed that combines population growth projections with water use data to forecast total water demand in future years. Water uses were broken out into specific categories and assumptions made about each to more accurately project future use. Three separate data sets were collected and included in the model: current population, current water use by type, and projected population.

2.2 Population

Population data for 2000 through 2010 were estimated by subarea by MWA. Using draft Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan (RTP) growth forecast (baseline of 2008), it is predicted that the Mojave Water Agency service area will grow at a rate of approximately 2.5 percent per year from 2010 through 2035. Table 2-1 uses the assumption that each of the subareas grow at the nearest city-wide rate, with the Alto subarea having the highest annual change in rate at 2.7 percent over the 2010-2035 period.

[4] Schlumberger Water Services, September 2004, "Mojave Water Agency 2004 Regional Water Management Plan."

TABLE 2-1
CURRENT AND PROJECTED POPULATION ESTIMATES - MWA SERVICE AREA

Subarea	2005	2010	2015	2020	2025	2030	2035	Annual % Change 2010-2035
Alto	302,389	341,421	387,124	432,826	479,786	526,746	573,705	2.7%
Baja	5,414	5,570	6,280	6,990	7,661	8,332	9,004	2.5%
Centro	34,716	36,145	39,840	43,535	47,010	50,485	53,960	2.0%
Este	6,680	7,695	8,528	9,361	10,169	10,977	11,785	2.1%
Oeste	9,206	9,582	10,310	11,038	11,738	12,437	13,136	1.5%
Morongo	36,434	36,944	38,931	40,918	42,211	43,504	44,798	0.9%
Total MWA Region	**394,839**	**437,357**	**491,013**	**544,668**	**598,575**	**652,481**	**706,388**	**2.5%**

Note: 2010 data is current based upon 2009 estimate and is not a projected number.

Current population was estimated using three data sets. Baseline population was derived from 2000 Census Block data by subarea using a Geographic Information System (GIS). Population data for the Year 2008 and 2009 was derived from the Environmental Systems Research Institute (ESRI) 2008 and 2009 estimates by Block Group using a GIS dataset purchased from Primary Data Source, a distributor of ESRI products. The geographies of some Block Groups, which are larger than Blocks, did not match up well with MWA subarea boundaries, decreasing the accuracy of the ESRI dataset. To correct this problem, the over-counted or under-counted populations were accounted for by adding or removing those geographic areas to the totals using 2000 Census Block data interpolated forward to 2008 based upon the population change from 2000-2008 of the original ESRI Block Group subsets. Population from years 2001-2007 was interpolated using Single Family Residential house construction data from the San Bernardino County Assessor. ESRI did not publish Block Group estimates for 2010 because U.S. Census "actuals" are available instead. However, the Census data was not available in-time for the completion of this report, so population in 2010 was assumed to be equal to 2009. MWA boundaries and subareas are indicated on Figure 1-2, in the previous chapter.

Population growth projections in the model are based upon preliminary projections from the SCAG for their 2012 RTP. The "2012 projections" have a 2008 baseline, with projections for 2020 and 2035 for cities and for the county's total unincorporated population. The 2012 projections will not be final until the RTP is adopted by SCAG, but are considered a better alternative than the adopted SCAG "2008 projections," with a 2005 baseline, which contained very aggressive growth rates. In MWA staff's opinion, the 2008 projections have become obsolete both because of the significant local growth that occurred after the 2005 baseline and overly aggressive future growth assumptions.

The disadvantage of the 2012 projections is they are only available by incorporated city—and have not yet been disaggregated into Traffic Analysis Zones (TAZ's—similar size to Census Tracts), making it not possible to select SCAG's projections for other geographies, such as unincorporated areas, subareas, or retail purveyor boundaries.

In order to make the 2012 SCAG projections useful to the MWA service area, the projections by city served as the basis for projecting population growth in other geographies, based upon the change in population from 2000-2008 for the subject area relative to the nearest city or cities. Subarea population was calculated as (population in cities) plus (unincorporated population). City population projections were taken from SCAG. Unincorporated population is assumed to grow at the same ratio relative to the city populations as what occurred from 2000-2008.

Population projections were also developed for retail purveyors using the same method, as an option for them to use in their own 2010 Urban Water Management Plan's (UWMP's). For retailers that were located mostly within a city boundary, the SCAG projected growth rate for the city was applied to the retailer service area.

Approximately 10 percent of MWA's service area population is served by small water purveyors with less than 3,000 service connections or serving less than 3,000 afy. Also, a portion of the population is served by private wells and is not served by Urban Water Suppliers or small water purveyors. The sum of the MWA's subarea populations (Table 2-1) is larger than the sum of the purveyors' service area populations reported in their UWMPs due to there being multiple purveyors present in MWA's service area that serve less than 3,000 service connections or supply less than 3,000 acre-feet (af) of water annually, and residential dwellings that are supplied with their own wells.

2.3 Historic Water Use

Predicting future water supply requires accurate historic water use patterns and water usage records. Figure 2-1 illustrates the change in water demand since 2000. Please note the Figure includes minimal water producers and two power plants that are supplied directly with State Water Project (SWP) water.

Table 2-2 presents the total water demand by subarea, including direct SWP supplies and Groundwater Pumping amounts, which are the historical groundwater pumping quantities for the Mojave Water Agency from 2000 through 2010.

TABLE 2-2
TOTAL WATER DEMAND BY SUBAREA (AFY)

Subarea	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Alto	90,801	84,968	88,968	93,108	97,776	97,491	103,413	106,838	95,552	91,531	87,001
Baja	41,020	37,661	38,931	32,871	31,769	28,484	32,118	35,735	33,514	29,279	23,653
Centro	30,695	26,127	26,946	24,534	24,399	22,563	24,313	26,262	25,843	25,644	25,071
Este	8,008	7,510	7,688	6,860	7,537	6,981	8,411	8,050	8,299	7,101	5,863
Oeste	5,016	4,462	5,248	4,962	5,430	4,882	5,152	5,690	5,766	5,207	4,502
Mojave Basin Total[a]	**175,540**	**160,728**	**167,781**	**162,335**	**166,911**	**160,401**	**173,407**	**182,575**	**168,974**	**158,762**	**146,090**
Morongo[b]	5,440	5,524	5,831	5,348	5,861	5,879	6,300	6,403	5,797	5,990	5,794
Total MWA	**180,980**	**166,252**	**173,612**	**167,683**	**172,772**	**166,280**	**179,707**	**188,978**	**174,771**	**164,752**	**151,884**

Notes:

(a) Mojave Basin Watermaster Annual Reports, Appendix L in water years (ending September 30) plus minimal producers (estimated at 7,100 afy) and two power plants that are supplied directly with SWP water have been added to totals.

(b) MWA's Demand Forecast Model from historical data.

2.4 Projected Water Use

2.4.1 Water Use Data Collection

Current water use data were collected and broken out by water use sector into as much detail as possible, to allow for detailed analysis and for making different assumptions about each type of water use for future years. These assumptions became the basis for projections developed in MWA's population and water demand forecast computer model. Data was compiled from various sources, depending upon what data were available.

Mojave Basin Area Watermaster water-year data were used for minimal producers (individuals producing 10 acre-feet (af) or less of water within the boundaries of the Mojave Basin Area Judgment) and all parties to the Mojave Basin Area Judgment except water retailers. For retailers, the California Department of Water Resources (DWR) annual Public Water System Statistics (PWSS) (2009) data were used, if available, because they break out metered water deliveries by customer class and number of connections by customer class. Where DWR data were not available, water production and connection data were gathered from a combination of sources that provided a complete data set, including annual reports to the California Department of Public Health (CDPH), surveys sent out to retail water purveyors by the Alliance for Water Awareness and Conservation (AWAC), and data provided directly to MWA by retailers.

The combined data sources were considered accurate because for the Mojave Basin Area, combined yearly water use totals by subarea were generally within 2 percent of Mojave Basin Area Watermaster ("Watermaster") verified annual production numbers. In addition to water use data, the number of residential service connections was collected for each retailer to estimate service area population and per capita water use.

2.4.2 Water Use Projection Methodology

Water uses were broken into 11 categories, and assumptions were made about each to determine projections. Demand projections were based largely on population growth. Past and current population data were available by subarea and by retail water purveyor. Population and demand projections were provided to the retailers to use in their own UWMP's if desired; however, only projections by subarea have been included in the MWA UWMP.

The water uses identified below include those supplied by retail water purveyors as well as other parties to the Mojave Basin Area Judgment, Minimal Producers, and customers that MWA provides directly with SWP water. Retail water uses include Single-Family and Multi-Family Residential, Commercial Industrial and Institutional (CII), Unaccounted, Landscape Irrigation, and the "Other" category. Non-retail uses include Industrial, Recreational Lakes and Fish Hatcheries, Minimal Producers, Golf Courses, and Agriculture. Each category is explained and the assumptions used in the projection model are described below:

1. Single Family Residential (SFR): Single Family detached dwellings. SFR projections were made based upon gallons per capita per day (GPCD) and population (GPCD was converted to acre-feet per year (afy), multiplied by yearly SFR population to calculate demand in afy). The GPCD in years 2000-2010 was calculated in the model by converting total SFR demand to Gallons per Day and dividing by SFR population. A significant downward trend in GPCD has occurred within the Mojave Basin Area (from

201 GPCD in 2000 to 148 GPCD in 2010), while in the Morongo Basin/Johnson Valley Area ("Morongo") the GPCD is already low and has not changed significantly (average 113 GPCD from 2000 to 2010). Three possibilities were developed to book-end the possible range in future SFR GPCD based upon varying levels of conservation:

a. No conservation beyond the year 2010: GPCD remains flat at the 2010 level (148 GPCD in the Mojave Basin and 113 GPCD in the Morongo Area). This represents the high end of the range.

b. Extreme conservation on a regional basis: GPCD in the Mojave Basin decreases by 2020 to the current Morongo Area level of 113 GPCD, and GPCD in Morongo decreases 5 percent (to 107 GPCD). This represents the low end of the range.

c. Moderate conservation. Halfway between the high end of the range and the low end of the range as defined above (131 GPCD by 2020 for Mojave and 110 GPCD by 2020 for Morongo).

While a significant reduction in per-capita use has occurred in the Mojave Basin over the past decade, GPCD is still substantially higher than in the Morongo Area. Voluntary conservation programs, State-Mandated GPCD reductions, tiered rate structures at the retail level, and the continuously increasing cost of water will all influence future water demands. Recognizing these factors and that a substantial potential still exists for reductions in SFR per-capita use, Moderate conservation is anticipated to be the most likely future scenario, and is used in the SFR component of demand forecasts shown later in this chapter and in Chapter 3.

2. Multiple Family Residential (MFR): The MFR category is comprised of apartments, condominiums, townhouses, duplexes, and mobile home parks. Use is projected to increase in proportion to overall population growth, with a 2010 baseline.

3. Industrial Users: This category contains industrial use by entities that are parties to the Mojave Basin Area Judgment. Industrial users connected to municipal water systems are not included in this category, but are grouped in with the Commercial/Industrial/Institutional (CII) category. Because of the diversity of industrial producers, they were grouped into categories and assumptions made for each category for expected future water use. Specific major projects that are currently in development stages were included in the projections:

- Power Plants: Power plant water use has declined from 7,800 af in 2000 to 6,100 af in 2010. Existing power plants are not anticipated to increase water use, and speculation about potential new power plants in the High Desert cannot be quantified at this time. High Desert Power Project is provided directly with SWP water but is anticipated to be using 100 percent recycled water by 2015, reducing its SWP demand to zero. The LUZ Solar Plant in Kramer Junction is also provided directly with SWP water at an average of 1,300 afy, and is expected to use the same amount of SWP water in the future. Future regional power plant water use is projected to remain flat starting in 2015.

- Cement Plants: Operate either in on/off mode, but cannot increase production due to plant limitations, environmental and air permit issues. If demand exceeds production capacity, cement is imported. Future cement plant water use is assumed to equal the yearly average from 2000-2010.

- Ready-Mix Cement and Aggregate/Batch Plants: Production is primarily a factor of new construction rather than total population in the area. Population growth is projected to be relatively linear, so demand is projected to equal the yearly average from 2000-2010.
- Compressor Stations (gas lines): The compressor stations are owned by Pacific Gas & Electric (PG&E) and Southern California Gas (SCG) for major gas lines that run to the Los Angeles area. The water is used for cooling. Use has increased about 30 percent from 2000-2010, and is projected to remain at the 2010 level in future years.
- Railroads: Railroad use has declined significantly since 2000 and is projected to remain at the 2010 level in future years.
- Mining: Mining water use has remained relatively flat and is projected to continue at the average of 2000-2010 use for future years.
- Other: Other use was identified as primarily temporary transfers of production rights for specific road construction projects. This temporary use of water is not expected to continue in future years; therefore future water use in this category is projected to be zero.
- Dr Pepper/Snapple: Construction of this facility at Southern California Logistics Airport (SCLA) was completed in 2010. The plant is currently operating and is expected to use an average of 400 afy, which is assumed to remain constant in future years.

4. Commercial/Institutional/Industrial (CII): Called Commercial/Institutional in the DWR 2009 reporting instructions, and defined as "Retail establishments, office buildings, laundries, schools, prisons, hospitals, dormitories, nursing homes, hotels" (not intended to include Industrial/Manufacturing). However, nearly all water retailers included metered industrial use in with this category, primarily because they do not separate commercial and industrial customers in their billing systems. Industry included in this category is considered "baseline use" because it accounts primarily for smaller industries and shops associated with the local population, and is expected to grow with population.

   A linear regression method, based upon current population and CII demands, was used to determine the relationship between population growth and CII usage and to project forward using linear regression. Future CII demand is correlated to population using the following formula:

   CII demand = -49.85 + 0.0295x where x is the current population

   Because the growth is unpredictable, the model does not assume any conservation in this category.

5. Recreational Lakes and Fish Hatcheries: Jess Ranch Hatchery and Fishing Lake, Spring Valley Lake, Silver Lakes, California Department of Fish and Game hatchery, Mojave Narrows Regional Park, and Lakes in the Baja subarea. Excludes Hesperia Lake, which is accounted for in Hesperia Water District's demand numbers. Recreational Lake use is projected to remain flat at the average of 2000-2010 yearly demand.

6. Unaccounted: Calculated as the difference between total water production and metered deliveries reported by retail water purveyors. From 2000-08, Unaccounted water averaged 8 percent of total municipal production. For retailers that had only total production data available, 8 percent of production was allocated into the unaccounted category. Unaccounted water decreased substantially starting in 2008, and according to representatives from the retail water purveyors, this is due to a variety of efforts recently undertaken by many of the retailers to reduce their unaccounted water losses. The makeup of this category is not entirely known; however, it is likely that this difference is comprised of water pumped to waste from production wells, lost to leaks, and from meter inaccuracies. With a 2010 baseline, unaccounted use is projected to increase in proportion with increases in municipal production.
7. Minimal Producers (MP): Producers of 10 af or less within the boundaries of the Mojave Basin Area Judgment; primarily homeowners with their own wells. MP use is projected to increase in proportion with increases in overall population.
8. Golf Courses: It is anticipated that substantial population growth will generate demand for new Golf Courses. Golf Course water use is projected to increase proportionally with increases in population.
9. Other: Defined in the DWR 2009 reporting instructions as "fire suppression, street cleaning, line flushing, construction meters, temporary meters." These uses are assumed to grow with population. Construction water is likely to have varied significantly over the 2000-2010 period due to changing rates of growth, so "Other" use is projected to increase in proportion with increases in population based upon the average per-capita use for the period of 2000-2010.
10. Landscape Irrigation: Defined in the DWR 2009 reporting instructions as "parks, play fields, cemeteries, median strips, and golf courses." This use category increased at a faster pace than population during the period of 2000-08, most likely because medians and street landscaping were developed primarily in the construction boom during that period. With 2010 as a baseline, Landscape Irrigation use is projected to increase in proportion with increases in population.
11. Agriculture: Projected to remain flat at the 2010 level.

Table 2-3 summarizes the MWA's projected water demands by subarea through 2035.

TABLE 2-3
PROJECTED WATER DEMANDS
BY SUBAREA FOR MWA (AF)

Subarea	2005	2010	2015	2020	2025	2030	2035
Alto	97,491	87,001	93,994	99,440	108,851	118,262	127,674
Baja	28,484	23,653	24,413	24,834	25,212	25,573	25,919
Centro	22,563	25,071	26,278	27,149	28,028	28,908	29,787
Este	6,981	5,863	6,607	6,771	6,970	7,170	7,369
Oeste	4,882	4,503	4,767	4,930	5,089	5,247	5,404
Morongo	5,879	5,794	7,102	7,372	7,590	7,809	8,028
Total	**166,280**	**151,885**	**163,161**	**170,496**	**181,740**	**192,969**	**204,181**

Note: Totals by subarea from MWA's demand forecast model, including all water use categories as described in Section 2.4.2 assuming moderate conservation.

2.4.3 Return Flow

The Mojave Water Agency has four sources of water supply – natural surface water flows, SWP imports, treated wastewater imports from outside the MWA service area, and return flow from pumped ground water not consumptively used. In the projection model, natural and SWP supply are expressed as an annual average, although both sources of supply vary significantly from year to year. Almost all of the water use within MWA is supplied by groundwater. Native surface supply, SWP, and wastewater imports recharge the groundwater basins; therefore, water management practices render the annual fluctuations in these sources of supply relatively unimportant for long-term water supply planning.

Return flow is calculated as a percent of the water production for each water use category, per the methodology outlined in the MWA "Watermaster Consumptive Water Use Study and Update of Production Safe Yield Calculations for the Mojave Basin Area" completed by Webb Associates in February 2000 (2000 MWA Consumptive Use Study). Return flow factors for each category per the Study are explained below. The Watermaster is currently developing revised return flow factors to reflect changes in water use over the past decade. The revised numbers are anticipated to be available in 2011, and will replace the factors listed below, if different in future planning documents.

1. All municipal uses (SFR, MFR, CII, Unaccounted, Landscape Irrigation, and Other): 50 percent of production. Embedded within this calculation is return flow from effluent generated by municipal wastewater treatment facilities within MWA (directly recycled or recharged to groundwater). Only imported wastewater (described in Chapter 3) is accounted for as a separate supply in Table 3-1, and all other wastewater/recycled water is a component of the "Return Flow" category of supply.
2. Industrial producers: No return flow.
3. Recreational Lakes: total production minus calculated consumptive use. Consumptive use equals the annual surface evaporation rate (5.6 feet in the Alto Subarea, 6.7 feet in the Centro and Baja subareas) multiplied by lake surface area. Return flow equals 22 percent of recreational lake production in Alto and 16 percent of production in Centro and Baja.[5] No recreational lakes in other subareas.
4. Minimal Producers: 50 percent of production.
5. Golf Courses: total production minus calculated consumptive use. Consumptive use equals the net irrigation acreage times the consumptive use factor identified in the Webb study. Return flow equals 49 percent of production of the golf course in Alto and 57 percent of production in Centro. No golf courses in other subareas.
6. Agriculture: total production minus calculated consumptive use. Consumptive use equals the net irrigated acreage times the appropriate consumptive use factor identified in the Webb study. Return flow is calculated as a percent of agricultural production for each subarea: Alto, 46.5 percent; Baja, 37.2 percent; Centro, 39.2 percent; Este, 41.8 percent; Oeste, 48.5 percent.

[5] Based upon 1996-97 water year production numbers. Return flow was calculated as (total production) minus (consumptive use) divided by total production (%). This percentage return flow factor was applied to all years.

2.4.4 Morongo Area SWP Demand Projection

During the stakeholder review process for the UWMP demand forecast model, it was pointed out to MWA staff that assumptions about SWP demands for the Morongo Area should be looked at in more detail due to differences in urban water use and geology in the Morongo Area compared to the Mojave Basin area. In the model it is assumed water retailers in the Morongo Area that currently have or have planned SWP recharge projects will generate a demand for imported water from the SWP equal to (total pumping) minus (return flow) minus (natural supply). SWP demand projections in the model represent the combined demands from the Bighorn-Desert View Water Agency (BDVWA), Hi-Desert Water District (HDWD), Joshua Basin Water District (JBWD), San Bernardino County Special Districts Department (SDD) service areas and a small number of individual domestic pumpers.

Indoor water uses create a return flow (either through septic or sewer systems), but those flows may not reach the groundwater depending upon the location of the discharge relative to the aquifer. A recent study by MWA of the Apple Valley Ranchos Water Company service area indicates local indoor use averages 60 GPCD. Currently there are no sewer systems in the Morongo area, and it is assumed that return flows occur on the properties on which the water uses take place and that return flows reach the groundwater (GW) only where properties directly overlie defined GW basins. GIS analysis was conducted to determine the location of water-using properties relative to groundwater basins. Using GIS, all parcels with recorded improvements according to San Bernardino County Assessor data (i.e., developed properties) located in the Morongo area were identified. Out of 18,884 developed parcels, 86 percent of overlie GW basins and 14 percent are outside GW basin boundaries. In addition to return flows from septic tanks, return flow from golf course irrigation in Yucca Valley is estimated at 25 percent of pumping. In the demand model, golf course production is projected to be 500 afy in future years, which is equivalent to the current golf course water rights.

It was determined that the occurrence of return flows in basins other than where the pumping took place was not a factor in the SWP demand analysis. A compilation of studies of the various sub-basins within the Morongo area was used to determine the best estimate of natural supply to the area, which is further discussed in Chapter 3 and presented in Table 3-11.

Based upon the analysis above, return flow in the model was calculated as (60 GPCD) x (Morongo population) x (86%). For 2008, the result was 2,156 af. To validate this method, return flows were estimated in a similar manner for the Warren Basin and compared to recent return flow estimates by the US Geological Survey (USGS).[6] There were 7,094 improved parcels that overlaid the Warren Basin in 2009 (GIS parcel data analysis). Based on 2009 estimates by Census Block Group provided by ESRI of 2.35 persons per household and an 82.0 percent occupancy rate, the resulting return flow value is 923 afy, which is comparable to the USGS/HDWD estimate of 880 af in 2008.

SWP demands for the Morongo area are calculated as (total pumping) minus (return flows) minus (natural supply). Based upon the return flow and natural supply estimates above, the resulting SWP demand for the Morongo area was 1,460 af in 2008 and is projected to increase to between 3,000 and 3,300 af by 2035, depending on the level of conservation assumed. This

[6] "Warren Basin Water Storage and Balance" spreadsheet developed by High-Desert Water District with the assistance of the US Geological Survey (written correspondence, 2010).

assumes all water retailers are utilizing SWP water to meet demands in excess of return flow and natural supply.

2.5 Other Factors Affecting Water Usage

A major factor that affects water usage is weather. Historically, when the weather is hot and dry, water usage increases. The amount of increase varies according to the number of consecutive years of hot, dry weather and the conservation activities imposed. During cool, wet years, historical water usage has decreased to reflect less water usage for exterior landscaping. This factor is discussed below in detail.

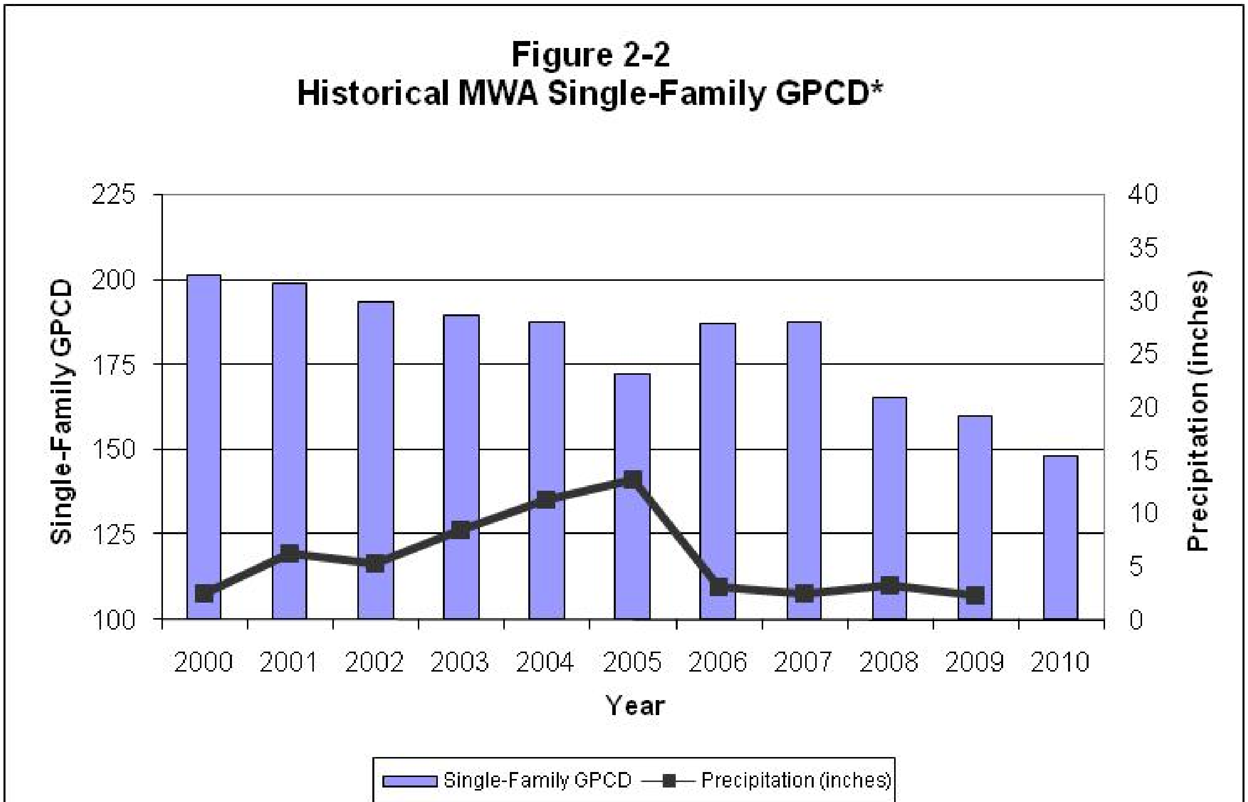
2.5.1 Weather Effects on Water Usage

California faces the prospect of significant water management challenges due to a variety of issues including population growth, regulatory restrictions and climate change. Climate change is of special concern because of the range of possibilities and their potential impacts on essential operations, particularly operations of the State Water Project. The most likely scenarios involve accelerated sea level rise and increased temperatures, which will reduce the Sierra Nevada snowpack and shift more runoff to winter months. These changes can cause major problems for the maintenance of the present water export system through the fragile levee system of the Sacramento-San Joaquin Delta. The other much-discussed climate scenario or impact is an increase in precipitation variability, with more extreme drought and flood events posing additional challenges to water managers.[7]

These changes would impact MWA's water supply by changing how much water is available, when it is available, how it can be captured and how it is used due to changes in priorities. Expected impacts to the SWP imported water supply include pumping less water south of the Delta due to reduced supply, and pumping more local groundwater to augment reductions in surface water supplies and reliability issues since groundwater is a more reliable source of water.

Historically, MWA's single-family sector use has fluctuated from 148 to 201 GPCD, as shown on Figure 2-2. Please note that the precipitation data used in the Figure is the average of the Barstow and the Victorville California Irrigation Management Information System (CIMIS) weather stations. CIMIS is a program in the California Department of Water Resources (DWR) that manages a network of over 120 automated weather stations in the state of California. While historically this variation in range of water use shown on Figure 2-2 was primarily due to seasonal weather variations, with the unusual economic events of the recent years and the effects of conservation, the weather may not be the only impact on the drop in usage for the single family user.

[7] Final California Water Plan Update 2009 Integrate Water Management: Bulletin 160.



*Precipitation data was averaged from California Irrigation Management Information System (CIMIS) Stations Barstow No. 134 and Victorville No. 117.

2.5.2 Conservation Effects on Water Usage

In recent years, water conservation has become an increasingly important factor in water supply planning in California. Since the 2005 UWMP there have been a number of regulatory changes related to conservation including new standards for plumbing fixtures, a new landscape ordinance, a state retrofit on resale ordinance, new Green Building standards, target demand reduction goals and more.

In 2003, MWA, retail water agencies, and others formed the AWAC. The mission of the AWAC, a coalition of 25 regional organizations, is to promote the efficient use of water and increase communities' awareness of conservation as an important tool to help ensure an adequate water supply. The AWAC have developed water conservation measures that include public information and education programs and have set a regional water use reduction goal of 15 percent gross per capita by 2015.

Through its Water Conservation Incentive Program (WCIP), MWA has been supporting regional conservation. The Cash for Grass program has been particularly successful, and has caused the removal of an estimated 2.9 million square feet of turf and saved about 500 af of water per year.

Section 3: Water Resources

3.1 Overview

This Section describes the water resources available to the Mojave Water Agency (MWA) for the 25-year period covered by the Plan. These are summarized in Table 3-1 and discussed in more detail below. Both currently available and planned supplies are discussed.

TABLE 3-1
SUMMARY OF CURRENT AND PLANNED WATER SUPPLIES (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Wholesale (Imported)						
SWP [(a)]	49,680	51,480	53,880	53,880	54,778	54,778
Local Supplies[(b)]						
Net Natural Supply	54,045	54,045	54,045	54,045	54,045	54,045
Agricultural Depletion from Storage[(c)]	10,425	10,425	10,425	10,425	10,425	10,425
Return Flow[(d)]	62,220	67,766	71,353	76,862	82,364	87,857
Wastewater Import[(e)]	5,304	5,397	5,491	5,789	6,087	6,385
Groundwater Banking Projects[(f)]						
Total Existing Supplies	**181,674**	**189,113**	**195,194**	**201,001**	**207,699**	**213,490**
Projected Demands[(g)]	**151,885**	**163,161**	**170,496**	**181,740**	**192,969**	**204,181**

Notes:
(a) Assumes 60% of Table A amount as the long-term supply until 2029 and then assume 61% in 2029 and after, based on the California Department of Water Resources 2009 contractor Delivery Reliability Report for MWA.
(b) Source: MWA's demand forecast model.
(c) Refer to Section 3.3.2 for an explanation of this supply.
(d) Refer to Section 3.3.3 for an explanation of this supply. It was assumed the GPCD remains at the "moderate" level as defined in Chapter 2.
(e) See Chapter 4 Recycled Water, Table 4-6.
(f) Groundwater Banking (stored groundwater) would only be used in drought conditions. For this reason, Groundwater Banking is not included in the total supply available in a Normal Year. See Table 3-13 for details.
(g) See Chapter 2 Water Use, Table 2-3, assuming "moderate" conservation.

The MWA has four sources of water supply – natural surface water flows, wastewater imports from outside the MWA service area, SWP imports, and return flow from pumped groundwater not consumptively used. A fifth source, "Agricultural Depletion From Storage," is also shown as a supply and is described in Section 3.3.2. In MWA's demand forecast projection model, natural and SWP supply are expressed as an annual average, although both sources of supply vary significantly from year to year. Almost all of the water use within MWA is supplied by pumped groundwater. Native surface supply, return flow, and SWP imports recharge the groundwater basins; therefore, water management practices render the annual fluctuations in these sources of supply relatively unimportant for water supply planning. MWA has an average natural supply of 54,045 acre-feet per year (afy) as shown in Table 3-1.

The projected demands shown in Table 3-1 represent total demands within MWA, including pumped groundwater and direct SWP use, assuming "moderate" conservation beyond 2010 as explained previously in Section 2.4. Figure 3-1 presents all available supplies compared with total demands, with local supplies shaded green and wholesale (SWP) supplies shaded blue. Available supplies are sufficient to meet projected demands beyond the year 2035. It should be noted that return flow as a supply is shown to increase over time because it is a function of water demand. In addition to the projections shown in Figure 3-1, demands and supplies were also evaluated with no additional conservation beyond 2010 and extreme conservation, as described in Section 2.4). Tables and charts for those supply and demand projections are included in Appendix F.

Water demands and supplies were also evaluated out 50 years to the year 2060, shown in Figure 3-2. This is beyond the 25-year planning horizon included in this plan and projections beyond 2035 are for informational purposes only. However, they give some insight into when in the future demands might exceed current supplies. It is assumed on Figure 3-2 that demands continue to increase at the same rate through 2060. The projection indicates that current supplies are sufficient to meet demands through 2044, assuming SWP supplies remain constant at the 2035 availability. See Appendix F for supply/demand forecasts through 2060 based upon no conservation and extreme conservation.

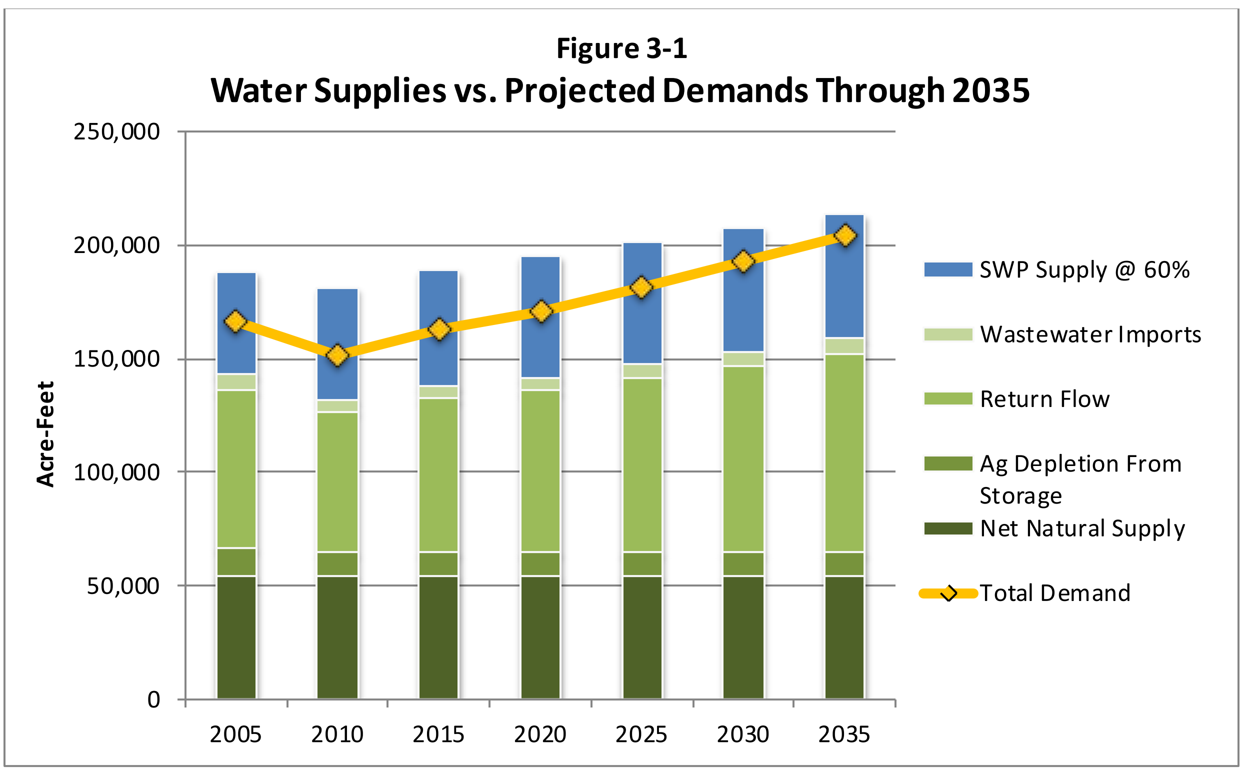
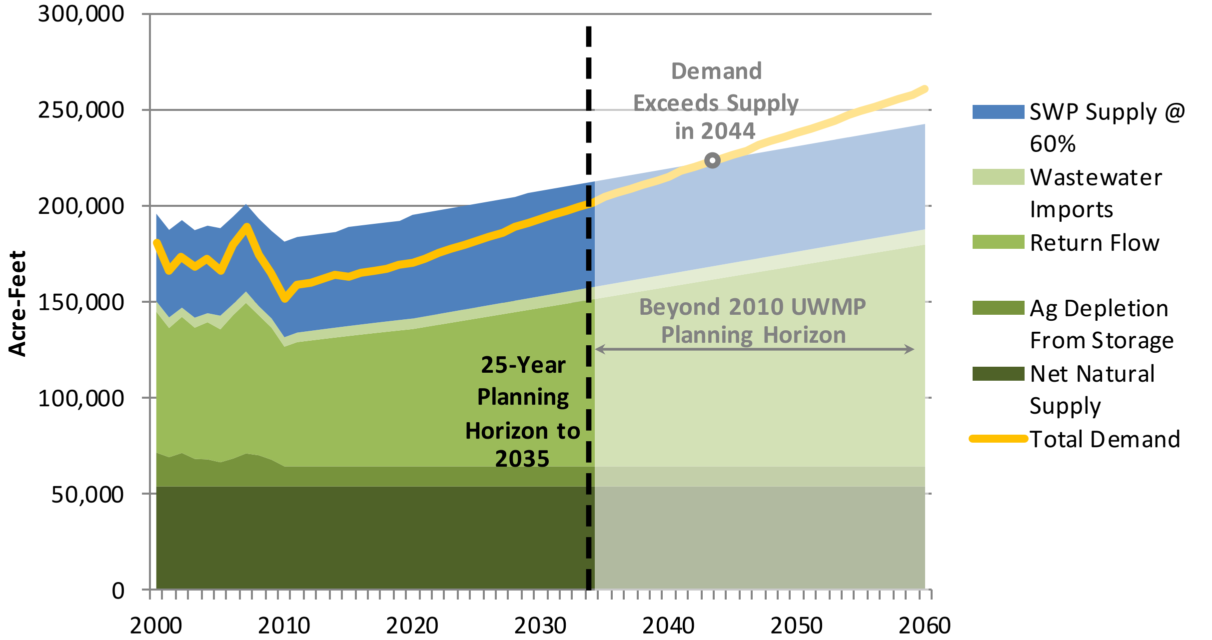


Figure 3-2

Water Supplies vs. Projected Demands Through 2060



The term "dry" is used throughout this chapter and in subsequent chapters concerning water resources and reliability as a measure of supply availability. As used in this Plan, dry years are those years when supplies are the lowest, which occurs primarily when precipitation is lower than the long-term average precipitation. The impact of low precipitation in a given year on a particular supply may differ based on how low the precipitation is, or whether the year follows a high-precipitation year or another low-precipitation year. For the State Water Project (SWP), a low-precipitation year may or may not affect supplies, depending on how much water is in SWP storage at the beginning of the year. Also, dry conditions can differ geographically. For example, a dry year can be local to the MWA service area (thereby affecting local groundwater replenishment and production), local to northern California (thereby affecting SWP water deliveries), or statewide (thereby affecting both local groundwater and the SWP). When the term "dry" is used in this Plan, statewide drought conditions are assumed, affecting both local groundwater and SWP supplies at the same time.

3.2 Wholesale (Imported) Water Supplies

3.2.1 Imported Water Supplies

Imported water supplies available to MWA consist primarily of the SWP supplies. According to the water supply contract between the California Department of Water Resources (DWR) and MWA revised on October 12, 2009, MWA's maximum annual entitlement from the SWP ("Table A amount") is 82,800 afy from 2010 to 2014; 85,800 afy from 2015 to 2019; and 89,800 afy from 2020 to 2035.

The SWP is the largest state-built, multi-purpose water project in the country. It was authorized by the California State Legislature in 1959, with the construction of most facilities completed by

1973. Today, the SWP includes 28 dams and reservoirs, 26 pumping and generating plants, and approximately 660 miles of aqueducts. The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. Storage released from Oroville Dam on the Feather River flows down natural river channels to the Sacramento-San Joaquin River Delta (Delta). While some SWP supplies are pumped from the northern Delta into the North Bay Aqueduct, the vast majority of SWP supplies are pumped from the southern Delta into the 444-mile-long California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains and the California Aqueduct then divides into the East and West Branches. MWA delivers its SWP supplies to use within the local groundwater basins through extensive transmission pipeline systems and direct releases from Silverwood Lake, a SWP regulating reservoir.

In the early 1960s, DWR began entering into individual SWP Water Supply Contracts with urban and agricultural public water supply agencies located throughout northern, central, and southern California for SWP water supplies. MWA is one of 29 water agencies (commonly referred to as "contractors") that have an SWP Water Supply Contract with DWR.

Each SWP contractor's SWP Water Supply Contract contains a "Table A," which lists the maximum amount of water an agency may request each year throughout the life of the contract. Table A is used in determining each contractor's proportionate share, or "allocation," of the total SWP water supply DWR determines to be available each year. The total planned annual delivery capability of the SWP and the sum of all contractors' maximum Table A amounts was originally 4.23 million acre-feet (af). The initial SWP storage facilities were designed to meet contractors' water demands in the early years of the SWP, with the construction of additional storage facilities planned as demands increased. However, essentially no additional SWP storage facilities have been constructed since the early 1970s. SWP conveyance facilities were generally designed and have been constructed to deliver maximum Table A amounts to all contractors. After the permanent retirement of some Table A amount by two agricultural contractors in 1996, the maximum Table A amounts of all SWP contractors now totals about 4.17 million af.

As mentioned above, currently, MWA is entitled to 82,800 afy of SWP water. Prior to two purchases by MWA of additional Table A supplies, MWA's Table A amount was 50,800 af. In 1997, MWA purchased 25,000 af from Berrenda Mesa Water District, bringing MWA's Table A amount to 75,800 af. In 2009, MWA purchased an additional 14,000 af of Table A from Dudley Ridge Water District in Kings County, which will be transferred incrementally to MWA. The first transfer of 7,000 af occurred in 2010, with 3,000 af to be transferred in 2015 and 4,000 af in 2020. These transfers are reflected in Table 3-3 below, which indicates MWA's Table A amounts from 2010 to 2035.

While Table A identifies the maximum annual amount of water an SWP contractor may request, the amount of SWP water actually available and allocated to SWP contractors each year is dependent on a number of factors and can vary significantly from year to year. The primary factors affecting SWP supply availability include hydrology, the amount of water in SWP storage at the beginning of the year, regulatory and operational constraints, and the total amount of water requested by SWP contractors.

Imported SWP water has been historically supplied to the MWA through the Mojave River and Morongo Basin pipelines and released from Silverwood Lake. Table 3-2 presents historical total

SWP deliveries to MWA. Table 3-3 presents MWA's SWP demand projections provided to DWR (MWA's wholesale supplier), according to the water supply contract revised in October 2009.

TABLE 3-2
HISTORICAL TOTAL SWP DELIVERIES

Year	Deliveries (afy)[a]	Year	Deliveries (afy)[b]
1978	22,500	**1994**	17,652
1979	0	**1995**	8,740
1980	0	**1996**	7,427
1981	0	**1997**	14,040
1982	0	**1998**	5,892
1983	24,489	**1999**	8,071
1984	0	**2000**	11,362
1985	0	**2001**	4,320
1986	0	**2002**	4,218
1987	0	**2003**	39,242
1988	0	**2004**	12,840
1989	0	**2005**	33,323
1990	0	**2006**	33,927
1991	3,423	**2007**	20,064
1992	10,674	**2008**	17,007
1993	11,487	**2009**	21,528

Notes:
(a) Source: Mojave Water Agency
(b) Deliveries from 1978 to 2001 include releases from Lake Silverwood, Rock Springs, Hodge, Lenwood, the Morongo Basin Pipeline, and to the LUZ Solar facility at Kramer Junction. Deliveries from 2002 to 2009 also include releases to Daggett, Newberry Springs, Oro Grande, Local Construction Projects and High Desert Power Project.

TABLE 3-3
CURRENT AND PLANNED WHOLESALE WATER SUPPLIES (AFY)

Water Supply Sources	2010	2015	2020	2025	2030	2035
California State Water Project (SWP)	82,800	85,800	89,800	89,800	89,800	89,800

3.2.2 Imported Water Supply Reliability

The amount of the SWP water supply delivered to the state water contractors in a given year depends on a number of factors, including the demand for the supply, amount of rainfall, snowpack, runoff, water in storage, pumping capacity from the Delta, and legal/regulatory constraints on SWP operation. Water delivery reliability depends on three general factors: the availability of water at the source, the ability to convey water from the source to the desired point of delivery, and the magnitude of demand for the water. Urban SWP contractors' requests for SWP water, which were low in the early years of the SWP, have been steadily increasing over time, which increases the competition for limited SWP dry-year supplies. Regulatory constraints also change over time and have become increasingly more restrictive.

In an effort to assess the impacts of these varying conditions on SWP supply reliability, DWR issued its "State Water Project Delivery Reliability Report 2009" (2009 SWP) update in August

2010. The biennial Report assists SWP contractors in assessing the reliability of the SWP component of their overall supplies. The 2009 SWP Report updates DWR's estimate of the current (2009) and future (2029) water delivery reliability of the SWP. The updated analysis shows that the primary component of the annual SWP deliveries (referred to as Table A deliveries) will be less under current and future conditions, when compared to the preceding report (State Water Project Delivery Reliability Report 2007). The report discusses areas of significant uncertainty to SWP delivery reliability:

- Restrictions on SWP and Central Valley Project (CVP) operations due to the State and federal biological opinions to protect endangered fish such as delta smelt and spring-run salmon;
- Climate change and sea level rise, which is altering the hydrologic conditions in the State;
- The vulnerability of Delta levees to failure due to floods and earthquakes.

"Water delivery reliability" is defined as the annual amount of water that can be expected to be delivered with a certain frequency. SWP delivery reliability is calculated using computer simulations based on 82 years of historical data.

The 2009 SWP Report shows a continuing erosion of the ability of the SWP to deliver water. For current conditions, the dominant factor for these reductions is the restrictive operational requirements contained in the federal biological opinions. Deliveries estimated for the 2009 Report are reduced by the operational restrictions of the biological opinions issued by the U.S. Fish and Wildlife Service in December 2008 and the National Marine Fisheries Service in June 2009 governing the SWP and Central Valley Project operations. The 2005 and 2007 SWP Reports were based on less restrictive operational rules.

For future conditions, the 2009 SWP Report includes the potential effects of climate change to estimate future deliveries. The changes in run-off patterns and amounts are included along with a potential rise in sea level. Sea level rise has the potential to require more water to be released to repel salinity from entering the Delta in order to meet the water quality objectives established for the Delta. The 2005 SWP Report did not include any of these potential effects. For the 2007 SWP Report, the changes in run-off patterns and amounts were incorporated into the analyses, but the potential rise in sea level was not.

These updated analyses in the 2009 SWP Report indicate that the SWP, using existing facilities operated under current regulatory and operational constraints and future anticipated conditions, and with all contractors requesting delivery of their full Table A amounts in most years, could deliver 60 percent of Table A amounts on a long-term average basis. DWR also prepared Delivery Reliability Reports (DRRs) for long-term average SWP supplies to individual SWP contractors based upon the unique conditions that impact each contractor. The DRR for MWA indicated average reliability would be 60 percent in 2009 and will increase to 61 percent in 2029. Table 3-4 provides the projected SWP water available to MWA over the next 25 years, based on the MWA's maximum Table A amounts from 2010 to 2035 and the supply reliability analyses provided in the 2009 SWP Report and associated DRR.

TABLE 3-4
CURRENT AND PLANNED WHOLESALE WATER SUPPLIES AVAILABLE
(LONG-TERM AVERAGE)

Wholesaler (Supply Source)	2010	2015	2020	2025	2030[(a)]	2035[(b)]
California State Water Project (SWP)						
% of Table A Amount Available	60%	60%	60%	60%	61%	61%
Anticipated Deliveries (afy)	49,680	51,480	53,880	53,880	54,778	54,778

Notes:
(a) Assumes 61% of Table A amount from 2029 and after.
(b) The DWR SWP Delivery Reliability Report 2009 projects SWP supplies to 2029. This 2010 UWMP covers the period from 2010 to 2035. Therefore, the available supplies from 2030 to 2035 are assumed to be the same as in 2029.

The values shown in Table 3-4 cover the period 2009 – 2029 based on the DWR estimates at the 2009 level for the current conditions and at the 2029 level for future conditions. Although the 2009 Report presents an extremely conservative projection of SWP delivery reliability, particularly in light of events occurring since its release, because it is based on the most up-to-date modeling by DWR, it remains the best available information concerning the SWP for use in preparing this Plan.

The 2009 SWP Reliability Report also includes analyses of SWP operational restrictions that took effect in 2008 and 2009 due to various court rulings regarding federal biological opinions. The overall result has been "erosion of the SWP to deliver water." The Report identifies several emerging factors related to these court rulings that have the potential to affect the availability and reliability of SWP supplies. The reliability analysis is located in Chapter 6, "Reliability Planning;" a detailed legal analysis of these factors is attached as Appendix G.

While the primary supply of water available from the SWP is allocated Table A supply, SWP supplies in addition to Table A water may periodically be available, including "Article 56C" carryover water, "Article 21" water, Turnback Pool water, and DWR Dry Year Purchase Programs. Pursuant to the long-term water supply contracts, SWP contractors have the opportunity to carry over a portion of their allocated water approved for delivery in the current year for delivery during the next year. Contractors can "carry over" water under Article 56C of the SWP long-term water supply contract with advance notice when they submit their initial request for Table A water, or within the last three months of the delivery year. The carryover program was designed to encourage the most efficient and beneficial use of water and to avoid obligating the contractors to "use or lose" the water by December 31 of each year. The water supply contracts state the criteria of carrying over Table A water from one year to the next. Normally, carryover water is water that has been exported during the year, has not been delivered to the contractor during that year, and has remained stored in the SWP share of San Luis Reservoir to be delivered during the following year. Storage for carryover water no longer becomes available to the contractors if it interferes with storage of SWP water for project needs (DWR, 2009).

Article 21 water (which refers to the SWP contract provision defining this supply) is water that may be made available by DWR when excess flows are available in the Delta (i.e., when Delta outflow requirements have been met, SWP storage south of the Delta is full, and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter.

The Turnback Pool is a program where contractors with allocated Table A supplies in excess of their needs in a given year may turn back that excess supply for purchase by other contractors who need additional supplies that year. The Turnback Pool can make water available in all types of hydrologic years, although generally less excess water is turned back in dry years.

As urban SWP contractor demands increase in the future, the amount of water turned back and available for purchase will likely diminish. In critical dry years, DWR has formed Dry Year Water Purchase Programs for contractors needing additional supplies. Through these programs, water is purchased by DWR from willing sellers in areas that have available supplies and is then sold by DWR to contractors willing to purchase those supplies.

Because the availability of these supplies is somewhat uncertain, they are not included as supplies to MWA in this Plan. However, MWA's access to these supplies when they are available may enable it to improve the reliability of its SWP supplies beyond the values used throughout this report.

3.2.3 Existing Supply Facilities

MWA receives SWP water at four locations off the aqueduct. The first of four turnouts to the MWA service area is located at Sheep Creek, which is essentially a stub out in the Phelan Area and not used at this time. Second is the Mojave River turnout, also known as the White Road Siphon, located southwest of the City of Victorville and serves the Mojave River Pipeline. The third turnout is the Highway 395 turnout, located southwest of the boundary dividing the City of Victorville from the City of Hesperia, which is being developed for the Oro Grande Wash Recharge Project. The Oro Grande Wash project is discussed later in this chapter and consists of a pipeline from the aqueduct that will recharge a desert wash and serve the southern Victorville area. The fourth and last turnout is known as the Morongo Siphon (or Antelope Siphon Turnout) and serves the Morongo Basin Pipeline. In addition, the MWA takes water delivery from Cedar Springs Dam at Silverwood Lake through controlled releases to the Mojave River. To distribute the supply of water to the points of demand, MWA has taken a central role in designing and constructing the Morongo Basin and Mojave River pipelines, which extend from the California Aqueduct. Figure 3-3 shows the location of the MWA turnouts and existing and planned water delivery facilities.

The Mojave River Pipeline extends approximately 76 miles from the California Aqueduct to recharge sites along the Mojave River. The large-diameter pipeline project was started in 1996 and completed in 2006 to deliver up to 45,000 afy to the Mojave Basin Area to offset growing depletion of native water supplies caused by the region's growth and the overpumping of groundwater. There are four groundwater recharge basins that have been constructed at Hodge, Lenwood, Daggett/Yermo, and Newberry Springs.

The Morongo Basin Pipeline is a 71-mile underground pipeline built by the MWA. It brings water from the California Aqueduct in Hesperia to the Rock Springs Recharge site along the Mojave River in south Apple Valley and to percolation ponds in the Hi-Desert Water District (HDWD) in Yucca Valley. Water flowing through the pipeline is diverted to recharge ponds in an effort to reduce overdraft in the Warren Valley Basin. The Morongo Basin Pipeline was completed in 1994 and deliveries began in 1995. The pipeline was financed by MWA, the HDWD, the Joshua

Basin Water District (JBWD), the Bighorn-Desert View Water Agency (BDVWA), and San Bernardino County Service Area 70 (CSA 70). Pipeline turnouts exist to serve JBWD, BDVWA, and CSA 70 as well as HDWD.

3.3 Local Water Supplies

MWA's local supply of water includes natural surface water flows, return flow from pumped groundwater not consumptively used, and wastewater imports from outside the MWA service area. All three sources are discussed in the following subsections.

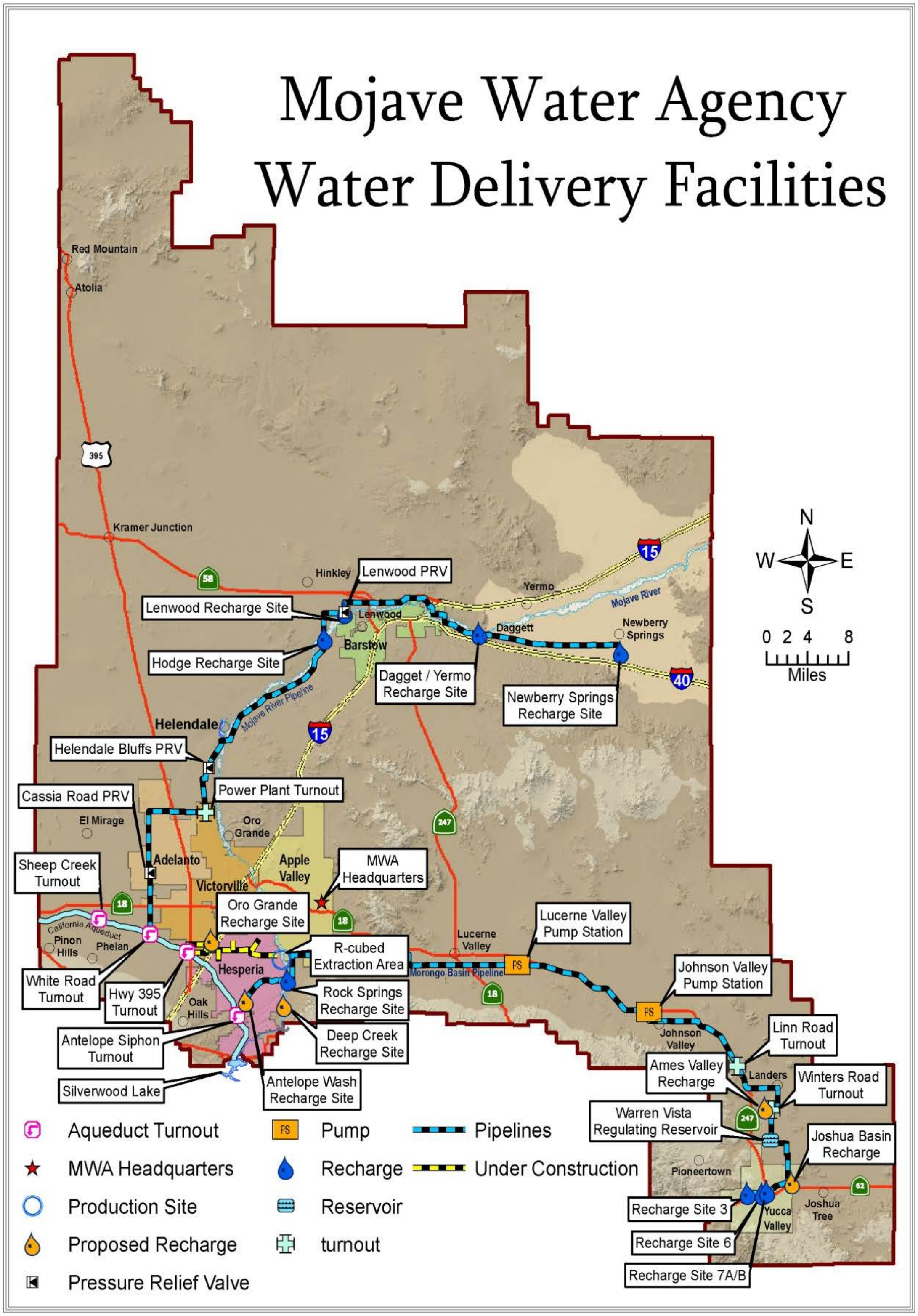
A fourth source, "Agricultural Depletion From Storage," is also shown as a supply and is described in Section 3.3.2.

3.3.1 Net Natural Supply

MWA has an average natural supply of 54,045 afy, including surface water and groundwater flows in the five subareas of the Mojave Basin Area and in the Morongo Basin/Johnson Valley Area ("Morongo"), as shown in Table 3-1. The estimates for the Mojave Basin Area are derived from Watermaster estimates, which are long-term natural supply estimates taken from Table 5-2 of the "MBAW Report to the Court."[8] The Watermaster utilizes these estimates, consistent with the requirements of the Judgment After Trial adjudicating water rights in the Mojave Basin Area ("Mojave Basin Judgment"),[9] to calculate annual yield for each of the five subareas and from that the quantities of water that each stipulating party to the Judgment will be able to produce without incurring replenishment obligations under the Mojave Basin Judgment. This determination and other information will ultimately result in the final calculation of Replacement Water and Makeup obligations of the stipulating parties. This has a direct effect on the calculation of the single largest demand for imported water supply, and has been adjudicated by the Court. Therefore, it is necessary to maintain the Mojave Basin Area long-term average supply regardless of actual variability in surface water flows that may affect calculations under the Judgment. The Morongo Area net natural supplies are derived from established reports on the individual regions within the basin. Long-term average natural supplies include wet and dry periods, which fluctuate substantially from year to year but are consistent over the long-term. ***Water management practices render the annual fluctuations in these sources of supply relatively unimportant for long-term water supply planning.***

[8] Mojave Basin Area Watermaster Annual Report for Water Year 2008-09.
[9] See Appendix D.

FIGURE 3-3
MWA WATER DELIVERY FACILITIES



3.3.2 Agricultural Depletion from Storage

Agriculture accounts for the largest water demand in the Baja Subarea. Table 3-1 identifies Agricultural Depletion from Storage as a local supply. Baja agricultural producers have repeatedly reported to Watermaster that they will not be able to purchase supplemental water. The Court was made aware of the continued overpumping by agricultural producers and opted not to enforce a level of rampdown that would bring the Baja Subarea into balance. Consequently, Baja producers rely on storage depletion as a supply. Therefore, in order to avoid showing demand from Baja agriculture on imported water supplies, the MWA projection model treats consumptive use of agriculture as a supply derived from storage depletion (Table 3-1).

3.3.3 Return Flow

A portion of the water pumped from the ground is returned to the groundwater aquifer and becomes part of the available water supply; this is defined as the return flow. For example, nearly all indoor water use returns to the basin either by percolation from septic tanks or treated wastewater effluent produced by municipal wastewater facilities. The portion of the groundwater pumped that does not return to the aquifer is referred to as consumptive use.

Return flow shown in Table 3-1 is calculated as a percent of the previous years' water production for each water use category, per the methodology outlined in the Albert A. Webb Associates Study[10] prepared in 2000. Return flow factors per the Webb Study were explained previously in Chapter 2 and, on a regional basis, average approximately 40 percent of the groundwater production. The return flows shown in Table 3-1 represent aggregate flows from all sources. Return flows from municipal demands are calculated as a flat 50% of total municipal groundwater production, with a portion of those flows resulting from septic tanks and a portion from recycled wastewater. The projections for recycled water flows in Chapter 4 are embedded within the overall return flow numbers shown in Table 3-1, and are therefore not identified as a separate source of supply.

3.3.4 Wastewater Import

Treated wastewater effluent is imported to MWA from three wastewater entities serving communities in the San Bernardino Mountains outside MWA's service area. Treated wastewater effluent from the Crestline Sanitation District and Lake Arrowhead Community Services District is imported to the Alto Subarea, and effluent from the Big Bear Area Regional Wastewater Agency is imported to the Este Subarea. Wastewater imports from outside MWA are recharged into the Mojave River Groundwater Basin and represent a relatively small portion of MWA's overall water supply portfolio, and are described in more detail in Chapter 4 Recycled Water.

3.4 Groundwater

This Section presents information about MWA's groundwater supplies, including a summary of the adopted Groundwater Management Plan (GWMP).

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[10] Mojave Basin Area Watermaster Consumptive Water Use Study and Update of Production Safe Yield Calculations for the Mojave Basin Area. Albert A. Webb Associates, February 16, 2000.

3.4.1 Groundwater Basin Description

The MWA service area overlies all or a portion of 36 groundwater basins and subbasins as defined by DWR Bulletin 118-03. Collectively, these basins and subbasins are grouped into two larger hydrogeologically distinct areas. Basins along the Mojave River and adjacent areas are referred to as the Mojave River Groundwater Basin. Remaining basins in the southeastern MWA service area are referred to as the Morongo Basin/Johnson Valley Area or "Morongo Area". The Mojave River Groundwater Basin is the larger and more developed of the two areas. These basins overlie two broad hydrologic regions also defined in DWR Bulletin 118-03. Most of the Mojave River Groundwater Basin lies within the South Lahontan hydrologic region. The Morongo Area and the Este Subarea of the Mojave River Groundwater Basin lie in the Colorado River hydrologic region. The 36 groundwater basins and subbasins as defined in the DWR Bulletin 118 are listed in Table 3-5 and grouped by the South Lahontan (Region 6) and Colorado River (Region 7) hydrologic regions. The MWA service area also overlaps a small portion of a DWR basin in the South Coast hydrologic region (Region 8) as shown by the last subbasin in Table 3-5. Figure 3-4 shows the DWR groundwater basins and the MWA service area boundary.

TABLE 3-5
DWR GROUNDWATER BASINS

DWR Basin	Sub-Basin	Groundwater Basin	Sub-Basin Name	Budget Type[a]
South Lahontan Hydrologic Region				
6-35		Cronise Valley		C
6-36	6-36.01	Langford Valley	Langford Well Lake	C
6-37		Coyote Lake Valley		A
6-38		Caves Canyon Valley		A
6-40		Lower Mojave River Valley		A
6-41		Middle Mojave River Valley		A
6-42		Upper Mojave River Valley		A
6-43		El Mirage Valley		A
6-44		Antelope Valley		A
6-46		Fremont Valley		C
6-47		Harper Valley		A
6-48		Goldstone Valley		C
6-49		Superior Valley		C
6-50		Cuddeback Valley		C
6-51		Pilot Knob Valley		C
6-52		Searles Valley		C
6-53		Salt Wells Valley		C
6-54		Indian Wells Valley		A
6-77		Grass Valley		C
6-89		Kane Wash Area		C
Colorado River Hydrologic Region				
7-10		Twentynine Palms Valley		C
7-11		Copper Mountain Valley		A
7-12		Warren Valley		A
7-13	7-13.02	Deadman Valley	Surprise Spring	C
7-13	7-13.01	Deadman Valley	Deadman Lake	C
7-15		Bessemer Valley		C
7-16		Ames Valley		C
7-17		Means Valley		C

DWR Basin	Sub-Basin	Groundwater Basin	Sub-Basin Name	Budget Type[(a)]
7-18	7-18.01	Johnson Valley	Soggy Lake	C
7-18	7-18.02	Johnson Valley	Upper Johnson Valley	C
7-19		Lucerne Valley		A
7-20		Morongo Valley		C
7-50		Iron Ridge Area		C
7-51		Lost Horse Valley		C
7-62		Joshua Tree		A
8-2	8-2.05	Upper Santa Ana Valley	Cajon	C

Notes:
Source: DWR
(a) Type A – either a groundwater budget or model exists, or actual extraction data is available. Type C – not enough available data to provide an estimate of the groundwater budget or basin extraction.

There have been many different and conflicting references to the basins, subbasins, and/or subareas within the MWA service area. For the purposes of this report, the two larger groundwater basins areas are referred to as the Mojave Basin Area and the Morongo Area. The Mojave Basin Area groundwater basin has been further divided into subareas for groundwater management and/or adjudication purposes. Subareas within the Mojave River Groundwater Basin include Oeste, Alto, Este, Centro and Baja as defined in the Mojave Basin Judgment and shown on Figure 3-4.

The Morongo Area represents the DWR groundwater basins east and southeast of Este Subarea that are within the MWA service area and the Morongo Area. The Morongo Area has been divided into regions based on faults, groundwater divides, and existing DWR groundwater basin boundaries. These Regions are shown on Figure 3-5 and include, from northwest to southeast, Johnson Valley, Means Valley, Ames Valley, Warren Valley, and Copper Mountain/Joshua Tree regions. These Region classifications and boundaries have been revised slightly from those used in the 2004 RWMP, based on recent evaluations in the Ames and Means Valleys (Kennedy/Jenks/Todd, 2007). Revisions include the separation of Means Valley from the former Ames/Means Subbasin and expansion of the Ames Valley Region to the east based on groundwater flow and existing DWR basin boundaries (Figure 3-5).

FIGURE 3-4
MWA GROUNDWATER BASINS

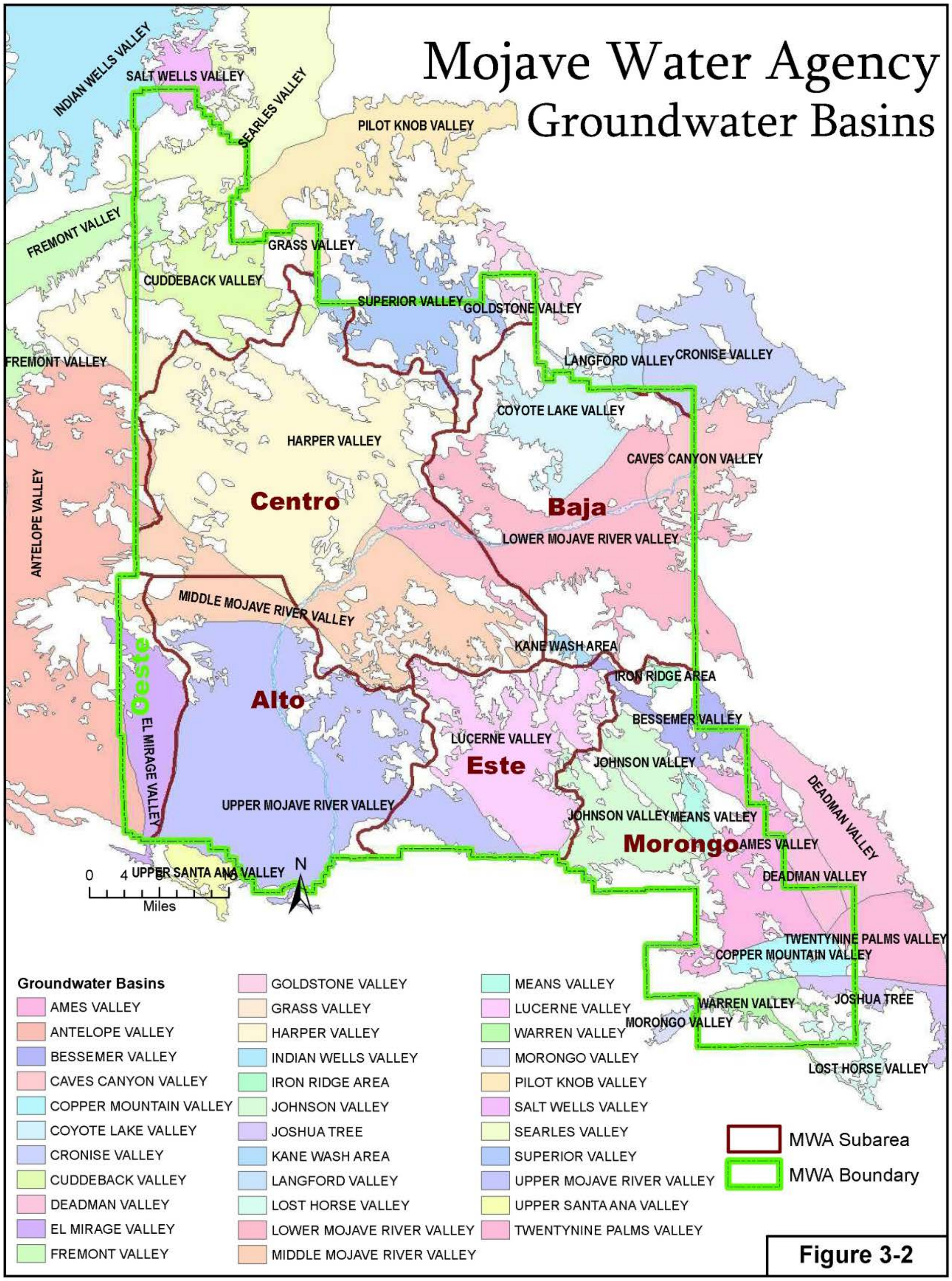
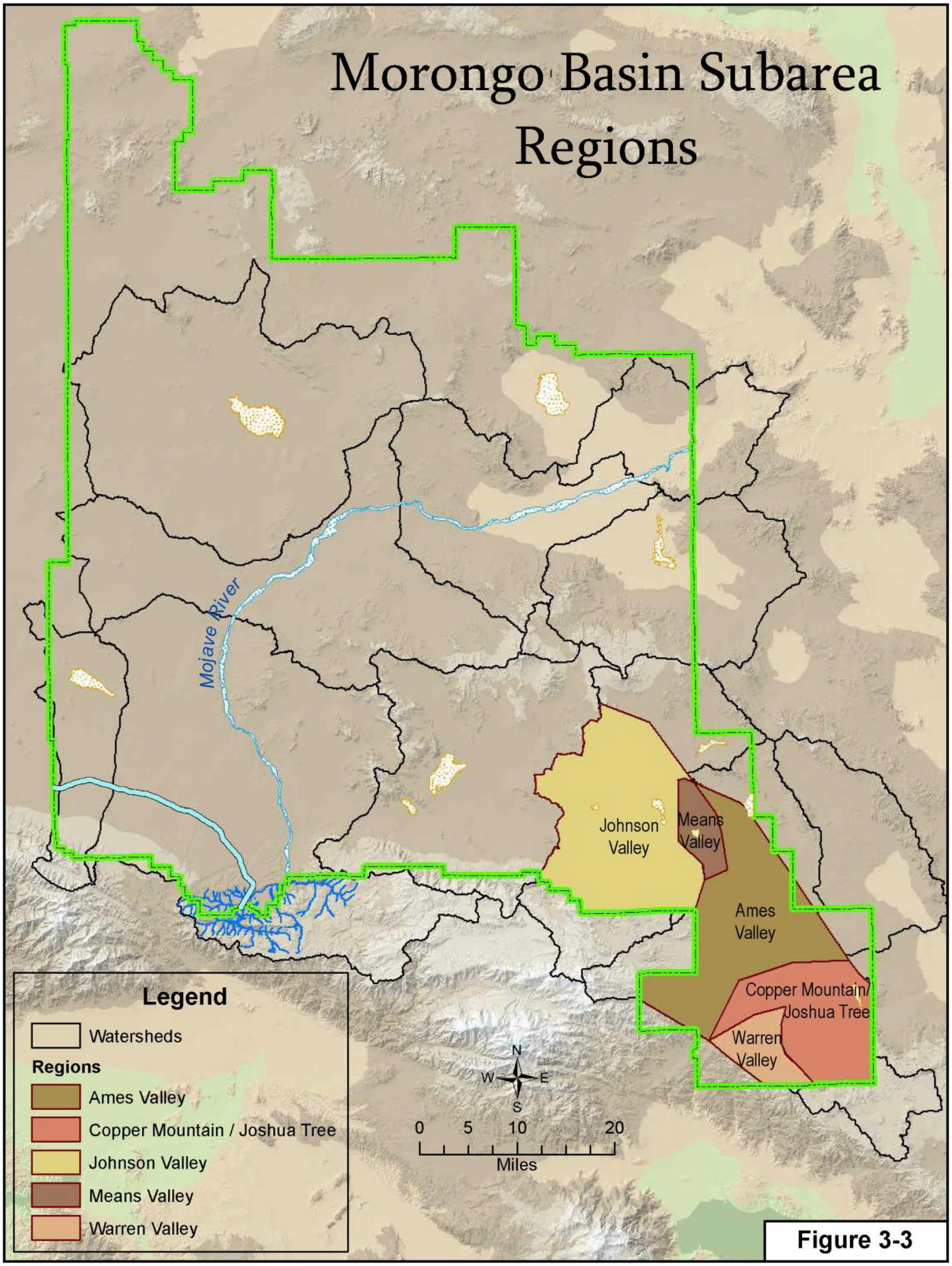


FIGURE 3-5
MORONGO AREA REGIONS



3.4.2 Adopted Groundwater Management Plan

The California State Legislature passed Assembly Bill 3030 (AB 3030) during the 1992 legislative session allowing local agencies to develop Groundwater Management Plans (GWMPs). The legislation declares that groundwater is a valuable resource that should be carefully managed to ensure its safe production and quality. The legislation also encourages local agencies to work cooperatively to manage groundwater resources within their jurisdiction. Senate Bill 1938 (SB 1938) was passed by the Legislature September 16, 2002 and made changes and additions to sections of the Water Code created by AB 3030.

MWA's 2004 Regional Water Management Plan (RWMP), adopted on February 24, 2005 by Resolution 798-05, also serves as the GWMP for MWA as it contains all the relevant components related to Groundwater Management Plans in California Water Code Sections 10750-10753.10., as well as the components recommended by DWR in California's Groundwater, Bulletin 118 (DWR, 2003). The 2004 RWMP Update (refer to Appendix H) both complements and formalizes a number of existing water supply and water resource planning and management activities in the MWA service area that overlies several groundwater basins (see above), as defined by DWR in Bulletin 118.

As part of the 2004 RWMP Update, the following Basin Management Objectives (BMOs) were established to plan water supplies through 2020:

- Balance future water demands with available supplies recognizing the need to:
  - Stabilize the groundwater basin storage balance over long-term hydrologic cycles
  - Protect and restore riparian habitat areas as identified in the Mojave Basin Area Judgment and the Department of Fish & Game Habitat Water Supply Management Plan
  - Limit the potential for well dewatering, land subsidence, and migration of poor quality water
  - Maintain a sustainable water supply through extended drought periods
  - Select projects with the highest likelihood of being implemented
- Maximize the overall beneficial use of water throughout MWA by:
  - Supplying water in quantity and of quality suitable to the various beneficial uses
  - Addressing issues throughout the MWA service area recognizing the interconnection and interaction between different areas
  - Distributing benefits that can be provided by MWA in an equitable and fair manner
  - Ensuring that costs incurred to meet beneficial uses provide the greatest potential return to beneficiaries of the project(s)
  - Avoiding redirected impacts

- Identifying sustainable funding sources including consideration of affordability

Balancing future water demands with available supplies will increase water supply reliability by preventing continued overdraft of the groundwater. With groundwater storage stabilized, there will be groundwater available during surface water supply shortages and delivery interruptions. With a balanced basin, groundwater elevations will be relatively stable. This will reduce the potential for land subsidence and associated aquifer compaction.

The adopted 2004 RWMP and GWMP also identified several water supply projects and management actions to provide a means to achieve the BMOs. Management actions can be grouped into the following seven major elements:

1. Monitoring regional groundwater quantity and quality
2. Improve characterization of the basin
3. Continue long-term planning
4. Groundwater protection
5. Construction and implementation
6. Financing
7. Public participation

Included in the 2004 RWMP and GWMP is the assumption that the Mojave Basin adjudication will continue to be implemented. The MWA Board acts as Watermaster for administration of the Mojave Basin Area Judgment. In the Mojave Basin Area, the Mojave Basin Area Judgment requires that annual water production records be collected and verified by producers exceeding 10 afy of production within each of the five Mojave Basin Area subareas. As the current Court-appointed Watermaster, much of the monitoring and studies in the Mojave Basin Area is conducted by MWA, based on the monitoring requirements described in the Judgment After Trial (1996). Data collected are reported in the Mojave Basin Area Watermaster Annual Reports to satisfy the mandates of the monitoring requirements. The Warren Valley Basin is also subject to a Court judgment that is administered by the Hi-Desert Water District acting as the Court-appointed Watermaster. The Management Actions identified neither supersede nor conflict with the Mojave Basin Area Judgment or the Warren Valley Judgment. All provisions of these Judgments are integral parts of the foundation of this Plan.

In addition to conducting regional groundwater management, MWA has also engaged with the U.S. Geological Survey (USGS) in a cooperative water resources program by which the USGS assists MWA with monitoring activities in their service area. MWA currently maintains a monitoring network of approximately 900 monitoring wells for regular measurements of water levels. Many of these wells are also sampled periodically for water quality. Using these data, MWA tracks water level trends and fluctuations throughout the service area. Groundwater production in the Mojave Basin is monitored and managed by the Watermaster.

As part of basin characterization activities, six groundwater models have been developed in the MWA service area to aid in management of groundwater. MWA continues to apply and refine these models in key management areas to better manage water quantity and quality.

3.4.3 Mojave River Groundwater Basin

The predominant groundwater basin within the MWA service area is the Mojave River Groundwater Basin that encompasses 1,400 square miles as outlined on Figure 3-6, and having an estimated total water storage capacity of nearly 5 million af (Bookman-Edmonston Engineering, Inc., 1994).

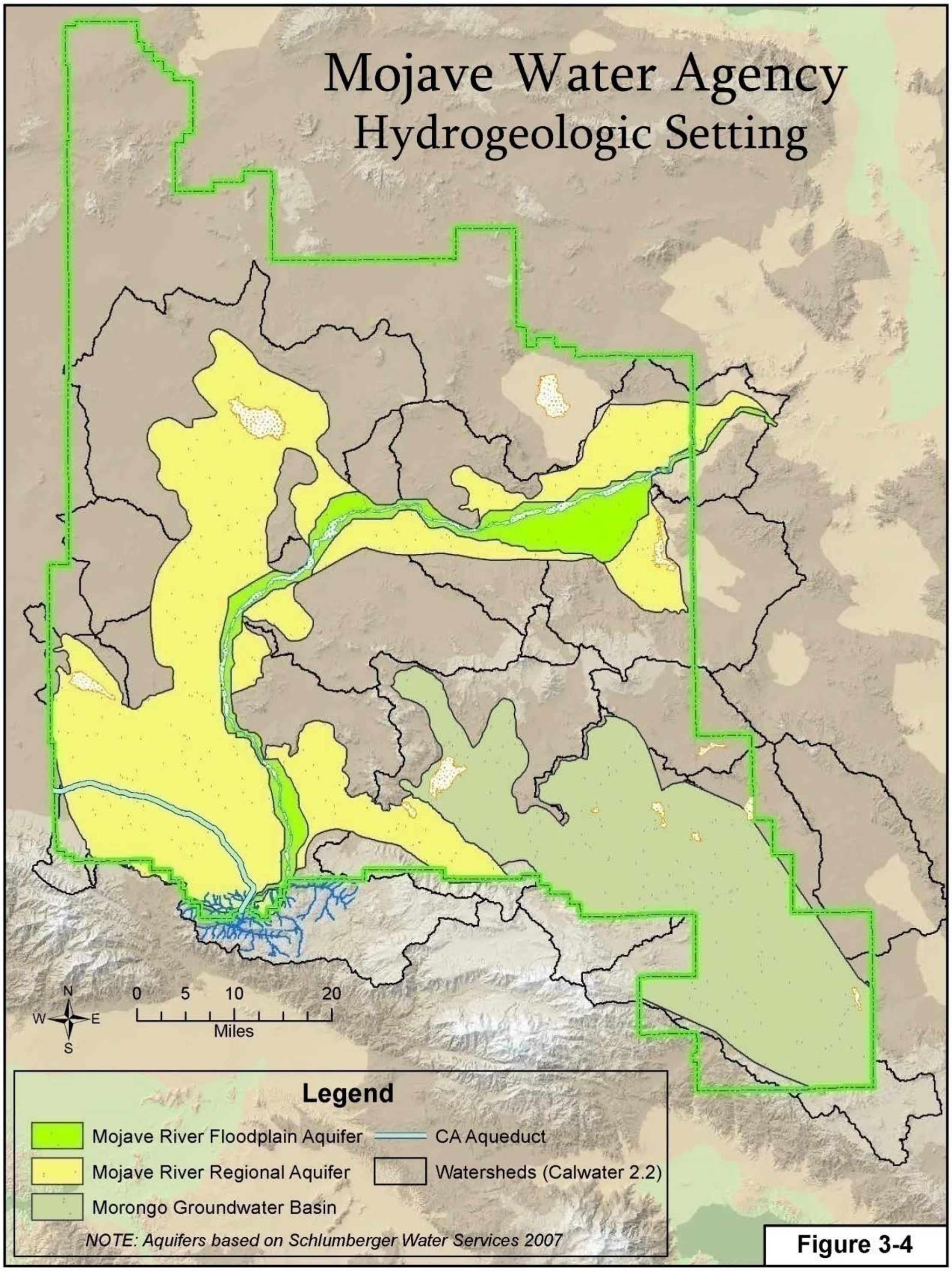
In the Mojave River Groundwater Basin, the Mojave River is the largest stream, originating near the Cajon Pass - a low-elevation gap in the San Bernardino Mountains. With the exception of small streams in the San Gabriel and the San Bernardino Mountains and short reaches of the Mojave River, there are no perennial streams in the Mojave Basin Area. Prior to ground-water development, the Mojave River flowed at a series of discharge areas near Victorville, at Camp Cady, at Afton Canyon, and at other areas where faults cause groundwater to discharge at land surface, such as near the Helendale or the Waterman Faults. Under present-day conditions the Mojave River does not flow perennially except at the Narrows near Victorville, downstream from the Victorville municipal wastewater treatment plant (an area known locally as the “Transition Zone”), and near Afton Canyon (Izbicki, 2004).

The Mojave River Groundwater Basin Area is essentially a closed basin – very little groundwater enters or exits the basin. However, within the basin groundwater movement occurs between the different subareas, as well as groundwater-surface water and groundwater-atmosphere interchanges. Groundwater is recharged into the basin predominantly by infiltration of water from the Mojave River, which accounts for approximately 80 percent of the total basin natural recharge. Other sources of recharge include infiltration of storm runoff from the mountains and recharge from human activities such as irrigation return flows, wastewater discharge, and enhanced recharge with imported water (Stamos et al., 2001). Over 90 percent of the basin groundwater recharge originates in the San Gabriel and San Bernardino Mountains (Hardt 1971). Groundwater is discharged from the basin primarily by well pumping, evaporation through soil, transpiration by plants, seepage into dry lakes where accumulated water evaporates, and seepage into the Mojave River.

Recent investigations by MWA, USGS, and others have resulted in an improved understanding the geology and hydrogeology of the Mojave Basin Area. Specifically, a more refined examination of the hydrostratigraphy has allowed for differentiation between the more permeable Floodplain Aquifer that has a limited extent along the Mojave River and the more extensive but less permeable Regional Aquifer (Stamos et al., 2001). The aerial extent of the Floodplain and Regional aquifers is shown on Figure 3-6. In the Mojave Basin Area, Alto, Centro, and Baja subareas contain both the Floodplain Aquifer and the Regional Aquifer while Oeste and Este subareas only contain the Regional Aquifer.

The Floodplain Aquifer is composed of sand and gravel weathered from granitic rocks of the San Gabriel and the San Bernardino Mountains and deposited in a fluvial depositional environment. These highly permeable sediments can yield large quantities of water to wells. The Floodplain Aquifer is directly recharged by infiltration of surface flows from the Mojave River during the winter rainy season (Figure 3-6). Recharge is greater near the mountain front where surface flows are more frequent.

FIGURE 3-6
HYDROGEOLOGIC SETTING



The Regional Aquifer underlies and surrounds the Floodplain Aquifer with interconnected alluvial fan and basin fill deposits that drain toward the Mojave River (Figure 3-6). In some areas, permeable deposits from the ancestral Mojave River are present, but overall the aquifer is much less permeable than the Floodplain Aquifer. The Regional Aquifer is generally recharged by groundwater movement from the Floodplain Aquifer to the Regional Aquifer, infiltration of runoff from the higher altitudes of the San Gabriel and San Bernardino Mountains, and smaller amounts of runoff from local intermittent streams and washes (Izbicki, 2004).

Prior to recent population growth, most of the groundwater production occurred in the Floodplain Aquifer. Groundwater production was initially developed along the Mojave River in the early 1900s. In the mid-1950's, groundwater production had increased to about 190,000 af, with most of the production still occurring along the river. By 1994, about half of the total basin production came from wells located away from the Mojave River in the Regional Aquifer (Stamos et al., 2001). The increase in water production and the re-distribution of pumping in the basin have significantly influenced the interaction between the Floodplain and Regional Aquifers. Prior to development in the area, groundwater flowed primarily from the Regional Aquifer into the Floodplain Aquifer. However, vertical groundwater gradients have been reversed in recent years, and downward flow from the Floodplain Aquifer is currently the primary recharge mechanism for the Regional Aquifer (Stamos et al., 2001).

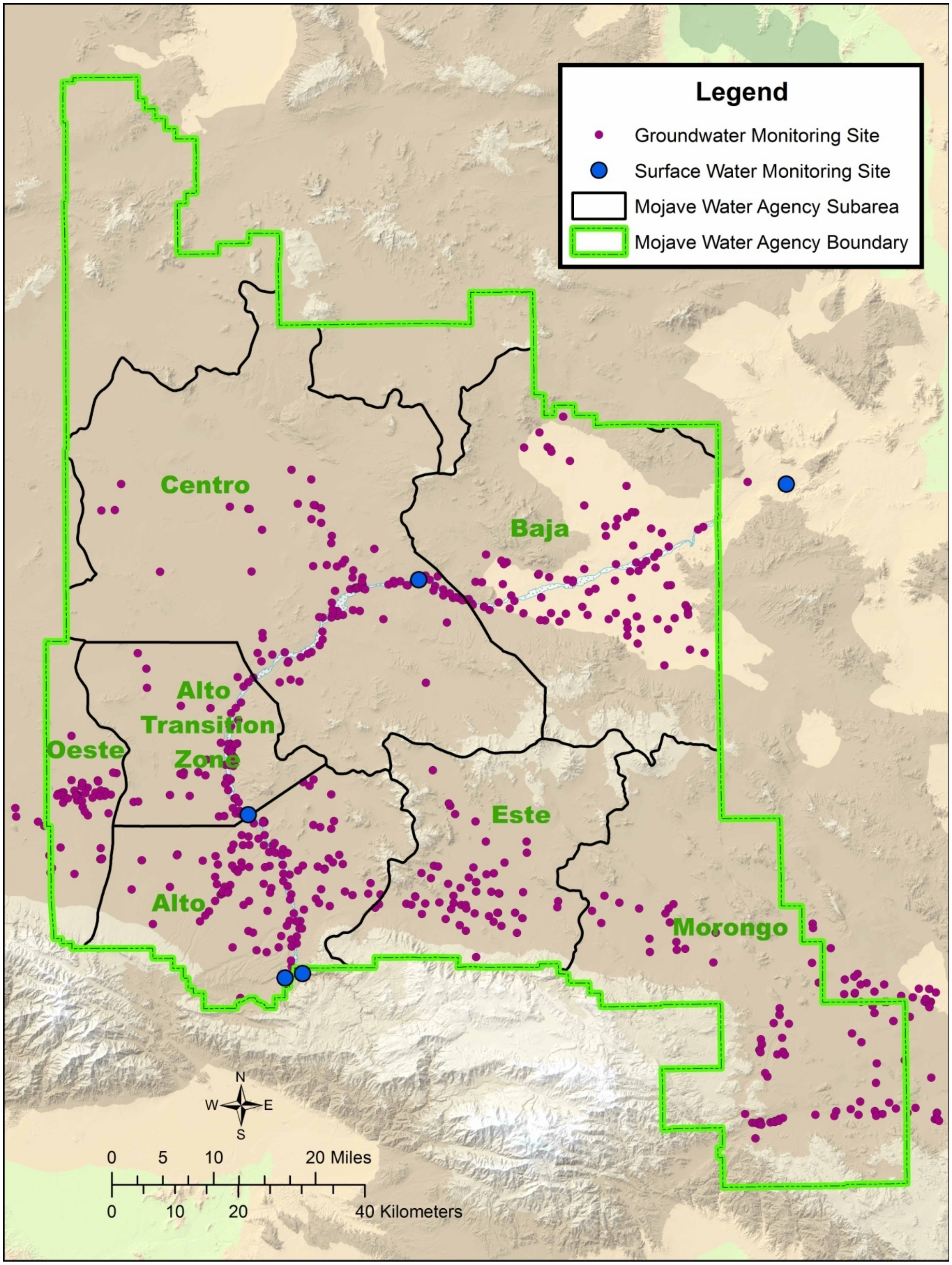
3.4.3.1 Groundwater Levels

Essentially all water supplies within MWA are pumped from the local groundwater basins and groundwater levels generally have been declining for the past 50 years or more. Adjudication proceedings were initiated due to concerns that rapid population growth would lead to further overdraft. The resulting Mojave Basin Area Judgment requires that additional surface water be imported to help balance the basins (MWA, 2004).

The MWA maintains a comprehensive groundwater monitoring program consisting of over 900 monitoring wells. The Mojave Basin Area Watermaster tracks water production within each of the five subareas in the Mojave Basin Area as part of the Watermaster's investigation into subarea conditions and recommendations on groundwater pumping amounts. The Watermaster relies on the MWA groundwater level monitoring program along with production records to make recommendations regarding the sustainable yield for each of the subareas. Figure 3-7 shows the locations of groundwater level monitoring. A summary of the recent water level trends for each of the five subareas in the Mojave Basin Area is presented below.

Alto Subarea - Alto subarea water levels near the Mojave River are relatively stable exhibiting seasonal fluctuations with rising levels in winter and declining levels in summer. It is expected that under current pumping conditions and long-term average flows in the river, water levels in the Floodplain Aquifer will generally remain stable. Water levels in the western portion of Alto in the Regional Aquifer exhibit declines consistent with heavy pumping and limited local recharge. Water levels in the eastern portion of Alto indicate similar trends although to a lesser extent; most likely due to limited pumping in the regional aquifer east of the river and possibly higher localized septic return flow due to the lack of sewers in some areas. Continued pumping in depleted areas of the Regional Aquifer may result in long-term local negative impacts such as declining yields and water quality problems. As a whole, the Alto subarea appears to be in regional balance although portions of the subarea have shown continued historical declines.

FIGURE 3-7
GROUNDWATER/SURFACE WATER MONITORING SITES



Localized declines in water levels may be ameliorated by a redistribution of groundwater production and return flows (e.g. construction of local wastewater treatment plants).

Centro Subarea - Water levels in Centro have been relatively stable with seasonal fluctuations and declines during dry years followed by recovery during wet periods. Water levels in the Harper Lake area indicate a slow recovery due primarily to reduced pumping during the past several years. Declines in water levels in wells in the vicinity of Hinkley (away from the river) show the effects of pumping and limited recharge, primarily due to agriculture.

Baja Subarea - Baja water levels continue to decline due to over-pumping and limited recharge. Wells near the river in the Daggett area respond to recharge when it is available but experience water level declines immediately following storm events. Water levels elsewhere in Baja, especially areas away from the Mojave River, indicate declines that are not positively impacted from storm events.

Este Subarea - Water levels in Este have remained stable for the past several years indicating a relative balance between recharge and discharge.

Oeste Subarea – Hydrographs for the southern portion of Oeste Subarea indicate a long-term decline in water levels, but declines in most wells appear relatively small (less than or about one foot per year) (Watermaster, 2010). More significant declines occur locally, especially in the vicinity of heavy pumping. Water levels in the north to central portion of Oeste near El Mirage indicate relatively stable conditions.

3.4.3.2 Available Groundwater Supplies

Recent and projected groundwater pumping within each subarea of the Mojave Basin Area is summarized in Tables 2-2 (see Chapter 2) and 3-6, respectively. In the Mojave Basin Area, Base Annual Production (BAP) rights were assigned by the Mojave Basin Area Judgment to each producer using 10 afy or more, based on historical production. BAP is defined as the producer's highest annual use verified for the five-year base period from 1986-90. Parties to the Judgment are assigned a variable Free Production Allowance (FPA) by the Watermaster, which is a percentage of BAP set for each subarea for each year. The allocated FPA represents each producer's share of the water supply available for that subarea. This FPA is reduced or "ramped-down" over time until total FPA comes into balance with available supplies.

Production Safe Yield (PSY) is also determined for each subarea for each year. The PSY in each subarea is assumed to equal the average net natural water supply plus the expected return flow from the previous year's water production. Exhibit H of the Judgment requires that in the event the FPA exceeds the estimated PSY by five percent or more of BAP, Watermaster recommends a reduction in FPA equal to, but not more than, a full five percent of the aggregate subarea BAP. Any water user that pumps more than their FPA in any year is required to buy "Replacement Water" equal to the amount of production in excess of the FPA. Replacement Obligations can be satisfied either by paying the Mojave Basin Area Watermaster to purchase imported water from MWA or by temporarily transferring unused FPA within that subarea from another party to the Judgment.

TABLE 3-6
MOJAVE BASIN AREA PROJECTED GROUNDWATER PRODUCTION (AFY)

Mojave Basin Area[a]	2010	2015	2020	2025	2030	2035
Subareas						
Alto	84,226	93,994	99,440	108,851	118,262	127,674
Baja	23,653	24,413	24,834	25,212	25,573	25,919
Centro	23,881	25,088	25,959	26,838	27,718	28,597
Este	5,863	6,607	6,771	6,970	7,170	7,369
Oeste	4,503	4,767	4,930	5,089	5,247	5,404
Total	**142,126**	**154,869**	**161,934**	**172,960**	**183,970**	**194,963**

Note:
(a) Acre-foot numbers represent groundwater production only and do not include demands met directly with SWP sources.

Table 3-7 shows the current FPA for water year 2009-2010 for each subarea and the estimated PSY. Also shown in Table 3-8 is the verified production for water year 2008-09 for comparison. Free Production Allowance as shown in Table 3-7 is greater than PSY by more than 5 percent in four of the five subareas. Water levels remain stable in most areas currently because verified production is less than the available supply. Given the constraints imposed by the Judgment and direction from the Court regarding ramp-down, it was recommended that the FPA be set as follows for each subarea for water year 2010-2011. Based on these recommendations, agricultural producers in Alto and Oeste have an established FPA that is currently 80 percent of their BAP for the 2010-2011 water year. FPA for Alto municipal and industrial use and for Oeste municipal and industrial have been reduced to 60 percent and 70 percent of their BAP, respectively. FPA for all uses in Centro and Este remain at 80 percent of BAP. All production in the Baja Subarea has been ramped-down to 65 percent of BAP, principally due to the extent of the overdraft and the predominance of agricultural production in Baja, which precludes the opportunity to have industrial and municipal producers achieve balance through a disproportionate share of the ramp-down, as it the case in Alto and Oeste. The current FPA for each Subarea is summarized below:

- Alto Subarea - 80 percent of BAP for agriculture and 60 percent of BAP for municipal and industrial
- Oeste Subarea - 80 percent of BAP for agriculture and 65 percent of BAP for municipal and industrial
- Este Subarea - 80 percent of BAP
- Centro Subarea - 80 percent of BAP
- Baja Subarea - 65 percent of BAP

TABLE 3-7
MOJAVE BASIN AREA PRODUCTION SAFE YIELD AND CURRENT FREE PRODUCTION ALLOWANCE (AFY)

Mojave Basin Area	Base Annual Production	2009-2010 FPA	Production Safe Yield	Percent Difference	2008-2009 Verified Production
Subareas					
Alto	116,412	74,534	69,862	4.0%	85,477
Baja	66,157	45,472	20,679	37.5%	27,037
Centro	56,269	45,350	33,375	21.3%	22,492
Este	20,205	16,376	7,156	45.6%	6,049
Oeste	7,095	5,727	4,052	23.6%	5,076

Source: Annual Watermaster Reports.

Table 3-8 summarizes the net average annual water supply estimates for each of the subareas that comprise the Mojave Basin Area. The net average water yield of the entire Mojave Basin Area is about 51,925 afy. The long-term average natural supply is shown under single- and multiple-dry years as well as average years because the long-term average includes dry periods, and any single or multiple-year dry cycle does not impact the long-term yield of the basins.

TABLE 3-8
MOJAVE BASIN AREA GROUNDWATER BASIN SUPPLY RELIABILITY

Anticipated Supply	Normal Year [(a)] (afy)	Single-Dry Water Year (afy)	Multiple Dry Water Year (afy)
Subareas			
Alto	25,900	25,900	25,900
Baja	5,500	5,500	5,500
Centro	18,500	18,500	18,500
Este	875	875	875
Oeste	1,150	1,150	1,150
Total	**51,925**	**51,925**	**51,925**

Note:
(a) Water supply balance in Table 5-2 from the Annual Watermaster Reports.

Adequacy of Supply

Essentially all of the water used within the MWA is supplied by pumping groundwater. The physical solution to the Mojave Basin Judgment sets limits on the amount of groundwater production that can occur in each subarea without incurring an obligation to buy imported water. Subareas upstream have an annual obligation to provide specific inflows to subareas downstream based on long-term averages between 1931 and 1990.

Because water use within the MWA service area is supplied entirely by groundwater, MWA does not have any inconsistent water sources that cause reduced deliveries to users within the service area. Natural supply estimates are based on the long-term averages which account for inconsistency in supplies (i.e. historic periods of drought are included in the long-term average).

A potential exception is any area where water quality could limit use as a potable supply. Wellhead treatment or provision of an alternative supply is planned for these areas.

MWA directly supplies imported SWP water to two power plants. The supply to the High Desert Power Project (HDPP) is annual, interruptible and only available if adequate SWP water is available on a year-to-year basis. The HDPP is converting to recycled water and has stored SWP water in the Mojave River Groundwater Basin to offset shortages. In September 2010, HDPP signed an agreement to purchase 4,000 afy of recycled water from the City of Victorville, which can come from any combination of SWP, recycled water from Victor Valley Wastewater Reclamation Authority (VVWRA), or the City of Victorville's new recycled treatment plant at the Southern California Logistics Airport (SCLA) site. As of 2015, the HDPP will be using 100 percent recycled water and will no longer rely on the SWP. The other power plant (LUZ Solar Plant) is entirely dependent upon SWP water delivered by exchange through the Antelope Valley-East Kern Water Agency (AVEK) system. LUZ currently has water stored in the Alto Subarea to offset potential SWP delivery reductions when allocations are low.

Sustainability

Producers in each subarea are allowed to produce as much water as they need annually to meet their requirements, subject only to compliance with the physical solution set forth in the Mojave Basin Area Judgment. An underlying assumption of the Judgment is that sufficient water will be made available to meet the needs of the Basin in the future from a combination of natural supply, imported water, water conservation, water reuse and transfers of FPA among parties.

MWA is actively operating recharge sites for conjunctive use along the Mojave River Pipeline and Morongo Basin Pipeline. Recharge sites including Hodge, Lenwood, Daggett, Newberry Springs, and Rock Springs Outlet provide MWA with the ability to recharge SWP water into subareas where replacement water is purchased. These sites also provide MWA with the ability to bank excess SWP water as available.

Water levels within each of the five subareas are evaluated as part of the Watermaster's investigation into subarea conditions and recommendations on FPA. The Judgment does not specifically require that Watermaster consider changes in water levels in its investigation but Paragraph 24 (o) of the Judgment requires Watermaster to consider changes in water in storage. Rising and falling water levels within the Mojave Basin Area are indications of changes in storage over time. If after full implementation of the Judgment, water levels continue to fall in certain parts of the Basin Area, the Court, at Watermaster's recommendation may direct recharge or reductions in water production as necessary to achieve long term sustainability. Such action is not anticipated given the current projections of use and availability of supplemental water to MWA. However, the Judgment is a protective tool to protect sustainability.

3.4.4 Morongo Basin/Johnson Valley Area

The groundwater basins within the Morongo Basin/Johnson Valley Area ("Morongo Area") are bounded by the Ord and Granite Mountains to the north, the Bullion Mountains to the east, the San Bernardino Mountains to the southwest, and the Pinto and Little San Bernardino Mountains to the south. The larger Morongo Area includes numerous small alluvial basins that maintain relatively compartmentalized groundwater flow systems typically terminating in dry lakes scattered throughout the area (Lewis, 1972; Mendez and Christensen, 1997). These smaller alluvial basins are separated by faults and bedrock outcrops.

DWR defines about 15 groundwater basins that cover a portion of the Morongo Area as defined in this plan (Figure 3-4). Several of these basins lie mostly outside of the MWA service area, have low population, and are essentially undeveloped with respect to groundwater. The remaining basins have been grouped into five regions for the Morongo Area as previously described and shown on Figure 3-5.

The hydrogeology of the Morongo Area has not been investigated to the same extent as the Mojave River Groundwater Basin, but recent investigations have resulted in an improved understanding, especially in areas where the need for active groundwater management has been identified. These basins were formed in the Tertiary Period from movement along the San Andreas Fault to the south and the Garlock Fault to the north, creating the Mojave structural block (Norris and Webb, 1990). As such, the Morongo Area is characterized by numerous northwest trending strike-slip faults. The San Bernardino Mountains and bedrock underlying the groundwater basins consist mainly of Jurassic and Cretaceous granitic rocks. The bedrock surface dips steeply to the north and east, providing a large thickness of alluvial sediments a short distance from the mountain front. The Tertiary and Quaternary age alluvial sediments are the main aquifers in the groundwater basin.

Groundwater flow in the Morongo Area is generally from south to north in Johnson Valley and from west to east-northeast elsewhere in the area. Natural recharge originates from the mountains on the southern and western boundaries of the Area, resulting in groundwater flow gradients to the north, east, and south adjacent to the boundaries, before turning to the east-northeast. The east-northeast flow direction is maintained to the eastern boundary of MWA. Groundwater flow is complicated locally by pumping, faulting, shallow bedrock, and enhanced recharge basins. For example, in the vicinity of the developed area of Yucca Valley, groundwater flow is controlled to some extent by local recharge basins.

3.4.4.1 Available Groundwater Supplies

Recent historical and projected groundwater pumping for the Morongo Area is summarized in Tables 3-9 and 3-10.

TABLE 3-9
MORONGO AREA
HISTORICAL GROUNDWATER PRODUCTION (AFY) BY WATER YEAR

	2005	2006	2007	2008	2009
Morongo Area	5,879	6,300	6,403	5,797	5,990

Source: Production data reported by retail water agencies plus MWA estimate of minimal producers (approximately 200 afy) within the Morongo Area.

TABLE 3-10
MORONGO AREA PROJECTED GROUNDWATER PRODUCTION (AFY)

	2010	2015	2020	2025	2030	2035
Morongo Area[(a)]	5,794	7,102	7,372	7,590	7,809	8,028

Note:
(a) Groundwater production projections are based on the “Moderate” conservation assumptions using the MWA demand forecast model.

Two of the Morongo Area regions have been documented as having either historical or current overdraft conditions including the Ames Valley and Copper Mountain Valley/Joshua Tree regions. MWA is currently assisting the retailers in these regions with enhanced recharge projects to alleviate overdraft and provide an alternative source of water supply.

In the Ames Valley and Johnson Valley regions, the Bighorn-Desert View Water Agency (BDVWA) has implemented a Water Infrastructure Restoration Program (WIRP) that outlines specific system improvements to remediate deficiencies in infrastructure and operations. Two WIRP projects that are near completion include the Ames Valley Recharge Project (see Section 3.6) and a Groundwater Management Plan (BDVWA GWMP). Local groundwater is currently the sole source of its water supply, but BDVWA has annual 9 percent capacity in the Morongo Basin Pipeline and may purchase SWP water from MWA. Although the infrastructure needed to deliver SWP water to the Ames Valley region already exists, additional facilities are needed to convey imported SWP water to spreading grounds for recharge, storage, and subsequent recovery. A Feasibility Study, including a groundwater model, is scheduled for completion in 2011 and documents the ability to store and recover SWP water in the basin.

The BDVWA GWMP is being developed for the BDVWA in parallel with the Recharge Feasibility Study. The BDVWA GWMP will provide groundwater management strategies for a long-term sustainable supply from the Ames Valley groundwater subbasin including enhanced aquifer recharge and pumping restrictions. The plan is also scheduled for completion in 2011.

BDVWA is the Lead Agency for the WIRP and the GWMP, but the implementation also includes other participating agencies. MWA is a financial participant, while Hi-Desert Water District (HDWD) and San Bernardino County Service Area (CSA) No. 70 are cooperative partners who will benefit through participation in the groundwater storage and recovery program. The GWMP will address the purchase of SWP water for recharge and pumping restrictions in the event that overdraft conditions are not controlled.

To assist with the Copper Mountain Valley/Joshua Tree subbasins overdraft, the Joshua Basin Recharge Project (see Section 3.6) will create a mechanism for the Joshua Basin Water District (JBWD) to make use of SWP water via the Morongo Basin Pipeline. Currently, JBWD has an agreement in place with MWA in which JBWD has an annual 27 percent capacity in the Morongo Basin Pipeline and may purchase SWP water via the Morongo Basin Pipeline. However, currently they cannot access this SWP water without the extension of the Morongo Basin Pipeline and construction of recharge facilities that would occur under the proposed Project. The Joshua Basin Recharge Project provides needed recharge into the Copper Mountain Valley/Joshua Tree subbasins to relieve overdraft conditions.

Table 3-11 summarizes the net average annual water supply estimates for each of the regions that comprise the Morongo Area. The net average water yield of the entire Morongo Area is about 2,120 afy. These numbers generally represent the perennial yield of the basins based on varying levels of data as summarized below.

For the Ames Valley Region, a perennial yield of 900 afy was derived from recent groundwater modeling by Todd Engineers for BDVWA. Data and analyses will be documented in the Draft Feasibility Study for the Ames Valley Recharge Project scheduled to be finalized in 2011. The methodology used in the model was more rigorous than the water balance approach used in a 2007 analysis (Kennedy/Jenks/Todd, 2007). For that study, an average annual recharge of 686 afy was estimated for the Ames Valley based on a percentage of rainfall in the upper reaches of the contributing watershed. For the feasibility study, a more detailed approach considered runoff coefficients for various precipitation amounts and retention time between runoff and recharge. The revised approach indicated an average annual recharge of 765 afy for a model period that represented 85 percent of normal rainfall. When normalized to rainfall, an average annual recharge of about 900 afy was estimated. Although the model also considered septic return flows, those totals are not included in the perennial yield calculation.

Current production wells in the Ames Valley are located to limit subsurface outflow from the recharge project's subbasin and should be able to capture perennial yield as needed. In addition, the supply estimate of 900 afy is somewhat under-estimated, given that no recharge or groundwater storage was assigned to a large downgradient area that has not been adequately investigated due a lack of significant groundwater development.

The supplies shown in Table 3-11 for the Johnson Valley and Means Valley regions are 900 afy and 20 afy, respectively. These estimates of perennial yield were derived from a water balance from the 2007 basin conceptual model report (Kennedy/Jenks/Todd, 2007). Groundwater supplies for Copper Mountain/Joshua Tree and the Warren Valley are documented in the USGS Evaluation completed by Nishikawa et al. in cooperation with JBWD (USGS Nishikawa, Izbicki, et al., 2004) and the USGS Evaluation completed by Nishikawa et al. in cooperation with JBWD (USGS Nishikawa, Densmore et al., 2004), respectively.

The perennial yields described above are maintained for both a single-dry year and multiple-dry year scenarios in Table 3-11. Although recharge to the groundwater basin is typically less during dry years, the perennial yield values account for the transient nature of recharge in the groundwater system. Due to the time lag associated between recharge and change in groundwater storage near supply wells, these basins are considered reliable in both dry and wet years if long-term overdraft is avoided.

As discussed later in this Chapter, MWA has planned for water shortages by banking excess and available SWP in the groundwater basins for use at a later time. MWA also improves their reliability of water supply by using some of this banked water as operational storage during the year. Table 3-13 shows the storage available in MWA's existing banked accounts by subarea. For operational reliability, a portion of the banked supply is used to accommodate the day to day or month to month variances in supply that can occur during the year and leave retailers short of supply.

TABLE 3-11
MORONGO BASIN/JOHNSON VALLEY AREA GROUNDWATER BASINS SUPPLY RELIABILITY

Anticipated Supply	Normal Year[(a)] (afy)	Single-Dry Water Year (afy)	Multiple Dry Water Year (afy)
Regions			
Ames Valley[(b)]	900	900	900
Johnson Valley[(c)]	900	900	900
Means Valley[(c)]	20	20	20
Copper Mountain Valley/Joshua Tree[(d)]	200	200	200
Warren Valley[(e)]	100	100	100
Total	**2,120**	**2,120**	**2,120**

Notes:

(a) To avoid double counting with MWA's demand forecast model which includes return flows from septic tanks, this normal year has been calculated as the safe or perennial yield of the basin and does not include return flows in the safe yield calculation.

(b) Todd Engineers is completing a "Hydrogeologic Feasibility Study and Groundwater Management Plan for the Ames/Reche Project" for the Bighorn Desert View Water Agency, in 2011, that will better define the Ames Valley perennial yield. The perennial yield of 900 afy shown above represents subsurface inflow/recharge to the region only and no return flows are included.

(c) Source: "Basin Conceptual Model and Assessment of Water Supply and Demand for the Ames Valley, Johnson Valley, and Means Valley Groundwater Basins", April 2007, Kennedy/Jenks/Todd. Tables in ES.

(d) USGS Nishikawa, Izbicki et al., 2004.

(e) USGS Nishikawa, Densmore et al., 2004.

There are three water supply agreements that are applicable to groundwater management in the Morongo Area, including (1) the Warren Valley Basin Agreement, (2) a court approved agreement between the BDVWA and HDWD in a portion of the Ames Valley basin and (3) an agreement for the users of the Morongo Basin Pipeline. The purpose of the agreement is to improve reliability of the shared water supply.

The Warren Valley Basin Agreement is an agreement between MWA, HDWD, and the Warren Valley Basin Watermaster. This agreement affects the use of the Morongo Basin Pipeline including pipeline users in the Ames Valley, Means Valley, and Johnson Valley groundwater basins. The primary purpose of the agreement is to more efficiently use available water supply and to provide supplemental water to the Watermaster in the event that water levels drop too low to support the adjudicated water rights.

The Ames Valley Basin Water Agreement is a 1991 Agreement between HDWD and BDVWA for the construction and operation of the HDWD Mainstream Well in the Ames Valley basin. At the time the Agreement was entered, the HDWD service area included areas within the Ames Valley basin and the Warren Valley basin. That agreement is currently being expanded to include all pumpers in the Ames Valley including CSA No. 70 and to provide a monitoring and management plan for operation of the basin with the Ames Valley Recharge Project.

The Morongo Basin Pipeline Agreement of 1991 is an agreement between BDVWA, HDWD, JBWD, CSA No. 70, and MWA for construction, operation, and financing of the Morongo Basin Pipeline Project.

Adequacy of Supply

The entire Morongo Area has limited natural supply, with a large portion of the Area relying on MWA's ability to provide SWP water through the Morongo Basin Pipeline. The Warren Basin (i.e. Town of Yucca Valley) was the first to experience obvious overdraft issues and relies on imported water and the three associated recharge sites to support the adjudication. Remaining water districts in the region consisting of BDVWA, CSA No. 70, and JBWD are at or close to surpassing their natural supply and these agencies plan recharge facilities in the immediate near future to address their own supply issues. The Morongo Basin Pipeline has capacity to deliver water to the benefit of the BDVWA, HDWD, JBWD and the CSA No. 70.

Sustainability

The Warren Valley adjudication mandates that groundwater extraction from the basin does not exceed the estimated annual supplies and empowers the HDWD as Watermaster to enforce pumping limits as mandated by the Court. The Watermaster performs monitoring in accordance with the Rules and Regulations of the Warren Valley Watermaster (1995). Monitoring activities currently performed by the Watermaster include water production and verification, water level measurement, and water quality.

In the Ames Valley, BDVWA, MWA, HDWD, and CSA No. 70 are currently negotiating an agreement to sustainably manage the Ames Valley Region. This agreement will replace the 1991 Stipulated Judgment and will be incorporated into the GWMP. Collectively, the agreement and GWMP will provide the institutional framework for the purchase, recharge, and recovery of imported SWP water through the Morongo Basin Pipeline Agreement. A basin-wide groundwater monitoring program will provide the necessary data for effective management into the future.

For the Copper Mountain/Joshua Tree Region, ongoing implementation of an enhanced recharge project and the GWMP will ensure sustainability in the region. In the Johnson Valley Region, BDVWA is undertaking an evaluation of the estimated water supply as part of their WIRP as discussed previously. The Means Valley Region is small and sparsely populated with only limited domestic groundwater development. No impediments to sustainable management are envisioned for these regions.

3.4.5 Potential Supply Inconsistency

Because water use within the MWA service area is supplied almost entirely by groundwater, MWA does not have any inconsistent water sources that cause reduced deliveries to users within the service area. A potential exception is areas where water quality could limit use as a potable supply or the LUZ Solar Power Plant which is supplied directly with SWP and has no alternative supply. Procurement of alternative supplies is planned for these areas. While many of the sources that recharge the groundwater basin have high annual variability, including flows on the Mojave River and supplies from the State Water Project, the groundwater basins used within the MWA service area are sufficiently large to allow for continued water use during dry periods with only a temporary decline in groundwater levels (MWA, 2004).

MWA's groundwater basins contain numerous areas with water quality issues, as described in Chapter 5. Key contaminants include arsenic, nitrates, iron, manganese, Chromium VI, and total dissolved solids (TDS). Measurements in excess of drinking water standards have been found for many of these constituents in local areas of each subarea in the Mojave Basin Area and each region within the Morongo Area. Ongoing water quality monitoring allows identification of more sensitive areas. Groundwater pumping in these areas will have to be avoided, treated or blended.

Another potential water quality issue facing MWA is the accumulation of salt in the groundwater basins. Because the Mojave River Basin and Morongo Areas are closed basins, salts concentrated in the locally-generated wastewater, salts contained in the imported reclaimed wastewater, and salts in the SWP supplies have few to no natural outlets from the basin. Although SWP supply introduces salts into the system, the concentrations of key salt constituents are often less than ambient concentrations, resulting in some improvement in local water quality.

From 2005-2009, an average of about 4,800 afy of reclaimed wastewater was discharged into the MWA from outside its boundary. In 2010, an average of approximately 49,680 afy of SWP water is assumed to be imported. By 2020, MWA is planning to increase its SWP utilization to 53,880 afy, which will further increase the introduction of salts into the system. In an effort to understand potential long-term water quality changes that may occur in the basin over time due to the long-term effects of wastewater and importation of SWP water into the MWA service area, the Lahontan Regional Water Quality Control Board (RWQCB) and the MWA worked cooperatively to develop a salt balance model for the MWA service area. The model was finalized in 2007 and generally showed that the importation of SWP water mitigated the long-term effects of salt loading (TDS increases) primarily caused by population increases and the associated larger volumes of wastewater entering into the basin(s).

Over the past several years, the MWA has made efforts to greatly increase the understanding of the water quantity and quality of the groundwater basins that lie within its service area. The Agency currently maintains a monitoring network of approximately 900 monitoring wells that record water levels on a regular basis. Many monitoring wells in the MWA monitoring network are sampled to analyze water quality. Additional information concerning water quality issues and replacement capacity is also provided in Chapter 5.

3.5 Transfers, Exchanges, and Groundwater Banking Programs

In addition to SWP water supplies and groundwater, MWA is currently exploring opportunities to purchase water supplies from other water agencies and sources. Transfers, exchanges, and groundwater banking programs, such as those described below, are important elements to enhancing the long-term reliability of the total mix of supplies currently available to meet water demand.

3.5.1 Transfers and Exchanges

An opportunity available to MWA to increase water supplies is to participate in voluntary water transfer programs. Since the drought of 1987-1992, the concept of water transfers has evolved into a viable supplemental source to improve supply reliability. The initial concept for water transfers was codified into law in 1986 when the California Legislature adopted the “Katz” Law (California Water Code, Sections 1810-1814) and the Costa-Isenberg Water Transfer Law of 1986 (California Water Code, Sections 470, 475, 480-483). These laws help define parameters for water transfers and set up a variety of approaches through which water or water rights can be transferred among individuals or agencies.

According to the California Water Plan Update 2009, up to 27 million afy of water are delivered for agricultural use every year. Over half of this water use is in the Central Valley, and much of it is delivered by, or adjacent to, SWP and Central Valley Project (CVP) conveyance facilities. This proximity to existing water conveyance facilities could allow for the voluntary transfer of water to many urban areas, including MWA, via the SWP. Such water transfers can involve water sales, conjunctive use and groundwater substitution, and water sharing and usually occur as a form of spot, option, or core transfers agreement. The costs of a water transfer would vary depending on the type, term, and location of the transfer. The most likely voluntary water transfer programs would probably involve the Sacramento or southern San Joaquin Valley areas.

One of the most important aspects of any resource planning process is flexibility. A flexible strategy minimizes unnecessary or redundant investments (or stranded costs). The voluntary purchase of water between willing sellers and buyers can be an effective means of achieving flexibility. However, not all water transfers have the same effectiveness in meeting resource needs. Through the resource planning process and ultimate implementation, several different types of water transfers could be undertaken.

3.5.2 Opportunities for Short and Long-Term Transfers and Exchanges

Prior to purchases of Table A amount (permanent transfers) from other water agencies, MWA's Table A amount was 50,800 afy. In January 1997, MWA purchased 25,000 af of Table A from Berrenda Mesa Water District/Kern County Water Agency. It was transferred to MWA in 1998, bringing MWA's Table A to 75,800 afy. In October 2009, MWA purchased 14,000 af from Dudley Ridge Water District; the transfer of Table A from Dudley to MWA is occurring in 3 stages:

- 7,000 af in 2010 for a total of 82,800;
- 3,000 af in 2015 for a total of 85,800;
- 4,000 af in 2020 for a total of 89,800

Table 3-12 summarizes the potential water transfer and exchange opportunities identified by MWA at this time. One option of utilizing unused SWP water would be to transfer a portion of it to another party as part of a storage agreement or exchange program. MWA and Metropolitan Water District of Southern California (Metropolitan) agreed on a Water Exchange Pilot Program with the goals of facilitating a water exchange in the short-term and helping to determine the feasibility of a similar long-term exchange program between the two parties. Under the terms of the Exchange Pilot Program, Metropolitan delivers to MWA up to 75,000 af of its SWP deliveries or other water. In exchange, in years when Metropolitan requests water, MWA will provide Metropolitan water through exchange of MWA's SWP deliveries for that year. This program ended in 2010 when MWA returned the remainder of the exchange water to Metropolitan. Through the program, there were two deliveries to storage by Metropolitan in 2003 and 2005 for a total of almost 45,000 af. No long-term arrangement has been pursued, but there may be opportunities in the future for additional short- or long-term exchanges with Metropolitan.

MWA also has a Table A exchange program in place with the Solano County Water Agency (SCWA). This agreement allowed MWA to receive Table A deliveries from the SCWA during hydrologic periods when the SCWA had approved Table A allocations in excess of their needs. MWA is no longer storing SCWA water for future exchanges; however, MWA is still returning previously-stored water to SCWA under the program. The remaining amounts of exchange water expire in 2014 and 2015, and when that water is returned the program will end.

Although the exchange programs with both Metropolitan and SCWA are limited in scope and duration, they represent the types of exchange opportunities MWA and other SWP contractors have to maximize their utilization of available water supplies from the SWP. MWA continues to explore opportunities for these types of exchanges.

Another MWA transfer program consists of an existing agreement to transfer up to 2,250 afy to the Antelope Valley-East Kern Water Agency (AVEK). The water is transported by AVEK to the LUZ Solar Power Plant located near Kramer Junction within the MWA service area.

In addition, the rules of the Mojave Basin Area Judgment allow for the possibility of in-basin transfers. Under the rules of the Judgment, producers are allowed to sell or lease unused BAP and FPA to other parties within the same subarea. This mechanism primarily allows industrial and municipal users to purchase BAP from agricultural or other users to augment their ability to pump water.

TABLE 3-12
WATER TRANSFER AND EXCHANGE OPPORTUNITIES IN MWA SERVICE AREA

Name/Type	Exchange/Transfer	Duration	Proposed Quantities
Pre-delivery of Unused SWP Supplies	Current water contract	Permanent	Up to 220,000 acre-feet total from 2010 to 2030
Solano County Water Agency	Exchange Pilot Program	Ending in 2015. No further action.	Pilot program only
Metropolitan Water District Water Exchange Program	Exchange Pilot Program	Ended in 2010. No further action.	Pilot program only
Other SWP Contractors	Water transfer, exchange, or banking	Under consideration	Not defined
Transfers within Mojave Basin Subareas	Base Annual Production (BAP) and/or Free Production Allowance (FPA)	Ongoing	Variable

Source: MWA.

3.5.3 Groundwater Banking Programs

With recent developments in conjunctive use and groundwater banking, significant opportunities exist to improve water supply reliability for MWA. Conjunctive use is the coordinated operation of multiple water supplies to achieve improved supply reliability. Most conjunctive use concepts are based on storing surface water supplies in a local groundwater basin during times of surplus for use during dry periods when surface water supplies would likely be reduced.

Groundwater banking programs involve storing available SWP surface water supplies during wet years in groundwater basins in, for example, the San Joaquin Valley. Water would be stored either directly by surface spreading or injection, or indirectly by supplying surface water to farmers for use in lieu of their intended groundwater pumping. During water shortages, the stored water could be extracted and conveyed through the California Aqueduct to MWA as the banking partner, or used by the farmers in exchange for their surface water allocations, which would be delivered to MWA as the banking partner through the California Aqueduct. Several conjunctive use and groundwater banking opportunities are available to MWA.

MWA has its own conjunctive use program to take advantage of the fact that the available MWA SWP supply on average is still greater than the demand in the service area. MWA is able to store this water for future use when SWP supplies are not available. This activity also allows MWA to take advantage of wet year supplies because of the abundant groundwater storage available in the Basins. This concept is used in the planned water supply projects such as the Regional Recharge and Recovery Project, discussed in more detail in the following section.

In 2006, MWA adopted a "Water Banking Policy" to guide the Agency in determining where water will be "banked". Banking targets were established for each groundwater basin where banking may occur under this Policy to prioritize where available water will be banked. The targets are generally based on the calculation of three times the non-agricultural water demand (groundwater production) within the Subarea. Current targets are as follows:

- Alto Subarea – 261,000 af
- Centro Subarea – 33,000 af
- Baja Subarea – 31,000 af
- Este Subarea – 5,000 af
- Oeste Subarea – 6,000 af
- Morongo Area - 21,000 af

Table 3-13 shows the storage available in MWA's existing banked accounts by subarea as of January 5, 2011. Unless otherwise noted, the water was all excess SWP water that MWA has purchased over the past years and stored in various groundwater basins for use when SWP is limited or there are groundwater shortages. MWA will continue to make such purchases when available to ensure the supply of water to their retailers. Some individual retailers in the MWA service area have their own individual banked storage accounts that are included in a separate column in the table below.

TABLE 3-13
STATUS OF MWA GROUNDWATER STORAGE ACCOUNTS

Subarea	MWA-Owned Stored Water[(a)] (af)	Retailer-Owned Stored Water[(b)] (af)	Total Stored Water (af)
Alto	66,663	28,851	95,514
Baja	18,139	0	18,139
Centro	17,380	0	17,380
Este	1,357	0	1,357
Oeste	0	0	0
Morongo	0	17,146	17,146
Total	**103,539**	**45,997**	**149,536**

Notes:
(a) MWA's banked groundwater storage accounts as of January 5, 2011.
(b) Retailer-owned water is owned by one of MWA's retailer agencies and consists of excess SWP purchased by MWA and then bought by the retailer.

3.6 Planned Water Supply Projects and Programs

The MWA operates under a Regional Water Management Plan, which was revised in 2004 and adopted on February 24, 2005. The 2004 RWMP defines MWA's overall water management objectives for the period of 2004 through 2020 and identifies a variety of potential projects and programs that might be developed to balance future water demands with available supplies and to maximize the overall beneficial use of water throughout the MWA's service area. The adopted RWMP projected that groundwater overdraft, combined with expected growth and associated increasing demand for water, were projected to result in a substantial groundwater recharge requirement by 2020. The 2004 RWMP notes that there are two fundamental actions that could be taken to address the problem of groundwater overdraft and future growth/water demand:

(1) Supply enhancement projects, either involving groundwater recharge or an increase in groundwater efficiency; and

(2) Management actions involving conservation, storage agreements, and water transfers/water banking.

Supply enhancement projects listed in Table 3-14 and briefly described below have the potential to address the key management issues related to overdraft of groundwater basins, localized water quality issues, and future growth/water demand. These projects are being planned to supplement the other groundwater recharge programs and facilities operated by MWA throughout their service area mentioned previously.

TABLE 3-14
PLANNED WATER SUPPLY PROJECTS AND PROGRAMS IN MWA SERVICE AREA

Name/Type	Planned Delivery (afy)	MWA Subarea/ Region	Retailer Served	Date Supply Available
Regional Recharge and Recovery Project[(a)] ("R³ Project")	Phase 1 – 15,000 Phase 2 - 40,000 total	Alto	AVRWC, Adelanto, Hesperia Water District, CSA 64, Victorville Water District, Golden State Water Company	Phase 1 – 2012 Phase 2 – 2015-2020
Oro Grande Wash Recharge [(a)]	8,000	Alto	Victorville Water District,	2012
Ames Valley Recharge[(b)]	1,500	Ames Valley	BDVWA, HDWD, CSA No. 70 W-1, CSA No. 70 W-4	2011
Joshua Basin Recharge[(c)]	1,000	Copper Mountain/ Joshua Tree	JBWD	2012-2013
Antelope Valley Wash Recharge[(d)]	3,500	Alto	Hesperia Water District	2015

Notes:
(a) Project is currently being advertised for bid.
(b) Feasibility study is currently being completed for project.
(c) NEPA is currently being completed for project??.
(d) Source: MWA staff.

3.6.1 Regional Recharge and Recovery Project (“R^3 Project”)

The Regional Recharge and Recovery Project, known as “R^3,” is a conjunctive use project currently under construction that will store SWP water underground in the local aquifer and later recover and distributes the water to local retail water purveyors. R^3 is part of a comprehensive solution developed by the MWA and the region’s stakeholders to ensure a sustainable water supply for the region. R^3 is an integral part of the Regional Water Management portfolio identified in MWA’s 2004 Regional Water Management Plan. The project will deliver SWP water from an SWP turnout in Hesperia to a recharge site in the floodplain aquifer along the Mojave River in Hesperia and southern Apple Valley. MWA-owned production wells on either side of the Mojave River located immediately downstream of the recharge site will then recover and deliver the stored water through pipelines directly to retail water agencies.

This project will provide a new source of supply for major water providers in the Mojave Basin and offset their need to continue excessive pumping within the declining regional aquifer system. Water providers that benefit from the R^3 Project could include the Apple Valley Ranchos Water Company, City of Adelanto, City of Hesperia, Golden State Water Company, San Bernardino County Service Area 64 and the Victorville Water District. Phase 1 of the project (15,000 afy of supply) has an estimated completion date of 2012. Phase 2 is planned to be completed after 2015.

3.6.2 Oro Grande Wash Recharge

The Oro Grande Wash Recharge project is currently under construction, with a recharge capacity of 8,000 af for nine months of operation. The project recharge facilities would be located at a site downstream on the Oro Grande Wash near the Green Tree Golf Course, the southern portion of the Oro Grande Wash downstream and north of the California Aqueduct and Goss Road/Eucalyptus Avenue. The project includes three primary components: California Aqueduct intake structure/turnout facilities, conveyance pipeline and Oro Grande Wash recharge facilities.

3.6.3 Ames Valley Recharge

The Ames Valley Recharge project will deliver SWP water to the Ames Valley for recharge at the Pipes Wash Spreading Grounds to mitigate historical overdraft conditions in the Region. This project was originally identified as the Ames/Means Valley Recharge Project in the 2004 RWMP, but since recharge is occurring only in the Ames Valley, it is referred to as the Ames Valley Recharge Project in this document. The recharge project will serve water agencies using groundwater in the basin including BDVWA, HDWD, and CSA No. 70. BDVWA, in cooperation with MWA, is implementing the project, which consists of a feasibility study, approximately 0.75 miles of conveyance pipeline to connect to the Morongo Basin Pipeline, recharge to the Pipes Wash, and the installation of monitoring wells. The initial recharge capacity is planned at 1,500 afy.

3.6.4 Joshua Basin Recharge

Joshua Basin Water District Recharge and Pipeline will create a mechanism for the JBWD to make use of SWP water via the Morongo Basin Pipeline. The JBWD is part of Improvement District M and therefore is paying a share of the debt associated with the construction of the

Morongo Pipeline facilities. The project is just beginning construction and is expected to provide recharge of 1,000 afy into the Copper Mountain Valley/Joshua Tree Subarea in 2012.

3.6.5 Antelope Valley Wash Recharge

Antelope Valley Wash Recharge ponds could provide groundwater recharge capacity of 3,500 afy upgradient from the City of Hesperia wells. The Hesperia Master Plan of drainage identifies a 65-acre site for a storm water detention basin in the Antelope Valley Wash south of Ranchero Road. In addition to storm water detention, the site might be able to accommodate groundwater recharge. The Morongo Basin Pipeline passes by this area and would be the source of recharge water.

3.7 Development of Desalination

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[i]). MWA has initiated efforts to determine additional source of future supply with potential options including desalination credits (MWA, 2004). However, at this time, none of the opportunities are practical or economically feasible for MWA, and MWA has no current plans to pursue them. Therefore, desalinated supplies are not included in the supply summaries in this Plan. However, should a future opportunity emerge for MWA to consider development of desalination, these potential future supply opportunities are described in the following section, including opportunities for desalination of brackish water, groundwater, and seawater.

3.7.1 Opportunities for Brackish Water and/or Groundwater Desalination

As discussed in Chapter 5, the groundwater supplies in the MWA service area are not considered brackish in nature, and desalination is not required. There are brackish supplies near the dry lakes but it is not practical to pump, treat and potentially induce migration of better quality water to the dry lake areas and potentially cause subsidence. However, MWA and the retail water purveyors could partner with other SWP contractors and provide financial assistance in construction of other regional groundwater desalination facilities in exchange for SWP supplies. The desalinated water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to MWA from the SWP contractor. A list summarizing the groundwater desalination plans of other SWP contractors is not available; however, MWA would begin this planning effort should the need arise.

In addition, should an opportunity emerge with a local agency other than an SWP contractor, an exchange of SWP deliveries would most likely involve a third party, such as Metropolitan Water District. Most local groundwater desalination facilities would be projects implemented by retailers of SWP contractors and, if an exchange program was implemented, would involve coordination and wheeling of water through the contractor's facilities to MWA.

3.7.2 Opportunities for Seawater Desalination

Because the MWA service area is not in a coastal area, it is neither practical nor economically feasible for MWA to implement a seawater desalination program. However, similar to the brackish water and groundwater desalination opportunities described above, MWA could provide financial assistance to other SWP contractors in the construction of their seawater desalination facilities in exchange for SWP supplies.

Section 4: Recycled Water

4.1 Overview

This Section of the Plan describes the existing and future recycled water opportunities available to the MWA service area. The description includes estimates of potential supply and demand for 2010 to 2035 in five year increments. MWA does not have the authority to determine how or where recycled water is used. This chapter simply identifies existing and projected wastewater flows by the wastewater agencies within the MWA service area, and potential opportunities for the use of recycled water.

4.2 Recycled Water Plan

Table 4-1 identifies the local water, wastewater, imported wastewater, and planning agencies that are within MWA's service area and could potentially have a role in any recycled water activities related to MWA. Local water agencies within the MWA service area share many issues related to local and regional water supplies. Wastewater agencies that collect and treat wastewater within the MWA service area share a common interest in maximizing the beneficial uses of treated wastewater. Wastewater is also imported to the Mojave Basin Area from several agencies as shown in Table 4-1. Lastly, the various planning agencies with general land use plans are included because they will coordinate where future growth is to occur.

TABLE 4-1
PARTICIPATING AGENCIES IN RECYCLED WATER

Water Agencies	Wastewater Agencies	Imported Wastewater Agencies	Planning Agencies
City of Adelanto	City of Adelanto	Lake Arrowhead CSD	City of Adelanto
Golden State Water Company - Barstow	City of Barstow	Big Bear Area Regional Wastewater Agency	City of Barstow
Helendale Community Services District (CSD)	Helendale (CSD)	Crestline Sanitation District (SD)	City of Hesperia
Hesperia Water District	Marine Corps Logistics Base (MCLB)		City of Victorville
Hi-Desert Water District	Victor Valley Water Reclamation Authority (VVWRA)		San Bernardino County Department of Public Works and Flood Control
San Bernardino County Service Areas 42 and 64			San Bernardino County Planning Department
Victorville Water District			Town of Apple Valley
			Town of Yucca Valley

Currently, MWA has a documented 2004 Regional Water Management Plan (RWMP) that serves to identify any wastewater treatment plans that may provide recycled water within its service area. Also, some of the wastewater agencies listed above have been coordinating recycled water usage on a regional level and that is discussed in the following sections.

4.3 Potential Sources of Recycled Wastewater

There are two categories of potential sources of recycled water in the MWA service area: wastewater generated within the service area and wastewater imported into the service area.

1. **Wastewater Generated Within MWA:** The City of Adelanto, the City of Barstow, Victorville Water District, the Helendale Community Services District (CSD) and the Victor Valley Wastewater Reclamation Authority (VVWRA) provide wastewater collection and treatment services within the MWA boundary. The VVWRA serves portions of Victorville, Hesperia, Apple Valley, and San Bernardino County Service Areas 42 and 64. Helendale CSD serves the community of Silver Lakes. Also, the US Marine Corps has a Marine Corps Logistics Base (MCLB), at Barstow and has two on-site wastewater treatment facilities for the Base population. The remainder of the wastewater generated within the MWA service area is handled by individual septic systems.

   VVWRA was originally formed by the Mojave Water Agency to help meet the requirements of the federal Clean Water Act and provide wastewater treatment for the growing area. The original treatment plant, with supporting pipelines and infrastructure, began operating in 1981, providing tertiary level treatment for up to 4.5 million gallons per day (MGD). The VVWRA is now a joint powers authority and public agency of the state of California.

2. **Imported Wastewater:** Wastewater is imported to the MWA service area from the Lake Arrowhead Community Services District (LACSD), Big Bear Area Regional Wastewater Agency (BBARWA), and Crestline Sanitation District (SD). Treated wastewater from the Lake Arrowhead CSD is discharged into retention ponds adjacent to the Mojave River near the Hesperia Lakes recreation area. Wastewater from the BBARWA is discharged onto alfalfa crops or a retention basin within the Este Subarea. The Crestline SD wastewater is used for pasture irrigation at the Los Flores Ranch with some discharge making its way off the ranch and into the West Fork of the Mojave River.

4.3.1 Existing Wastewater Treatment Facilities

4.3.1.1 The City of Adelanto

The City of Adelanto operates a 1.5 MGD activated sludge wastewater treatment facility through an operations and maintenance contract. According to the City's "Sewer Master Plan" completed in December 2007, the facility treated in excess of 2.1 MGD of wastewater in 2007 and discharged this quantity to percolation ponds in northern Adelanto.

4.3.1.2 The City of Barstow

The City of Barstow collects wastewater through a system constructed starting in 1939. Barstow currently contracts out the operation of its wastewater collection and treatment system. The system has the capacity to treat an average flow of 4.5 MGD (peak flow of 7.6 MGD) through aeration basins, secondary clarifiers, a chlorine contact chamber, and a chlorine contact lagoon. After treatment, the effluent is discharged to ponds and an irrigated field adjacent to the Mojave River and the treatment facilities. In 2009, the City of Barstow's average treated wastewater flow was 2.4 MGD. With anticipated growth, the treatment plant is anticipated to be expanded to 5.5 MGD by 2030 plus an additional 4.6 MGD capacity West Side Wastewater Treatment Plant (WWTP) is required at a new site. The City of Barstow's "Draft Sewer Master Plan" completed in

November 2009, assumed that the Sun Valley Golf Course would be a primary user of recycled water and that a recycled water system may be constructed as part of the infrastructure of many new planned developments in the area of the new West Side WWTP site.

4.3.1.3 Victorville Water District

The Victorville Water District (VWD) has constructed a wastewater treatment plant at the Southern California Logistics Airport (SCLA) to process waste from the Dr. Pepper/Snapple processing and bottling plant and sanitary wastewater from portions of the City of Victorville. The treatment plant is sized for treating 1.0 MGD of industrial wastewater flows and 1.5 MGD of sanitary flows from the City of Victorville. Industrial wastewater consists of food and beverage clients in the SCLA Industrial Park as well as from the Dr. Pepper Snapple Group (DPSG). The Treatment Plant is designed in a modular fashion consisting of equalization, aeration and anaerobic sludge holding tanks and membrane bioreactor tanks.

The effluent is discharged as recycled water (disinfected, tertiary recycled water as defined in California Code of Regulations, Title 22) for use as coolant at the High Desert Power Project (HDPP) and irrigation at the Westwinds Golf Course. Disinfected treated effluent is delivered to the two recycled water users via an approximate 1.8 mile distribution pipeline. At the Westwinds Golf Course, recycled water is stored in a 1.0 million gallon elevated storage tank.

The sludge drying beds have a single membrane liner to protect against leakage. The dried sludge will be removed and disposed of off-site to a legal disposal site.

The 2.5 MGD Treatment Plant came on-line in July 2010, with current flows at approximately 1.1 MGD. VWD signed an agreement with High Desert Power Project (HDPP) to sell up to 4,000 acre-feet (af) of recycled water each year, which can come from any combination of State Water Project (SWP), recycled water through the VVWRA regional treatment plant or recycled water from the City's new treatment plan. HDPP has been generating electricity at SCLA since 2003 and recently obtained a state permit to use recycled water for cooling the plant.

4.3.1.4 Victor Valley Wastewater Reclamation Authority

VVWRA conveys wastewater using 41.5 miles of interceptor sewer and two pump stations to its Regional Wastewater Treatment Plant. Approximately 12.6 MGD was treated at the VVWRA facility in 2009, which has a capacity of 18.0 MGD. Processes employed include screening, grit removal, primary clarification, biological oxidation of wastes with complete nitrification and partial denitrification, secondary clarification, coagulation, flocculation, filtration, and disinfection. Dissolved air flotation thickening and anaerobic digestion stabilizes biosolids that are then dewatered and dried prior to disposal via direct agricultural land application or by mixing with finished compost for agricultural markets.

The treated wastewater effluent is then discharged directly into the Mojave River channel downstream from the Lower Narrows or percolated into ponds in the Floodplain Aquifer.

In 2002, VVWRA submitted an application to the Lahontan Regional Water Quality Control Board (Regional Board) for a master water recycling permit in order to use up to 1,680 acre-feet per year (afy) of recycled water for irrigation of the Westwinds Golf Course at the SCLA. At the time, the Golf Course utilized potable groundwater from the underlying Mojave River aquifer. The California Department of Fish and Game (DFG) objected to the use of recycled water at the golf course as it would reduce stream flow, decrease the amount of flow necessary to maintain riparian habitat in the Alto Transition Zone and decrease the amount of water that could be extracted from the overdrafted Mojave groundwater basin. In June 2003, the Regional Board approved Order R6V-2003-028, Water Recycling Requirements for VVWRA and Victorville Water District, Westwinds Golf Course.

In order to assure the viability of the riparian area in the Transition Zone, the DFG and VVWRA entered into a Memorandum of Understanding (MOU) regarding VVWRA current and future discharges into the Mojave River Transition Zone. The general terms of the MOU are that DFG will not appeal or challenge the Regional Board's Order. In turn, VVWRA will continue to discharge 9,000 af annually from the Regional Treatment Facility and will also discharge not less than 20 percent of the amount of treated wastewater resulting from any increases in the amount of daily influent wastewater flow to the VVWRA Regional Treatment Plant. A copy of the MOU is included in Appendix I.

The Regional Treatment Plant is currently capable of treating a portion of the flow to a tertiary level and the remaining flow to a secondary level for percolation. A majority of the tertiary treated wastewater is discharged into the Mojave River Basin and a smaller amount is currently used to irrigate landscaping at the treatment plant and the nearby Westwinds Golf Course. The capacity of the Regional Treatment Plant was increased to its current 18.0 MGD capacity in 2009. Also, the Regional Board Order R6V-2008-004 along with the National Pollutant Discharge Elimination System (NPDES) Permit No. CA0102822 allows the facility to discharge up to 14.0 MGD of tertiary-treated effluent to surface water, which is the Mojave River.

4.3.1.5 Helendale CSD

A smaller wastewater agency within the MWA service area is the Helendale CSD which serves a population of approximately 7,000 in the Silver Lakes community. In 2006, the formation of the Helendale CSD began with the dissolution of County Service Area 70 Improvement Zone B. (CSA 70C). In 2002, the CSA 70C completed their *Final Master Sewer Plan*, (2002 CSA 70C Sewer Master Plan) which described the existing wastewater treatment plant as capable of handling 1.2 MGD of average flow and having sufficient capacity beyond Year 2020 based on current projected growth. In 2009, the average daily flow was 0.57 MGD, which was the same as the projected 2005 flow in the 2002 CSA 70B Sewer Master Plan. Since the resulting wastewater flows are lower than projected (2009 flows equal projected 2005 flows), the existing treatment plant should have adequate capacity to the Year 2020 as predicted in the 2002 Sewer Master Plan. Also, if the growth rate accelerates, the existing 1.2 MGD plant can be expanded.

4.3.1.6 US Marine Corps Logistics Base

Another small wastewater agency within the MWA service area is the United States Marine Corps MCLB at Barstow that is separated into two divisions: (1) Nebo and (2) Yermo Annex, with both divisions providing wastewater treatment services. The 2009 effluent flows were as follows:

- Nebo Main Base - 11.42 million gallons (0.03 MGD)
- Yermo Annex - 31.37 million gallons (0.09 MGD)

The disposal plan for both treatment facilities is to discharge fully treated water to percolation ponds. However, in 2009 for the Nebo Main Base, no secondary treated flow was percolated due to the effluent being evaporated in the existing oxidation ponds. The Nebo Base is undergoing an upgrade of the existing secondary treatment facilities to tertiary treatment. The upgrade is expected to be operational in 2012, when the existing oxidation ponds will be bypassed and the tertiary treated flow will be sent directly to the percolation ponds. The planned Regional Board permitted capacity is expected to be 225,000 gallons per day (gpd).

The Yermo Annex was recently upgraded to produce tertiary treated effluent and has a permitted capacity of 180,000 gpd.

4.3.1.7 Imported Wastewater

Table 4-2 summarizes the wastewater flows imported into the Mojave basin from 2006 to the present. As can be seen from the table, in 2009, the Alto Subarea received 1,432 af from the Lake Arrowhead CSD, discharged into retention ponds along the Mojave River about two miles downstream of the Forks, just south of the City of Hesperia. The Forks is located where the Mojave River is formed by the confluence of two smaller streams (Deep Creek and West Fork) descending from the mountains near the southeast corner boundary of the City of Hesperia and north of Silverwood Lake. The Crestline SD discharged 714 af in 2009 into the Alto subarea upstream of the West Fork gage at the Los Flores Ranch. In 2009, the Este Subarea received 2,436 af from the Big Bear Area Regional Wastewater Agency discharged near Camp Rock Road and Highway 247 in the Lucerne Valley.

TABLE 4-2
IMPORTED WASTEWATER FLOW (AFY)

Agency	2006	2007	2008	2009	Average Flow (afy)
Lake Arrowhead CSD	1,504	1,677	1,277	1,432	1,473
Crestline SD	819	674	799	714	752
Big Bear Area Regional Wastewater Agency	2,848	2,399	2,700	2,436	2,596
Total Imported WW	**5,171**	**4,750**	**4,776**	**4,582**	**4,821**

Source: MWA Watermaster Reports.
Data in water years starting in October.

4.3.2 Planned Improvements and Expansions

4.3.2.1 The City of Adelanto

The City of Adelanto is currently constructing a 2.5 MGD upgrade that will increase its wastewater treatment capabilities to 4.0 MGD and produce treated water that can be used for lawn/public parks irrigation, construction and dust control and other beneficial uses.

According to the City of Adelanto's *2007 Sewer Master Plan*, after the initial expansion is completed to 4.0 MGD, the ultimate capacity for the WWTP is planned to be 8.0 MGD, when the City nears build-out. Also, two sub-regional wastewater treatment plants (6.0 MGD and 3.0 MGD) are proposed to be constructed in incremental capacities. Because no exact dates were provided for the planned expansions in the *2007 Sewer Master Plan*, the dates used in the summary tables at the end of this Section are assumed.

The funding requirements for the planned treatment facilities were also presented in the *2007 Sewer Master Plan*, with estimated construction costs at approximately $122M.

4.3.2.2 The City of Barstow

The City of Barstow's *2009 Draft Sewer Master Plan* recommends that the existing WWTP will require an expansion of 1.0 MGD when the projects within the Public Improvement District (PID) Scenario (PID No.'s 77-1, 81-1 and 83-1) approach build-out. By the year 2020, the City of Barstow should construct a new 2.2 MGD West Side WWTP and by year 2030, the City should expand the West Side WWTP by 2.4 MGD to 4.6 MGD.

Expanding the existing WWTP's capacity by approximately 1.0 MGD will tend to maximize the capacity of the existing interceptor sewer system. In addition to matching existing interceptor and WWTP capacities, there is another advantage to a West Side WWTP, water recycling. It is assumed that the Sun Valley Golf Course would be a primary user of recycled water and that a recycled water system may be constructed as part of the infrastructure of many new planned developments.

The funding requirements for the planned WWTP Capital Improvements have an estimated total cost of $158.8M, which includes estimated construction costs plus 40 percent for Professional Services and Contingencies, the *2009 Draft Sewer Master Plan.*

4.3.2.3 Victorville Water District

VWD's newly constructed wastewater treatment plant is expandable to 5 MGD, but at this time VWD has no plans to expand the plant. In VWD staff discussions, it was pointed out that the 2.5 MGD capacity treatment plant was constructed specifically to accommodate HDPP. While the existing wastewater flows into the treatment plant are at approximately 1.1 MGD, VWD staff confirms that within five years, or by 2015, the treatment plant flows will be at full capacity and will remain that way most likely for the next twenty years.

4.3.2.4 Victor Valley Wastewater Reclamation Authority

VVWRA wastewater flow projections were developed based upon the estimated sewered population and a wastewater flow of approximately 80 gallons per person per day. Also, flow contributions from septic abandonment and commercial, industrial, and institutional sources were estimated and included.

Table 4-3 shows that from 2009 to 2035, the VVWRA average daily flow is anticipated to increase from 12.6 MGD to 25.5 MGD, which is an annual increase of 2.8 percent. In addition to the resident population, the wastewater flow projections include commercial business, industries, institutions (schools, hospitals, prisons, etc.), and septic conversions to the sewer system.

TABLE 4-3
PROJECTED VVWRA FLOW BASED ON HISTORICAL GROWTH RATES

Year	Flow, MGD	Growth (%)
2008	12.26	
2009	12.6	2.8%
2010	12.9	2.8%
2011	13.3	2.8%
2012	13.7	2.8%
2013	14.1	2.8%
2014	14.4	2.8%
2015	14.8	2.8%
2016	15.3	2.8%
2017	15.7	2.8%
2018	16.1	2.8%
2019	16.6	2.8%
2020	17.0	2.8%
2021	17.5	2.8%
2022	18.0	2.8%
2023	18.5	2.8%
2024	19.0	2.8%
2025	19.5	2.8%
2026	20.0	2.8%
2027	20.6	2.8%
2028	21.1	2.8%
2029	21.7	2.8%
2030	22.3	2.8%
2031	22.9	2.8%
2032	23.5	2.8%
2033	24.2	2.8%
2034	24.9	2.8%
2035	25.5	2.8%

Source: VVWRA Flow Projection Update, April 2009. Prepared by RBF Consulting.
Source document only projects to Year 2022, so it is assumed that from 2022-2035, the same growth rate will continue as previously estimated.

Since 2005, VVWRA has violated water discharge requirements as set forth by the Regional Board. Specifically, in February 2008, the Regional Board issued Cease and Desist Order R6V-2008-005 due to VVWRA discharge affecting the water for municipal and domestic supply. The discharge caused nitrate-nitrogen concentrations in underlying groundwater to exceed or threaten to exceed a water quality objective in the Basin Plan.[11]

The Order states that the existing Regional Treatment Plant does not include wastewater treatment for nitrogen removal and facilities that provide nitrogen will not be constructed until 2009-2011. Among the requirements of the Order, interim effluent limitations for ammonia-nitrogen and nitrate-nitrogen removal were specified. Additionally, the Order specifies facility improvement actions to occur in less than five years.

[11] Local Agency Formation Commission County of San Bernardino Staff Report, dated October 9, 2009.

A revised Phase III upgrade project to the Regional Treatment Plant is anticipated to have improved nitrogen removal technology and be able to meet the new permit effluent limits by mid-2012.

As an additional measure to mitigate the reduced capacity from the nitrogen removal required, VVWRA is planning to construct sub-regional wastewater treatment plants in the town of Apple Valley and the City of Hesperia. These smaller plants will recycle water for local landscape irrigation near the site of treatment. In turn, this will reduce the treatment demand on the Regional Treatment Plant. Moreover, the Hesperia and South Apple Valley interceptors are reaching capacity and the sub-regional plants will provide a long-term solution. Further, the move to constructing sub-regional treatment plants to capture and treat wastewater in Hesperia and Apple Valley would provide capacity at the Regional Treatment Plant for the City of Victorville, CSA 42, and CSA 64.

In the long-run, the capacity of the sub-regional plants, pump stations, and percolation ponds will require future expansion in order to meet the processing demands generated by Apple Valley and Hesperia. Additionally, it is likely that the sub-regional plants will require the same level of regulatory requirements regarding nitrogen as the Regional Treatment Plant. The estimated completion date of the sub-regional plants is unknown.

The conceptual details of the plants are:

- **Town of Apple Valley** – 1.0 MGD facility located in the Town, adjacent to the Otoe Road Pump Station in the southwest corner of Brewster Park. The facility will initially have a capacity to treat 1.0 MGD, expandable to 4.0 MGD, providing recycled water to the public parks.
- **City of Hesperia** – 1.0 MGD facility located in the City, on city-owned property northwest of the intersection of Interstate 15 and Main Street. The facility will initially have a capacity to treat 1.0 MGD, expandable to 4.0 MGD, providing recycled water to the residential communities and commercial businesses along the I-15 corridor.
- **City of Hesperia** – 2.0 MGD pump station and 3-mile force main located in the City beginning near the intersection of Mauna Loa Street and Maple Avenue.

During the development of MWA's UWMP, concerns were raised about the possibility that VVWRA's planned sub-regional plants could impact the water supply balances assumed in the UWMP by changing the location and amount of effluent wastewater flows that are returning to groundwater. A change in groundwater supplies has the potential to increase the demands for imported SWP water beyond those otherwise anticipated in the UWMP. These concerns were addressed in an analysis conducted by MWA staff.[12]

VVWRA's existing Regional Treatment Plant, located on Shay Road, currently discharges effluent in the Transition Zone (TZ) portion of the Alto Subarea, located in northern Alto and downstream of the Victor Valley area. Effluent flows to the TZ meet anthropogenic (human) consumptive demands in the TZ, but flows in substantial excess of consumptive use tend to flow to the Centro subarea, becoming supply for Centro. The planned sub-regional plants would be located in Hesperia and Apple Valley, and would either supply recycled water directly to customers or recharge the treated effluent to groundwater in the southern Alto area. Sewage

[12] Reference for MWA analysis—document to be completed soon.

flows to the VVWRA's Regional Treatment Plant originate from municipal uses in the Victor Valley, located primarily in southern Alto. If effluent discharges from the Regional Treatment Plant continue to increase as development increases, a greater portion of the return flows generated in southern Alto become diverted to the TZ, causing a potential imbalance in assumed water supply by decreasing return flows to southern Alto but increasing unused supplies to Centro. Conversely, if flows to the Regional Treatment Plant were reduced and instead directed toward sub-regional plants, water supplies to the TZ would be reduced, with the potential of causing groundwater levels to decline and water supplies to Centro to decline.

The analysis prepared by MWA staff attempted to "book-end" the possible future outcomes, impacts to basin balance and SWP demands through the year 2035, with or without the construction of sub-regional plants. Several scenarios were developed and evaluated based upon projected wastewater flows, including a scenario that staff felt was the most realistic based upon existing and planned wastewater infrastructure. In the realistic scenario, total wastewater flows to VVWRA roughly doubled, with the sub-regional plants operating at build-out capacity and about two-thirds of future flows still going to the Regional Treatment Plant. Analysis of the realistic scenario determined that it would not cause a material increase in demand for imported water supply when compared to other possible wastewater scenarios.

Another factor that could affect the water supply balance would be if the City of Hesperia decides to construct and operate its own water reclamation facilities. The City of Hesperia's "2008 Recycled Water Master Plan" and "2008 Wastewater Master Plan" both detail the necessary recycled water demand and facilities to construct three separate wastewater reclamation plants (WRPs), two within the City boundaries and the third in planned within the Rancho Las Flores development, which is located south of the City of Hesperia's boundary.

Geographically, approximately 5 percent of the City of Hesperia is currently served by sewers that ultimately flow to VVWRA's Regional Treatment Plant. The remaining area is undeveloped or served by on-site systems (septic tanks). Much of the VVWRA's interceptor system has been in use for over 20 years, and according to VVWRA's *2005 Sewer Facilities Plan* and its FY 2009-10 Budget, the Hesperia and South Apple Valley interceptors are reaching capacity (estimated to reach capacity between 2012 and 2015 respectively). As identified in the FY 2009-10 Budget, the Hesperia interceptor south of Bear Valley Road is in critical need of expansion and the Hesperia interceptor north of Bear Valley Road will require improvements this fiscal year to meet capacity needs. Because of these capacity concerns, the City of Hesperia may chose to construct its own WRPs and therefore, the location of the planned WRPs may affect the water supply balance discussed previously for MWA's demand forecast model.

For the remainder of this 2010 UWMP, it is assumed that VVWRA will construct and build their planned sub-regional plants and their demand projections will be used for future recycled water demands or for groundwater recharge.

The funding requirements for the "future CIP Projects" have an estimated total cost of $42.7M, per the Local Agency Formation Commission County of San Bernardino Staff Report, dated October 9, 2009.

4.3.2.5 Helendale CSD

The projected average flow at 100 percent build-out of Phase I for Helendale is 1.0 MGD, with the entire Helendale CSD build-out projected average flow being 1.9 MGD. In 2005 and in 2009, the average daily flow was 0.57 MGD, so 100 percent build-out of Phase I has not occurred yet and is not projected to occur until after 2035. Table 4-4 summarizes the Helendale CSD projected wastewater flow through 2035.

TABLE 4-4
PROJECTED HELENDALE CSD WASTEWATER FLOW

Year	Estimated EDUs	Average Daily Flow, MGD
2005	2,328	0.57
2010	2,543	0.62
2015	2,759	0.68
2020	2,974	0.73
2025	3,189	0.78
2030	3,404	0.83
2035	3,619	0.89

Source: 2002 CSA 70C Sewer Master Plan. Assumed 245 gallons per day per equivalent dwelling unit (EDU). From 2025-2035, it is assumed that the same growth rate will continue as previously estimated.

The 2002 CSA 70C Sewer Master Plan included cost estimates for the sewer system improvements for the 20-year planning period and water reuse within the Helendale CSD service area, which included the construction of an additional percolation pond and planning for the addition of tertiary filtration facility (for water recycling/reuse) and water reuse in accordance with Title 22 regulations.

4.3.2.6 MCLB

Future wastewater demands are expected to remain at their current 2009 rate until 2035 because there are no planned US Marine Corps Base expansions at this time.

4.3.2.7 Hi-Desert Water District

Hi-Desert Water District (HDWD) serves potable water to a population of approximately 25,000. According to previous planning studies, the projected population for the HDWD's service area at build-out condition is approximately 80,000. In order to protect groundwater quality in the area, the HDWD is planning to connect the majority of its water customers to a new wastewater collection and treatment system.

As discussed in HDWD's 2009 "Sewer Master Plan" (HDWD 2009 Sewer Master Plan), the treatment system will consist of a water reclamation facility (WRF) involving the construction and installation of the Hi-Desert WRF, with an initial treatment capacity of 1.5 MGD and a possible build-out treatment capacity of 6.0 MGD. The wastewater will be treated to and delivered to recharge basins operated by the HDWD to percolate into the Warren Valley Groundwater Basin.

The Phase 1 sewer collection system will focus on the urban development in close proximity to State Highway 62 (Twenty-nine Palms Highway). In December 2010, the Lahontan Regional Water Board proposed amending Chapter 4 of the Region's Basin Plan to prohibit the discharge of wastes from septic systems in specific areas in the Town of Yucca Valley (Town), which is

HDWD's Service Area, to mitigate and eliminate the threat of nitrate contamination to groundwater due to septic tank discharges. Because the Town lacks a municipal wastewater collection and treatment system, all residents and businesses in Yucca Valley use septic systems and subsurface disposal systems to treat and dispose of domestic wastewater.

Like many areas in California, the Yucca Valley has experienced periods of rapid population growth and localized increases in septic system density, such as along the main business corridor, one of the areas addressed by this prohibition. This rise in system density in certain areas, combined with system failures due to age or inadequate maintenance in the Town as a whole, presents a significant threat to public health for Town residents due to increased wastewater loading to the vadose zone (unsaturated soil strata), and impacts to local groundwater used for municipal supply from nitrates, pathogens, and salts (total dissolved solids).

The prohibition bans discharges of wastes from septic systems in Phases 1, 2, and 3 in the Town, pursuant to a time schedule, with the prohibition becoming effective for Phase 1 (essentially the main business corridor in Town) by March 17, 2016. This is the planned timing to have Phase 1 of the proposed WRF constructed.

On August 5, 2009 the HDWD adopted the Mitigated Negative Declaration and Mitigation, Monitoring and Reporting Program (MMRP) for a proposed centralized wastewater treatment facility and collection system. Table 4-5 summarizes the HDWD projected wastewater flow through build-out.

TABLE 4-5
PROJECTED HDWD WASTEWATER FLOW

Year	Average Daily Flow, AFY	Treatment Capacity, MGD
2010	880	0
2015	880	0
2020	1,399*	1.5
2025	1,470	1.5
2030	1,545	1.5
2035	1,624	1.5

Source: HDWD's staff.
* Phase 1 of the WRF Project is expected to be on-line in 2016, which will comply with the Regional Board's Order R7-2011-0004.

HDWD is considered a disadvantaged community with a median income lower than the State and National averages. Therefore HDWD is seeking grants and other low cost financing to fund their WRF Project. HDWD is working on a finance plan that will outline the best alternatives to fund the project. A capital cost estimate for Phase 1, which will include the treatment plant and collection system will be determined on an Equivalent Dwelling Unit (EDU) basis with a Single Family Residence being used as the base unit, one (1) EDU = 210 gallons of wastewater/day, which is the basis of cost analysis for determining wastewater flows and sizing for system capacity.[13]

- Assessment Cost by EDU = $10,220 (assume 30 percent Grants)

[13] HDWD January 2009 Sewer Master Plan and Preliminary Design Report.

- Annual Assessment[14] = $620 per year / $52 per month

4.3.2.8 Summary of Planned Wastewater Treatment Capacity

While some of the wastewater agencies are planning to expand their treatment capacity in the near future to be able to produce recycled water, others will continue to use their existing secondary treatment facilities.

Table 4-6 provides the projected imported wastewater flow for the MWA service area from the Lake Arrowhead CSD, Crestline SD, and BBARWA, as discussed in Section 4.3.1.7. Using the 2009 flows listed in Table 4-2, the projections have been estimated using the MWA demand forecast model and assuming a 1 percent increase from 2010 through 2035.

TABLE 4-6
PROJECTED IMPORTED WASTEWATER FLOW

Imported Wastewater Agency[(a)]	Flow (afy)					
	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Lake Arrowhead CSD	1,406	1,467	1,527	1,622	1,717	1,812
Crestline SD	839	875	912	968	1,025	1,081
Big Bear Area Regional Wastewater Agency	3,059	3,055	3,052	3,199	3,345	3,492
Total	**5,304**	**5,397**	**5,491**	**5,789**	**6,087**	**6,385**

Note:
(a) 2010 data is actual. Projections made using MWA's demand forecast model assuming a 1% increase from 2010 to 2035.

Table 4-7 provides the projected wastewater treatment capacity for the MWA service area.

TABLE 4-7
PROJECTED CAPACITY WASTEWATER COLLECTED AND TREATED

Wastewater Collected and Treated in Service Area	Capacity (MGD)					
	2010	**2015**	**2020**	**2025**	**2030**	**2035**
City of Adelanto[(a)]	4.0	4.0	8.0	11.0	17.0	17.0
City of Barstow[(b)]	4.6	4.6	7.7	7.7	10.1	10.1
Victorville Water District[(c)]	2.5	2.5	2.5	2.5	2.5	2.5
VVWRA[(d)]	18.0	22.0	22.0	26.0	26.0	26.0
Helendale CSD[(e)]	1.2	1.2	1.2	1.2	1.2	1.2
MCLB[(f)]	0.8	0.4	0.4	0.4	0.4	0.4
Hi-Desert Water District[(g)]	0.0	0.0	1.5	1.5	1.5	1.5
Total	**31.1**	**36.2**	**43.3**	**50.3**	**58.7**	**58.7**

Notes:
(a) In the City's "2007 Sewer Master Plan", no exact dates are given for the planned expansions, so the dates provided in the table are assumed. All flow will meet Title 22 requirements for recycled water standards.
(b) Dates are taken from the City's "2009 Draft Sewer Master Plan." All flow will meet Title 22 requirements for recycled water standards.
(c) Victorville Water District information came from Lahontan Regional Board Order No. R6V-2010-0023.
(d) Capacity assumed from Local Agency Formation Commission County of San Bernardino Staff Report, dated October 9, 2009.

[14] Based on tax assessment debt financed over 25 years at a combined rate of 3.5%. These costs are typically financed through an Assessment District.

(e) 2002 CSA 70B Sewer Master Plan stated the existing treatment plant is capable of handling 1.2 MGD of average flow and has sufficient capacity beyond Year-2020 based on current projected growth.
(f) 2010 capacity is 0.18 MGD (Yermo Annex) +.6 MGD (secondary treated only) (Nebo). 2012 capacity and beyond is 0.18 MGD (Yermo Annex) +.225 MGD (Nebo). Both are tertiary treated capacities.
(g) See Table 4-5.

4.3.3 Summary of Available Source Water Flows

Within the MWA service area, there are currently two sources of recycled water (VVWRA and the Victorville Water District); however there are several other sources (all wastewater flows) of potential recycled water within MWA's service area that may soon be treated to become recycled water. The possible source wastewater flow projected to be available is shown in Table 4-8.

TABLE 4-8
SUMMARY OF AVAILABLE SOURCE WASTEWATER FLOW

Source	2010 Flow (MGD)	Projected Flow (MGD)	Projected to be Available for Non-Potable Use (afy)	Date for Flow Projection
City of Adelanto[(a)]	2.5	17.0	19,044	2030
City of Barstow[(b)]	2.5	10.1	11,314	2030
Victorville Water District[(c)]	1.1	2.5	2,801	2030
VVWRA[(d)]	12.9	22.3	24,981	2030
Helendale CSD[(e)]	0.6	0.8	896	2030
MCLB[(f)]	0.1	0.1	112	2030
Hi-Desert Water District[(g)]	0.0	1.4	1,545	2030
Imported WW[(h)]	4.7	5.4	6,087	2030
Total	**24.4**	**59.6**	**66,780**	

Notes:
(a) Flows assumed from the City's "2007 Sewer Master Plan." All flow will meet Title 22 requirements for recycled water standards.
(b) Flows assumed from the City's "2009 Draft Sewer Master Plan." All flow will meet Title 22 requirements for recycled water standards.
(c) See Section 4.3.2.3.
(d) Taken from Table 4-3.
(e) Taken from Table 4-4.
(f) Flows are to remain at 2009 rates in the future.
(g) Taken from Table 4-5.
(h) Taken from Table 4-6.

4.4 Recycled Water Demand

In this section, current recycled water use is discussed, and potential recycled water users within MWA's service area are identified. For each potential user, estimates are provided for annual demand. A plan for encouraging and optimizing the use of recycled water is also discussed.

4.4.1 Current Use

In 2010, recycled water started being used by the Victorville Water District for the HDPP power plant cooling system. Before this, recycled water was being used at VVWRA's treatment facility for landscape irrigation at the VVWRA on-site composting facility for processing, dust control and fire protection and for irrigation at the Westwinds Golf Course. Most of the treated wastewater effluent is recharged to the groundwater basin. Because the Mojave Basin is essentially a closed basin, these supplies contribute to the overall water supply of the area.

Table 4-9 provides a summary of existing recycled water use.

TABLE 4-9
EXISTING RECYCLED WATER USES

Type of Use	Treatment Level	Actual 2009 Use (afy)
HDPP – cooling system	Disinfected tertiary	Use started in 2010
Landscape – Golf course	Disinfected tertiary	336
	Total	**336**

4.4.2 Potential Users

Many wastewater agencies within MWA's service area have completed planning documents for recycled water and determined potential users in their specific service area. As part of the UWMP requirements, the potential uses of recycled water need to be identified and listed. Therefore, the following list identifies the planned recycled water agency planning to develop recycled water and their proposed usage type.

- City of Adelanto - Reuse for landscape irrigation in schools and parks.
- City of Barstow - Reuse for landscape irrigation on the Sun Valley Golf Course.
- Victorville Water District - Reuse for landscape irrigation on golf course and cooling for power plant.
- VVWRA - Reuse for landscape irrigation on golf courses, parks, municipalities, and schools. Also cooling for power plant.
- Helendale CSD - Reuse is unknown at this time.
- MCLB – Reuse is for groundwater recharge.
- HDWD - Reuse is unknown at this time.

Based on the assumption that all of the additional flows would be recycled, and that the possible users are identified, the projected recycled wastewater that will be produced and used is shown in Table 4-10.

TABLE 4-10
POTENTIAL RECYCLED WATER PROJECTIONS

Agency	Flows (MGD)					
	2010	2015	2020	2025	2030	2035
City of Adelanto[(a)]	2.5	4.0	7.3	11.0	17.0	17.0
City of Barstow[(a)]	2.5	4.4	6.3	8.2	10.1	10.1
Victorville Water District[(a)]	1.1	2.5	2.5	2.5	2.5	2.5
VVWRA[(a)]	12.9	14.8	17.0	19.5	22.3	25.5
Helendale CSD[(b)]	0.6	0.7	0.7	0.8	0.8	0.9
MCLB[(a)]	0.1	0.1	0.1	0.1	0.1	0.1
Total	**19.7**	**26.5**	**33.9**	**42.1**	**52.8**	**56.1**

Notes:
(a) See Table 4-8.
(b) See Table 4-4.

The recycled water projects from all of the agencies listed in Table 4-10 will potentially be funded from local funds, a number of federal or state grants and low-interest loans obtained through the State Revolving Fund. In some cases, consultants have been retained to provide engineering and environmental documentation services for the sub-regional treatment facilities. The cost of providing recycled water, transmission infrastructure, and ownership of distribution facilities has yet to be determined. The recycling programs will address a number of issues in the MWA service area. The need for additional collection and transmission facilities and the need for additional treatment capacity will all contribute to these programs.

The funding requirements of each of the various recycled water plans by each specific agency were discussed previously in Section 4.3.2.

4.4.3 Projected Recycled Water Demand

Potential recycled water demand has not yet been evaluated by the Cities within the MWA service area. While some cities are in the planning stages and plan to produce recycled water, they are not yet at the planning level and thus have not actually developed customer lists at this point in time. They are assuming that potential customers are there, once the recycled water is available.

4.4.4 Projected Recycled Water Comparison

MWA's 2005 UWMP projected a total recycled water usage and treated wastewater effluent discharge to groundwater from VVWRA of 8,390 afy by the year 2010. Approximately 336 afy was served in 2009 to the Westwinds Golf Course of SCLA for landscape irrigation. The remainder of treated wastewater effluent from the VVWRA Regional treatment plant was discharged into the Mojave River and thus indirectly percolated to the groundwater basin. Table 4-11 provides a comparison of the 2005 projected demand versus the actual 2010 use. The difference in the projected 2005 use and the actual 2010 use is because the projection for 2010 did not anticipate the steep growth in wastewater flows that occurred because of steep growth in population within the areas served by VVWRA. An additional factor was that all the excess treated effluent is discharged to the Mojave River or discharged into the groundwater basin because additional recycled water users have not been established at this time.

TABLE 4-11
RECYCLED WATER USES - 2005 PROJECTION COMPARED WITH 2010 ACTUAL

User Type	2005 Projection for 2010 (afy)	2010 Actual Use (afy)
Recycled (Landscape)	336	336
Groundwater Recharge	8,390	0
Total	**8,726**	**336**

4.5 Methods to Encourage Recycled Water Use

The retail water purveyors are the entities that will develop future recycled water delivery systems. Methods to encourage recycled water use, such as financial incentives, will be analyzed at the retail level.

Section 5: Water Quality

5.1 Overview

The quality of any natural water is dynamic in nature. This is true for the State Water Project (SWP) water brought into the MWA service area. During periods of intense rainfall or snowmelt, routes of surface water movement are changed; new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over time. These same basic principles apply to groundwater. Depending on water depth, groundwater will pass through different layers of rock and sediment and leach different materials from those strata. Water quality is not a static feature of water, and these dynamic variables must be recognized.

Water quality regulations also change. This is the result of the discovery of new contaminants, changing understanding of the health effects of previously known as well as new contaminants, development of new analytical technology, and the introduction of new treatment technology. All retail water purveyors are subject to drinking water standards set by the Federal Environmental Protection Agency (EPA) and the California Department of Public Health (CDPH). Mojave Water Agency (MWA) imports SWP water for groundwater basin recharge. Retail purveyors extract groundwater from these groundwater basins for delivery.

This Section provides a general description of the water quality of both imported water and groundwater supplies. A discussion of potential water quality impacts on the reliability of these supplies is also provided.

Several state, regional and county agencies have jurisdiction and responsibility for monitoring water quality and contaminant sites. Programs administered by these agencies include basin management, waste regulation, contaminant cleanup, public outreach, and emergency spill response.

5.2 Imported Water Quality

MWA provides imported SWP water to its service area. The source of SWP water is rain and snow from the Sierra Nevada, Cascade, and Coastal mountain ranges. This water travels to the Sacramento-San Joaquin Delta, which is a network of natural and artificial channels and reclaimed islands at the confluence of the Sacramento and San Joaquin rivers. The Delta forms the eastern portion of the San Francisco estuary, receiving runoff from more than 40 percent of the state's land area. It is a low-lying region interlaced with hundreds of miles of waterways. From the Delta, the water is pumped into a series of canals and reservoirs, which provides water to urban and agricultural users throughout the San Francisco Bay Area and Central and Southern California. As discussed in Chapter 3, MWA receives SWP water at four locations off the East Branch of the SWP. Figure 3-3 shows the location of the MWA turnouts.

Another important property of SWP water is the mineral content. SWP water is generally low in dissolved minerals, such as calcium, magnesium, sodium, potassium, iron, manganese, nitrate, and sulfate. Most of these minerals do not cause health concerns. Nitrate is the main exception, as it has significant health effects for infants; however, the nitrate content of SWP water is very low. Also of significance is the chloride content. Although not a human health risk, chloride can have a negative impact on agricultural activities and regulatory compliance for local sanitation agencies. The chloride content of SWP water varies widely from well over 100 milligrams per liter (mg/L) to below 40 mg/L, depending on Delta conditions.

Since SWP water imports to the Mojave River Basin will be persistent, long term, and increasing, these imports are deemed to be a significant factor in the long term salt balance in the Mojave River Groundwater Basin. Data regarding the quantity and quality of SWP water delivered to the MWA service area readily available from the California Department of Water Resources (DWR). Although the quality of SWP water varies seasonally, for the period between 2005 and 2009 the average total dissolved solids (TDS) concentration has been approximately 269 mg/L for the Mojave River Groundwater Basin (see Figure 5-6 in the following section). A cooperative study between the Lahontan Regional Water Quality Control Board and the MWA was completed in 2007 to address salt balance within the MWA service area. Section 5.3 includes a description of the study and resulting water quality model.

5.3 Groundwater Quality

Over the past several years, the MWA has made efforts to greatly increase the understanding of the water quantity and quality of the groundwater basins that lie within its service area. The Agency currently maintains a monitoring network of approximately 900 monitoring wells that record water levels on a regular basis. Many monitoring wells in the MWA monitoring network are sampled to test for water quality. The collected water samples are generally tested for the following:

- Inorganics
- Metals
- General Mineral
- Isotopes (sometimes)

MWA has chosen the above suite of analytes to determine the overall native water quality of their groundwater basins and to determine if the water quality characteristics of the basins are changing over time.

MWA's groundwater basins contain numerous areas with water quality issues. Key contaminants include arsenic, nitrates, iron, manganese, Chromium VI, and TDS. Measurements in excess of drinking water standards have been found for some of these constituents within the Mojave River Basin and the Morongo Basin/Johnson Valley Area ("Morongo"). Groundwater in these areas may have to be treated prior to consumption.

Another potential water quality issue facing MWA is the accumulation of salt in the groundwater basins. Because the Mojave Basin Area and Morongo Area are considered closed basins, salts added to the locally generated wastewater, salts contained in the imported reclaimed wastewater and salts in the State Water Project (SWP) supplies are mostly not removed from the basin.

From 2005-2009, an annual average of approximately 4,800 acre-feet per year (afy) of imported wastewater was discharged into the MWA service area. In 2010, approximately 49,680 acre-feet (af) of SWP water is anticipated to be imported annually. By 2020, MWA is planning to increase its annual SWP utilization to 53,800 af, which will further increase the introduction of salts into the system.

In an effort to understand potential long-term water quality changes that may occur in the MWA's groundwater basins over time due to the long-term effects of wastewater and importation of SWP water into the MWA service area, the Lahontan Regional Water Quality Control Board (RWQCB) and the MWA worked cooperatively to develop a regional salt balance model for the MWA service area. The model was finalized in 2007 and generally showed that the importation of SWP water mitigated the long-term effects of salt loading (TDS increases) primarily caused by population increases and the associated larger volumes of wastewater entering into the basin(s) (2007 Schlumberger).

Groundwater quality for a number of constituents including nitrates, manganese, fluoride, iron, arsenic, and TDS are presented for each subarea on Figures 5–1 through 5-6, respectively. These figures have been provided by MWA and the data range is from January 2005 through November 2009. Groundwater quality can vary throughout a subarea, but the figures represent the average of available data, and give a good overall picture of the water quality in each. It should be noted that groundwater production occurs in some areas with known water quality issues, which can increase the average concentration of a particular constituent for a given subbasin. Examples include arsenic concentrations detected in wells in the vicinity of Pioneer Town (within the Morongo Area) and iron and manganese in the southern Alto Transition Zone. While the levels of constituents in these isolated areas can be above the regulatory compliance maximum contaminant levels (MCL's), these are local issues pertaining to certain potentially producible areas and zones within a basin. Producible areas within a particular basin that are affected by constituents over the MCL can be avoided or treated prior to use as necessary. An example of the aforementioned is the wellhead treatment of arsenic by the City of Victorville for groundwater produced from some of their wells.

FIGURE 5-1
NITRATES[15]

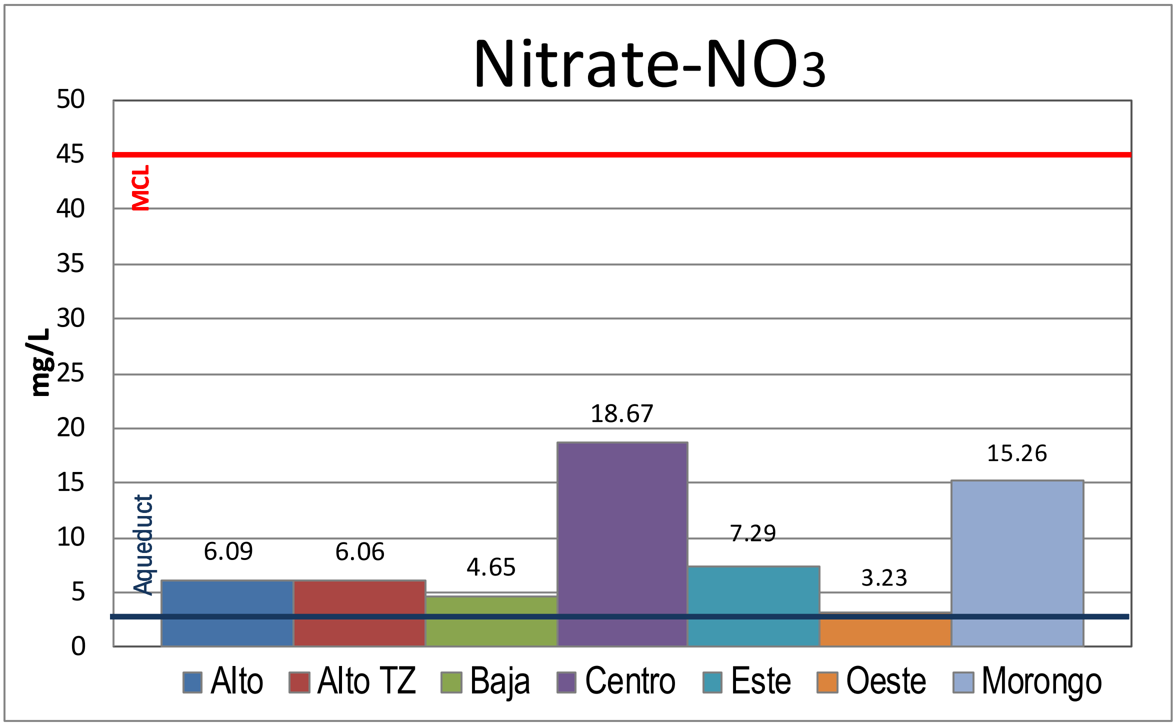
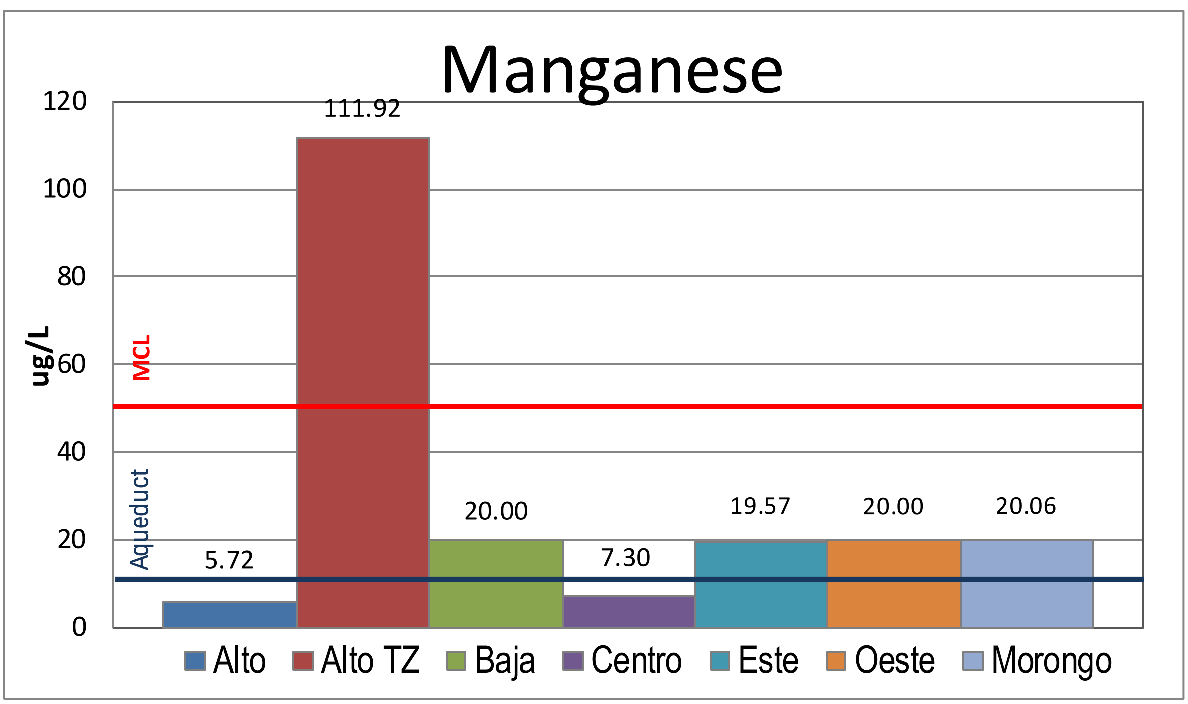


FIGURE 5-2
MANGANESE[12]



[15] Dataset date range: 01/2005 to 11/2009. Raw data source is MWA. Data source for 5-year average: CDPH. Data source for Aqueduct 5-year average: MWA and Victorville Water District.

FIGURE 5-3
FLUORIDE[12]

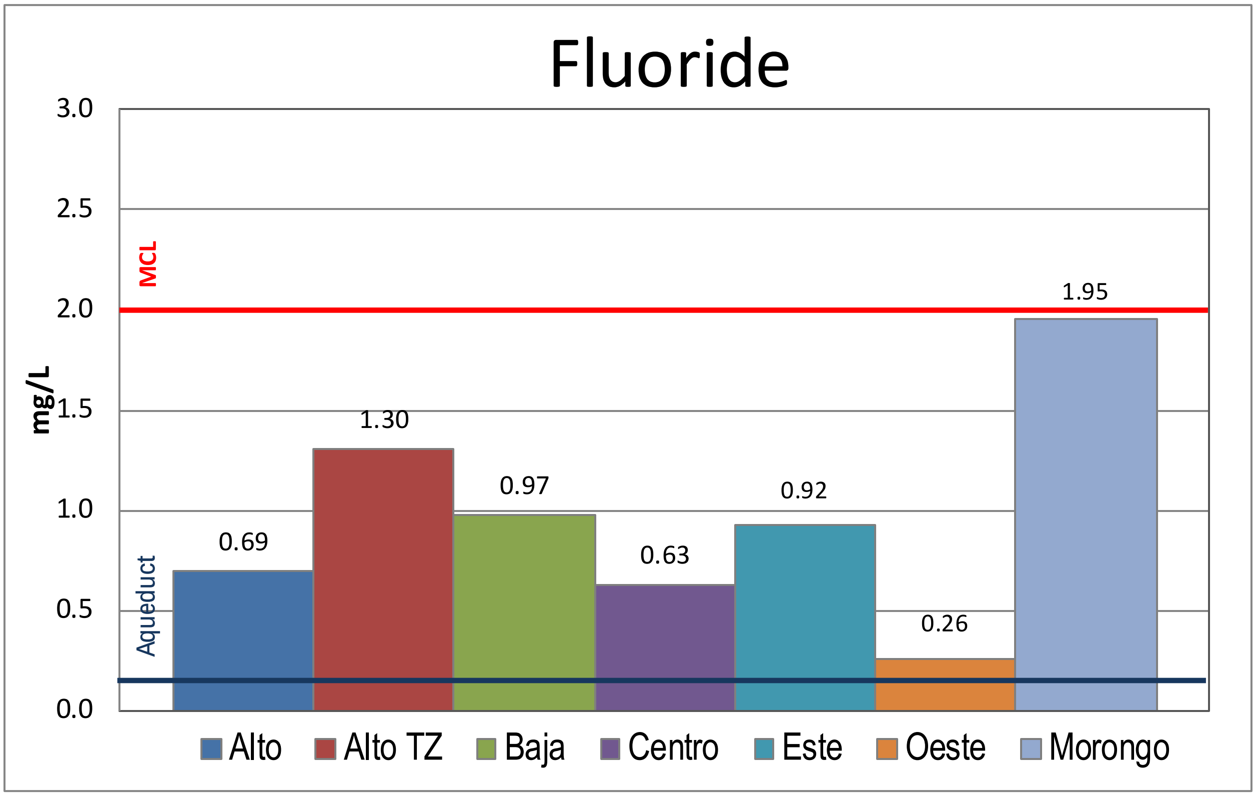
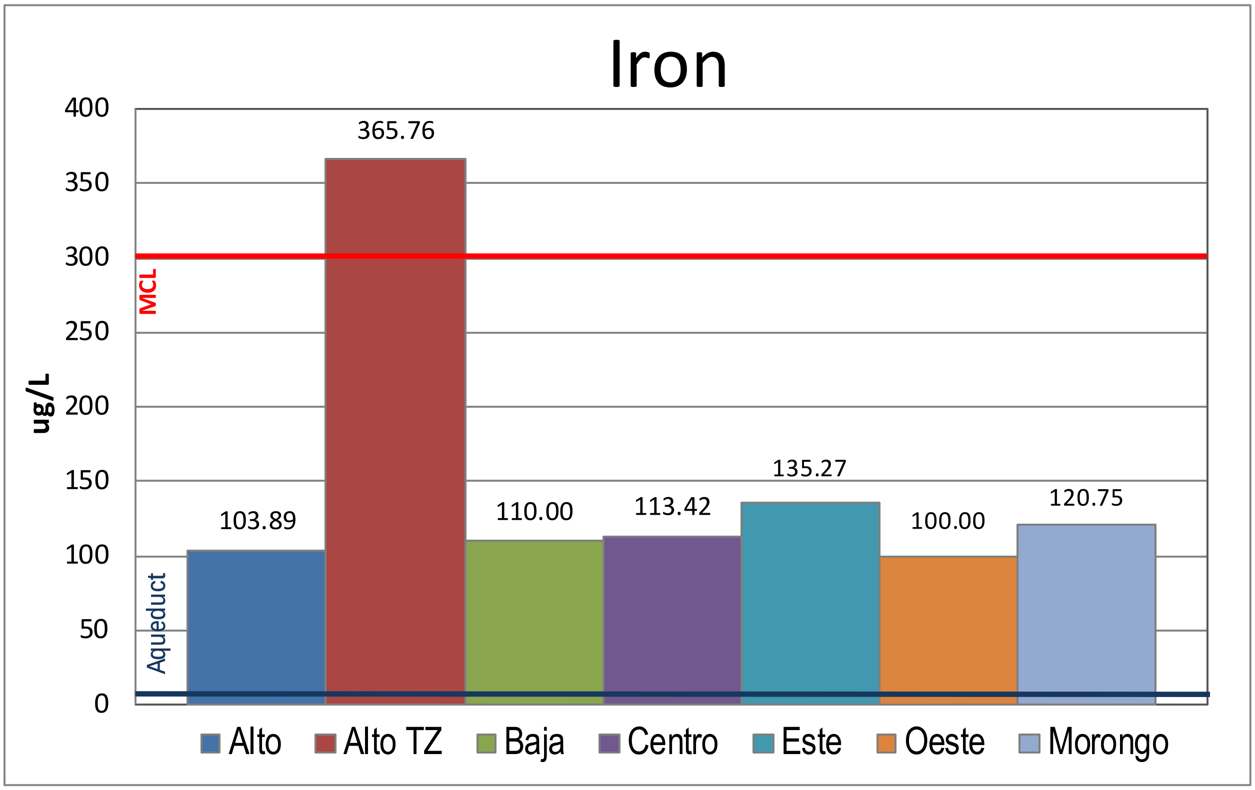


FIGURE 5-4
IRON[16]



[16] Dataset date range: CDPH 01/2005 to 11/2009 - Aqueduct 07/2008 to 11/2010. Raw data source is MWA. Data source for 5-year average: CDPH. Data source for Aqueduct 3-year average: DWR. Data source for MCL: State of California. Caveats: CDPH Groundwater samples were undifferentiated and were for both "total iron" and "dissolved iron". For the Iron by subarea, this acts to probably inflate the iron values. Local Aqueduct samples were for "total iron." Additional data for "dissolved iron" was obtained from DWR for Check 41 (Tehachapi Afterbay). Although this is a reduced time series, this is considered to be the best available representative data.

FIGURE 5-5
ARSENIC[12]

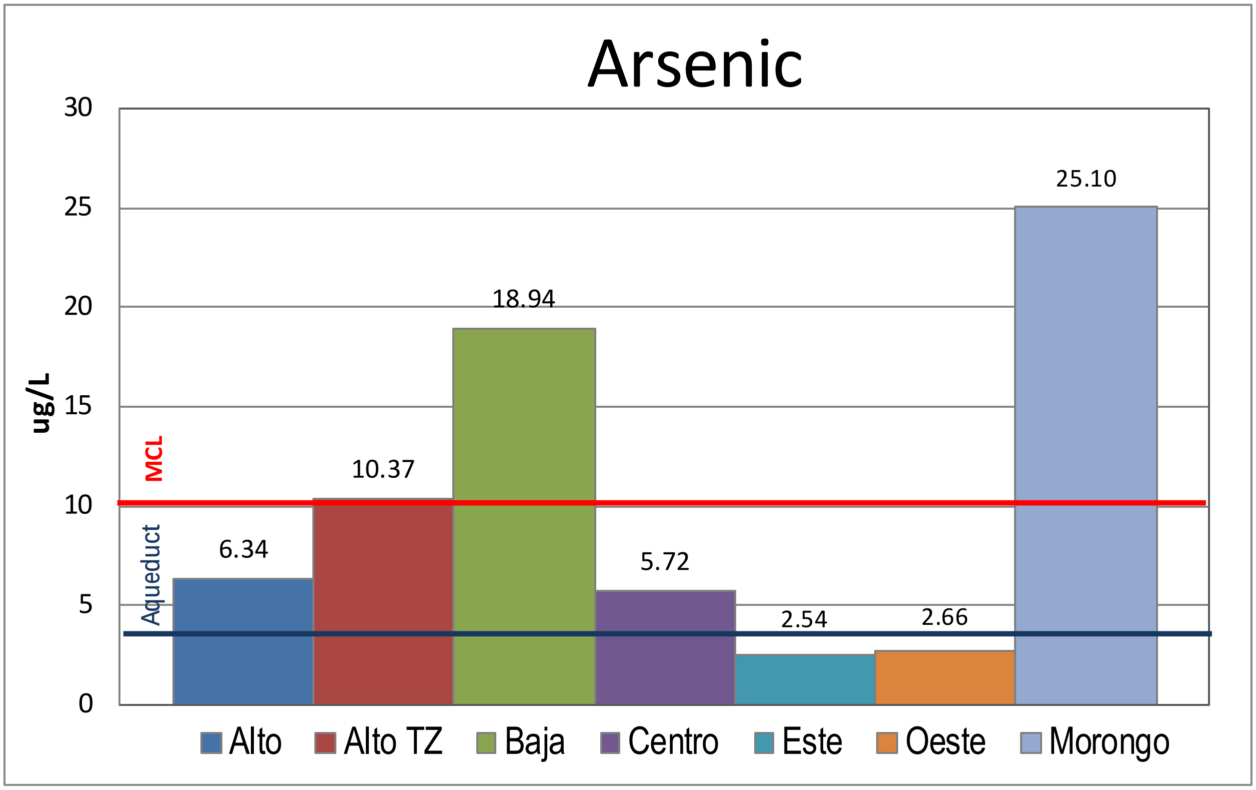
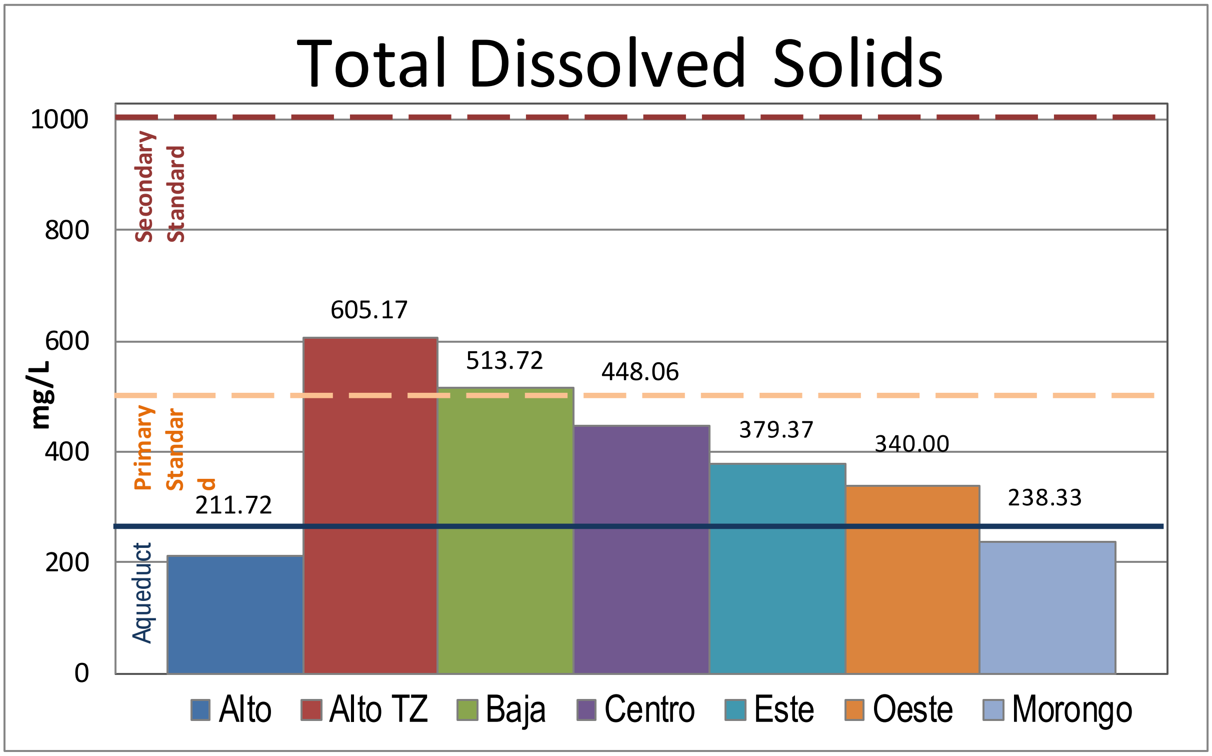


FIGURE 5-6
TDS[12]



5.4 Groundwater Protection

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high quality supply. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other agencies that have local or regional authority or programs. To increase its groundwater protection activities, MWA has been taking the following actions as presented below.

5.4.1 Water Quality Monitoring

Water quality sampling has been performed continuously in the Mojave Service Area since the early 1900's. As a result, an extensive body of water quality data is available. The 2007 Groundwater Analysis (2007 Schlumberger) highlighted the many strengths and weaknesses of these data.

The frequency and spatial distribution of historic groundwater sampling in the region by multiple entities has been highly variable in response to funding cycles, changes in responsibility, and short term or localized priorities. As a result, although adequate field and laboratory practices were generally maintained, the existing body of data lacks the consistency and some of the key elements of information required for more sophisticated modeling at a regional scale using currently available state-of-the-art tools and techniques. However, the available data is diverse, widely distributed, of reasonable quality, and therefore suitable for qualitative and limited quantitative regional modeling as performed in the 2007 Groundwater Analysis project.

Notwithstanding the above, as a result of the 2007 Groundwater Analysis project, it was possible to make a number of recommendations for future actions;

- Responsibility – Many agencies currently have partial and overlapping jurisdiction over water quality sampling and database management. However, no one agency is charged with maintenance of a single consistent water quality database. There are drawbacks to this situation from a historical perspective. Unless some deliberate action is taken it is reasonable to expect this condition to persist into the future.

- Water Quality Data – The 2007 Groundwater Analysis project highlighted deficiencies in the available data, particularly with respect to depth specific sampling. More comprehensive regional monitoring programs will allow better resource management in the future. More frequent and depth specific sampling, as well as wider distribution of monitoring wells is needed. Expanded monitoring programs may require more sophisticated field procedures and/or permanent monitoring installations, both of which tend to increase data acquisition cost. It is strongly recommended that further modeling efforts be utilized to optimize design and planning of future data acquisition campaigns.

- Project Specific Monitoring – The water quality planning model was used to estimate the future impact of various management actions. This analysis showed, for example, that the Regional Recharge and Recovery Project, known as "R^3," (described in Chapter 3 previously) has a favorable moderate overall impact on water quality. It is recommended that an optimized water quality monitoring program be conducted in conjunction with the R^3 program implementation. The results may be used to improve future predictions.

- Future Modeling Requirements – The data from MWA's monitoring program, used to initiate the database was complete and consistent with respect to geo-referencing, constituents, quality indicators, etc. However, some of the older data gathered and archived over several decades by various other agencies lacks the information required to verify sample integrity, location, or depth. This may be due to the original sampling and analysis procedures, or the data lost in the archival process. However, as a result of MWA's continuing monitoring program the overall consistency of the database will improve over time. With given detailed localized analysis of the available data, more sophisticated modeling should be possible at a local, project specific, scale.

5.4.2 Recharge Site Management Activities

Currently, MWA only considers recharge in areas where the groundwater quality is not impaired or known to have any constituents of concern. Because MWA does not currently own any retail water production wells, it cannot control where the retail water purveyors locate their production wells. However, if a retailer chooses to locate a production well near or in an area with impaired groundwater quality, then the retailer is responsible for treating or correcting the constituent causing the concern.

Uncertainty surrounding the overall long-term effects of human influences on the TDS levels in closed basins such as the Mojave Basin has drawn a great deal of attention in recent years. The concept of assimilative capacity has been developed to represent the remaining capability of a system at a point in time to assimilate input of a foreign or toxic substance before a given threshold is reached. The threshold is generally related to some health standard.

Although no formal definition of assimilative capacity for TDS has been found, for the purpose of this Plan an ad-hoc definition has been adopted as “the ability of the surface and groundwater system to sustain long-term influx of TDS from internal and external anthropogenic (human) sources.”

The TDS load in a basin at any point in time is a function of an initial water quality plus the cumulative sum of all TDS sources and sinks during the study period. The 2007 Schlumberger Report concludes that model findings would suggest that the MWA basin(s) assimilative capacity may be managed through monitoring, modeling and management actions.

5.4.3 Hazardous Materials Response

Currently, local and county hazardous materials teams handle responses to hazardous materials incidents. Increased coordination between MWA and hazardous materials teams will allow for assessment of the potential for chemical spills to impact groundwater and recharge sites.

The Lahontan Regional Water Quality Control Board (RWQCB) has worked with MWA in the past to share data and help assess situations where contamination may affect water wells. MWA has and will assist regulatory agencies as needed, while regulatory agencies have relied on MWA as a data repository or utilized some of MWA’s monitoring network in the past.

5.5 Water Quality Impacts On Reliability

5.5.1 Groundwater

The quality of water dictates numerous management strategies a water purveyor will implement, including, but not limited to, the selection of raw water sources, treatment alternatives, blending options, and modifications to existing treatment facilities. Maintaining and utilizing high quality sources of water simplifies management strategies by increasing water supply alternatives, water supply reliability, and decreasing the cost of treatment. Maintaining high quality source water allows for efficient management of water resources by minimizing costs.

Maintaining the quality of water supplies increases the reliability of each source by ensuring that deliveries are not interrupted due to water quality concerns. A direct result from the degradation of a water supply source is increased treatment cost before consumption. The poorer the quality of the source water, the greater the treatment cost. Groundwater may degrade in quality to the point that is not economically feasible for treatment. In this scenario the degraded source water is taken off-line. This in turn can decrease water supply reliability by potentially decreasing the total supply and increasing demands on alternative water supplies.

Currently, water quality does not materially affect water supply reliability in the region. Maintaining the current level of quality is vital to maintaining a reliable water supply. Some small areas have undesirable local concentrations of some constituents for which wellhead treatment or an alternative water supply has been identified as a remedial action.

Limiting migration of poor quality water is an objective of the MWA. A goal of the MWA’s regional monitoring program is to detect long-term changes in groundwater quality. This includes migration of poor quality water. By understanding the occurrence and movement of poor quality groundwater, management actions can be taken to avoid these areas and/or limit migration of poorer quality water into regions of higher quality water. Monitoring along with water management actions will help maintain and increase long-term water supply reliability.

One of the ways limiting migration has been addressed is through the installation of multi-level monitoring wells to facilitate water quality sampling and wellhead monitoring at discreet levels within the well. This technique has been used successfully to identify the source of arsenic and other constituents of concern, often found in deeper aquifer zones, to ensure that new wells being constructed do not facilitate the migration of poor quality water into high quality water within a well column. This information has been particularly critical to development of new production wells to serve the R^3 Project and identifying the source of known arsenic in groundwater in Hesperia and southern Apple Valley.

Section 6: Reliability Planning

6.1 Overview

The Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the next twenty years in five year increments. The Act also requires an assessment for a single-dry year and multiple-dry years. This chapter presents the reliability assessment for Mojave Water Agency's (MWA's) service area.

As stated in MWA's *2004 Regional Water Management Plan*, the general goal of MWA's groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high quality supply. This Plan helps MWA to achieve this goal even during dry periods based on a conservative water supply and demand assumptions over the next 25 years, as discussed in the following sections.

6.2 Reliability of Water Supplies

Each water supply source has its own reliability characteristics. In any given year, the variability in weather patterns around the state may affect the availability of supplies to the MWA's service area differently. For example, from 2000 through 2002, southern California experienced dry conditions in all three years. During the same period, northern California experienced one dry year and two average years. MWA's service area is typical in terms of water management in southern California; local groundwater supplies are used to a greater extent when imported supplies are less available due to dry conditions in the north, and larger amounts of imported water supplies are used during periods when northern California has wetter conditions. This pattern of "conjunctive use" has been in effect since State Water Project (SWP) supplies first came to the MWA's service area in 1978. SWP supplies have supplemented the overall supply of the MWA service area, which previously depended solely on local groundwater supplies.

To supplement these local groundwater supplies, MWA contracted with the California Department of Water Resources (DWR) for delivery of SWP water, providing an imported water supply to the groundwater basins. However, the variability in SWP supplies affects the ability of the Agency to meet the overall water supply needs for the service area. While each of the groundwater basin's available supply sources have some variability, the variability in SWP supplies has the largest effect on overall supply reliability.

As discussed in Section 3.2, each SWP contractor's Water Supply Contract contains a Table A amount that identifies the maximum amount of water that the contractor may request. However, the amount of SWP water actually allocated to contractors each year is dependent on a number of factors than can vary significantly from year to year. The primary factors affecting SWP supply availability include hydrologic conditions in northern California, the amount of water in SWP storage reservoirs at the beginning of the year, regulatory and operational constraints, and the total amount of water requested by the contractors. The availability of SWP supplies to MWA and the other SWP contractors is generally less than their full Table A amounts in many years and can be significantly less in very dry years.

DWR's "State Water Project Delivery Reliability Report 2009" (2009 SWP Reliability Report), issued in August 2010, assists SWP contractors in assessing the reliability of the SWP component of their overall supplies. The Report updates DWR's estimate of the current (2009) and future (2029) water delivery reliability of the SWP. The updated analysis shows that the primary component of the annual SWP deliveries (referred to as Table A deliveries) will be less under current and future conditions, when compared to the preceding report (SWP Delivery Reliability Report 2007).

In the 2009 Report, DWR presents the results of its analysis of the reliability of SWP supplies, based on model studies of SWP operations. In general, DWR model studies show the anticipated amount of SWP supply that would be available for a given SWP water demand, given an assumed set of physical facilities and operating constraints, based on 82 years of historic hydrology. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints. In these model studies, DWR assumed existing SWP facilities and operating constraints for both the 2009 and 2029 studies. The primary differences between the two studies are an increase in projected SWP contractor demands and an increase in projected upstream demands (which affects SWP supplies by reducing the amount of inflows available for the SWP). DWR presents the anticipated future SWP delivery reliability resulting from these studies as a percent of full contractor Table A amounts, which is 60 percent of Table A as the long-term average supply. DWR also prepared Deliver Reliability Reports (DRRs) for individual SWP contractors, with MWA's reliability projected to be 60% until 2029, and then 61 percent in 2029 and after.

The 2009 SWP Reliability Report also includes analyses of various SWP operational restrictions that took effect in 2008 and 2009 due to various court rulings regarding federal biological opinions. The overall result has been "erosion of the SWP to deliver water." The Report identifies several emerging factors related to these court rulings that have the potential to affect the availability and reliability of SWP supplies. Although the 2009 Report presents an extremely conservative projection of SWP delivery reliability, particularly in light of events occurring since its release, it remains the best available information concerning the SWP. A detailed legal analysis of these factors is attached as Appendix F.

6.3 Average, Single-Dry, and Multiple-Dry Year Planning

As discussed previously in Chapter 3, the MWA has five sources of water supply – SWP imported water, natural surface water flow, "agricultural depletion from storage", return flow from pumped groundwater not consumptively used, and wastewater imports from outside the MWA service area. What is unusual about MWA is that almost all of the water use within MWA is supplied by pumped groundwater. Native surface supply and SWP imports recharge the groundwater basins and are not supplied directly to any retailers, with the exception of two power plants.

These supplies are available to meet demands during average, single-dry, and multiple-dry years. The following sections elaborate on the different supplies available to MWA during each of the various dry year conditions and what supplies can be expected. Included in the return flow supply is the recycled water used within MWA's service area. Each subsection will explain the criteria used for estimating single-dry and multiple dry supplies that are then used in the comparison tables in Section 6.4.

6.3.1 Wholesale Imported State Water Project Supply

For this Plan, the availability of SWP supplies to MWA was estimated by multiplying MWA's Table A amount (82,800 acre-feet per year (afy) in 2010 and 89,800 in 2030) by the delivery percentages from DWR's 2009 SWP Reliability Report, discussed below. The three hydrologic conditions required to be evaluated for all UWMPs include:

1) an average year condition,
2) a single-dry year condition, and
3) a multiple-dry year condition,

The delivery percentages used for SWP imported water for each of the above conditions were taken from DWR's 2009 Report based on the 82-year average, 1977, and the 1931-1934 average, for the average year, single-dry year, and multiple-dry year conditions, respectively. The delivery percentages are detailed in Table 6-1 for MWA.

TABLE 6-1
WHOLESALE SUPPLY RELIABILITY:
SINGLE-DRY YEAR AND MULTIPLE-DRY YEAR CONDITIONS

Wholesaler[(a)]	Average Year[(b)]	Single-Dry Year[(c)]	Multiple-Dry Year[(d)]
California State Water Project (SWP)			
2010			
% of Table A Amount Available	60%	7%	34%
Anticipated Deliveries (afy)	49,680	5,796	28,152
2030			
% of Table A Amount Available[(e)]	61%	11%	35%
Anticipated Deliveries (afy)	54,778	9,878	31,430

Notes:
(a) The percentages of Table A amount projected to be available are taken from Table 6.4 and 6.13 of DWR's State Water Project Delivery Reliability Report 2009 (August 2010). Supplies are calculated by multiplying MWA's Table A amount of 82,800 af (2010) or 89,800 af (2030) by these percentages.
(b) Assumes 60% of Table A amount as the long-term supply until 2029 and then assume 61% in 2029 and after, based on the California Department of Water Resources 2009 contractor Delivery Reliability Report for MWA
(c) Based on the worst case historic single dry year of 1977.
(d) Supplies shown are annual averages over four consecutive dry years, based on the worst-case historic four-year drought of 1931-1934.
(e) See Table 6.13 in DWR's SWP 2009 Report. Table A amount is 89,800 afy.

The DWR analyses projected that the SWP deliveries during multiple-dry year periods could average about 34 to 35 percent of Table A amounts and could drop as low as 7 to 11 percent during an unusually dry single year. Table 6-1 summarizes the estimated SWP supply availability in a single dry year (based on a repeat of the worst-case historic hydrologic conditions of 1977) and over a multiple dry year period (based on a repeat of the worst-case historic four-year drought of 1931-1934). During a single-dry or critical year in 2010, as defined by the Sacramento River Index, the SWP will be able to supply an average of 5,796 acre-feet (af) to MWA. Similarly in 2010, during a multiple-dry year period (1931-1934), MWA's SWP supply is estimated at 28,152 afy.

The values shown in Table 6-1 cover the period 2009 – 2029 based on the DWR estimates at the 2009 level for the current conditions and at the 2029 level for future conditions. Therefore, in for a single-dry or critical year in 2035, the SWP will be able to supply an average of 9,878 af to MWA. Similarly in 2035, during a multiple-dry year period, MWA's SWP supply is estimated at 31,430 afy.

Although the 2009 Report presents an extremely conservative projection of SWP delivery reliability, particularly in light of events occurring since its release, because it is based on the most up-to-date modeling by DWR, it remains the best available information concerning the SWP for use in preparing this Plan.

6.3.2 Local Supplies

The MWA local water supplies are each discussed below with an explanation of how the estimates by supply source were derived for average, single-dry and multiple-dry year periods.

6.3.2.1 Net Natural Supply

MWA has an average natural supply of 54,045 afy, including surface and subsurface water flows to the five subareas in the Mojave Basin area and to the Morongo Area, as shown in Table 3-1. Because the definition of the net natural supply is long-term natural supply estimates, the supplies are going to remain constant regardless of any annual changes in hydrology. Annual fluctuations in natural surface flows do not impact the long-term sustainability of the groundwater basins; therefore, the supply is assumed to be 100 percent available in single-dry year and multiple-dry year conditions.

6.3.2.2 Agricultural Depletion from Storage

As previously discussed in Section 3.3, agricultural production in excess of natural yield is still occurring in the Baja Subarea. The overproduction is not offset by Replacement Water purchases of imported SWP supply. The overproduction results in depletion of groundwater in storage. Therefore, the MWA demand forecast model considers water consumptively used by agriculture in Baja as supply derived from storage depletion. Please refer to Section 3.3.2 for a description of Agriculture Depletion from Storage.

The source of this supply originates as groundwater in the Mojave River Basin and is a function of agricultural groundwater production. Therefore, in both single-dry year and multiple-dry year conditions, this "depletion from storage" is assumed to occur 100 percent of the time.

6.3.2.3 Return Flow

As previously discussed in Section 3.3, the return flow is supplied from pumped groundwater not consumptively used, so while the primary source is groundwater, the return flow also includes any wastewater treated effluent discharged into the basin and recycled water as discussed in the subsection below.

In both dry year conditions: single-dry year and multiple-dry year, the return flow supply is assumed to remain 100 percent available because return flow is a direct function of water demands, which tend to increase rather than decrease, during periods of dry weather.

Recycled Water

Recycled water is available from a number of agencies within the MWA service area. Since recycled water is produced from wastewater, this source has the advantage of consistently being available during any type of single-dry, or multiple-dry year. The water agencies and cities planning recycled water facilities as discussed in Chapter 4 of this Plan.

Even though MWA currently has no rights to any of the recycled water, the regional water supply balance still benefits from recycled water supplies because the groundwater basin is a closed system. While 2009 production of recycled water from waste water treatment plants totaled approximately 22,068 afy (19.7 MGD), within MWA's service area, the majority of this is currently recharged to the groundwater basins. In Table 3-1, the recycled water supply is included in the return flow, as it is in the MWA demand forecast model.

In this Plan, because of the consistency advantage with recycled water, 100 percent of the existing supply of recycled water is assumed to be available, which is 22,068 afy in an average year, a single-dry year, and in each year of a multiple-dry year period. As shown in Table 4-10, the supply of recycled water is projected to increase to a total of 67,885 afy (60.6 MGD) by 2035. Similar to the existing recycled water supply, 100 percent of the 67,885 afy of planned recycled water supply is assumed to be available in an average year, a single-dry year, and in each year of a multiple-dry year period.

6.3.2.4 Local Supply Summary - Groundwater

The sum of the natural surface water flows, agricultural depletion from groundwater storage, and return flow from pumped groundwater not consumptively used is the total local supplies for MWA. Therefore, the total local supply added to the SWP imported supply is the combined total required Mojave Basin Area and the Morongo Area.

Total groundwater supplies (as shown in Table 3-6) from the Mojave Basin Area are projected to be 140,000 to 190,000 acre-feet per year (afy) in average years and in dry years due to the adjudication of the basin, which include SWP deliveries. However, as shown in Table 3-8, the net average yield from the Mojave Basin Area is projected to be approximately 51,925 afy in average and dry years. Supplies from the Morongo Area are projected to be approximately 2,120 afy in average years and in dry years. The projected groundwater supplies used in this Plan are generally the midpoints of the ranges mentioned above.

6.3.3 Banked Groundwater Storage

Since 2006, MWA has created its own conjunctive use program to take advantage of the fact that the available MWA SWP supply on average is still greater than the demand in the service area so MWA has been able to store the water in various groundwater basins for future use when SWP supplies are not available or there are groundwater shortages.

During normal and wet years, MWA delivers SWP water in excess of local demands and stores the surpluses as a part of the groundwater storage program. During dry years when SWP supplies are not sufficient to meet demands, MWA debits from banked supplies to meet demands. Some retail water agencies also have banked storage accounts which they may choose to draw from during any year, regardless of weather conditions. Table 3-13 in Chapter 3 shows the storage available as of January 5, 2011, in MWA's existing banked accounts by subarea. The individual retailers' banked storage accounts are included in a separate column in that table. Currently, MWA has 103,539 af of banked groundwater for future use. Retailers of MWA have a total of 45,997 af.

6.3.4 Additional Planned Banking

MWA's 2004 Regional Water Management Plan identifies a need for Supply enhancement projects to address the problem of groundwater overdraft and future growth/water demand. As presented in Section 3.6, the planned supply projects currently underway will provide a total supply of 29,000 afy by 2015 and 54,000 afy by 2020.

For single-dry and multiple-dry year conditions, it will be MWA's decision on how much to withdraw from available banks.

6.4 Supply And Demand Comparisons

The available supplies and water demands for MWA's service area were analyzed to assess the region's ability to satisfy demands during three scenarios: an average water year, single-dry year, and multiple-dry years. The tables in this Section present the supplies and demands for the various drought scenarios for the projected planning period of 2010-2035 in five year increments. Table 6-2 presents the base years for the development of water year data. Tables 6-3, 6-4, and 6-5 at the end of this Section summarize, respectively, Average Water Year, Single-Dry Water Year, and Multiple-Dry Year supplies.

TABLE 6-2
BASIS OF WATER YEAR DATA

Water Year Type	Base Years	Historical Sequence
Average Water Year	Average	1922-2003
Single-Dry Water Year	1977	--
Multiple-Dry Water Years	1931-1934	--

6.4.1 Average Water Year

Table 6-3 summarizes MWA's water supplies available to meet demands over the 20-year planning period during an average/normal year. For SWP supplies it is 60 percent of Table A as the long-term average supply until 2029, and then 61 percent in 2029 and after. As presented in the table, MWA's water supply is broken down into existing and planned water supply sources, including wholesale (imported) water, local supplies, and planned recharge programs.

6.4.2 Single-Dry Year

The water supplies and demands for MWA's service area over the 20-year planning period were analyzed in the event that a single-dry year occurs, similar to the drought that occurred in California in 1977. During a single-dry year, SWP availability is anticipated to be reduced to 7 percent in 2009 and 11 percent in 2029. Table 6-4 summarizes the existing and planned supplies available to meet demands during a single-dry year. Demand during dry years was assumed to increase by 10 percent due to increased irrigation needs.

6.4.3 Multiple-Dry Year

The water supplies and demands for MWA's service area over the 20-year planning period were analyzed in the event that a four-year multiple-dry year event occurs, similar to the drought that occurred during the years 1931 to 1934. During multiple-dry years, SWP availability is anticipated to be reduced to 34 percent in 2009 and 35 percent in 2029. Table 6-5 summarizes the existing and planned supplies available to meet demands during multiple-dry years. Demand during dry years was assumed to increase by 10 percent.

6.4.4 Summary of Comparisons

As shown in the analyses above, MWA has adequate supplies to meet demands during average, single-dry, and multiple-dry years throughout the 20-year planning period.

TABLE 6-3
PROJECTED AVERAGE/NORMAL YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Wholesale (Imported)						
SWP[a]	49,680	51,480	53,880	53,880	54,778	54,778
Local Supplies[a]						
Net Natural Supply	54,045	54,045	54,045	54,045	54,045	54,045
Agricultural Depletion from Storage	10,425	10,425	10,425	10,425	10,425	10,425
Return Flow	62,220	67,766	71,353	76,862	82,364	87,857
Wastewater Import	5,304	5,397	5,491	5,789	6,087	6,385
Recharge Banking Projects[a,b]	0	0	0	0	0	0
Total Existing Supplies	**181,674**	**189,113**	**195,194**	**201,001**	**207,698**	**213,490**
Total Estimated Demands[c]	***151,885***	***163,161***	***170,496***	***181,740***	***192,969***	***204,181***

Notes:
(a) Taken from Chapter 3 Water Resources, Table 3-1.
(b) Not needed during average/normal years.
(c) See Chapter 2 Water Use, Table 2-3, assuming "moderate" conservation.

TABLE 6-4
PROJECTED SINGLE-DRY YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Wholesale (Imported)						
SWP[(a)]	5,796	6,006	6,286	6,286	9,878	9,878
Local Supplies[(b,c)]						
Net Natural Supply	54,045	54,045	54,045	54,045	54,045	54,045
Agricultural Depletion from Storage	10,425	10,425	10,425	10,425	10,425	10,425
Return Flow	62,220	67,766	71,353	76,862	82,364	87,857
Wastewater Import	5,304	5,397	5,491	5,789	6,087	6,385
Recharge Banking Projects[(b,d)]	29,284	35,838	39,946	46,507	49,467	56,009
Total Supplies	**167,074**	**179,477**	**187,546**	**199,914**	**212,266**	**224,599**
Total Estimated Demands[(e)]	***167,074***	***179,477***	***187,546***	***199,914***	***212,266***	***224,599***

Notes:

(a) SWP supplies are calculated by multiplying MWA's Table A amount by percentages of single dry deliveries projected to be available for the worst case single dry year of 1977 (7% in 2009 and 11% in 2029), taken from Tables 6.40 and 6.13 of DWR's 2009 SWP Reliability Report.

(b) Taken from Chapter 3 Water Resources, Table 3-1.

(c) Assumed 100% available during single-dry year. Refer to Section 6.3.2.

(d) This does not include any retailers' stored water. Amount is assumed to be equal to meet necessary demand after all other supplies are taken into account.

(e) See Chapter 2 Water Use, Table 2-3, assuming "moderate" conservation. Also assumes increase in total demand of 10 percent during dry years.

TABLE 6-5
PROJECTED MULTIPLE-DRY YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies[(a)]						
Wholesale (Imported)						
SWP[(b)]	28,152	29,172	30,532	30,532	31,430	31,430
Local Supplies[(c,d)]						
Net Natural Supply	54,045	54,045	54,045	54,045	54,045	54,045
Agricultural Depletion from Storage	10,425	10,425	10,425	10,425	10,425	10,425
Return Flow	62,220	67,766	71,353	76,862	82,364	87,857
Wastewater Import	5,304	5,397	5,491	5,789	6,087	6,385
Recharge Banking Projects[(c,e)]	6,928	12,672	15,700	22,261	27,915	34,457
Total Supplies	**167,074**	**179,477**	**187,546**	**199,914**	**212,266**	**224,599**
Total Estimated Demands[(g)]	***167,074***	***179,477***	***187,546***	***199,914***	***212,266***	***224,599***

Notes:

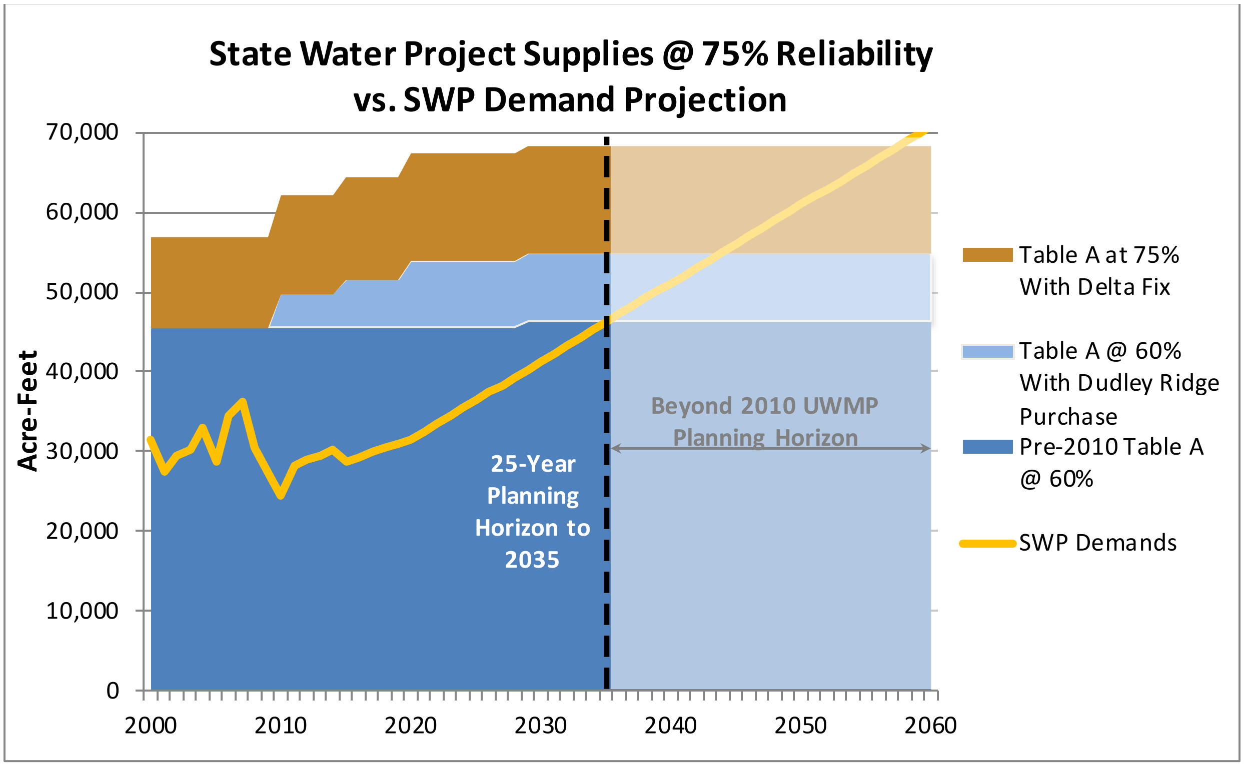
(a) Supplies shown are annual averages over four consecutive dry years (unless otherwise noted).
(b) SWP supplies are calculated by multiplying MWA's Table A amount by percentages of single-dry deliveries projected to be available for the worst case four-year drought of 1931-1934 (34% in 2009 and 35% in 2030), taken from Tables 6.4 and 6.13 of DWR's 2009 SWP Reliability Report.
(c) Taken from Chapter 3 Water Resources, Table 3-1.
(d) Assumed 100% available during multiple-dry year. Refer to Section 6.3.2.
(e) This does not include any retailers' stored water. Amount is assumed to be equal to meet necessary demand after all other supplies are taken into account.
(f) Assumed 25% available during multiple-dry year. Based on total amount of storage available divided by 4 (4-year dry period). Planned Supplies are conjunctive use supply.
(g) Chapter 2 Water Use, Table 2-3, assuming "moderate" conservation. Also assumes increase in total demand of 10 percent during dry years.

6.4.5 Potential Future SWP Supplies

An ongoing planning effort to increase long-term supply reliability for both the SWP and Central Valley Project (CVP) is taking place through the Bay Delta Conservation Plan (BDCP). The co-equal goals of the BDCP are to improve water supply and restore habitat in the Delta. The BDCP is being prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties. Several "isolated conveyance system" alternatives are being considered in the plan which would divert water from the North Delta to the South Delta where water is pumped into the south-of-Delta stretches of the SWP and CVP. The new conveyance facilities would allow for greater flexibility in balancing the needs of the estuary with reliable water supplies. In December 2010, DWR released a "Highlights of the BDCP" document which summarizes the activities and expected outcomes of the BDCP. The results of preliminary analysis included in the document indicate the proposed conveyance facilities may increase the combined average long-term water supply to the SWP and CVP from 4.7 million acre-feet (MAF) per year to 5.9 MAF/year. This would represent an increase in reliability for State Water Project contractors from 60 percent to 75 percent. Planned completion of the BDCP and corresponding environmental analysis is early-2013.

Figure 6-1 presents a visual display of how MWA's Table A amount will be able to meet various demand estimates using long-term average trends in SWP supply.

FIGURE 6-1
SWP SUPPLY VS. SWP DEMAND



Section 7: Water Demand Management Measures

7.1 Overview

In 2006 Mojave Water Agency (MWA) became a signatory to the Memorandum of Understanding Regarding Water Conservation in California (MOU) of the California Urban Water Conservation Council (CUWCC) and is firmly committed to the implementation of the Best Management Practices (BMPs) or Demand Management Measures (DMMs). The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, MWA agreed to implement a series of locally cost-effective conservation methods in the MWA service area through cooperation with, and participation of, the retail water purveyors.

Those signing the CUWCC MOU have pledged to develop and implement fourteen comprehensive conservation BMPs. The MOU was compiled with two primary purposes: to expedite implementation of reasonable water conservation measures in urban areas; and, to establish assumptions for use in calculating estimates of reliable future water conservation savings resulting from proven and reasonable conservation measures.

The MOU and BMPs were revised by the CUWCC in 2008. The revised BMPs now contain a category of "Foundational BMPs" that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs). These revisions are reflected in the reporting database starting with reporting year 2009.

The new category of foundational BMPs is a significant shift in the revised MOU. For MWA and other wholesalers these changes do not represent a substantive shift in requirements.

7.2 Conservation Program Background

MWA is a wholesale water agency serving ten (10) retail water purveyors that are required to complete an 2010 Urban Water Management Plan (UWMP) due to having more than 3,000 connections or delivering more than 3,000 acre-feet per year (afy). MWA and these ten retailers are therefore subject to the Urban Water Management Planning Act, AB 1420 and SBX7-7 requirements, in addition to the commitment of compliance with the BMPs as a signatory to the MOU. In the MWA service area, demand management is addressed both at the local (retail agency) and wholesale level.

MWA first started addressing and quantifying conservation goals in its 2004 Regional Water Management Plan (RWMP), which called for a reduction in the water consumption by ten percent in the Mojave River Basin and five percent in the Morongo Area by the year 2020. The conservation priorities identified in the Plan were based on the CUWCC's 14 BMPs.

In August of 2003, local stakeholders decided that a united regional water conservation program was needed and the Alliance for Water Awareness and Conservation (AWAC) was formed. Among other things, AWAC expanded the conservation goals identified in the RWMP to 20 percent by 2020 for the Mojave Basin Area and 5 percent by 2015 for the Morongo Area; this goal was adopted by MWA in 2006 and supersedes the RWMP goal. The AWAC goal is a locally determined baseline and savings reduction target that predates the adoption of SBX7-7 and therefore is not intended to be consistent with the new requirement, although they may be complimentary.

According to the enabling MOU, the purpose of the AWAC is to "provide a vehicle to attract support for a regional water conservation program and coordinate implementation of activities by forming partnerships to obtain common, measurable goals." AWAC set three goals that aim to change water-use habits and empower High Desert communities with the tools to ensure adequate supplies of water for future generations:

1. Educate the local communities with the understanding of the importance of water conservation;
2. Provide the local communities with the tools to effectively reduce per capita consumption to targeted goals; and,
3. Reduce regional water use by 10 percent gross per capita by 2010 and 20 percent gross per capita by 2020 (5 percent in the Morongo Area by 2015) to achieve a sustainable, reliable supply to meet regional water demands.

In addition to its participation in the AWAC, MWA has signed MOUs with a number of local education centers, special districts and other agencies to create greater awareness about the need to manage and conserve water resources. These collaborations include: Lewis Center for Educational Research, Mojave Desert Resource Conservation District, Mojave Weed Management Area, Copper Mountain College, Barstow Community College and the Victor Valley Community College.

As the water wholesaler for the region, MWA is responsible for the implementation only of a subset of the BMPs. To date, four of the retail agencies within MWA have independently signed the MOU. In response, MWA has taken a leadership role in the implementation and support of a number of the BMPs that that extend beyond the MOU's wholesaler responsibilities.

Table 7-1 provides a summary of MWA's status in implementing the BMP requirements. The reporting forms have been submitted to the CUWCC and are included in Appendix J. MWA is implementing all of the BMPs applicable to wholesale water suppliers.[17]

[17] Water Loss Control and the AWWA M36 process are not applicable to MWA's operations; this is discussed further in Section 7.3.3.

TABLE 7-1
BMP STATUS

BMP	Status
Water Loss Control	N/A
Public Information	✓
School Education	✓
Wholesale Agency Programs	*
Conservation Coordinator	✓

* CUWCC doesn't provide coverage report.

The following sections provide more detail on MWA's conservation programs and compliance with the BMPs.

7.3 Utility Operations

7.3.1 Water Conservation Coordinator

MWA has a two full-time staff that work exclusively on developing and implementing water conservation (WC) programs.

7.3.2 Wholesale Agency Assistance Programs

MWA provides both technical and financial assistance to the retail agencies for implementing conservation programs and strategies. MWA works with water agencies and cities individually, collectively and through AWAC to provide conservation support. Table 7-2 shows the number of retailers participating in the various MWA programs.

MWA provides the following support to its retailers, individually or through AWAC:

- Free conservation devices: faucet aerators, showerheads, and hose nozzles
- Washing machine rebates: $175 each
- Residential High Efficiency Toilet (HET) rebates: up to $165 each
- Small to large landscape rebates: $0.50 per ft^2 of turf converted to desert adaptive landscaping with 25 percent canopy coverage
- Public Information and Education Programs

MWA is also developing a program to provide technical support to its retailers for addressing the new American Water Works Association (AWWA) requirements for System Water Audit BMP implementation.

TABLE 7-2
MWA ASSISTANCE PROGRAMS

Program Activities	Number of Agencies Assisted per Year			
	2007	2008	2009	2010
Landscape Programs	N/A	14	14	14
Residential Retrofit	27	28	28	29
Washing Machines	N/A	20	20	20
Public Information	27	28	28	29
School Education	27	28	28	29
Water Waste	2	4	5	5
WC Coordinator	27	28	28	29
HET Replacements	N/A	21	23	23

7.3.3 Water Loss Control

This requirement is not applicable because MWA does not own or operate a distribution system. The water received from the State Water Project goes directly into groundwater recharge without treatment or distribution. MWA is planning the Regional Recharge and Recovery Project, known as "R^3," which is a conjunctive use project that stores SWP water underground in the local aquifer and later recovers and distributes the water to local retail water purveyors. Once the first phase of "R^3" is complete, scheduled for 2012, then MWA will own a distribution system and this requirement will need to be considered again.

7.4 Education

7.4.1 Public Information Programs

Public information programs that promote efficient water use are implemented throughout the service area. MWA works in conjunction with AWAC to provide outreach, educational and informational materials and literature; public service announcements and paid advertisements; flyers and bill inserts for retailers; conservation website; and articles in newsletters, Chamber of Commerce publications and regional newspapers (Table 7-3). Additionally, MWA assists in hosting and staffing workshops on conservation, sponsors and hosts public events and booths at community functions, and works with retailers to further their conservation goals through special projects based on their individual needs.

TABLE 7-3
PUBLIC INFORMATION EVENTS

Activity	Number Of Events 2006	2007	2008	2009	2010
Paid Advertising			9	4	25
Public Service Announcement			600	250	250
Bill Insert/ Newsletter/Brochure			25	25	10
Demonstration Garden	4	5	5	6	7
Special/Media Events			14	16	10
Speaker's Bureau			15	9	4

7.4.2 School Education Programs

School education programs are run by the retailers with MWA's support. MWA provides literature, staff support and in-kind services through funding for, and participation in, teacher training workshops known as "Project Wet". These training courses on water education curriculum are done in collaboration with the retailers and the Mojave Environmental Education Consortium (MEEC).

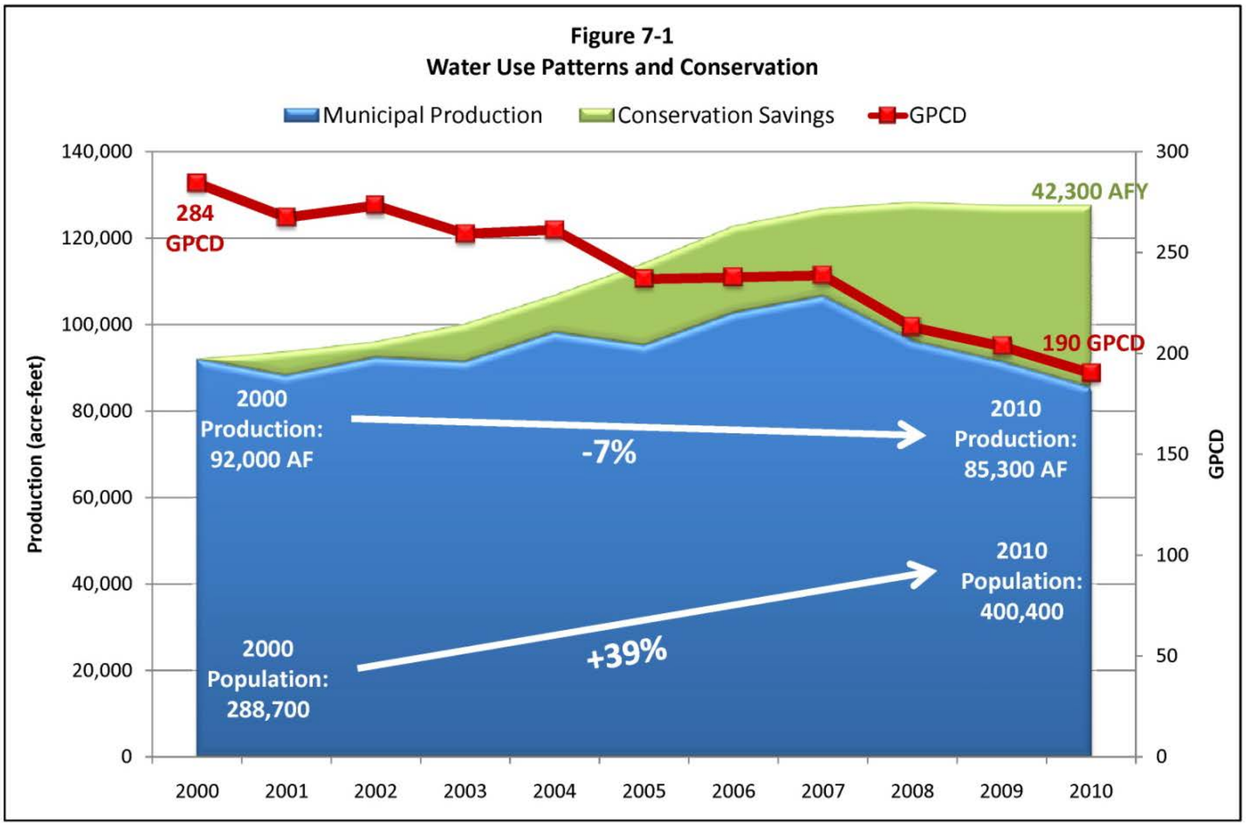
7.5 Program Results

Conservation is a crucial element of MWA's water supply management program and therefore tracking the savings from conservation activities is an integral and evolving element of the program. Water savings are achieved through a combination of active (programmatic) and passive (foundational) programs. Active programs include incentives, conversions and retrofits and typically are measurable and quantifiable. Passive savings are a result of activities such as outreach, education, regulations and standards — programs which are typically more challenging to quantify. In an attempt to measure program success and inform future planning MWA monitors water use patterns and utilizes an analytic approach based on common assumptions and models.

Water savings indicate that MWA is well on track to meeting its AWAC goals. Since 2000, per capita use has dropped by about 33 percent and since 2004, when the AWAC goals were set, per capita use has dropped by about 27 percent. It is expected that some portion of the recent reduction in use is related to the economic downturn and may show some bounce back as conditions recover, however the larger trend in the service area points to consistent and sustained reductions in per capita use.

Population growth and per-capita municipal production volume data have been tracked and correlated with the implementation of the AWAC regional conservation activities starting in August 2003. Figure 7-1 shows municipal production over time coupled with per capita use and population growth for the Mojave Groundwater Basin. Municipal production has fallen approximately 7 percent or 6,700 acre-feet (af) between 2000 and 2010; at the same time population grew by almost 40 percent. The theoretical savings of 42,300 af represent how much higher use would have been without conservation activities and efficiency standards.

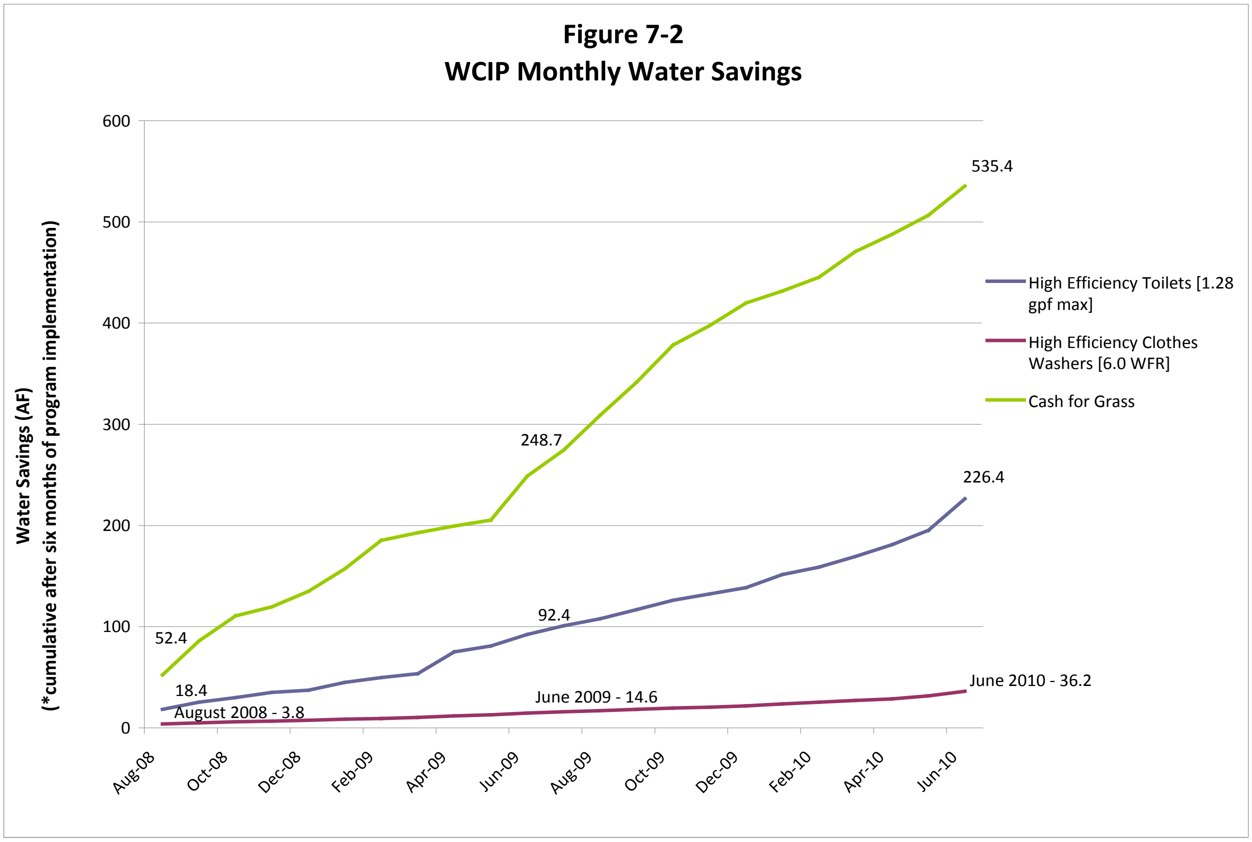
FIGURE 7-1
WATER USE PATTERNS AND CONSERVATION FOR MOJAVE GROUNDWATER BASIN



The savings in Figure 7-1 represent the impacts of both the foundational and active programs. MWA also applies an analytic approach to determine and predict impacts of its programmatic activities. The calculations indicate that water conservation incentive program activities saved about 869 afy since August 2008 (Figure 7-2). The largest portion of the savings is from the turf replacement program (Cash For Grass), followed by toilet and washer replacements.

The savings calculations are based on the fresh water avoided cost approach recommended by the CUWCC. Savings from HETs and High Efficiency Clothes Washers (HECWs) are estimated based on CUWCC water savings studies. Landscape conversion calculations are based on recorded evapotranspiration rates and other regional climatic factors which are used to develop a water savings coefficient that is applied to the number of units or area of landscape converted and rebated.

FIGURE 7-2
SAVINGS FROM CONSERVATION INCENTIVES



7.6 Conclusion

MWA is on track to meeting, and potentially even exceeding, its AWAC water reduction goals with municipal per capita consumption having dropped from 284 to 190 gpcd since 2000. This reduction provides both long-term supply reliability as well as insulation from short-term variations. Through aggressive programs and wholesale planning and collaboration, MWA has succeeded in decoupling population growth and demand from historic patterns. MWA continues to work with its retailers on a voluntary basis through a variety of incentive, outreach, education and support programs.

Section 8: Water Shortage Contingency Planning

8.1 Overview

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought which limits supplies, an earthquake which damages water delivery or storage facilities, a regional power outage, or a toxic spill that affects water quality. This chapter of the Plan describes how Mojave Water Agency (MWA) plans to respond to such emergencies so that emergency needs are met promptly and equitably.

Cities and water agencies within MWA rely on large groundwater reserves to meet potable water supply needs. During previous drought periods, municipal water suppliers continued to draft from these reserves to meet customer needs without imposing restrictions on water use, but at rates exceeding natural replenishment in most areas. The large groundwater basin in the area serves as a reservoir and buffers the impacts of seasonal and year-to-year variations in precipitation and surface water deliveries. The area aquifers are expected to be in balance in the near future due to the combination of water imports, State-mandated conservation requirements, and/or production "ramp-down." During multiple-year droughts or State Water Project outages, the basin will continue to be pumped to meet demands. Actions of the MWA to address water shortages are summarized below.

8.2 Coordinated Planning

The Mojave Water Agency was formed to manage water resources within the Agency's service area. In this capacity, MWA has been planning and implementing projects to increase water supply reliability and prevent future water shortages. MWA is a State Water Project (SWP) contractor and has a contract Table A amount of 82,800 af. This water is diverted from the California Aqueduct and distributed to recharge sites throughout the area to replace groundwater withdrawn by retailers. Deliveries from the SWP are variable and MWA's full Table A amount is not available every year. During dry and multiple dry years, it is expected that SWP deliveries will be significantly reduced.

The Mojave Basin Judgment calls for charging groundwater producers for use above their production allowance and using these funds to import "Replacement Water" from the SWP so that over time extractions come into balance with available supplies. Similar principles are employed in the Warren Valley Basin to achieve long-term balance of supply and demand. Once the basin is in balance it will be less impacted by fluctuations in deliveries of water from the SWP.

For the Morongo Basin/Johnson Valley Area ("Morongo Area"), as previously discussed in Section 3.4.4, there are three water supply agreements that deal with coordinated water supplies throughout the area, including (1) the Warren Valley Basin Agreement, (2) a Stipulated Judgment in a portion of the Ames Valley basin and (3) an agreement for the users of the Morongo Basin Pipeline.

For the non-adjudicated regions in the Morongo Area such as Joshua Basin, Johnson Valley, and the Means Valley, each of these groundwater basins is being coordinated by MWA as well.

Joshua Basin Water District (JBWD) is the retailer using the supply from the Joshua Tree/Copper Mountain Valley Region and is currently about to begin construction on recharge basins that will supply SWP water to the groundwater basins so the current overdraft conditions can be lessened. For the Johnson Valley Region, because the area is not yet populated, the water supply in the basin is not an issue. However, MWA is monitoring the basin so when development does occur, MWA will have a data set to act from. This is also true for the Means Valley Region, which is small and sparsely populated with only limited domestic groundwater development.

8.2.1 MWA and the Retail Water Purveyors

All of the retail water agencies within MWA boundaries that are required to complete their own individual 2010 UWMPs, have Water Shortage Contingency Plans included in their 2010 UWMPs which are not discussed in this section.

The Water Shortage Contingency Plans of these retail agencies utilize a variety of methods to reduce water demand including mandatory prohibitions on water wasting, voluntary water conservation measures, mandatory water conservation measures and prohibitions on certain uses of water during severe shortages, specific triggering mechanisms for determining the appropriate stage of alert, and water supply allotments for each stage of alert. As a wholesale agency, MWA does not have the authority to impose mandatory restrictions on retail customers due to water shortages. Therefore, this level of contingency planning is conducted by the retail water agencies.

8.3 Minimum Water Supply Available During Next Three Years

The minimum water supply available during the next three years would occur during a three-year multiple-dry year event between the years 2011 and 2013. MWA actively implements a conjunctive use program utilizing State Water Project water to recharge local aquifers. In addition to meeting Replacement Water obligations under the Mojave Basin Area Judgment, when SWP supplies are high (in surplus of Replacement Water needs), MWA meets the imported demands of individual stakeholders and also stores surplus water in local aquifers. When SWP supplies are low during dry periods, groundwater storage is used to meet demands. As shown in Table 8-1, the total supplies are approximately 165,000 acre-feet per year (afy) during the next three years. It is assumed that reduced SWP supplies will be met with pumping from groundwater storage, with the total water demand remaining the same as during normal years. When comparing these supplies to the demand projections provided in Chapters 2 and 6 of this Plan, MWA has adequate supplies available to meet projected demands should a multiple-dry year period occurring during the next three years and SWP imported supply be reduced.

TABLE 8-1
ESTIMATE OF MINIMUM SUPPLY FOR THE NEXT THREE YEARS

	Supply (afy)		
Source	**2011**	**2012**	**2013**
Existing Supplies			
Wholesale (Imported)			
SWP Table A Supply[a]	28,152	28,152	28,152
Local Supply[b]			
Net Natural Supply	54,045	54,045	54,045
Agricultural Depletion from Storage	10,425	10,425	10,425
Return Flow	64,583	65,395	66,204
Wastewater Import	5,323	5,341	5,360
Recharge Banking Projects[b,c]	0	0	0
Total Existing Supplies	**162,528**	**163,358**	**164,186**
Total Estimated Demands[d]	***158,702***	***160,359***	***162,010***

Notes:
(a) SWP supplies are calculated by multiplying MWA's Table A amount of 82,800 af by 34% of total deliveries projected to be available based on the worst-case historic four-year drought of 1931-1934. See Table 6-1.
(b) Taken from Chapter 3 Water Resources, Table 3-1. Local supplies are assumed to be 100% available. Only SWP supplies are reduced.
(c) Not needed in this scenario.
(d) See Chapter 2 Water Use, Table 2-3, assuming "moderate" conservation.

8.4 Actions To Prepare For Catastrophic Interruption

8.4.1 General

The MWA service area is bounded on the west by a major portion of the San Andreas Fault. A major earthquake along the southern portion of the San Andreas Fault would affect the MWA service area. The California Division of Mines and Geology has stated two of the aqueduct systems that import water to southern California (including the California Aqueduct) could be ruptured by displacement on the San Andreas Fault, and supply may not be restored for a three to six-week period. The situation would be further complicated by physical damage to pumping equipment and local loss of electrical power.

DWR has a contingency aqueduct outage plan for restoring the California Aqueduct to service should a major break occur, which it estimates would take approximately four months to repair.

Experts agree it may be at least three days after the earthquake before outside help could get to the area. Extended supply shortages of both groundwater and imported water, due to power outages and/or equipment damage, would be severe until the water supply could be restored.

Power outages currently do not affect MWA because they do not own or operate any wells or distribution systems. However, MWA is planning the Regional Recharge and Recovery Project, known as "R^3," which is a conjunctive use project that stores SWP water underground in the local aquifer and later recovers and distributes the water to local retail water purveyors as an additional supply. Once the first phase of R^3 is complete, scheduled for 2012, then MWA will be pumping groundwater and a power outage could affect the water supply from the R^3 project but local retailers will still have their own production wells to rely on.

Each of the retailers that will be served by the R^3 project will take delivery at a regulating reservoir. The MWA has stressed to the retailers that R^3 cannot be their primary source of supply or available for peaking – they will have to maintain a primary system of wells and associated storage separate from R^3.

For the retailer water agencies, all of the water systems have some form of storage as both regulating reservoirs and emergency supply. MWA does not monitor the various pressure zones that the retailers operate and the storage that they actually have available to them. The public would be asked to reduce consumption to minimum health and safety levels, extending the supply to seven days. This would provide sufficient time to restore a significant amount of groundwater production. After the groundwater supply is restored, the pumping capacity of the retail purveyors could meet the reduced demand until such time that the imported water supply was reestablished. Updates on the water situation would be made as often as necessary.

The area's water sources are generally of good quality, and no insurmountable problems resulting from industrial or agricultural contamination are foreseen. If contamination did result from a toxic spill or similar accident, the contamination would be isolated and should not significantly impact the total water supply. In addition, such an event would be addressed in the retailers' emergency response plan.

8.4.2 SWP Emergency Outage Scenarios

In addition to earthquakes, the SWP could experience other emergency outage scenarios. Past examples include slippage of aqueduct side panels into the California Aqueduct near Patterson in the mid-1990s, the Arroyo Pasajero flood event in 1995 (which also destroyed part of Interstate 5 near Los Banos), and various subsidence repairs needed along the East Branch of the Aqueduct since the 1980s. All these outages were short-term in nature (on the order of weeks), and DWR's Operations and Maintenance Division worked diligently to devise methods to keep the Aqueduct in operation while repairs were made. Thus, the SWP contractors experienced no interruption in deliveries.

One of the SWP's important design engineering features is the ability to isolate parts of the system. The Aqueduct is divided into "pools." Thus, if one reservoir or portion of the California Aqueduct is damaged in some way, other portions of the system can still remain in operation. The primary SWP facilities are shown on Figure 8-1.

Other events could result in significant outages and potential interruption of service. Examples of possible nature-caused events include a levee breach in the Delta near the Harvey O. Banks Pumping Plant, a flood or earthquake event that severely damaged the Aqueduct along its San Joaquin Valley traverse, or an earthquake event along either the West or East Branches. Such events could impact some or all SWP contractors south of the Delta.

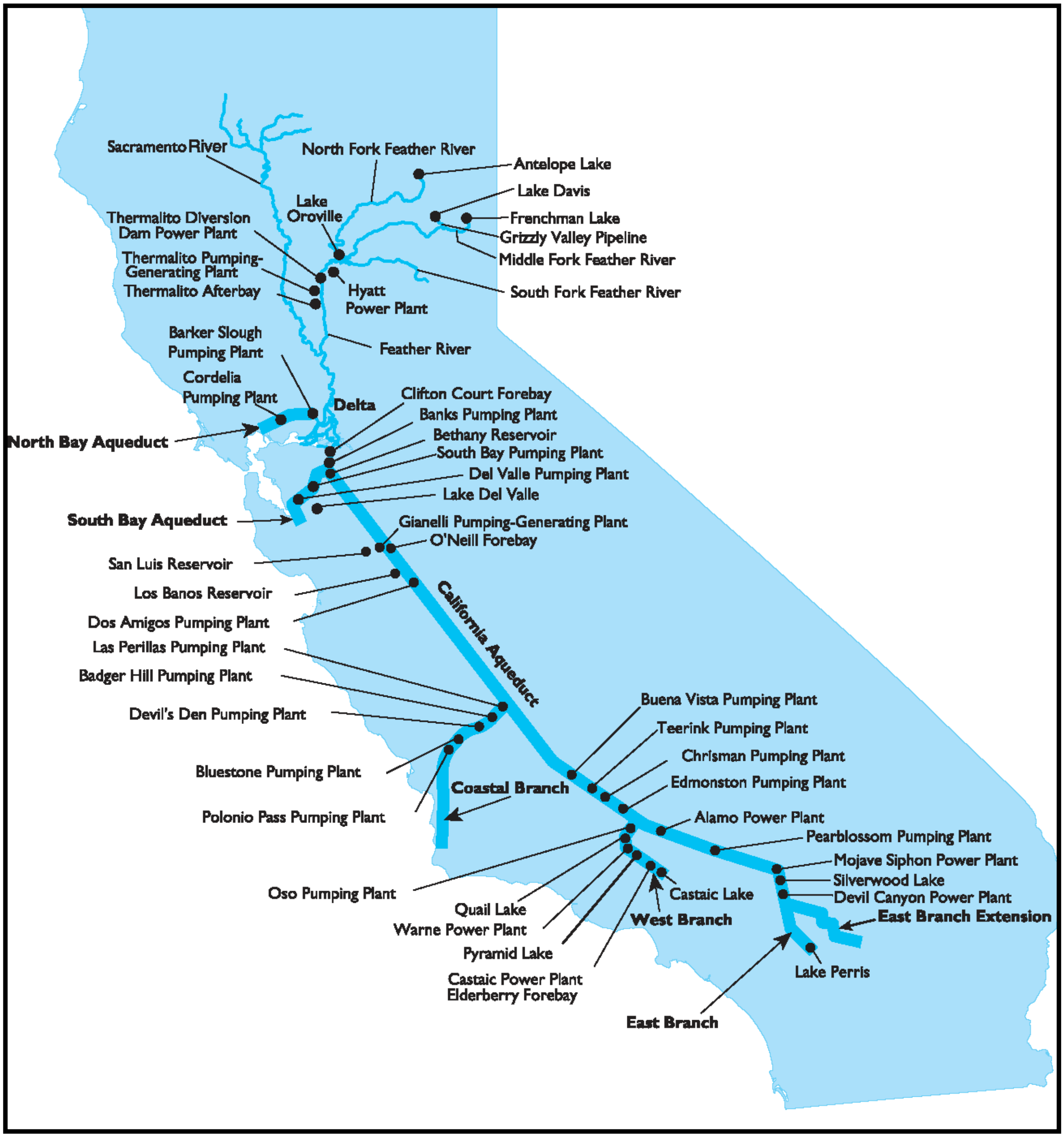
The response of DWR, MWA, and other SWP contractors to such events would be highly dependent on the type and location of any such event. In typical SWP operations, water flowing through the Delta is diverted at the SWP's main pumping facility, located in the southern Delta, and is pumped into the California Aqueduct. During the relatively heavier runoff period in the winter and early spring, Delta diversions generally exceed SWP contractor demands, and the excess is stored in San Luis Reservoir. Storage in SWP aqueduct terminal reservoirs, such as Pyramid and Castaic Lakes, is also refilled during this period. During the summer and fall, when diversions from the Delta are generally more limited and less than contractor demands, releases from San Luis Reservoir are used to make up the difference in deliveries to contractors. The SWP share of maximum storage capacity at San Luis Reservoir is 1,062,000 af.

MWA receives its SWP deliveries through the East Branch of the California Aqueduct. The other contractors receiving deliveries from the East Branch are Metropolitan Water District, Antelope Valley-East Kern Water Agency, Palmdale Water District, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, San Gabriel Valley Municipal Water District, San Bernardino Valley Municipal Water District, San Gorgonio Pass Water Agency, and Coachella Valley Water District. The East Branch has two terminal reservoirs, Silverwood Lake and Lake Perris, which were designed to provide emergency storage and regulatory storage (i.e., storage to help meet peak summer deliveries) for several of the East Branch contractors. However, MWA does not have contract rights to storage capacity in those reservoirs.

In addition to SWP storage south of the Delta in San Luis and the terminal reservoirs, a number of contractors have stored water in groundwater banking programs in the San Joaquin Valley, and many also have surface and groundwater storage within their own service areas.

Three scenarios that could impact the delivery to MWA of its SWP supply or other supplies delivered to it through the California Aqueduct are described below. For each of these scenarios, it was assumed that an outage of six months could occur. MWA's ability to meet demands during the worst of these scenarios is presented following the scenario descriptions.

FIGURE 8-1
PRIMARY SWP FACILITIES



Scenario 1: Levee Breach Near Banks Pumping Plant

As demonstrated by the June 2004 Jones Tract levee breach and previous levee breaks, the Delta's levee system is fragile. The SWP's main pumping facility, Banks Pumping Plant, is located in the southern Delta. Should a major levee in the Delta near these facilities fail catastrophically, salt water from the eastern portions of San Francisco Bay would flow into the Delta, displacing the fresh water runoff that supplies the SWP. All pumping from the Delta would be disrupted until water quality conditions stabilized and returned to pre-breach conditions. The re-freshening of Delta water quality would require large amounts of additional Delta inflows, which might not be immediately available, depending on the timing of the levee breach. The Jones Tract repairs took several week s to accomplish and months to complete; a more severe breach could take much longer, during which time pumping from the Delta might not be available on a regular basis.

Assuming that the Banks Pumping Plant would be out of service for six months, DWR could continue making at least some SWP deliveries to all southern California contractors from water stored in San Luis Reservoir. The water available for such deliveries would be dependent on the storage in San Luis Reservoir at the time the outage occurred and could be minimal if it occurred in the late summer or early fall when San Luis Reservoir storage is typically low.

Scenario 2: Complete Disruption of the California Aqueduct in the San Joaquin Valley

The 1995 flood event at Arroyo Pasajero demonstrated vulnerabilities of the California Aqueduct (the portion that traverses the San Joaquin Valley from San Luis Reservoir to Edmonston Pumping Plant). Should a similar flood event or an earthquake damage this portion of the aqueduct, deliveries from San Luis Reservoir could be interrupted for a period of time. DWR has informed the SWP contractors that a four-month outage could be expected in such an event. MWA's assumption is a six-month outage.

Arroyo Pasajero is located downstream of San Luis Reservoir and upstream of the primary groundwater banking programs in the San Joaquin Valley. Assuming an outage at a location near Arroyo Pasajero that resulted in the California Aqueduct being out of service for six months, supplies from San Luis Reservoir would not be available to those SWP contractors located downstream of that point. This would include MWA.

Scenario 3: Complete Disruption of the East Branch of the California Aqueduct

The East Branch of the California Aqueduct begins at a bifurcation of the Aqueduct south of Edmonston Pumping Plant, which pumps SWP water through and across the Tehachapi Mountains. From the point of bifurcation, the East Branch is an open canal. Water is conveyed through the canal to the Pearblossom Pumping Plant, where the first of four turnouts to the MWA service area is located at the Sheep Creek, which is essentially a stub out in Phelan area and not used at this time. The second is the Mojave River turnout, also known as the White Road Siphon, located north of Lake Silverwood. The third turnout is new and is the Highway 395 turnout which is being developed for the Oro Grande Wash Recharge Project. The fourth and last turnout is known as the Morongo Siphon and was constructed to supply Morongo Basin Pipeline which releases SWP water in the Alto Subarea near the City of Hesperia and to Yucca Valley. In addition, occasionally, MWA takes water delivery from Cedar Springs Dam at

Silverwood Lake, for groundwater recharge. Figure 3-3 shows the location of the MWA turnouts.

If a major earthquake (an event similar to or greater than the 1994 Northridge earthquake) were to damage a portion of the East Branch, deliveries could be interrupted. The exact location of such damage along the East Branch would be key to determining emergency operations by DWR and the East Branch SWP contractors. For this scenario, it was assumed that the East Branch would suffer a single-location break and deliveries of SWP water from north of the Tehachapi Mountains or of contractor water stored in groundwater banking programs in the San Joaquin Valley would not be available. It was also assumed that Silverwood and Perris dams would not be damaged by the event and that water in Silverwood and Perris Lakes would be available to the three East Branch SWP contractors that have capacity rights in them.

In any of these three SWP emergency outage scenarios, DWR and the SWP contractors would coordinate operations to minimize supply disruptions. Depending on the particular outage scenario or outage location, some or all of the SWP contractors south of the Delta might be affected. But even among those contractors, potential impacts would differ given each contractor's specific mix of other supplies and available storage. During past SWP outages, the SWP contractors have worked cooperatively to minimize supply impacts among all contractors. Past examples of such cooperation have included certain SWP contractors agreeing to rely more heavily on alternate supplies, allowing more of the outage-limited SWP supply to be delivered to other contractors; and exchanges among SWP contractors, allowing delivery of one contractor's SWP or other water to another contractor, with that water being returned after the outage was over.

Of these three SWP outage scenarios, the East Branch outage scenario presents the worst-case scenario for MWA. In this scenario, MWA would rely solely on local supplies. An assessment of the supplies available to meet demands in MWA's service area during a six-month East Branch outage and the additional levels of conservation projected to be needed are presented in Table 8-2 for 2010 through 2035.

During an outage, the local supplies available would consist of groundwater. It was assumed that local well production would be unimpaired by the outage and that the outage would occur during a year when average/normal supplies would be available. Note that adequate well and aquifer capacity exists to pump at levels higher than those assumed in this assessment, particularly during a temporary period such as an outage. However, to be conservative, groundwater production was assumed to be one-half of annual supplies.

Table 8-2 shows that, for a six-month emergency outage, MWA is in an excellent position to handle the emergency outage due to all of the water banking it has been storing over the last several years and the long term buffering capacity of local aquifers. Currently, MWA has 103,539 acre-feet banked in groundwater storage, not including water banked under individual retailer storage accounts. For the six months, no additional conservation would be required. Additionally, it is likely that potential cooperation among SWP contractors and/or temporarily increased retail purveyor groundwater production during such an outage could increase supplies so that lower amounts, or even no amount, of additional conservation would be needed and the banked water could be saved for future emergency. In an emergency such as this, these levels of additional conservation would likely be achieved through voluntary conservation, but mandatory measures would be enacted by the retailers if needed.

TABLE 8-2
PROJECTED SUPPLIES AND DEMANDS DURING
SIX-MONTH DISRUPTION OF IMPORTED SUPPLY SYSTEM

Water Supply Source	2010	2015	2020	2025	2030	2035
Local Supplies[(a)]						
Existing Supplies[(b)]						
Net Natural Supply	27,023	27,023	27,023	27,023	27,023	27,023
Agricultural Depletion from Storage	5,213	5,213	5,213	5,213	5,213	5,213
Return Flow	31,110	33,883	35,677	38,431	41,182	43,929
Wastewater Import	2,652	2,699	2,746	2,895	3,044	3,193
Recharge Banking Projects[(c)]	9,945	12,763	14,589	17,308	20,023	22,733
Total Existing Local Supplies	**75,943**	**81,581**	**85,248**	**90,870**	**96,485**	**102,091**
Demands						
Total Estimated Demands[(e)]	***75,943***	***81,581***	***85,248***	***90,870***	***96,485***	***102,091***

Notes:
(a) Assumes complete disruption in SWP supplies and in deliveries through the California Aqueduct for six months.
(b) See Table 3-1. Annual supplies from Table 3-1 have been divided by 2 to represent 6 months of supply.
(c) See Table 3-13 for MWA's Groundwater storage accounts as of January 5, 2011. This does not include any retailers' stored water.
(d) See Table 3-14. Planned Supplies are conjunctive use supply but are not needed for this scenario.
(e) Demands are assumed to be one-half of average/normal year demands, assuming "moderate" conservation (see Table 2-3).

8.4.3 Regional Power Outage Scenarios

For a major emergency such as an earthquake, Southern California Edison (Edison) has declared that in the event of an outage, power would be restored within a 24 hour period. For example, following the 1994 Northridge earthquake, Edison was able to restore power within 19 hours. Edison experienced extensive damage to several key power stations, yet was still able to recover within a 24-hour timeframe.

8.5 Mandatory Prohibitions During Shortages

As explained earlier, MWA is not a direct purveyor of retail water supplies and does not have any emergency powers or the authority to implement water shortage plans within its boundaries. It relies instead on efforts of the individual cities and water agencies. However, MWA does have an Ordinance No. 9 that allows the Agency to sell and deliver SWP water to these entities. MWA Ordinance 9 requires customers taking direct delivery of SWP water from MWA to maintain a backup supply in the event of outages or shortages in supply from the SWP. MWA informs customers under Ordinance 9 that supplies are variable and interruptible, with no guarantee of a specified delivery quantity. Ordinance 9 is MWA's only authority to reduce water supplies to its customers during shortages. However, customers under ordinance 9 represent only a small portion of the overall water use within the MWA service area, with a majority of water users receiving water supply from groundwater production. Highlights of the Ordinance (Appendix K) are discussed below:

- Each application shall contain such information as is necessary to assure the Board of MWA that the application is for service of a wholesale nature and that the MWA will not thereby become subject to the obligations of a retail water purveyor providing direct retail service to consumers. In the event the Applicant seeks a waiver of such requirement, the application shall so state and there shall be attached thereto a statement of the reasons for seeking a waiver any documentary evidence in support thereof.

- Each application shall contain information indicating that the Applicant is capable of sustaining its service requirements from independent sources during the period of any interruption or curtailment of service from Agency facilities. In no instance shall MWA be the sole source of water supply to any water retailer for any development within the retailer's service area.

- In any year in which there may occur a shortage in available supply of SWP, the MWA shall reduce the delivery of SWP proportionately to all parties to which the MWA supplies water, including Improvement District M of Division 2 (entities that lie within the greater Morongo Basin/Johnson Valley Area ("Morongo Area") and take water from the Morongo Basin Pipeline). It is provided that the MWA may apportion available SWP on some other basis if such is required to meet minimum demands for domestic supply, fire protection, fire suppression or sanitation to a specific area of the Agency during the year. No vested rights are obtained by the Customer upon the sale and delivery of water apportioned by this Section nor are any such rights inferred by virtue of an MWA decision to provide water to a Customer in a specific year.

8.6 Consumptive Reduction Methods During Restrictions

As explained in the previous section, MWA does not have the power to implement mandatory prohibitions during water supply shortages, with the exception of customers receiving direct SWP supplies under MWA Ordinance No. 9.

8.7 Penalties For Excessive Use

The penalties for excessive water use are stated in the text of the Judgment for the Mojave Groundwater Basin and the text of the Warren Valley Judgment for the Warren Groundwater Basin. The Court has continuing jurisdiction for the Mojave Basin Area Judgment and water producers in noncompliance can readily be taken to court.

8.8 Financial Impacts Of Actions During Shortages

There will be no financial impacts to MWA during a water shortage because of the available water that is banked in the MWA service area and able to be sold to retailers.

8.9 Water Shortage Contingency Resolution

As explained in Section 8.5, the only ordinance or resolution that MWA has for assisting in water shortages is Ordinance 9, which only deals with a small portion of the water users within MWA service area.

8.10 Mechanism To Determine Reductions In Water Use

As explained in Section 8.5, MWA does not have the power to implement mandatory prohibitions during water supply shortages, with the exception of customers receiving direct SWP supplies under MWA Ordinance No. 9.

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Appendix A

UWMP Checklist

Appendix B

Public Outreach Materials

Appendix C

UWMP Public Hearing Transcripts and Comment Letters

Appendix D

Judgment After Trial January 10, 1996, Mojave Basin Area Adjudication Text *(included as CD)*

Appendix E

Warren Valley Judgment Text *(included as CD)*

Appendix F

Demand Projections for High and Low Conservation Assumptions

Appendix G

Legal Analysis of Reliability Factors

Appendix H

MWA 2004 Groundwater Management Plan *(included as CD)*

Appendix I

VVWRA MOU with California Department of Fish and Game (DFG)

Appendix J

BMP Reports 2007-2010

Appendix K

MWA Ordinance No. 9

APPENDIX A

Judgment After Trial
January 10, 1996

Mojave Basin Area Adjudication

JUDGMENT AFTER TRIAL

JANUARY 10, 1996

MOJAVE BASIN AREA ADJUDICATION
CITY OF BARSTOW, ET AL V. CITY OF ADELANTO, ET AL
RIVERSIDE COUNTY SUPERIOR COURT CASE NO. 208568

CHAMBERS OF
VICTOR MICELI
JUDGE OF THE SUPERIOR COURT

Superior Court
STATE OF CALIFORNIA
COUNTY OF RIVERSIDE

COURTHOUSE
4050 MAIN STREET
RIVERSIDE, CALIFORNIA 92501

January 10, 1996

TO: ALL PARTIES LISTED ON THE ATTACHED MAILING LIST

FROM: E. MICHAEL KAISER, JUDGE by ss

SUBJECT: CITY OF BARSTOW VS CITY OF ADELANTO, Case No.: 208568

The Judgment in the above-entitled case was signed on January 10, 1996. Please find attached the amended two pages of Exhibit B, Table B-1.

Please find attached two amended pages of Exhibit B, Table B-1.

~~12/10/92~~
~~01/20/93~~
~~03/03/93~~
~~04/19/93~~
~~04/28/93~~
09/25/95

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
SAN BERNARDINO CO SERVICE AREA 70J	1,005	0.8213	1,005	954	904	854	804
SAN BERNARDINO CO SERVICE AREA 70L	355	0.2901	355	337	319	301	284
SAN FILIPPO, JOSEPH & SHELLEY	35	0.0286	35	33	31	29	28
SILVER LAKES ASSOCIATION	3,987	3.2583	3,987	3,787	3,588	3,388	3,189
SOUTHDOWN, INC	1,519	1.2414	1,519	1,443	1,367	1,291	1,215
SOUTHERN CALIFORNIA WATER COMPANY	940	0.7682	940	893	846	799	752
SPRING VALLEY LAKE ASSOCIATION	3,056	2.4974	3,056	2,903	2,750	2,597	2,444
SPRING VALLEY LAKE COUNTRY CLUB	977	0.7984	977	928	879	830	781
STORM, RANDALL	62	0.0507	62	58	55	52	49
SUDMEIER, GLENN W	121	0.0989	121	114	108	102	96
SUMMIT VALLEY RANCH	452	0.3694	452	429	406	384	361
TATRO, RICHARD K & SANDRA A	280	0.2288	280	266	252	238	224
TATUM, JAMES B	829	0.6775	829	787	746	704	663
TAYLOR, ALLEN C / HAYMAKER RANCH	456	0.3727	456	433	410	387	364
THOMAS, S DALE	440	0.3596	440	418	396	374	352
THOMAS, WALTER	36	0.0294	36	34	32	30	28
THOMPSON, JAMES A	418	0.3416	418	397	376	355	334
THOMPSON, RODGER	76	0.0621	76	72	68	64	60
THRASHER, GARY	373	0.3048	373	354	335	317	298
THUNDERBIRD COUNTY WATER DISTRICT	118	0.0964	118	112	106	100	94
TURNER, ROBERT	70	0.0572	70	66	63	59	56
VAIL, JOSEPH B & PAULA E	126	0.1030	126	119	113	107	100
* VAN BURGER, CARL	710	0.5802	710	674	639	603	568
VAN LEEUWEN FAMILY TRUST	341	0.2787	341	323	306	289	272

* Durston Well, location 06N/04W-18F, APN 468-151-11 - water production right of 357 acre/feet, claimed by Durston/Van Burger/CVB Investments and Industrial Asphalt. Product right to be determined in a subsequent severed proceeding, jurisdiction reserved.

~~12/10/92~~
~~01/20/93~~
~~02/03/93~~
~~04/18/93~~
~~04/28/93~~
09/25/95

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL PRODUCTION [1]	BASE ANNUAL PRODUCTION RIGHT [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AGCON, INC	0	0.0000	0	0	0	0	0
AGUAYO, JEANETTE L	212	0.3742	212	201	190	180	169
ATCHISON, TOPEKA, SANTA FE RAILWAY CO	120	0.2118	120	114	108	102	96
AVDEEF, THOMAS	34	0.0600	34	32	30	28	27
AZTEC FARM DEVELOPMENT COMPANY (Now, Virgil Gorman)	220	0.3883	220	209	198	187	176
BARNES, FAY - EXECUTOR OF ESTATE OF WAYNE BARNES	243	0.4289	243	230	218	206	194
BROMMER, MARVIN	361	0.6372	361	342	324	306	288
BURNS, RITA J & PAMELA E	16	0.0282	16	15	14	13	12
CHAPA, LARRY R	96	0.1694	96	91	86	81	76
CHOI, YONG IL & JOUNG AE	38	0.0671	38	36	34	32	30
CHRISTISON, JOEL	75	0.1324	75	71	67	63	60
COOK, KWON H	169	0.2983	169	160	152	143	135
DE VRIES, NEIL	3,800	6.7070	3,800	3,610	3,420	3,230	3,040
DESERT COMMUNITY BANK	156	0.2753	156	148	140	132	124
DURAN, FRANK T	50	0.0883	50	47	45	42	40
GAINES, JACK	117	0.2065	117	111	105	99	93
GESIRIECH, WAYNE	121	0.2136	121	114	108	102	96
GORMAN, VIRGIL	138	0.2436	138	131	124	117	110
GRIEDER, RAYMOND H & DORISANNE	30	0.0530	30	28	27	25	24
GRILL, NICHOLAS P & MILLIE D	21	0.0371	21	19	18	17	16
GROEN, CORNELIS	1,043	1.8409	1,043	990	938	886	834
HANIFY, DBA - WHITE BEAR RANCH	152	0.2683	152	144	136	129	121
HARMSEN, JAMES & RUTH ANN	1,522	2.6863	1,522	1,445	1,369	1,293	1,217
HARPER LAKE COMPANY	1,433	2.5293	1,433	1,361	1,289	1,218	1,146

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FILED
RIVERSIDE COUNTY

JAN 1 0 1996

ARTHUR A. Sims, Clerk
By Y.A. Burns
Y.A. Burns
Deputy

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

CITY OF BARSTOW, et al,
Plaintiff,
v.
CITY OF ADELANTO, et al,
Defendant.

MOJAVE WATER AGENCY,
Cross-complainant,
v.
ANDERSON, RONALD H. et al,
Cross-defendants.

CASE NO. 208568

ASSIGNED TO JUDGE KAISER DEPT.4 FOR ALL PURPOSES

JUDGMENT AFTER TRIAL

TABLE OF CONTENTS

I. INTRODUCTION

A. The Complaint. The original complaint herein was filed by the City of Barstow and Southern California Water Company (collectively "Plaintiffs") in San Bernardino Superior Court, North Desert District, on May 30, 1990 as Case No. BCV6672, and transferred to Riverside County Superior Court on November 27, 1990. Plaintiffs allege that the cumulative water Production upstream of the City of Barstow Overdrafted the Mojave River system, and request an average Annual flow of 30,000 acre-feet of surface water to the City of Barstow area. The complaint also includes a request for a writ of mandate to require the Mojave Water Agency ("MWA") to act pursuant to its statutory authority to obtain and provide Supplemental Water for use within the Mojave Basin Area.

B. The MWA Cross-Complaint. On July 26, 1991, the MWA filed its first amended cross-complaint in this case. The MWA first amended cross-complaint and its ROE amendments name Producers who collectively claim substantially all rights of water use within the Mojave Basin Area, including Parties downstream of the City of Barstow. The MWA cross-complaint, as currently amended, requests a declaration that the available native water supply to the Mojave Basin Area (not including water imported from the California State Water Project) is inadequate to meet the demands of the combined Parties and requests a determination of the water rights of whatever nature within the MWA boundaries and the Mojave Basin Area. The MWA has named as Parties several hundred Producers within the Basin Area.

///

C. <u>The Arc Las Flores Cross-Complaint</u>. On July 3, 1991, Arc Las Flores filed a cross-complaint for declaratory relief seeking a declaration of water rights of certain named cross-defendants and a declaration that the appropriative, overlying and riparian rights of Arc Las Flores be determined to be prior and paramount to any rights of the Plaintiffs and other appropriators.

D. <u>Stipulation and Trial</u>. On October 16, 1991, the Court ordered a litigation standstill. The purpose of the standstill was to give the parties time to negotiate a settlement and develop a solution to the overdraft existing in the Mojave River Basin.

A committee of engineers and attorneys, representing a variety of water users and interests throughout the Mojave River Basin, was created to develop a physical solution to the water shortage problem. The work of the committee resulted in a stipulated interlocutory order and judgment, which was entered by the court on September 23, 1993.

Several non-stipulating parties requested a trial. On April 20, 1994, the Court issued a memorandum setting forth the trial issues. This cause came on regularly for trial on February 6, 1995, and was tried in Department 4 of the above-entitled Court, the Honorable E. Michael Kaiser, Judge, Presiding, without a jury. Oral and documentary evidence was introduced on behalf of the respective parties and the cause was argued and submitted for decision.

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///

II. DECREE

NOW, THEREFORE, IT IS ORDERED, ADJUDGED AND DECREED:

A. JURISDICTION, PARTIES, DEFINITIONS.

1. Jurisdiction and Parties.

a. Jurisdiction. This Court has jurisdiction to enter Judgment declaring and adjudicating the rights to reasonable and beneficial use of water by the Parties in the Mojave Basin Area pursuant to Article X, Section 2 of the California Constitution. This Judgment constitutes an adjudication of water rights of the Mojave Basin Area pursuant to Section 37 of Chapter 2146 of Statutes of 1959 ("the MWA Act").

b. Parties. All Parties to the MWA cross-complaint are included in this Judgment. The MWA has notified those Persons claiming any right, title or interest to the natural waters within the Mojave Basin Area to make claims. Such notice has been given: 1) in conformity with the notice requirements of Water Code §§ 2500 et seq.; 2) pursuant to Section 37 of the MWA Act; and 3) pursuant to order of this Court. Subsequently, all Producers making claims have been or will be included as Parties. The defaults of certain Parties have been entered, and certain named cross-defendants to the MWA cross-complaint who are not Producers have been dismissed. All named Parties who have not been dismissed have appeared herein or have been given adequate opportunity to appear herein. The Court has jurisdiction of the subject matter of this action and of the Parties hereto.

c. Minimal Producers. There are numerous Minimal Producers in the Basin Area and their number is expected to increase in the future. In order to minimize the cost of administering this Judgment and to assure that every Person producing water in the Basin Area participates fairly in the Physical Solution, MWA shall:

i. within one Year following entry of this Judgment, prepare a report to the Court: 1) setting forth the identity and verified Base Annual Production of each Minimal Producer in each Subarea of the Basin Area; and 2) recommending a proposed system of Minimal Producer Assessments. The system of Minimal Producer Assessments shall achieve an equitable allocation of the costs of the Physical Solution that are attributable to Production of verified Base Annual Production amounts by Minimal Producers in each Subarea to and among such Minimal Producers. Minimal Producer Assessments need not be the same for existing Minimal Producers as for future Minimal Producers.

ii. within one Year following entry of this Judgment, prepare a report to the Court setting forth a proposed program to be undertaken by MWA, pursuant to its statutory authority, to implement the proposed system of Minimal Producer Assessments. The Court may order MWA to implement the proposed program or, if MWA's statutory authority is inadequate to enable implementation, or if either the proposed program or the proposed system of Minimal Producer Assessments is unacceptable to the Court, the Court may then order MWA either to implement an alternative program or system, or in the alternative, to name all Minimal Producers as Parties to this litigation and to serve them for the purpose of adjudicating their water rights.

Any Minimal Producer whose Annual Production exceeds ten (10) acre-feet in any Year following the date of entry of Judgment shall be made a Party pursuant to Paragraph 12 and shall be subject to Administrative, Replacement Water, Makeup Water and Biological Resources Assessments. Any Minimal Producer who produced during the 1986-1990 period may become a Party pursuant to Paragraph 40 with a Base Annual Production Right based on such Minimal Producer's verified Base Annual Production. To account properly for aggregate Production by Minimal Producers in each Subarea, Table B-1 of Exhibit B shall include an estimated aggregate amount of Base Annual Production by all Minimal Producers in each Subarea. The Base Annual Production of any Minimal Producer who becomes a Party shall be deducted from the aggregate amount and assigned to such Minimal Producer.

2. Physical and Legal Complexity. The physical and legal issues of the case as framed by the complaint and cross-complaints are extremely complex. Production of more than 1,000 Persons producing water in the Basin Area has been ascertained. In excess of 1,000 Persons have been served. The water supply and water rights of the entire Mojave Basin Area and its hydrologic Subareas extending over 4000 square miles have been brought into issue. Most types and natures of water right known to California law are at issue in the case. Engineering studies by the Parties, jointly and severally, leading toward adjudication of these rights and a Physical Solution, have required the expenditure of over two Years' time and hundreds of thousands of dollars.

3. Need for a Declaration of Rights and Obligations and for Physical Solution. A Physical Solution for the Mojave Basin

Area based upon a declaration of water rights and a formula for Intra- and Inter-Subarea allocation of rights and obligations is necessary to implement the mandate of Article X, Section 2 of the California Constitution and California water policy. Such Physical Solution requires the definition of the individual rights of all Producers within the Basin Area in a manner which will equitably allocate the natural water supplies and which will provide for equitable sharing of costs for Supplemental Water. Nontributary supplemental sources of water are or will be available in amounts, which when combined with water conservation, water reclamation, water transfers, and improved conveyance and distribution methods within the Basin Area, will be sufficient in quantity and quality to assure implementation of a Physical Solution. Sufficient information and data are known to formulate a reasonable and just allocation of existing water supplies as between the hydrologic Subareas within the Basin Area and as among the water users within each Subarea. Such Physical Solution will allow the public water supply agencies and individual water users within each hydrologic Subarea to proceed with orderly water resource planning and development. It will be necessary for MWA to construct conveyance facilities to implement the Physical Solution. Absent the construction of conveyance facilities, some Subareas may be deprived of an equitable share of the benefits made possible by the Physical Solution. Accordingly, this Physical Solution mandates the acquisition or construction of conveyance facilities for importation and equitable distribution of Supplemental Water to the respective Subareas. Such construction is dependent on the availability of appropriate financing, and any such financing assessed to the Parties will be based upon benefit to the Parties in accordance with the MWA Act.

4. Definitions. As used in this judgment, the following terms shall have the meanings herein set forth:

a. Afton - The United States Geological Survey gauging station "Mojave River at Afton, CA."

b. Annual or Year - As used in this Judgment refers to the Annual period beginning October 1 and ending September 30 of the following Year.

c. Aquaculture Water - Water so identified in Exhibit "B". Such water may be used only for fish breeding and rearing. The Annual Consumptive Use of such water in acre-feet is equal to the water surface area, in acres, of the fish rearing facilities multiplied by seven (feet).

d. Assessments - Those Assessments levied and collected pursuant to this judgment including Replacement Water, Makeup Water, Administrative and Biological Resource Assessments.

e. Barstow - The United States Geological Survey Gauging Station "Mojave River at Barstow, CA."

f. Base Annual Production - The verified maximum Year Production, in acre-feet, for each Producer for the five Year Period 1986-1990 as set forth in Table B-1 of Exhibit "B", except where otherwise noted therein. The maximum Year Production for each Producer was verified based on one or more of the following: flow meter readings, electrical power or diesel usage records or estimated applied water duty. The Base Annual Production for recreational lakes in the Baja Subarea and for Aquaculture shall be equal either to the area of water surface multiplied by seven feet or to verified Production, whichever is less. The five Year period 1986-1990 shall also be the time period for which Base Annual Production for Minimal Producers shall be calculated.

g. <u>Base Annual Production Right</u> - The relative Annual right of each Producer to the Free Production Allowance within a given Subarea, expressed as a percentage of the aggregate of all Producers' Base Annual Production in the Subarea. The percentage for each Producer is calculated by multiplying that Producer's Base Annual Production in a Subarea times one hundred (100) and dividing the result by the aggregate Base Annual Production for all Producers in the Subarea. The percentage shall be rounded off to the nearest one ten-thousandth of one per cent.

h. <u>Base Flow</u> - That portion of the total surface flow measured Annually at Lower Narrows which remains after subtracting Storm Flow.

i. <u>Carry Over Right</u> - The right of a Producer to delay and accumulate the Production of such Producer's share of a Subarea Free Production Allowance until

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and only until the following Year free of any Replacement Water Assessment.

j. Consumption or Consumptive Use - The permanent removal of water from the Mojave Basin Area through evaporation or evapo-transpiration. The Consumptive Use rates resulting from particular types of water use are identified in Paragraph 2 of Exhibit "F".

k. Free Production Allowance - The total amount of water, and any Producer's share thereof, that may be Produced from a Subarea each Year free of any Replacement Obligation.

l. Groundwater - Water beneath the surface of the ground and within the zone of saturation; i.e., below the existing water table, whether or not flowing through known and definite channels.

m. Harper Lake Basin - That portion of the Centro Subarea identified as such on Exhibit "A".

n. Lower Narrows - The United States Geological Survey gauging station "Mojave River near Victorville, CA."

o. Makeup Water - Water needed to satisfy a Minimum Subarea Obligation.

p. Makeup Obligation - The obligation of a Subarea to pay for Makeup Water to satisfy its Subarea Obligation.

q. Minimal Producer - Any Person whose Base Annual Production, as verified by MWA is not greater than ten (10) acre-feet. A Person designated as a Minimal Producer whose Annual Production exceeds ten (10) acre-feet in any Year following the date of entry of Judgment is no longer a Minimal Producer.

r. Minimum Subarea Obligation - The minimum Annual amount of water a Subarea is obligated to provide to an adjoining downstream Subarea or the Transition Zone or, in the case of the Baja Subarea, the minimum Annual Subsurface Flow at the MWA eastern boundary toward Afton in any Year, as set forth in Exhibit "G".

s. Mojave Basin Area or Basin Area - The area shown on Exhibit "A" that lies within the boundaries of the line labelled "Limits of Adjudicated Area" which generally includes the area tributary to the Mojave River and its tributaries except for such area not included within the Mojave Water Agency's jurisdiction.

t. MWA - Cross complainant Mojave Water Agency.

u. Overdraft - A condition wherein the current total Annual Consumptive Use of water in the Mojave Basin Area or any of its Subareas exceeds the long term average Annual natural water supply to the Basin Area or Subarea.

v. Party (Parties) - Any Person(s) named in this action who has intervened in this case or has

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become subject to this Judgment either through stipulation, default, trial or otherwise.

w. Person(s) - Any natural person, firm, association, organization, joint venture, partnership, business, trust, corporation, or public entity.

x. Produce - To pump or divert water.

y. Producer(s) - A Person, other than a Minimal Producer, who Produces water.

z. Production - Annual amount of water produced, stated in acre-feet of water.

aa. Production Safe Yield - The highest average Annual Amount of water that can be produced from a Subarea: (1) over a sequence of years that is representative of long-term average annual natural water supply to the Subarea net of long-term average annual natural outflow from the Subarea, (2) under given patterns of Production, applied water, return flows and Consumptive Use, and (3) without resulting in a long-term net reduction of groundwater in storage in the Subarea.

bb. Purpose of Use - The broad category of type of water use including but not limited to municipal, irrigation, industrial, aquaculture, and lakes purposes. A change in Purpose of Use includes any reallocation of water among mixed or sequential uses, excluding direct reuse of municipal wastewater.

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cc. Recirculated Water - Water that is Produced but not consumed by the Parties listed in Table B-2 of Exhibit "B" and then returned either to the Mojave River or to the Groundwater basin underlying the place of use.

dd. Replacement Obligation - The obligation of a Producer to pay for Replacement Water for Production from a Subarea in any Year in excess of the sum of such Producer's share of that Year's Free Production Allowance for the Subarea plus any Production pursuant to a Carry Over Right.

ee. Replacement Water - Water purchased by Watermaster or otherwise provided to satisfy a Replacement Obligation.

ff. Responsible Party - The Person designated by a Party as the Person responsible for purposes of filing reports and receiving notices pursuant to the provisions of this Judgment.

gg. Stored Water - Water held in storage pursuant to a Storage Agreement with Watermaster.

hh. Storm Flow - That portion of the total surface flow originating from precipitation and runoff without having first percolated to Groundwater storage in the zone of saturation and passing a particular point of reckoning, as determined annually by the Watermaster.

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ii. Subareas - The five Subareas of the Mojave Basin Area -- Este, Oeste, Alto, Centro and Baja -- as shown on Exhibit "A".

jj. Subarea Obligation - The average Annual amount of water that a Subarea is obligated to provide to an adjoining downstream Subarea or the Transition Zone or, in the case of the Baja Subarea, the average Annual Subsurface Flow toward Afton at the MWA eastern boundary as set forth in Exhibit "G".

kk. Subsurface Flow - Groundwater which flows beneath the earth's surface.

ll. Supplemental Water - Water imported to the Basin Area from outside the Basin Area, water that would otherwise be lost from the Basin Area but which is captured and made available for use in the Basin Area, or any Producer's share of Free Production Allowance that is not Produced and is acquired by Watermaster pursuant to this Judgment.

mm. Transition Zone - The portion of the Alto Subarea, shown on Exhibit "A", that lies generally between the Lower Narrows and the Helendale Fault.

nn. Watermaster - The Person(s) appointed by the Court to administer the provisions of this Judgment.

5. Exhibits. The following exhibits are attached to this Judgment and made a part hereof.

Exhibit "A" - Map entitled, "Map showing Mojave Water Agency, Mojave River, Mojave Basin Area and Hydrologic Subareas and

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Limits of Adjudicated Area Together with Geologic and Other Pertinent Features."

Exhibit "B" - Table entitled, "Table B-1: Table Showing Base Annual Production and Base Annual Production Right of Each Producer Within Each Subarea, and Free Production Allowances for Subareas for First Five Years after entry of the Interlocutory Judgment" and "Table B-2: Table Showing Total Water Production for Aquaculture and Recreational Lake Purposes."

Exhibit "C" - Engineering Appendix.

Exhibit "D" - Time Schedules.

Exhibit "E" - List of Producers and Their Designees.

Exhibit "F" - Transfers of Base Annual Production Rights.

Exhibit "G" - Subarea Obligations.

Exhibit "H" - Biological Resource Mitigation.

Exhibit "I" - Map Showing Potential Groundwater Recharge Areas

B. <u>DECLARATION OF HYDROLOGIC CONDITIONS</u>.

6. <u>Mojave Basin Area as Common Source of Supply</u>. The area shown on Exhibit "A" as the Mojave Basin Area is comprised of five Subareas. The waters derived from the Mojave River and its tributaries constitute a common source of supply of the five Subareas and of the Persons producing therefrom.

7. <u>Existence of Overdraft</u>. In each and every Year, for a period in excess of five (5) years prior to the May 30, 1990 filing date of Plaintiffs' Complaint, the Mojave Basin Area and each of its respective Subareas have been and are in a state of Overdraft, and it is hereby found that there is no water available

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for Production from the Basin Area or any Subarea therein except pursuant to this Judgment.

C. DECLARATION OF RIGHTS AND OBLIGATIONS.

8. Production Rights of the Parties. The Base Annual Production and Base Annual Production Right of each Party are declared as set forth in Table B-1 of Exhibit "B". Certain Parties also have the right to continue to Produce Recirculated Water in the amounts set forth in Table B-2 of Exhibit "B", subject to the following:

a. Aquaculture. Two of the Producers listed in Table B-2 of Exhibit "B", California Department of Fish and Game Mojave River Fish Hatchery (Hatchery) and Jess Ranch Water Company (Jess), Produce Recirculated Water for Aquaculture. The Hatchery and Jess or their successors or assignees shall have the right to continue to Produce up to the amounts listed in Table B-2 of Exhibit "B" as Recirculated Water for Aquaculture on the property where it was used in the Year for which Base Annual Production was verified. Production of such amount of Recirculated water by Jess shall be free of any Replacement Water Assessments, Makeup Water Assessments or Administrative Assessments but shall be subject to Biological Resources Assessments and each Jess well producing Recirculated Water shall be subject to an Annual administrative fee equal to the lowest Annual fee paid to MWA by a Minimal Producer. Neither the Hatchery nor Jess Recirculated Water may be transferred or used for any other purpose or transferred for use on any other property, except as provided in Paragraph 7 of Exhibit "F" for the Hatchery. Any Production of Recirculated Water by Jess in excess of the amount shown in Table B-2 shall be subject to all

Assessments. Production of Recirculated Water by the Hatchery will be subject to the rules set forth in Paragraph 7 of Exhibit "F". All Jess Aquaculture Recirculated Water shall be discharged immediately and directly to the Mojave River.

b. <u>Camp Cady</u>. One Producer listed in Table B-2 of Exhibit "B", California Department of Fish and Game-Camp Cady (Camp Cady), Produces Recirculated Water for Lakes containing Tui Chub, an endangered species of fish. Camp Cady or its successors or assignees shall have the right to continue to Produce up to the amount listed in Table-B-2 of Exhibit "B" as Recirculated Water at Camp Cady. Production of each amount of Recirculated water shall be free of any Assessments. Camp Cady Recirculated Water may not be transferred or used for any other purpose or transferred for use on any other property. Any Production of Recirculated Water by Camp Cady in excess of the amount shown in Table B-2 of Exhibit "B" shall be subject to all Assessments except Biological Resource Assessments. All Camp Cady Recirculated Water shall be allowed to percolate immediately and directly to the Groundwater basin underlying Camp Cady.

c. <u>Recreational Lakes in Baja Subarea</u>. All Producers listed in Table B-2 of Exhibit "B" except the Hatchery, Jess and Camp Cady Produce Recirculated Water for recreational lakes in the Baja Subarea. Such Producers or their successors or assignees shall have the right to continue to Produce up to the amounts identified in Table B-2 of Exhibit "B" as Recirculated Water for use in recreational lakes on the property where it was used in the Year for which Base Annual Production was verified, free of any Replacement Water Assessments, Makeup Water

Assessments, or Administrative Assessments, but such Production shall be subject to any Biological Resource Assessment. Each well producing such Recirculated Water shall be subject to an Annual administrative fee equal to the lowest Annual fee paid by a Minimal Producer. Recirculated Water cannot be transferred or used for any other purpose. All recreational lake Recirculated Water shall be allowed to percolate immediately and directly to the Groundwater basin underlying the recreational lake.

9. MWA Obligations. The Physical Solution is intended to provide for delivery and equitable distribution to the respective Subareas by MWA of the best quality of Supplemental Water reasonably available. MWA shall develop conveyance or other facilities to deliver this Supplemental Water to the areas depicted in Exhibit "I," unless prevented by forces outside its reasonable control such as an inability to secure financing consistent with sound municipal financing practices and standards.

a. Secure Supplemental Water. MWA, separate and apart from its duties as the initial Watermaster designated under this Judgment, shall exercise its authority under Sections 1.5 and 15 of the MWA Act to pursue promptly, continuously and diligently all reasonable sources to secure Supplemental Water as necessary to fully implement the provisions of this Judgment.

b. Supplemental Water Prices. The MWA shall establish fair and equitable prices for Supplemental Water delivered to the Watermaster under this Judgment.

c. Supplemental Water Delivery Plan. Not later than September 30, 1996, MWA shall prepare a report on potential alternative facilities or methods to deliver Supplemental Water to the areas shown on Exhibit "I." The report shall include, for each alternative, a development time schedule, a summary of cost estimates, an analysis of the relative benefits to Producers in each Subarea and an analysis of alternative methods of financing and cost allocation, including any state or federal sources of funding that may be available.

d. Water Delivery Cost Allocation. The report required by subdivision (c) above shall recommend methods of financing and cost allocation that are based on benefits to be received. MWA's cost allocation plan shall be subject to Court review as provided in subdivision (f) below to verify that costs are allocated fairly and according to benefits to be received. The MWA financing and cost allocation plan may include a mix of revenue sources including the following:

(1) Developer or connection fees to the extent MWA can demonstrate a nexus, as required by law, between the fees and the impact of the development upon the water resources of the Mojave Basin Area and each subarea thereof;

(2) Other methods of financing available to MWA, including but not limited to property based taxes, assessments or standby charges;

(3) Water sales revenues, but only to the extent other sources are not available or appropriate, and in no event shall the water sales price to cover facility

capital costs exceed a rate equal to fifty percent of the variable cost rate charged to MWA under its contract for water delivery from the California State Water Project;

e. Legislative Changes. MWA shall seek promptly to have enacted amendments to the MWA Act (Water Code Appendix, Part 97) that allow MWA to implement any methods of governmental financing available to any public entity in California.

f. Court Review and Determination of Benefit. Not later than September 30, 1996, MWA shall submit its report to the Court in a noticed motion pursuant to Paragraph 36. The report shall set forth MWA's recommendations as to the following: (1) which alternatives should be implemented; (2) methods of cost allocation for the recommended alternatives; (3) financing for the recommended alternatives; and (4) a time schedule to complete the recommended alternatives. The Court may approve or reject the recommendations. The Court may further order the use of alternatives and time schedules or it may order additional studies and resubmittals, as it may deem proper.

10. Priority and Determination of Production Rights. The water rights involved herein are of differing types and commenced at different times. Many of the rights involved are devoted to public uses. The Declaration of Water Rights that is part of the judgment and the Physical Solution decreed herein takes into consideration the competing priorities which have been asserted in addition to the equitable principles applicable to apportionment of water in this situation. The following factors

have been considered in the formulation of each Producer's Base Annual Production Right:

a. The Mojave Basin Area and each of its hydrologic Subareas have continuously for many Years been in a state of system-wide Overdraft;

b. All Producers have contributed to the Overdraft;

c. None of the priorities asserted by any of the Producers is without dispute;

d. Under the complex scheme of California water law, the allocation of water and rights mechanically based upon the asserted priorities would be extremely difficult, if not impossible, and would not result in the most equitable apportionment of water;

e. Such mechanical allocation would, in fact, impose undue hardship on many Parties;

f. There is a need for conserving and making maximum beneficial use of the water resources of the State;

g. The economy of the Mojave Basin Area has to a great extent been established on the basis of the existing Production;

h. The Judgment and Physical Solution take into consideration the unique physical and climatic conditions of the Mojave Basin Area, the Consumptive Use of water in the several sections of the Basin, the character and rate of return flows, the extent of established uses, the availability of storage water, the relative benefits and detriments between upstream areas and downstream areas if a limitation is imposed on one and not the

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other, and the need to protect public interest and public trust concerns.

In consideration of the foregoing factors, and in accordance with the terms and conditions of this Judgment, the Parties are estopped and barred from asserting special priorities or preferences.

11. Exercise of Carry Over Rights. The first water Produced by a Producer during any Year shall be deemed to be an exercise of any Carry Over Right. Such Carry Over Right may be transferred in accordance with Exhibit "F".

12. Production Only Pursuant to Judgment. This Judgment, and the Physical Solution decreed herein, addresses all Production within the Mojave Basin Area. Because of the existence of Overdraft, any Production outside the framework of this Judgment and Physical Solution will contribute to an increased Overdraft, potentially damage the Mojave Basin Area and public interests in the Basin Area, injure the rights of all Parties, and interfere with the Physical Solution. Watermaster shall bring an action or a motion to enjoin any Production that is not pursuant to the terms of this Judgment.

13. Declaration of Subarea Rights and Obligations. In the aggregate, Producers within certain Subareas have rights, as against those in adjoining upstream Subareas, to receive average Annual water supplies and, in any one Year, to receive minimum Annual water supplies equal to the amounts set forth in Exhibit "G", in addition to any Storm Flows. In turn, in the aggregate, Producers within certain Subareas have an obligation to provide to adjoining downstream Subareas such average Annual water supplies in

the amounts and in the manner set forth in Exhibit "G". In any one Year, Producers within certain Subareas have an obligation to provide to adjoining downstream Subareas such minimum Annual water supplies in the amounts and in the manner set forth in Exhibit "G". The Producers in the Baja Subarea have an obligation to provide average and minimum Subsurface Flows toward Afton at the MWA eastern boundary equal to the amounts shown in Exhibit "G". Producers in each of the Subareas have rights in the aggregate, as against each adjoining downstream Subarea or, in the case of the Baja Subarea, as against flows at the MWA eastern boundary toward Afton, to divert, pump, extract, conserve, and use all surface water and Groundwater supplies originating therein or accruing thereto, and so long as the adjoining downstream Subarea Obligations are satisfied under this Judgment and there is compliance with all of its provisions. Watermaster shall maintain a continuing account of the status of each Subarea's compliance with its Subarea Obligation, including any cumulative credits or debits and any requirement for providing Makeup Water. The accounting and determinations relative to Subarea Obligations shall be made in accordance with procedures set forth in Exhibit "G".

III. INJUNCTION

14. Injunction Against Unauthorized Production. Each and every Party, its officers, agents, employees, successors, and assigns, is ENJOINED AND RESTRAINED from Producing water from the Basin Area except pursuant to the provisions of the Physical Solution in this Judgment.

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15. Injunction Re Change in Purpose of Use Without Notice Thereof to Watermaster. Each and every Party, its officers, agents, employees, successors, and assigns, is ENJOINED AND RESTRAINED from changing its Purpose of Use at any time without first notifying Watermaster of the intended change.

16. Injunction Against Unauthorized Recharge. Each and every Party, its officers, agents, employees, successors and assigns, is ENJOINED AND RESTRAINED from claiming any right to recapture Water that has been recharged in the Basin Area except pursuant to a Storage Agreement with Watermaster. This provision does not prohibit Parties from importing Supplemental Water into the Basin Area for direct use.

17. Injunction Against Transportation from Mojave Basin Area. Except upon further order of the Court, each and every Party, its officers, agents, employees, successors and assigns, is ENJOINED AND RESTRAINED from transporting water hereafter Produced from the Basin Area to areas outside the Basin Area.

18. Injunction Against Diverting Storm Flows. No Party may undertake or cause the construction of any project that will directly reduce the amount of Storm Flow that would otherwise go through the naturally occurring hydrologic regime to a downstream Subarea or that will reduce the surface area over which Storm Flow currently occurs by alteration to the bed of the Mojave River. This paragraph shall not prevent any flood control agency or municipality from taking such emergency action as may be necessary to protect the physical safety of its residents and its structures from flooding. Any such action shall be done in a manner that will minimize any reduction in the quantity of Storm Flows.

IV. CONTINUING JURISDICTION

19. Jurisdiction Reserved. Full jurisdiction, power and authority are retained by and reserved to the Court for purposes of enabling the Court upon the application of any Party, by a motion noticed in accordance with the notice procedures of Paragraph 36 hereof, to make such further or supplemental order or directions as may be necessary or appropriate for interim operation before the Physical Solution is fully operative, or for interpretation, enforcement or carrying out of this Judgement, and to modify, amend or amplify any of the provisions of this Judgment or to add to the provisions thereof consistent with the rights herein decreed; provided, that nothing in this paragraph shall authorize either a reduction of the Base Annual Production Right of any Party, except in accordance with the rules set forth in Exhibit "F", or a reduction of the Base Flow portion of any Subarea Obligation.

V. Physical Solution

A. GENERAL

20. Purpose and Objective. The Court hereby declares and decrees that the Physical Solution herein contained: 1) is a fair and equitable basis for satisfaction of all water rights in the Mojave Basin Area; 2) is in furtherance of the mandate of the State Constitution and the water policy of the State of California; and 3) takes into account applicable public trust interests; and therefore adopts and orders the Parties to comply with the Physical Solution. As noted in Paragraph 3 of this Judgment, the declaration of rights and obligations of the Parties and Subareas is a necessary component of this Physical Solution. The purpose of

the Physical Solution is to establish a legal and practical means for making the maximum reasonable beneficial use of the waters of the Basin Area by providing for the long-term conjunctive utilization of all water available thereto to meet the reasonable beneficial use requirements of water users therein.

21. Need for Flexibility. It is essential that this Physical Solution provide maximum flexibility and adaptability in order that the Court may be free to use existing and future technological, social, institutional and economic options in order to maximize reasonable beneficial use of the waters of the Basin Area. To that end, the Court's retained jurisdiction may be utilized where appropriate, to supplement the Physical Solution.

22. General Pattern of Operations. The Producers will be divided into five Subareas for purposes of administration. The Subarea rights and obligations are herein decreed. A fundamental premise of the Physical Solution is that all Parties will be allowed, subject to this Judgment, to Produce sufficient water to meet their reasonable beneficial use requirements. To the extent that Production by a Producer in any Subarea exceeds such Producer's share of the Free Production Allowance of that Subarea, Watermaster will provide Replacement Water to replace such excess Production according to the methods set forth herein. To the extent that any Subarea incurs a Makeup Obligation, Watermaster will provide Supplemental Water to satisfy such Makeup Obligation according to the methods set forth herein. For the initial five (5) full Years after entry of this Judgment (including any interlocutory Judgment), the Free Production Allowance for each Subarea shall be set as the amount of water equal to the following

percentages of the aggregate Base Annual Production for that Subarea:

	Judgment Year	Percentage
1993-1994	First Full Year	100
1994-1995	Second Full Year	95
1995-1996	Third Full Year	90
1996-1997	Fourth Full Year	85
1997-1998	Fifth Full Year	80

The extent of Overdraft now varies between Subareas and the reasonableness of any physical solution as applied to each Producer depends in part upon such Producer's foreseeable needs and the present and future availability of water within the Subarea in which each Producer is located. The Physical Solution described in this Judgment in part generally contemplates (i) initially allowing significant unassessed production on a substantially uniform basis for all Producers and Subareas and (ii) a phasing in of the monetary obligations necessary to obtain Supplemental Water. The above two provisions will affect each Subarea differently, may not be sufficient to ultimately eliminate the condition of Overdraft in each Subarea and could result in increased Overdraft within a Subarea. Any adverse impact to any Subarea caused by the implementation of the provisions shall be the responsibility of the Producers in each such Subarea.

B. ADMINISTRATION.

23. Administration by Watermaster. Watermaster shall administer and enforce the provisions of the Judgment and any subsequent instructions or orders of this Court.

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(a) Standard of Performance. Watermaster shall, in carrying out its duties, powers and responsibilities herein, act in an impartial manner without favor or prejudice to any Subarea, Producer, Party or Purpose of Use.

(b) Removal of Watermaster. Full jurisdiction, power and authority are retained and reserved by the Court for the purpose of enabling the Court on its own motion, or upon application of any Party, and upon notice in accordance with the notice procedures of paragraph 36 hereof, and after hearing thereon, to remove any appointed Watermaster and substitute a new Watermaster in its place. The Court shall find good cause for the removal of Watermaster upon a showing that Watermaster has failed to perform its duties, powers and responsibilities in an impartial manner, or has otherwise failed to act in the manner consistent with the provisions set forth in this Judgment or subsequent order of the Court.

(c) MWA Appointed as Initial Watermaster. The MWA is hereby appointed, until further order of the Court, as Watermaster to administer and enforce the provisions of this Judgment and any subsequent orders of this Court issued in the performance of its continuing jurisdiction. In carrying out this appointment, MWA shall segregate and separately exercise in all respects the Watermaster powers delegated by the Court under this Judgment from MWA's statutory powers. All funds received, held, and disbursed by MWA as Watermaster shall be by way of separate Watermaster accounts, subject to separate accounting and auditing. Meetings and hearings held by the MWA Board of Directors when acting as Watermaster shall be noticed and conducted separately from MWA meetings. All Watermaster staff and consultant functions shall be separate and distinct from MWA staff and consultant functions; provided, however, that pursuant to duly adopted Watermaster rules, which shall be subject to review according to Paragraph 36 hereof, Watermaster staff and consultant functions may be accomplished by MWA staff and consultants, subject to strict time and cost accounting principles so that Watermaster functions, and the Assessments provided under this Judgment, do not subsidize, and are not subsidized by, MWA functions. Subject to these principles, MWA shall implement practicable cost efficiencies through consolidation of Watermaster and MWA staff and consultant functions.

24. Powers and Duties. Subject to the continuing supervision and control of the Court, Watermaster shall have and may exercise the following express powers, and shall perform the following duties, together with any specific powers, authority and duties granted or imposed elsewhere in this Judgement or hereafter ordered or authorized by the Court in the exercise of its continuing jurisdiction:

a. Rules and Regulations. To adopt any and all appropriate rules and regulations for conduct pursuant to this Judgment after public hearing. Notice of hearing and a copy of the proposed rules and regulations, and any amendments thereof, shall be mailed to all Parties thirty days prior to the date of the hearing thereon.

b. Employment of Experts and Agents. To employ such administrative personnel, engineering, legal, accounting, or other specialty services and consulting assistants as may be deemed appropriate in carrying out the terms of this Judgment.

c. Makeup and Replacement Obligations. To determine the Makeup Obligations for each Subarea and Replacement Obligations for each Producer and each Subarea, pursuant to the terms of the Judgment.

d. Measuring Devices, etc. To adopt rules and regulations regarding determination of amounts of Production and installation of individual water meters. The rules and regulations shall provide for approved devices or methods to measure or estimate Production. Producers who meter Production on the date of entry of this Judgment shall continue to meter Production. Thereafter, Producers who do not meter Production on the effective date of entry of this Judgment may be required by Watermaster rules and regulations to install water meters upon a showing that then employed measurement devices or methods do not accurately determine actual Production. The rules and regulations shall require that within three Years after the date of entry of this Judgment, any Producer who provides piped water for human Consumption to more than five service connections shall have installed an individual water meter on each service connection.

e. Hydrologic Data Collection. To install, operate and maintain such wells, measuring devices and/or meters necessary to monitor stream flow, precipitation and groundwater levels and to obtain such other data as may be necessary to carry out the provisions of this Judgment, including a study of the Basin Area phreatophyte consumptive use.

f. Assessments. To set, levy and collect all Assessments specified herein.

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g. Purchase of and Recharge with Supplemental Water. In accordance with Paragraph 27, to the extent Supplemental Water is available and is reasonably needed for Replacement Water or Makeup Water, to use Replacement Water Assessment proceeds to purchase Replacement Water, and to use Makeup Water Assessment proceeds to purchase Makeup Water and to have such Replacement Water and Makeup Water provided to the appropriate Subarea as soon as practicable. Watermaster may prepurchase Supplemental Water and apply subsequent Assessments towards the costs of such prepurchases.

h. Water Quality. To take all reasonable steps to assist and encourage appropriate regulatory agencies to enforce reasonable water quality regulations affecting the Basin Area, including regulation of solid and liquid waste disposal.

i. Notice List. To maintain a current list of Responsible Parties to receive notice hereunder.

j. Annual Administrative Budget. To prepare a proposed administrative budget for each Year, hold hearings thereon, and adopt an administrative budget according to the time schedule set forth in Exhibit "D". The administrative budget shall set forth budgeted items and Administrative Assessments in sufficient detail to show the allocation of the expense among the Producers. Following the adoption of the budget, expenditures within budgeted items may thereafter be made by Watermaster in the exercise of powers herein granted, as a matter of course.

k. Annual Report to Court.

(1) To file an Annual report with this Court not later than April 1 of each Year beginning April 1 following the

first full Year after entry of Judgment. Prior to filing the Annual report with the Court, Watermaster shall notify all Parties that a draft of the report is available for review and shall provide notice of a hearing to receive comments and recommendations for changes in the report. The public hearing shall be conducted on the same date and at the same place as the hearings required by Paragraphs 3 and 4 of Exhibit "D". The notice of hearing may include such summary of the draft report as Watermaster may deem appropriate. Watermaster shall also distribute the report to the Parties requesting copies.

(2) The Annual report shall include an Annual fiscal report of the preceding Year's operation and shall include details as to operation of each of the Subareas and an audit of all Assessments and expenditures pursuant to this Physical Solution and a review of Watermaster activities pursuant to this Judgment. The Annual report shall include a compilation of at least the following:

Determinations and data required by:

i) Paragraph 24(c) (Makeup and Replacement Obligations)

ii) Paragraph 24(e) (Hydrologic Data Collection)

iii) Paragraph 24(g) (Purchase of and Recharge with Supplemental Water)

iv) Paragraph 24(i) (Notice List)

Rules and regulations adopted pursuant to:

v) Paragraph 24(a) (Rules and Regulations)

vi) Paragraph 24(d) (Measuring Devices, etc.)

vii) Paragraph 24(s) (Storage Agreements)

Reports required by:

viii) Paragraph 24(j) (Annual Administrative Budget)

ix) Paragraph 24(n) (Transfers)

x) Paragraph 24(o) (Free Production Allowance)

xi) Paragraph 24(p) (Production Reports)

xii) Exhibit "D" (Prior Year Report)

xiii) Exhibit "F" (Transfers of Base Annual Production Rights)

xiv) Exhibit "G" (Status of Subarea Obligation)

xv) Exhibit "H" (Biological Resource Mitigation)

l. Investment of Funds. To hold and invest any funds in investments authorized from time to time for public agencies in the State of California.

m. Borrowing. To borrow in anticipation of receipt of Assessment proceeds in an amount not to exceed the Annual amount of Assessments levied but uncollected.

n. Transfers. To prepare on an Annual basis and maintain a report or record of any transfer of Base Annual Production Rights. Such report or record shall be available for inspection by any Party upon reasonable notice to the Watermaster.

o. Free Production Allowance. Not later than the end of the 1997-1998 Water Year, and Annually thereafter, to recommend in the Watermaster Annual Report an adjustment, if needed, to the Free Production Allowance for any Subarea. In making its recommendation, Watermaster shall be guided by the factors set forth in Exhibit "C", including but not limited to an annual calculation of the change of water in storage. The Annual report shall include all assumptions and calculations relied upon in making its recommendations. Following the 1997-1998 Water Year, or any time thereafter, Watermaster shall obtain prior Court approval for any increase or reduction of any Subarea's Free Production Allowance. In no event shall a reduction in any Year for a Subarea exceed five percent of the aggregate Base Annual Production of that Subarea. In the event Watermaster recommends in its report to the Court that the Free Production Allowance for any Subarea may need to be increased or reduced, the Court shall conduct a hearing, after notice given by Watermaster according to paragraph 36, upon Watermaster's recommendations and may order such changes in Subarea Free Production Allowance. The most recent Subarea Free Production Allowances shall remain in effect until revised according to this Paragraph 24(o).

p. Production Reports. To require each Producer to file with Watermaster, pursuant to procedures and time schedules to be established by Watermaster, a report on a form to be prescribed by Watermaster showing the total Production of such Party for each reporting period rounded off to the nearest tenth of an acre foot, and such additional information and supporting documentation as Watermaster may require.

q. Production Adjustment for Change in Purpose of Use. If Watermaster determines, using the Consumptive Use rates set forth in Exhibit "F", that a new Purpose of Use of any Producer's Production for any Year has resulted in a higher rate of Consumption than the rate applicable to the original Purpose of Use of that Producer's Production in the Year for which Base Annual Production was determined, Watermaster shall use a multiplier (1) to adjust upward such Production for the purpose of determining the Producer's Replacement Water Assessment and, (2) to adjust upward the Free Production Allowance portion of such Production for the purpose of determining the Producer's Makeup Water Assessment. The multiplier shall be determined by dividing the number of acre feet of Consumption that occurred under the new Purpose of Use by the number of acre feet of Consumption that would have occurred under the original Purpose of Use for the same Production.

r. <u>Reallocation of Base Annual Production Rights</u>. To reallocate annually the Base Annual Production Rights in each Subarea to reflect any permanent transfers of such Rights among Parties.

s. <u>Storage Agreements</u>. To enter into Storage Agreements with any Party in order to accommodate the acquisition of Supplemental Water. Watermaster may not enter into Storage Agreements with non-Parties unless such non-Parties become subject to the provisions of this Judgment and the jurisdiction of the Court. Such Storage Agreements shall by their terms preclude operations which will have a substantial adverse impact on any Producer. If a Party pursuant to a Storage Agreement has provided for predelivery or postdelivery of Replacement Water for the Party's use, Watermaster shall at the Party's request credit such water to the Party's Replacement Obligation. Watermaster shall adopt uniformly applicable rules for Storage Agreements. Watermaster shall calculate additions, extractions and losses of water stored under Storage Agreements and maintain an Annual account of all such water.

t. <u>Subarea Advisory Committee Meetings</u>. To meet on a regular basis and at least semi-annually with the Subarea Advisory Committees to review Watermaster activities pursuant to this Judgment and to receive advisory recommendations from the Subarea Advisory Committees.

u. Unauthorized Production. To bring such action or motion as is necessary to enjoin unauthorized Production as provided in Paragraph 12 hereinabove.

v. Meetings and Records. To ensure that all meetings and hearings by Watermaster shall be noticed and conducted according to then current requirements of the Ralph M. Brown Act, Government Code Sections 54950, et seq. Watermaster files and records shall be available to any person according to the provisions of the Public Records Act, Government Code §§ 6200 et seq.

w. Data, Estimates and Procedures. To rely on and use the best available records and data to support the implementation of this Judgment. Where actual records of data are not available, Watermaster shall rely on and use sound scientific and engineering estimates. Watermaster may use preliminary records of measurements, and, if revisions are subsequently made, Watermaster may reflect such revisions in subsequent accounting. Exhibit "C" sets forth methods and procedures for determining surface flow components. Watermaster shall use either the same procedures or procedures that will yield results of equal or greater accuracy.

x. Biological Resource Mitigation. To implement the Biological Resource Mitigation measures set forth in Exhibit "H" herein.

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C. ASSESSMENTS

25. Purpose. Watermaster shall levy and collect Assessments from the Parties based upon Production in accordance with the time schedules set forth in Exhibit "D". Watermaster shall levy and collect such Assessments as follows:

a. Administrative Assessments. Administrative Assessments to fund the Administrative Budget adopted by the Watermaster pursuant to Paragraph 24(j) shall be levied uniformly against each acre foot of Production. A Producer who does not Produce in a given Year shall pay an Administrative Assessment in amount equal to the lowest MWA assessment for Minimal Producers for that Year.

b. Replacement Water Assessments. Replacement Water Assessments shall be levied against each Producer on account of such Producer's Production, after any adjustment pursuant to Paragraph 24(q), in excess of such Producer's share of the Free Production Allowance in each Subarea during the prior Year.

c. Makeup Water Assessments. Makeup Water Assessments shall be levied against each Producer in each Subarea on account of each acre-foot of Production therein which does not bear a Replacement Assessment hereunder, after any adjustment pursuant to Paragraph 24(q), to pay all necessary costs of satisfying the Makeup Obligation, if any, of that Subarea.

d. Biological Resource Assessment. To establish and, to the extent needed, to maintain the Biological Resource Trust Fund balance at one million dollars (in 1993 dollars) pursuant to Paragraph 24(x) and Exhibit "H", a Biological Resource Assessment in an amount not to exceed fifty cents (in 1993 dollars) for each acre-feet of Production shall be levied uniformly against each producer except the California Department of Fish and Game.

e. MWA Assessment of Minimal Producers. The MWA shall identify and assess Minimal Producers through its own administrative procedures, and not acting as Watermaster.

26. Procedure. Each Party hereto is ordered to pay the Assessments herein provided for, which shall be levied and collected in accordance with the procedures and schedules set forth in Exhibit "D". Any Assessment which becomes delinquent, as defined in Paragraph 7 of Exhibit "D", shall bear interest at the then current San Bernardino County property tax delinquency rate Said interest rate shall be applicable to any said delinquent Assessment from the due date thereof until paid. Such delinquent Assessment, together with interest thereon, costs of suit, attorneys fees and reasonable costs of collection, may be collected pursuant to motion giving notice to the delinquent Party only, or Order to Show Cause proceeding, or such other lawful proceeding as may be instituted by the Watermaster; and shall, if provided for in the MWA Act, constitute a lien on the property of the Party as of the same time and in the same manner as does the tax lien securing County property taxes. The Watermaster shall Annually certify a list of all such unpaid delinquent Assessments to the MWA (in accordance with applicable provisions of the MWA Act). The MWA (in accordance with applicable provisions of the MWA Act) shall include the names of those Parties and the amounts of the liens in its list to the County Assessor's Office in the same manner and at the same time as it does its administrative assessments. MWA shall account for receipt of all collections of Assessments collected pursuant to

this Judgment, and shall pay such amounts collected pursuant to this Judgment to the Watermaster. The Watermaster shall also have the ability to enjoin production of those Persons who do not pay Assessments pursuant to this Judgment.

27. Availability of Supplemental Water. All Replacement and Makeup Water Assessments collected by the Watermaster shall be used to acquire Supplemental Water from MWA. Watermaster shall determine when to request Supplemental Water from MWA and shall determine the amount of Supplemental Water to be requested. MWA shall use its best efforts to acquire as much Supplemental Water as possible in a timely manner. If MWA encounters delays in the acquisition of Supplemental Water which, due to cost increases, results in collected assessment proceeds being insufficient to purchase all Supplemental Water for which the Assessments were made, MWA shall purchase as much water as the proceeds will allow when the water becomes available. If available Supplemental Water is insufficient to meet all Makeup and Replacement Water obligations, Watermaster shall allocate the Supplemental Water for delivery to the Subareas on an equitable and practicable basis pursuant to duly adopted Watermaster rules and regulations, giving preference to: First, Transition Zone Replacement Water Obligations as set forth in Exhibit "G"; Second, Makeup Water Obligations; and Third, other Replacement Water Obligations. MWA may acquire Supplemental Water at any time. MWA shall be entitled to enter into a Storage Agreement with Watermaster to store water MWA acquires prior to being paid to do so by Watermaster. Such water, including such water acquired and stored prior to the date of this Judgment or prior to the entry of

a Storage Agreement, may later be used to satisfy MWA's duty under this paragraph.

28. Use of Replacement Water Assessment Proceeds and Makeup Water Assessment Proceeds. The Proceeds of Replacement Water Assessments and any interest accrued thereon shall only be used for the purchase of Replacement Water for that Subarea from which they were collected. In addition, the proceeds of Replacement Water Assessments collected on account of Production in the Transition Zone, except as provided in Exhibit "G", shall only be used for the purchase of Replacement Water for the Transition Zone, and the proceeds of Replacement Water Assessments collected on account of Production in that portion of the Baja Subarea downstream of the Calico-Newberry fault shall only be used for the purchase of Replacement Water for that portion of the Baja Subarea downstream of the Calico-Newberry fault. The proceeds of Makeup Water Assessments and any interest accrued thereon shall only be used for the purchase of Makeup Water to satisfy the Makeup Obligation for which they are collected.

29. MWA Annual Report to the Watermaster. MWA shall Produce and deliver to Watermaster an Annual written report regarding actions of MWA required by the terms of this Judgment. The report shall contain: 1) a summary of the actions taken by MWA in identifying and assessing Minimal Producers, including a report of Assessments made and collected; 2) a summary of other MWA activities in collecting Assessment on behalf of Watermaster; 3) a report of water purchases and water distribution for the previous Year; 4) actions taken to implement its Regional Water Management Plan, including actions relating to conveyance facilities referred

to in this Judgment. The MWA report will be provided to Watermaster not less than 30 days prior to the Annual Watermaster report to the Court required by this Judgment.

D. SUBAREA ADVISORY COMMITTEES.

30. Authorization. The Producers in each of the five Subareas are hereby authorized and directed to cause committees of Producer representatives to be organized and to act as Subarea Advisory Committees.

31. Composition and Election. Each Subarea Advisory Committee shall consist of five (5) Persons who shall be called advisors. In the election of advisors, every Party shall be entitled to one vote for every acre-foot of Base Annual Production for that Party in that particular Subarea. Parties may cumulate their votes and give one candidate a number of votes equal to the number of advisors to be elected multiplied by the number of votes to which the Party is normally entitled, or distribute the Party's votes on the same principle among as many candidates as the Party thinks fit. In any election of advisors, the candidates receiving the highest number of affirmative votes of the Parties are elected. Elections shall be held upon entry of this Judgment and thereafter every third year. In the event a vacancy arises, a temporary advisor shall be appointed by unanimous decision of the other four advisors to continue in office until the next scheduled election. The California Department of Fish and Game shall serve as a permanent ex-officio member of the Alto and Baja Subarea Advisory Committees. Rules and regulations regarding organization, meetings and other activities shall be at the discretion of the individual

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Subarea Advisory Committees, except that all meetings of the committees shall be open to the public.

32. Compensation. The Subarea Advisory Committee members shall serve without compensation.

33. Powers and Functions. The Subarea Advisory Committee for each Subarea shall act in an advisory capacity only and shall have the duty to study, review and make recommendations on all discretionary determinations made or to be made hereunder by Watermaster which may affect that Subarea.

E. TRANSFERABILITY.

34. Assignment, Transfer, etc. of Rights. In order to further the purposes of this Judgment and Physical Solution, any Base Annual Production Right, or any portion thereof, may be sold, assigned, transferred, licensed or leased pursuant to the rules and procedures set forth in Exhibit "F".

F. MISCELLANEOUS PROVISIONS.

35. Water Quality. Nothing in this Judgment shall be interpreted as relieving any Party of its responsibilities to comply with state or federal laws for the protection of water quality or the provisions of any permits, standards, requirements, or orders promulgated thereunder.

36. Review Procedures. Any action, decision, rule or procedure of Watermaster pursuant to this Judgment shall be subject to review by the Court on its own motion or on timely motion by any Party, as follows:

a. Effective Date of Watermaster Action. Any order, decision or action of Watermaster pursuant to this Judgment on noticed specific agenda items shall be deemed to have occurred on the date of the order, decision or action.

b. Notice of Motion. Any Party, may, by a regularly noticed motion, petition the Court for review of Watermaster's action or decision pursuant to this Judgment. The motion shall be deemed to be filed when a copy, conformed as filed with the Court, has been delivered to Watermaster together with the service fee established by Watermaster sufficient to cover the cost to photocopy and mail the motion to each Party. Watermaster shall prepare copies and mail a copy of the motion to each Party or its designee according to the official service list which shall be maintained by Watermaster according to Paragraph 37. A Party's obligation to serve notice of a motion upon the Parties is deemed to be satisfied by filing the motion as provided herein. Unless ordered by the Court, any such petition shall not operate to stay the effect of any Watermaster action or decision which is challenged.

c. Time for Motion. A motion to review any Watermaster action or decision shall be filed within ninety (90) days after such Watermaster action or decision, except that motions to review Watermaster Assessments hereunder shall be filed within thirty (30) days of mailing of notice of the Assessment.

d. De Novo Nature of Proceeding. Upon filing of a petition to review Watermaster action, the Watermaster shall notify the Parties of a date when the Court will take evidence and hear argument. The Court's review shall be de novo and the Watermaster decision or action shall have no evidentiary weight in such proceeding.

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e. Decision. The decision of the Court in such proceeding shall be an appealable Supplemental Order in this case. When the same is final, it shall be binding upon Watermaster and the Parties.

f. Payment of Assessments. Payment of Assessments levied by Watermaster hereunder shall be made pursuant to the time schedule in Exhibit "D"; notwithstanding any motion for review of Watermaster actions, decisions, rules or procedures, including review of Watermaster Assessments.

37. Designation of Address for Notice and Service. Each Party shall designate the name and address to be used for purposes of all subsequent notices and service herein, either by its endorsement on the Stipulation for Judgment or by a separate designation to be filed within thirty (30) days after Judgment has been entered. Said designation may be changed from time to time by filing a written notice of such change with Watermaster. Any Party desiring to be relieved of receiving notices of Watermaster activity may file a waiver of notice on a form to be provided by Watermaster. Watermaster shall maintain at all times a current list of Parties to whom notices are to be sent and their addresses for purposes of service. Watermaster shall also maintain a full current list of names and addresses of all Parties or their successors, as filed herein. Copies of such lists shall be available to any Person. If no designation is made, a Party's designee shall be deemed to be, in order of priority: i) the Party's attorney of record; ii) if the Party does not have an attorney of record, the Party itself at the address on the Watermaster list.

38. Service of Documents. Delivery to or service upon any Party by Watermaster, by any other Party, or by the Court, of any document required to be served upon or delivered to a Party under or pursuant to the Judgment shall be deemed made if made by Deposit thereof (or by copy thereof) in the mail, first class, postage prepaid, addressed to the designee of the Party and at the address shown in the latest designation filed by that Party.

39. No Abandonment of Rights. It is in the interest of reasonable beneficial use of the Basin Area and its water supply that no Party be encouraged to take and use more water in any Year than is actually required. Failure to Produce all of the water to which a Party is entitled hereunder shall not, in and of itself, be deemed or constitute an abandonment of such Party's right, in whole or in part.

40. Intervention After Judgment. Any person who is not a Party or successor to a Party and who proposes to Produce water from the Basin Area may seek to become a Party to this Judgment through a Stipulation for Intervention entered into with Watermaster. Watermaster may execute said Stipulation on behalf of the other Parties herein but such Stipulation shall not preclude a Party from opposing such Intervention at the time of the Court hearing thereon. Said Stipulation for Intervention must thereupon be filed with the Court, which will consider an order confirming said intervention following thirty (30) days' notice to the Parties. Thereafter, if approved by the Court, such intervenor shall be a Party bound by this Judgment and entitled to the rights and privileges accorded under the Physical Solution herein.

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41. <u>Recordation of Notice</u>. MWA shall within sixty (60) days following entry of this Judgment record in the Office of the County Recorder of the County of San Bernardino a notice substantially complying with the notice content requirements set forth in Section 2529 of the California Water Code.

42. <u>Judgment Binding on Successors, etc.</u> Subject to specific provisions hereinbefore contained, this Judgment and all provisions thereof are applicable to and binding upon and inure to the benefit of not only the Parties to this action, but as well to their respective heirs, executors, administrators, successors, assigns, lessees, licensees and to the agents, employees and attorneys in fact of any such Persons.

43. <u>Costs</u>. No Party stipulating to this Judgment shall recover any costs or attorneys fees in this proceeding from another stipulating Party.

44. <u>Entry of Judgment</u>. The Clerk shall enter this Judgment.

Dated: JAN 10 1996

E. MICHAEL KAISER

E. Michael Kaiser, Judge
Superior Court of the State
of California for the
County of Riverside

EXHIBIT A

MAP OF MOJAVE BASIN AREA

[INDEX MAP AND DETAIL SHEET CONSISTING OF 42 1" = 4,000' SCALE MAPS COVERING THE BASIN AREA; THE MAP IS ON DISPLAY AT THE OFFICE OF THE MOJAVE WATER AGENCY, 22450 HEADQUARTERS, APPLE VALLEY, CA 92307 AND ON FILE WITH THE COURT]

EXHIBIT B

PRODUCTION TABLES

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~~12/10/92~~
~~01/00/93~~
~~03/02/93~~
~~04/10/93~~
~~04/28/93~~
09/25/95

EXHIBIT B

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TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ESTE SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
ABSHIRE, DAVID V	24	0.1093	24	22	21	20	19
ANDERSON, ROSS C & BETTY J	34	0.1548	34	32	30	28	27
BAR H MUTUAL WATER COMPANY	53	0.2414	53	50	47	45	42
BELL, CHUCK	494	2.2497	494	469	444	419	395
BURNS, BOBBY J & EVELYN J	1,300	5.9204	1,300	1,235	1,170	1,105	1,040
CASA COLINA FOUNDATION	90	0.4099	90	85	81	76	72
CENTER WATER CO	40	0.1822	40	38	36	34	32
CLUB VIEW PARTNERS	1,276	5.8111	1,276	1,212	1,148	1,084	1,020
CROSS, LAWRENCE E	23	0.1047	23	21	20	19	18
CRYSTAL HILLS WATER COMPANY	194	0.8835	194	184	174	164	155
DAHLQUIST, GEORGE R	594	2.7052	594	564	534	504	475
DELPERDANG, ROBERT H	56	0.2550	56	53	50	47	44
DESERT DAWN MUTUAL WATER COMPANY	15	0.0683	15	14	13	12	12
GAETA, TRINIDAD	512	2.3317	512	486	460	435	409
GAYJIKIAN, SAMUEL & HAZEL	102	0.4645	102	96	91	86	81
GRACETOWN INVESTMENT CO - JETCO PROP FUND	752	3.4247	752	714	676	639	601
GUBLER, HANS	30	0.1366	30	28	27	25	24
HAL-DOR LTD	23	0.1047	23	21	20	19	18
HANDLEY, DON R & MARY ANN	73	0.3325	73	69	65	62	58
HART, MERRILL W	473	2.1541	473	449	425	402	378
HERT, SCOTT	276	1.2569	276	262	248	234	220
HI-GRADE MATERIALS	442	2.0129	442	419	397	375	353
HITCHIN LUCERNE, INC	16	0.0729	16	15	14	13	12
JAMS RANCH	28	0.1275	28	26	25	23	22

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	RIGHT (PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
JUBILEE MUTUAL WATER COMPANY	142	0.6467	142	134	127	120	113
JUNIPER RIVIERA COUNTY WATER DISTRICT	37	0.1685	37	35	33	31	29
LEE, DOO HWAN	78	0.3552	78	74	70	66	62
LOPEZ, BALTAZAR	385	1.7533	385	365	346	327	308
LUA, ANTONIO	348	1.5848	348	330	313	295	278
LUCERNE VALLEY MUTUAL WATER COMPANY	54	0.2459	54	51	48	45	43
LUCERNE VALLEY PARTNERS	1,213	5.5242	1,213	1,152	1,091	1,031	970
LUCERNE VISTA WATER CO	21	0.0956	21	19	18	17	16
MITSUBISHI CEMENT CORPORATION	1,299	5.9158	1,299	1,234	1,169	1,104	1,039
MONACO INVESTMENT COMPANY	70	0.3188	70	66	63	59	56
MOSS, LAWRENCE W & HELEN J	43	0.1958	43	40	38	36	34
PARK, CHANHO	597	2.7188	597	567	537	507	477
PARK, JEONG, IL & HEA JA	96	0.4372	96	91	86	81	76
PEREZ, EVA	247	1.1249	247	234	222	209	197
PETTIGREW, DAN	1,422	6.4760	1,422	1,350	1,279	1,208	1,137
PETTIGREW, HOWARD L	1,500	6.8312	1,500	1,425	1,350	1,275	1,200
PLUESS-STAUFER CALIFORNIA INC	23	0.1047	23	21	20	19	18
REED, MIKE	58	0.2641	58	55	52	49	46
ROGERS, ROY	1,449	6.5990	1,449	1,376	1,304	1,231	1,159
SAN BERNARDINO CO SERVICE AREA 29	21	0.0956	21	19	18	17	16
- SEALS, LAWRENCE	113	0.5146	113	107	101	96	90
SON'S RANCH	140	0.6376	140	133	126	119	112
SOUTHERN CALIFORNIA WATER COMPANY	178	0.8106	178	169	160	151	142
SPECIALTY MINERALS, INC	42	0.1913	42	39	37	35	33

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EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
SPILLMAN, JAMES R & NANCY J	23	0.1047	23	21	20	19	18
STEWART WATER COMPANY	54	0.2459	54	51	48	45	43
STRINGER, W EDWARD	573	2.6095	573	544	515	487	458
THE CUSHENBURY TRUST, C/O SPECIALTY MINERALS, INC	10	0.0455	10	9	9	8	8
TURNER, LOYD & CAROL	77	0.3507	77	73	69	65	61
VISOSKY, JOSEPH F JR	1,120	5.1006	1,120	1,064	1,008	952	896
WEISER, SIDNEY & RAQUEL	90	0.4099	90	85	81	76	72
WILLOW WELLS MUTUAL WATER COMPANY	30	0.1366	30	28	27	25	24

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EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MINIMAL PRODUCER POOL	2,000	9.1083	2,000	1,900	1,800	1,700	1,600
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	1,485	6.7629					
ESTE SUBAREA TOTALS =	21,958	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN OESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

OESTE SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AEROCHEM, INC	660	5.3645	660	627	594	561	528
BROWN, DOUG & SUE	46	0.3739	46	43	41	39	36
CHAMISAL MUTUAL	96	0.7803	96	91	86	81	76
DAVIS, PAUL	19	0.1544	19	18	17	16	15
DOSSEY, D A	14	0.1138	14	13	12	11	11
MEADOWBROOK DAIRY	2,335	18.9791	2,335	2,218	2,101	1,984	1,868
RESSEGUE, JOHN & BILL	259	2.1052	259	246	233	220	207
SAN BERNARDINO CO SERVICE AREA 70G	110	0.8941	110	104	99	93	88
SAN BERNARDINO CO SERVICE AREA 70L	1,306	10.6153	1,306	1,240	1,175	1,110	1,044
THORESON, ROBERT F & A KATHLEEN	40	0.3251	40	38	36	34	32
TROEGER, RICHARD H	112	0.9103	112	106	100	95	89
VAN DAM BROTHERS	1,860	15.1183	1,860	1,767	1,674	1,581	1,488

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN OESTE SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

OESTE SUBAREA / PRODUCER	BASE ANNUAL PRODUCTION [1] (ACRE-FEET)	BASE ANNUAL PRODUCTION RIGHT [2] (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MINIMAL PRODUCER POOL	1,500	12.1921	1,500	1,425	1,350	1,275	1,200
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	3,946	32.0735					
OESTE SUBAREA TOTALS =	12,303	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
ABBOND, EDWARD & GRACE	28	0.0229	28	26	25	23	22
ABBOTT, LEONARD C	284	0.2321	284	269	255	241	227
ADELANTO, CITY OF	1,573	1.2855	1,573	1,494	1,415	1,337	1,258
ADELANTO, CITY OF - GEORGE A F B	3,433	2.8055	3,433	3,261	3,089	2,918	2,746
AGCON, INC	384	0.3138	384	364	345	326	307
APPLE VALLEY COUNTRY CLUB	709	0.5794	709	673	638	602	567
APPLE VALLEY DEVELOPMENT	724	0.5917	724	687	651	615	579
APPLE VALLEY FOOTHILL CO WATER DISTRICT	167	0.1365	167	158	150	141	133
APPLE VALLEY HEIGHTS COUNTY WATER DISTRICT	125	0.1022	125	118	112	106	100
APPLE VALLEY RANCHOS WATER COMPANY	13,022	10.6419	13,022	12,370	11,719	11,068	10,417
APPLE VALLEY RECREATION & PARKS	45	0.0368	45	42	40	38	36
APPLE VALLEY VIEW MUTUAL WATER CO	36	0.0294	36	34	32	30	28
APPLE VALLEY, TOWN OF	298	0.2435	298	283	268	253	238
ARC LAS FLORES	6,331	5.1739	6,331	6,014	5,697	5,381	5,064
BACA, ENRIQUE	74	0.0605	74	70	66	62	59
BALDY MESA WATER DISTRICT	1,495	1.2218	1,495	1,420	1,345	1,270	1,196
BASS, NEWTON T	514	0.4201	514	488	462	436	411
BASTIANON, RENO	77	0.0629	77	73	69	65	61
BASURA, STEVE	25	0.0204	25	23	22	21	20
BEINSCHROTH, A J	90	0.0736	90	85	81	76	72
BOYCE, KENNETH & WILLA	102	0.0834	102	96	91	86	81
BROWN, BOBBY G & VALERIA R	42	0.0343	42	39	37	35	33
BURNS, ULYSSES & ANNIE L	164	0.1340	164	155	147	139	131
CARDOZO, MANUEL & MARIA	909	0.7429	909	863	818	772	727

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
CDFG - MOJAVE NARROWS REGIONAL PARK	2,107	1.7219	2,107	2,001	1,896	1,790	1,685
CDFG - MOJAVE RIVER FISH HATCHERY	20	0.0163	20	19	18	17	16
CLARK, KENNETH R	223	0.1822	223	211	200	189	178
CLEAR VIEW FARMS	501	0.4094	501	475	450	425	400
COPELAND, ET AL (C/O DON W. LITTLE)	175	0.1430	175	166	157	148	140
CRAMER, MARGARET MUIR	280	0.2288	280	266	252	238	224
CUNNINGHAM, WILLIAM	29	0.0237	29	27	26	24	23
DEXTER, CLAIR F	175	0.1430	175	166	157	148	140
DEXTER, J P	515	0.4209	515	489	463	437	412
DIBERNARDO, JOHN	203	0.1659	203	192	182	172	162
DOLCH, ROBERT & JUDY	426	0.3481	426	404	383	362	340
DOMBROWSKI, MICHAEL W & SUSAN M	19	0.0155	19	18	17	16	15
DOWSE, PHILIP	20	0.0163	20	19	18	17	16
EVENSON, EDWIN H & JOYCELAINE	70	0.0572	70	66	63	59	56
FISHER, DOLORES DR	48	0.0392	48	45	43	40	38
FISHER, JEROME	633	0.5173	633	601	569	538	506
FITZWATER, R E	291	0.2378	291	276	261	247	232
GARCIA, SONIA L	288	0.2354	288	273	259	244	230
GOMEZ, CIRIL - LIVING TRUST	330	0.2697	330	313	297	280	264
GREEN ACRES ESTATES	25	0.0204	25	23	22	21	20
GULBRANSON, MERLIN	163	0.1332	163	154	146	138	130
HELENDALE SCHOOL DISTRICT	18	0.0147	18	17	16	15	14
HESPERIA GOLF AND COUNTRY CLUB	678	0.5541	678	644	610	576	542
HESPERIA WATER DISTRICT	12,213	9.9808	12,213	11,602	10,991	10,381	9,770

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
HI-GRADE MATERIALS	149	0.1218	149	141	134	126	119
HODGE, STANLEY W	67	0.0548	67	63	60	56	53
HOLWAY, ROBERT	88	0.0719	88	83	79	74	70
HRUBIK, THOMAS A	3,862	3.1561	3,862	3,668	3,475	3,282	3,089
INDUSTRIAL ASPHALT	109	0.0891	109	103	98	92	87
JESS RANCH WATER COMPANY	7,480	6.1129	7,480	7,106	6,732	6,358	5,984
JOHNSON, LARRY & CARLEAN	82	0.0670	82	77	73	69	65
JOHNSON, RONALD	31	0.0253	31	29	27	26	24
JOHNSTON, HARRIET AND LARRY W	127	0.1038	127	120	114	107	101
KEMPER CAMPBELL RANCH	473	0.3865	473	449	425	402	378
LAKE ARROWHEAD COMMUNITY SERVICES DISTRICT	658	0.5377	658	625	592	559	526
LAWSON, ERNEST & BARBARA	15	0.0123	15	14	13	12	12
LENHERT, RONALD & TONI	37	0.0302	37	35	33	31	29
LEWIS HOMES OF CALIFORNIA	1,693	1.3836	1,693	1,608	1,523	1,439	1,354
LONGMAN, JACK	115	0.0940	115	109	103	97	92
LOUNSBURY, J PETER & CAROLYN	208	0.1700	208	197	187	176	166
LOW, ROBERT	399	0.3261	399	379	359	339	319
LUCKEY, MANLEY J	800	0.6538	800	760	720	680	640
LUTH, KEN	27	0.0221	27	25	24	22	21
MARIANA RANCHOS COUNTY WATER DISTRICT	245	0.2002	245	232	220	208	196
MCCALL, REX	44	0.0360	44	41	39	37	35
MCINNIS, WILLIAM S	30	0.0245	30	28	27	25	24
MITCHELL, ROBIN & JUDITH	36	0.0294	36	34	32	30	28
MURPHY, BERNARD H	25	0.0204	25	23	22	21	20

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MURPHY, BERNARD TRUST	162	0.1324	162	153	145	137	129
MURPHY, KENNETH	42	0.0343	42	39	37	35	33
MUTUAL FUNDING CORP	101	0.0825	101	95	90	85	80
NAVAJO MUTUAL WATER CO	88	0.0719	88	83	79	74	70
NUNN, DONALD & PEARL	66	0.0539	66	62	59	56	52
O'BRYANT, ROBERT C & BARBARA	107	0.0874	107	101	96	90	85
ORMSBY, HARRY G	386	0.3154	386	366	347	328	308
PALISADES RANCH	824	0.6734	824	782	741	700	659
PARKER, DAVID E	37	0.0302	37	35	33	31	29
PEARL, ALICE	147	0.1201	147	139	132	124	117
PEARSON, DERYL B	22	0.0180	22	20	19	18	17
PERRY, THOMAS A	35	0.0286	35	33	31	29	28
PETTIS TRUST	126	0.1030	126	119	113	107	100
PHENIX PROPERTIES LTD	652	0.5328	652	619	586	554	521
PITTMAN, LEROY W	148	0.1209	148	140	133	125	118
POLICH, LEE & DONNA	65	0.0531	65	61	58	55	52
RANCHERITOS MUTUAL WATER CO	169	0.1381	169	160	152	143	135
RIVERSIDE CEMENT CO - ORO GRANDE PLANT	3,452	2.8211	3,452	3,279	3,106	2,934	2,761
ROGERS, ROY (ORO GRANDE RANCH)	115	0.0940	115	109	103	97	92
RUDMAN, ROBERT T	300	0.2452	300	285	270	255	240
RUE RANCH	30	0.0245	30	28	27	25	24
SAN BERNARDINO CO SERVICE AREA 42	465	0.3800	465	441	418	395	372
SAN BERNARDINO CO SERVICE AREA 64	3,822	3.1234	3,822	3,630	3,439	3,248	3,057
SAN BERNARDINO CO SERVICE AREA 70C	2,346	1.9172	2,346	2,228	2,111	1,994	1,876

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
SAN BERNARDINO CO SERVICE AREA 70J	1,005	0.8213	1,005	954	904	854	804
SAN BERNARDINO CO SERVICE AREA 70L	355	0.2901	355	337	319	301	284
SAN FILIPPO, JOSEPH & SHELLEY	35	0.0286	35	33	31	29	28
SILVER LAKES ASSOCIATION	3,987	3.2583	3,987	3,787	3,588	3,388	3,189
SOUTHDOWN, INC	1,519	1.2414	1,519	1,443	1,367	1,291	1,215
SOUTHERN CALIFORNIA WATER COMPANY	940	0.7682	940	893	846	799	752
SPRING VALLEY LAKE ASSOCIATION	3,056	2.4974	3,056	2,903	2,750	2,597	2,444
SPRING VALLEY LAKE COUNTRY CLUB	977	0.7984	977	928	879	830	781
STORM, RANDALL	62	0.0507	62	58	55	52	49
SUDMEIER, GLENN W	121	0.0989	121	114	108	102	96
SUMMIT VALLEY RANCH	452	0.3694	452	429	406	384	361
TATRO, RICHARD K & SANDRA A	280	0.2288	280	266	252	238	224
TATUM, JAMES B	829	0.6775	829	787	746	704	663
TAYLOR, ALLEN C / HAYMAKER RANCH	456	0.3727	456	433	410	387	364
THOMAS, S DALE	440	0.3596	440	418	396	374	352
THOMAS, WALTER	36	0.0294	36	34	32	30	28
THOMPSON, JAMES A	418	0.3416	418	397	376	355	334
THOMPSON, RODGER	76	0.0621	76	72	68	64	60
THRASHER, GARY	373	0.3048	373	354	335	317	298
THUNDERBIRD COUNTY WATER DISTRICT	118	0.0964	118	112	106	100	94
TURNER, ROBERT	70	0.0572	70	66	63	59	56
VAIL, JOSEPH B & PAULA B	126	0.1030	126	119	113	107	100
VAN BURGER, CARL	710	0.5802	710	674	639	603	568
VAN LEEUWEN FAMILY TRUST	341	0.2787	341	323	306	289	272

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
VANNI, MIKE	54	0.0441	54	51	48	45	43
VICTOR VALLEY COMMUNITY COLLEGE DIST	240	0.1961	240	228	216	204	192
VICTOR VALLEY WATER DISTRICT	13,354	10.9133	13,354	12,686	12,018	11,350	10,683
VICTORVILLE, CITY OF	12	0.0098	12	11	10	10	9
VOGLER, ALBERT H	132	0.1079	132	125	118	112	105
WACKEEN, CAESAR	1,635	1.3362	1,635	1,553	1,471	1,389	1,308
WAKULA, JOHN	291	0.2378	291	276	261	247	232
WARD, KEN & BARBARA	65	0.0531	65	61	58	55	52
WEBER, DAVE	80	0.0654	80	76	72	68	64
WEST, CAROLYN & SMITH, RICHARD	24	0.0196	24	22	21	20	19
WEST, HOWARD & SUZY	72	0.0588	72	68	64	61	57
WHITTINGHAM, RICHARD V	15	0.0123	15	14	13	12	12
YEAGER, E L - CONSTRUCTION COMPANY INC	34	0.0278	34	32	30	28	27

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN ALTO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

ALTO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MINIMAL PRODUCER POOL	4,000	3.2689	4,000	3,800	3,600	3,400	3,200
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	4,967	4.0592					
ALTO SUBAREA TOTALS =	122,365	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AGCON, INC	0	0.0000	0	0	0	0	0
AGUAYO, JEANETTE L	212	0.3742	212	201	190	180	169
ATCHISON, TOPEKA, SANTA FE RAILWAY CO	120	0.2118	120	114	108	102	96
AVDEEF, THOMAS	34	0.0600	34	32	30	28	27
AZTEC FARM DEVELOPMENT COMPANY	220	0.3883	220	209	198	187	176
BARNES, FAY - EXECUTOR OF ESTATE OF WAYNE BARNES	243	0.4289	243	230	218	206	194
BROMMER, MARVIN	361	0.6372	361	342	324	306	288
BURNS, RITA J & PAMELA E	16	0.0282	16	15	14	13	12
CHAFA, LARRY R	96	0.1694	96	91	86	81	76
CHOI, YONG IL & JOUNG AE	38	0.0671	38	36	34	32	30
CHRISTISON, JOEL	75	0.1324	75	71	67	63	60
COOK, KWON W	169	0.2983	169	160	152	143	135
DE VRIES, NEIL	3,800	6.7070	3,800	3,610	3,420	3,230	3,040
DESERT COMMUNITY BANK	156	0.2753	156	148	140	132	124
DURAN, FRANK T	50	0.0883	50	47	45	42	40
GAINES, JACK	117	0.2065	117	111	105	99	93
GESIRIECH, WAYNE	121	0.2136	121	114	108	102	96
GORMAN, VIRGIL	138	0.2436	138	131	124	117	110
GRIEDER, RAYMOND H & DORISANNE	30	0.0530	30	28	27	25	24
GRILL, NICHOLAS P & MILLIE D	21	0.0371	21	19	18	17	16
GROEN, CORNELIS	1,043	1.8409	1,043	990	938	886	834
HANIFY, DBA - WHITE BEAR RANCH	152	0.2683	152	144	136	129	121
HARMSEN, JAMES & RUTH ANN	1,522	2.6863	1,522	1,445	1,369	1,293	1,217
HARPER LAKE COMPANY	1,433	2.5293	1,433	1,361	1,289	1,218	1,146

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
HI DESERT MUTUAL WATER CO	34	0.0600	34	32	30	28	27
HILEMAN, KATHERINE	19	0.0335	19	18	17	16	15
HILL, MELVIN	2,335	4.1213	2,335	2,218	2,101	1,984	1,868
HOY, MIKE	632	1.1155	632	600	568	537	505
JORDAN, RAYMOND	460	0.8119	460	437	414	391	368
JUSTICE, CHRIS	421	0.7431	421	399	378	357	336
KING, GENEVIEVE E	69	0.1218	69	65	62	58	55
LEE, SEPOONG ETAL & WOO POONG	77	0.1359	77	73	69	65	61
LEYERLY, GENEVA	65	0.1147	65	61	58	55	52
LEYERLY, RICHARD	862	1.5214	862	818	775	732	689
LUDINGTON, JAMES E & JO ANN	58	0.1024	58	55	52	49	46
LYON, LOUIS & ERIKA	130	0.2295	130	123	117	110	104
MARTIN, LENDELL	14	0.0247	14	13	12	11	11
MCCOLLUM, CHARLES L	347	0.6125	347	329	312	294	277
MEAD, G C	90	0.1589	90	85	81	76	72
MEYERS, LONNIE	27	0.0477	27	25	24	22	21
MITCHELL, CHARLES A	201	0.3548	201	190	180	170	160
MOFFITT, THOMAS R & EDITH I	62	0.1094	62	58	55	52	49
MOST, MILTON W	9,660	17.0500	9,660	9,177	8,694	8,211	7,728
NELSON, MILDRED L	52	0.0918	52	49	46	44	41
NEWBERRY SPRINGS COMPANY, INC	2,489	4.3931	2,489	2,364	2,240	2,115	1,991
OHAI, REYNOLDS & DOROTHY	137	0.2418	137	130	123	116	109
OROPEZA, JOSE M	190	0.3354	190	180	171	161	152
OSTERKAMP, GEROLD	260	0.4589	260	247	234	221	208

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TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
OWL ROCK PRODUCTS COMPANY	466	0.8225	466	442	419	396	372
PG & E	1,657	2.9246	1,657	1,574	1,491	1,408	1,325
REDDY, BOMMI V & KARUNA V	24	0.0424	24	22	21	20	19
ROWLAND, JAMES & HELEN	22	0.0388	22	20	19	18	17
RUISCH, DALE W	650	1.1473	650	617	585	552	520
SHIRKEY, ALAN G & MARY E	35	0.0618	35	33	31	29	28
SMITH, ROBERT A	43	0.0759	43	40	38	36	34
SOPPELAND, WAYNE	783	1.3820	783	743	704	665	626
SOUTHERN CALIFORNIA WATER COMPANY	11,309	19.9605	11,309	10,743	10,178	9,612	9,047
SPINK, WALTHALL	44	0.0777	44	41	39	37	35
ST CHARLES, DONALD B	609	1.0749	609	578	548	517	487
SUN 'N SKY COUNTRY CLUB	337	0.5948	337	320	303	286	269
TALLAKSON, WILLIAM V	17	0.0300	17	16	15	14	13
TILLEMA, HAROLD	874	1.5426	874	830	786	742	699
VAN DAM, ELDERT & SUSAN	722	1.2743	722	685	649	613	577
VAN LEEUWEN, JOHN	1,922	3.3923	1,922	1,825	1,729	1,633	1,537
VAN VLIET, HENDRIKA	820	1.4473	820	779	738	697	656
VANHOY, LUTHER C	23	0.0406	23	21	20	19	18
VERNOLA, PAT	3,116	5.4998	3,116	2,960	2,804	2,648	2,492
VISSER, ANNIE	91	0.1606	91	86	81	77	72
YANG, YOUNG MO	371	0.6548	371	352	333	315	296
YKEMA HARMSEN DAIRY	1,000	1.7650	1,000	950	900	850	800

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TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN CENTRO SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

CENTRO SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MINIMAL PRODUCER POOL	2,000	3.5300	2,000	1,900	1,800	1,700	1,600
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	864	1.5250					
CENTRO SUBAREA TOTALS =	56,657	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

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TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA PRODUCER	BASE ANNUAL [1] PRODUCTION (ACRE-FEET)	BASE ANNUAL [2] PRODUCTION RIGHT (PERCENT)	FREE PRODUCTION ALLOWANCES (ACRE-FEET) FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
AKE, CHARLES J & MARJORIE M	23	0.0333	23	21	20	19	18
ANGERER, ROBERT J & PEGGY	24	0.0347	24	22	21	20	19
ANTELOPE VALLEY DAIRY	5,430	7.8597	5,430	5,158	4,887	4,615	4,344
ARGUELLES, ALFREDO	1,047	1.5155	1,047	994	942	889	837
ATCHISON, TOPEKA, SANTA FE RAILWAY CO	80	0.1158	80	76	72	68	64
BAGLEY, ROY	20	0.0289	20	19	18	17	16
BALDERRAMA, ALFRED & LINDA	250	0.3619	250	237	225	212	200
BALL, DAVID P	81	0.1172	81	76	72	68	64
BARAK, RICHARD	132	0.1911	132	125	118	112	105
BARBER, JAMES B	167	0.2417	167	158	150	141	133
BARSTOW CALICO K O A	24	0.0347	24	22	21	20	19
BAUR, KARL & RITA	26	0.0376	26	24	23	22	20
BEDINGFIELD, LYNDELL & CHARLENE	56	0.0811	56	53	50	47	44
BENTON, PHILIP G	35	0.0507	35	33	31	29	28
BORGOGNO, STEVEN & LILLIAN B	1,844	2.6691	1,844	1,751	1,659	1,567	1,475
BOWMAN, EDWIN L	31	0.0449	31	29	27	26	24
BROWN, RONALD A	1,080	1.5632	1,080	1,026	972	918	864
BROWY, ORVILLE & LOUISE	33	0.0478	33	31	29	28	26
BRUINS, NICHOLAS	29	0.0420	29	27	26	24	23
CALICO LAKES HOMEOWNERS ASSOCIATION	1,031	1.4923	1,031	979	927	876	824
CALIF DEPT OF TRANSPORTATION	71	0.1028	71	67	63	60	56
CAMPBELL, M A & DIANNE	22	0.0318	22	20	19	18	17
CARTER, JOHN THOMAS	746	1.0798	746	708	671	634	596
CDFG - CAMP CADY	14	0.0203	14	13	12	11	11

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TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
CHANG, TIMOTHY & JANE	18	0.0261	18	17	16	15	14
CHASTAIN, W C	100	0.1447	100	95	90	85	80
CHEYENNE LAKE, INC	122	0.1766	122	115	109	103	97
CHIAO MEI DEVELOPMENT	451	0.6528	451	428	405	383	360
CHO BROTHERS RANCH	758	1.0972	758	720	682	644	606
CHUANG, MARSHAL	70	0.1013	70	66	63	59	56
CONNER, WILLIAM H	25	0.0362	25	23	22	21	20
COOL WATER RANCH	76	0.1100	76	72	68	64	60
CRYSTAL LAKES PROPERTY OWNERS ASSOCIATION	447	0.6470	447	424	402	379	357
DAGGETT COMMUNITY SERVICES DISTRICT	235	0.3402	235	223	211	199	188
DALJO CORPORATION	31	0.0449	31	29	27	26	24
DAVIS, RONALD & DONNA	53	0.0767	53	50	47	45	42
DE JONG, ALAN L	1,648	2.3854	1,648	1,565	1,483	1,400	1,318
DENNISON, QUENTIN D	29	0.0420	29	27	26	24	23
DESERT LAKES CORPORATION - (LAKE DOLORES)	483	0.6991	483	458	434	410	386
DOCIMO, DONALD P & PATRICIA J	23	0.0333	23	21	20	19	18
DONALDSON, JERRY & BEVERLY	90	0.1303	90	85	81	76	72
ELLISON, SUSAN	15	0.0217	15	14	13	12	12
EVKHANIAN, JAMES H	110	0.1592	110	104	99	93	88
FAWCETT, EDWARD C	20	0.0289	20	19	18	17	16
FELIX, ALAN E & CAROL L	36	0.0521	36	34	32	30	28
FERRO, DENNIS & NORMA	32	0.0463	32	30	28	27	25
FRIEND, JOSEPH & DEBORAH	60	0.0868	60	57	54	51	48
FUNDAMENTAL CHRISTIAN ENDEAVOR	285	0.4125	285	270	256	242	228

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BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	RIGHT (PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
GARCIA, DANIEL	23	0.0333	23	21	20	19	18
GOLD, HAROLD	249	0.3604	249	236	224	211	199
GRAVES, CHESTER B	32	0.0463	32	30	28	27	25
HAIGH, WHILLDYN & MARGARET	32	0.0463	32	30	28	27	25
HALL, LARRY	23	0.0333	23	21	20	19	18
HARALIK, BESS & ROBERT	27	0.0391	27	25	24	22	21
HARDESTY, LESLIE E & BECKY J	47	0.0680	47	44	42	39	37
HARESON, NICHOLAS & MARY	30	0.0434	30	28	27	25	24
HARTER FARMS	1,083	1.5676	1,083	1,028	974	920	866
HARTER, JOE & SUE	738	1.0682	738	701	664	627	590
HARTLEY, LONNIE	19	0.0275	19	18	17	16	15
HARVEY, FRANK	38	0.0550	38	36	34	32	30
HENDLEY, RICK & BARBARA	48	0.0695	48	45	43	40	38
HIETT, PATRICIA J	16	0.0232	16	15	14	13	12
HILARIDES, FRANK	1,210	1.7514	1,210	1,149	1,089	1,028	968
HOLLISTER, ROBERT H & RUTH M	44	0.0637	44	41	39	37	35
HONG, PAUL B & MAY	95	0.1375	95	90	85	80	76
HORTON'S CHILDREN'S TRUST	106	0.1534	106	100	95	90	84
HORTON, JOHN MD	183	0.2649	183	173	164	155	146
HOSKING, JOHN W & JEAN	94	0.1361	94	89	84	79	75
HUBBARD, ESTER & MIZUNO, ARLEAN	28	0.0405	28	26	25	23	22
HUNT, RALPH M & LILLIAN F	31	0.0449	31	29	27	26	24
HUTCHISON, WILLIAM O	901	1.3042	901	855	810	765	720
HYATT, JAMES & BRENDA	210	0.3040	210	199	189	178	168

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BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
IRVIN, BERTRAND W	29	0.0420	29	27	26	24	23
J V A AIR INC	54	0.0782	54	51	48	45	43
JACKSON, RAY	20	0.0289	20	19	18	17	16
JOHNSON, JAMES R	247	0.3575	247	234	222	209	197
JUSTICE, CHRIS	6	0.0087	6	5	5	5	4
KAPLAN, ABRAHAM M	76	0.1100	76	72	68	64	60
KASNER, ROBERT	1,001	1.4489	1,001	950	900	850	800
KATCHER, AUGUST M & MARCELINE	23	0.0333	23	21	20	19	18
KEMP, ROBERT & ROSE	32	0.0463	32	30	28	27	25
KIEL, MARY	34	0.0492	34	32	30	28	27
KIM, JOON HO	764	1.1059	764	725	687	649	611
KOSHAREK, JOHN & JOANNE	54	0.0782	54	51	48	45	43
LAKE JODIE PROPERTY OWNERS ASSOCIATION	254	0.3677	254	241	228	215	203
LAKE WAIKIKI	98	0.1419	98	93	88	83	78
LAKE WAINANI OWNERS ASSOCIATION	202	0.2924	202	191	181	171	161
LANGLEY, MICHAEL R	20	0.0289	20	19	18	17	16
LAWRENCE, WILLIAM W	45	0.0651	45	42	40	38	36
LEE, MOON & OKBEA	49	0.0709	49	46	44	41	39
LEE, VIN JANG T	630	0.9119	630	598	567	535	504
LESHIN, CONNIE & SOL	1,416	2.0496	1,416	1,345	1,274	1,203	1,132
LESHIN, SOL	1,997	2.8906	1,997	1,897	1,797	1,697	1,597
LEVINE, DR LESLIE	1,637	2.3695	1,637	1,555	1,473	1,391	1,309
LONG, BALLARD	35	0.0507	35	33	31	29	28
M BIRD CONSTRUCTION	41	0.0593	41	38	36	34	32

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FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
MAHJOUBI, AFSAR S	63	0.0912	63	59	56	53	50
MALIN, LILY	54	0.0782	54	51	48	45	43
MALONEY, JANICE	36	0.0521	36	34	32	30	28
MARCROFT, JAMES A & JOAN	38	0.0550	38	36	34	32	30
MARSHALL, CHARLES	20	0.0289	20	19	18	17	16
MAYBERRY, DONALD J	41	0.0593	41	38	36	34	32
MILBRAT, IRVING	73	0.1057	73	69	65	62	58
MITCHELL, CHARLOTTE	115	0.1665	115	109	103	97	92
MITCHELL, JAMES L & CHERYL A	155	0.2244	155	147	139	131	124
MOORE, WAYNE G & JULIA H	103	0.1491	103	97	92	87	82
MORRIS, KARL	304	0.4400	304	288	273	258	243
MULLIGAN, ROBERT & INEZ	35	0.0507	35	33	31	29	28
NEWBERRY COMMUNITY SERVICE DIST	23	0.0333	23	21	20	19	18
NU VIEW DEVELOPMENT, INC	2,899	4.1962	2,899	2,754	2,609	2,464	2,319
O P D L INC	109	0.1578	109	103	98	92	87
O'KEEFE, SARAH-LEE & JOKE E	50	0.0724	50	47	45	42	40
P & H ENGINEERING & DEV CORP	667	0.9654	667	633	600	566	533
PARKER, GEORGE R	144	0.2084	144	136	129	122	115
PATHFINDER INVESTORS	472	0.6832	472	448	424	401	377
PAYAN, PAUL	32	0.0463	32	30	28	27	25
PERKO, BERT K	132	0.1911	132	125	118	112	105
PITTS, JOE	30	0.0434	30	28	27	25	24
POHL, ANDREAS & CATHLYN	17	0.0246	17	16	15	14	13
POLAND, JOHN R & SANDRA M	92	0.1332	92	87	82	78	73

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FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
PRICE, ALAN E	37	0.0536	37	35	33	31	29
PRICE, DONALD	42	0.0608	42	39	37	35	33
PUCKHABER, WILLIAM F TRUST	63	0.0912	63	59	56	53	50
PURCIO, THOMAS F & PATRICIA A	80	0.1158	80	76	72	68	64
RANDOLPH, JOAN E	24	0.0347	24	22	21	20	19
REEVES, RICHARD	230	0.3329	230	218	207	195	184
RICE, DANIEL & MARY	121	0.1751	121	114	108	102	96
RICE, HENRY C & DIANA	24	0.0347	24	22	21	20	19
RIEGER, WALTER M	62	0.0897	62	58	55	52	49
RIKUO CORPORATION	1,517	2.1958	1,517	1,441	1,365	1,289	1,213
ROSSI, JAMES L & NAOMI I	614	0.8887	614	583	552	521	491
ROTEX CONSTRUCTION COMPANY	2,529	3.6606	2,529	2,402	2,276	2,149	2,023
SAN BERNARDINO COUNTY BARSTOW - DAGGETT AIRPORT	168	0.2432	168	159	151	142	134
SANTUCCI, ANTONIO & WILSA	30	0.0434	30	28	27	25	24
SCOGGINS, JERRY	105	0.1520	105	99	94	89	84
SHEPPARD, THOMAS & GLORIA	217	0.3141	217	206	195	184	173
SHORT, CHARLES & MARGARET	54	0.0782	54	51	48	45	43
SHORT, JEFF	30	0.0434	30	28	27	25	24
SILVER VALLEY RANCH, INC	109	0.1578	109	103	98	92	87
SMITH, WILLIAM E	19	0.0275	19	18	17	16	15
SNYDER, KRYL K & ROUTH, RICHARD J	64	0.0926	64	60	57	54	51
SOUTHERN CALIFORNIA EDISON CO - AGRICULTURE	5,858	8.4792	5,858	5,565	5,272	4,979	4,686
SOUTHERN CALIFORNIA EDISON CO - INDUSTRIAL	4,565	6.6076	4,565	4,336	4,108	3,880	3,652
SOUTHERN CALIFORNIA GAS COMPANY	98	0.1419	98	93	88	83	78

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BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL PRODUCTION [1]	BASE ANNUAL PRODUCTION RIGHT [2]	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND YEAR [3]	THIRD YEAR [3]	FOURTH YEAR [3]	FIFTH YEAR [3]
ST ANTONY COPTIC ORTHODOX MONASTERY	130	0.1882	130	123	117	110	104
STEWART, STANLEY & PATRICIA	27	0.0391	27	25	24	22	21
SUGA, TAKEAKI	154	0.2229	154	146	138	130	123
SUNDOWN LAKES, INC	168	0.2432	168	159	151	142	134
SWARTZ, ROBERT & IRENE	50	0.0724	50	47	45	42	40
TAPIE, RAYMOND & MURIEL	18	0.0261	18	17	16	15	14
TAYLOR, TOM	503	0.7281	503	477	452	427	402
THAYER, SHARON	58	0.0840	58	55	52	49	46
THE 160 NEWBERRY RANCH CALIFORNIA, LTD	1,033	1.4952	1,033	981	929	878	826
TRIPLE H PARTNERSHIP	993	1.4373	993	943	893	844	794
UNION PACIFIC RAILROAD COMPANY	249	0.3604	249	236	224	211	199
VAN BASTELAAR, ALPHONSE	78	0.1129	78	74	70	66	62
VAN DIEST, CORNELIUS	934	1.3519	934	887	840	793	747
VAN LEEUWEN, JOHN	1,084	1.5690	1,084	1,029	975	921	867
VANDER DUSSEN, AGNES	1,792	2.5938	1,792	1,702	1,612	1,523	1,433
VAUGHT, ROBERT E & KAREN M	43	0.0622	43	40	38	36	34
VERNOLA, PAT	1,310	1.8962	1,310	1,244	1,179	1,113	1,048
WARD, ERNEST & LAURA	38	0.0550	38	36	34	32	30
WARD, RONNY H	130	0.1882	130	123	117	110	104
WEBER, F R & JUNELL	96	0.1390	96	91	86	81	76
WEBSTER, THOMAS M & PATRICIA J	24	0.0347	24	22	21	20	19
WEIDKNECHT, ARTHUR J & PEGGY A	79	0.1143	79	75	71	67	63
WESTERN HORIZON ASSOCIATES INC	1,188	1.7196	1,188	1,128	1,069	1,009	950
WESTERN ROCK PRODUCTS	31	0.0449	31	29	27	26	24

~~12/10/92~~
~~01/20/93~~
~~03/03/93~~
~~04/18/93~~
~~04/28/93~~
09/25/95

EXHIBIT B

TABLE B-1

TABLE SHOWING BASE ANNUAL PRODUCTION AND
BASE ANNUAL PRODUCTION RIGHT OF EACH PRODUCER WITHIN BAJA SUBAREA
TOGETHER WITH FREE PRODUCTION ALLOWANCES
FOR FIRST FIVE YEARS OF THE JUDGMENT

BAJA SUBAREA	BASE ANNUAL [1] PRODUCTION	BASE ANNUAL [2] PRODUCTION RIGHT	FREE PRODUCTION ALLOWANCES (ACRE-FEET)				
PRODUCER	(ACRE-FEET)	(PERCENT)	FIRST YEAR	SECOND [3] YEAR	THIRD [3] YEAR	FOURTH [3] YEAR	FIFTH [3] YEAR
WET SET, INC	129	0.1867	129	122	116	109	103
WITTE, E DANIEL	27	0.0391	27	25	24	22	21
WLSR INC	133	0.1925	133	126	119	113	106
WORSEY, REVAE	29	0.0420	29	27	26	24	23
YARD, BETTY	26	0.0376	26	24	23	22	20
YERMO WATER COMPANY	453	0.6557	453	430	407	385	362
YOUNG, KEITH O - (DESERT TURF)	312	0.4516	312	296	280	265	249
MINIMAL PRODUCER POOL	3,500	5.0661	3,500	3,325	3,150	2,975	2,800
UNIDENTIFIED/UNVERIFIED PRODUCER POOL	320	0.4632					
BAJA SUBAREA TOTALS =	69,087	100					

1 Base Annual Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records, site inspection, land use estimates from 1987 and 1989 aerial photography and responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production Right expressed as a percentage of the Total Base Annual Production.

3 Values based on production ramp down of five percent (5%) per year. Free Production Allowance for the fifth year is equal to eighty percent (80%) of the Base Annual Production.

EXHIBIT B
TABLE B-2
TABLE SHOWING TOTAL WATER PRODUCTION
FOR AQUACULTURE AND RECREATIONAL LAKE PURPOSES
ALTO SUBAREA

PRODUCER	TOTAL WATER PRODUCTION [1]	BASE ANNUAL PRODUCTION [2]	RECIRCULATED WATER [3]
	(ACRE-FEET)		
CDFG - MOJAVE RIVER FISH HATCHERY	10,678	20	10,658
JESS RANCH WATER COMPANY	18,625	7,480	11,145
ALTO SUBAREA TOTALS =	29,303	7,500	21,803

Total Water Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records; James C. Hanson site inspection; land use estimates from 1989 aerial photography; responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production as shown on Table B-1.

3 Amount shown is the difference between the Total Water Production and the Base Annual Production.

EXHIBIT B
TABLE B-2
TABLE SHOWING TOTAL WATER PRODUCTION
FOR AQUACULTURE AND RECREATIONAL LAKE PURPOSES
BAJA SUBAREA

PRODUCER	TOTAL WATER PRODUCTION [1]	BASE ANNUAL PRODUCTION [2]	RECIRCULATED WATER [3]
	(ACRE-FEET)		
BROWY, ORVILLE & LOUISE	210	33	177
CALICO LAKES HOMEOWNERS ASSOCIATION	2,513	1,031	1,482
CDFG - CAMP CADY	102	14	88
CHEYENNE LAKE, INC	638	122	516
CRYSTAL LAKES PROPERTY OWNERS ASSOCIATION	6,575	447	6,128
DESERT LAKES CORPORATION - (LAKE DOLORES)	928	483	445
FUNDAMENTAL CHRISTIAN ENDEAVOR	440	285	155
HORTON'S CHILDREN'S TRUST	1,291	106	1,185
HORTON, JOHN MD	672	183	489
KIEL, MARY	188	34	154
LAKE JODIE PROPERTY OWNERS ASSOCIATION	2,805	254	2,551
LAKE WAIKIKI	400	98	302
LAKE WAINANI OWNERS ASSOCIATION	1,420	202	1,218
LEE, MOON & OKBEA	171	49	122
O F D L INC	434	109	325
RICE, DANIEL & MARY	614	121	493
SCOGGINS, JERRY	922	105	817
SILVER VALLEY RANCH, INC	455	109	346
SMITH, WILLIAM E	153	19	134
SUNDOWN LAKES, INC	1,109	168	941
TAPIE, RAYMOND & MURIEL	108	18	90
THAYER, SHARON	159	58	101
WET SET, INC	441	129	312
WLSR INC	678	133	545

EXHIBIT B
TABLE B-2
TABLE SHOWING TOTAL WATER PRODUCTION
FOR AQUACULTURE AND RECREATIONAL LAKE PURPOSES
BAJA SUBAREA

PRODUCER	TOTAL WATER PRODUCTION [1]	BASE ANNUAL PRODUCTION [2]	RECIRCULATED WATER [3]
	(ACRE-FEET)		
BAJA SUBAREA TOTALS =	23,426	4,310	19,116

1 Total Water Production is the reported maximum year production for each producer for the five year period 1986-1990. These values reflect the maximum production determined by one or more of the following: Southern California Edison records; James C. Hanson site inspection; land use estimates from 1989 aerial photography; responses to special interrogatories. All values are subject to change if additional information is made available, or if any value reported herein is found to be in error.

2 Base Annual Production as shown on Table B-1.

3 Amount shown is the difference between the Total Water Production and the Base Annual Production.

EXHIBIT C

ENGINEERING APPENDIX

CONTENTS

EXHIBIT C

ENGINEERING APPENDIX

The purpose of this Engineering Appendix is to establish the basis for measurements, calculations and determinations required in the operation of the Physical Solution.

A. Adjustment of Free Production Allowances. In the preparation of the report required by Paragraph 24 (o) of this Judgment, the Watermaster shall take into account all available pertinent hydrologic data and estimates, including at least the factors, or changes in the factors, shown in the attached Table C-1, "MOJAVE BASIN AREA ADJUDICATION SUBAREA HYDROLOGICAL INVENTORY BASED ON LONG-TERM AVERAGE NATURAL WATER SUPPLY AND OUTFLOW AND CURRENT YEAR IMPORTS AND CONSUMPTIVE USE," and changes in storage as determined by well levels, the factors listed in Paragraph 2(a) of Exhibit "H", and other pertinent data. The numbers for each of the factors for each Subarea shown in Table C-1 are Sample Numbers only, and are not intended to be used in determining actual water supply, Consumptive Use and outflow, or Free Production Allowance of the Subareas.

B. Determination of Surface Flow Components. The procedures used to determine the historical surface flow components of the Mojave River at various locations are summarized below.

1. Determination of Surface Flow Components at Lower Narrows. Since the records available for the discharge of the Mojave River at Lower Narrows only provide data on the total amount of surface flow and since Storm Flow occurs during and following periods of rainfall, it was necessary to determine what portion of

total measured surface flow at Lower Narrows was Storm Flow and what portion was Base Flow.

The Parties in reaching the physical solution provided for in the Judgment, used certain procedures to separate the Storm Flow and Base Flow components of the total measured surface flow at Lower Narrows. Hydrographs of the mean daily discharge at Lower Narrows were plotted for the Year under consideration together with corresponding rainfall data obtained from the National Oceanic and Atmospheric Administration (NOAA) for Lake Arrowhead. Hydrographs were also plotted for the combined flow of West Fork Mojave River and Deep Creek which together with the Lake Arrowhead precipitation data served as a guide for interpreting those periods during which Storm Flow was likely to have occurred at Lower Narrows.

Other factors considered included:

* Occurrences of Storm Flow at Barstow and Afton Canyon,
* Precipitation at Victorville and Barstow,
* Consideration of the time of Year and temperature, &
* Shape of hydrographs for Years having similar Base Flow characteristics.

Based on interpretation of all of the foregoing information, the flows occurring on those days during which Storm Flow most likely occurred were "scalped" by projecting an estimated Base Flow Curve through the Storm Flow Period. The Base Flow component of the total monthly flow was then determined as follows:

a. For those periods during which there was obviously no Storm Flow, the entire recorded mean daily flows were assumed to be Base Flow.

b. For the remaining Storm Flow periods, the Base Flow component was taken as the area under the Base Flow Curve, except that for those days within the Storm Flow period when the actual mean daily discharge is less than the amount indicated by the Base Flow Scalping Curves, then the actual recorded amount is used.

2. Determination of Surface Flow Components at Waterman Fault. The total amount of surface flow passing the Waterman Fault (under current riverbed conditions) is considered to be Storm Flow and can be estimated from the Storm Flow passing the USGS gauging station Mojave River at Barstow. The following table was developed to provide a method for estimating flow at Waterman Fault:

Storm Flow At Barstow Gage[1] (Acre-Feet)	Estimated Surface Flow at Waterman Fault (Acre-Feet)
2,000	0
10,000	6,200
20,000	14,300
30,000	22,600
40,000	31,400
50,000	40,500
60,000	49,200
70,000	58,400
80,000	67,800
90,000	76,800
100.000	85,400

[1]From Recorded Flow at USGS Gaging Station Mojave River at Barstow. Relationship is based on single storm events. More than one storm event separated by more than five day of zero flow will be considered as separate storms.

3. <u>Determination of Surface Flow Components at Afton</u>. Records available for the discharge of the Mojave River at Afton, California, provide data on the total mount of surface flow and since storm runoff occurs during and immediately following a major storm event in the watershed area tributary to the Baja Basin below Barstow or in the event of large Storm Flows at Barstow which reach Afton, it was necessary to determine what portion of the total measured surface flow at Afton is Storm Flow and what portion of Base Flow.

The Parties, in reaching the physical solution provided for in the Judgment, used certain procedures to separate the Storm Flow and Base Flow components of the total measured surface flow at Afton. Hydrographs of the mean daily discharge at Afton were plotted for the water Year under consideration. In the absence of Storm Flow, the Base Flow curve at Afton was generally a relatively constant amount. Storm Flows were evidenced by sharp spikes or abrupt departures from the antecedent Base Flow and a fairly rapid return to pre-storm Base Flow Condition. The hydrograph of flows at Barstow served as a guide for identifying those periods during which Storm Flow was likely to have occurred at Afton.

Based on interpretation of all of the foregoing information, the flows occurring on those days during which Storm Flow most likely occurred were "scalped" by projecting an estimated Base Flow Curve through the Storm Flow Period. The Base Flow component of the total monthly flow was then determined as follows:

a. For those periods during which there is obviously no Storm Flow, the entire recorded mean daily flows were assumed to be Base Flow.

b. For the remaining Storm Flow periods, the Base Flow component was taken as the area under the Base Flow Curve except that for those days within the Storm Flow period when the actual mean daily discharge was less than the amount indicated by the Base Flow Scalping Curves, then the actual recorded amount was used.

4. <u>Engineers' Work Papers</u>. These procedures are reflected in the Work Papers of the Engineers, copies of which are filed with the Watermaster.

TABLE C-1
Mojave Basin Area Adjudication
Subarea Hydrological Inventory Based On
Long-Term Average Natural Water Supply and Outflow
and Current Year Imports and Consumptive Use
(All Amounts in Acre-Feet)

	Este	Oeste	Alto	Centro	Baja	Basin Totals
WATER SUPPLY						
Surface Water Inflow						
Gaged	0	0	65,000	0	0	65,000
Ungaged	1,700	1,500	3,000	37,300 [1]	14,300 [2]	6,500 [3]
Subsurface Inflow	0	0	1,000	2,000	1,200	0 [4]
Deep Percolation of Precipitation	0	0	3,500	0	100	3,600
Imports						
Lake Arrowhead CSD	0	0	1,500	0	0	1,500
Big Bear ARWWA	2,000	0	0	0	0	2,000
TOTAL	3,700	1,500	74,000	39,300	15,600	78,600
CONSUMPTIVE USE AND OUTFLOW						
Surface Water Outflow						
Gaged	0	0	0 [1]	0 [5]	8,200	8,200
Ungaged	0	0	37,300	14,000	0	0
Subsurface Outflow	200	800	2,000	1,200	0	0
Consumptive Use						
Agriculture	6,800	2,900	16,100	20,300	30,200	76,500
Urban	1,900	1,200	36,300	9,500	9,700	58,600
Phreatophytes	0	0	5,100	900	1,500	7,500 [6]
Exports	0	0	0	0	0	0
TOTAL	8,900	4,900	97,000	45,900	49,600	150,800
Surplus / (Deficit)	(5,200)	(3,400)	(23,000)	(6,600)	(34,000)	(72,200)
Total Estimated Production (Current Year)	15,700	7,600	98,900	46,500	54,300	223,000
PRODUCTION SAFE YIELD (Current Year) [7]	10,500	4,200	75,900	39,900	20,300	150,800

1 Estimated from reported flows at USGS gaging station, Mojave River at Victorville Narrows.

2 Includes 14,000 acre-feet of Mojave River surface flow across the Waterman Fault estimated from reported flows at USGS gaging station, Mojave River at Barstow, and 300 acre-feet of local surface inflow from Kane Wash.

3 Represents the sum of Este (1,700 af), Oeste (1,500 af), Alto (3,000 af) and Baja (300 af from Kane Wash).

4 Inter subarea subsurface flows do not accrue to the total basin water supply.

5 Estimated from reported flows at USGS gaging station, Mojave River at Barstow.

6 Estimated by Bookman-Edmonston.

7 For purposes of this Table, the current year is 1990.

EXHIBIT D

TIME SCHEDULES

EXHIBIT D

TIME SCHEDULES

1. Prior Year Report. Annually not later than February 1 Watermaster shall provide to each Party a report covering the prior Year and setting forth at least the following:

a. Each Producer's Replacement Water Assessment, including any surcharges, based on rates applicable during the prior Year.

b. Each Producer's Makeup Water Assessment, based on rates applicable during the prior water Year.

2. MWA Supplemental Water Rates. Annually, not later than December 1, MWA shall set the rates per acre foot to be charged for Supplemental Water for the following Year, and shall project the rates for the following two Years.

3. Budget and Assessment Rates. Annually, not later than February 1, Watermaster shall provide to all Parties its proposal for its Administrative Budget, Administrative Assessment Rates, Replacement Water Rates, and Makeup Water Rates for the next ensuing Year and its rate projections for the next two (2) years. No later than March 1 of each Year, the Watermaster shall hold a public hearing to receive comments from Parties as to its proposal. Not later than April 1 of each Year, Watermaster shall adopt its final Budget and assessment rates for the next ensuing Year, and shall notify all Parties of its final Budget and Assessments rates within fifteen (15) days of adoption.

4. Free Production Allowance Adjustment. In any Year that Watermaster prepares a report pursuant to Paragraph 24 (o) of this Judgment that includes a recommendation for an adjustment of a Free

Production Allowance, Watermaster shall notify all Parties as to its recommendation not later than February 1, shall hold a public hearing thereon not later than March 1, and shall submit any such recommendation, which may be revised pursuant to the public hearing, to the Court not later than April 1.

5. Payment of Administrative Assessments and Biological Resource Assessments. Each Producer shall submit quarterly along with the Production report required by Paragraph 24 (p) an Administrative Assessment payment in an amount equal to the current Year Administrative Assessment Rate multiplied times the acre-feet of water Produced during the quarter and a Biological Resource Assessment payment in an amount equal to the current Year Biological Resource Assessment Rate multiplied times the acre-feet of water Produced during the quarter.

6. Payment of Replacement Water Assessments and Makeup Water Assessments. Replacement Water Assessments and Makeup Water Assessments for the prior Year shall be due and payable on July 1.

7. Delinquency of Assessments. Any assessment payable pursuant to this Judgment shall be deemed delinquent: i) if paid in Person, if not paid within five (5) days of the date due; ii) if paid by electronic funds transfer, if not paid within three (3) banking days of the date due; or iii) if paid by any other means, if not paid within ten (10) days of the date due. "Payment" shall occur when good and sufficient funds have been received by the Watermaster. Any assessment shall also be deemed delinquent in the event that any attempted payment is by funds that are not good and sufficient.

EXHIBIT E

LIST OF PRODUCERS AND THEIR DESIGNEES

EXHIBIT E

PRODUCER	DESIGNEE
ABBOND, EDWARD & GRACE	Same
ABBOTT, LEONARD C	Therese E. Parker, Esq.
ABSHIRE, DAVID V	Same
ADELANTO, CITY OF	Michael B. Jackson, Esq.
ADELANTO, CITY OF/GEORGE AFB	
AEROCHEM, INC	James Heiser, Esq.
AGCON, INC	Robert E. Hove
AGCON, INC.	Robert E. Hove
AGUAYO, JEANETTE L.	Same
AKE, CHARLES J & MARJORIE M	Same
ANDERSON, ROSS C & BETTY J	Same
ANGERER, ROBERT J & PEGGY	Same
ANTELOPE VALLEY DAIRY	Dick Van Dam
APPLE VALLEY COUNTRY CLUB	Terry Caldwell, Esq.
APPLE VALLEY DEVELOPMENT	Same
APPLE VALLEY FOOTHILL CO WATER	Doreen Ryssel
APPLE VALLEY HEIGHTS CO. WATER	Elizabeth Hanna, Esq.
APPLE VALLEY RANCHOS WATER	Fredric Fudacz, Esq.
APPLE VALLEY REC. & PARKS	Elizabeth Hanna, Esq.
APPLE VALLEY VIEW MUTUAL WATER CO.	Joseph Saltmeris, Esq.
APPLE VALLEY, TOWN OF	Sandra Dunn, Esq.
ARC LAS FLORES	William De Wolfe, Esq.
ARGUELLES, ALFREDO	Therese Parker, Esq.
ATCHISON, TOPEKA, SANTA FE	Curtis Ballantyne, Esq.
ATCHISON, TOPEKA, SANTA FE	Curtis Ballantyne, Esq.
AVDEEF, THOMAS & LUCILLE	Same
AZTEC FARM DEVELOPMENT CO	Al Jackson
BACA, ENRIQUE	Same
BAGLEY, ROY	Same
BALDERRAMA, ALFRED & LINDA	Same
BALDY MESA WATER DISTRICT	William Smillie

PRODUCER	DESIGNEE
BALL, DAVID P	Same
BAR H MUTUAL WATER COMPANY	Paul Nelson, President
BARAK, RICHARD	Therese Parker, Esq.
BARBER, JAMES B	Same
BARNES, FAY	Kirtland Mahlum, Esq.
BARSTOW CALICO K O A	Robert L. Moore
BASS, NEWTON T	Barbara Davisson, Business Manager
BASTIANON, REMO	Same
BASURA, STEVE	Same
BAUR, KARL & RITA	Same
BEDINGFIELD, LYNDELL&CHARLENE	Same
BEINSCHROTH, A J	Same
BELL, CHUCK	Therese Parker, Esq.
BENTON, PHILIP G	Same
BORGOGNO, STEVEN & LILLIAN	Same
BOWMAN, EDWIN L	Same
BOYCE, KENNETH & WILLA	Same
BROMMER, MARVIN	Same
BROWN, BOBBY G & VALERIA R	Same
BROWN, DOUG & SUE	Same
BROWN, RONALD A	Same
BROWY, ORVILLE & LOUISE	Same
BRUINS, NICHOLAS	Same
BURNS, BOBBY J & EVELYN J	Therese Parker, Esq.
BURNS, RITA J & PAMELA E	Same
BURNS, ANNIE L	Same
CALICO LAKES HOMEOWNERS	Billy Wyckoff
CALIF DEPT OF TRANSPORTATION	Alexander De Vorkin, Esq.
CAMPBELL, M A & DIANNE	Same
CARDOZO, MANUEL & MARIA	Robert Dougherty, Esq.
CARTER, JOHN THOMAS	Therese Parker, Esq.
CASA COLINA FOUNDATION	Charles E. Schwartz
CDFG - CAMP CADY	Marilyn Levin, Esq.

PRODUCER	DESIGNEE
CDFG - MOJAVE NARROWS REG.	Marilyn Levin, Esq.
CDFG - MOJAVE RIVER FISH	Marilyn Levin, Esq.
CENTER WATER CO	Morgan Daniels
CHAFA, LARRY R	Same
CHAMISAL MUTUAL	Earl D. McCool
CHANG, TIMOTHY & JANE	Same
CHASTAIN, W C	Same
CHEYENNE LAKE, INC	Michael Hayes
CHIAO MEI DEVELOPMENT	Maple Sia
CHO BROTHERS RANCH	Chung Cho Gong
CHOI, YONG IL & JOUNG AE	Same
CHRISTISON, JOEL	Same
CHUANG, MARSHAL	Therese Parker, Esq.
CLARK, KENNETH R	Same
CLEAR VIEW FARMS	Terry Caldwell, Esq.
CLUB VIEW PARTNERS	Manoucher Sarbaz
CONNER, WILLIAM H	Same
COOK, KWON W	Same
COOL WATER RANCH	Paul Henderson, Esq.
COPELAND, ETAL	Don W. Little
CRAMER, MARGARET MUIR	Terry Caldwell, Esq.
CROSS, LAWRENCE E & SHARON I	Same
CRYSTAL HILLS WATER COMPANY	Same
CRYSTAL LAKES PROPERTY OWNERS	Russell Khouri
CUNNINGHAM, WILLIAM	Same
DAGGETT COMMUNITY SERVICES	Lawrence Alf, CSD Chairman
DAHLQUIST, GEORGE R	Therese Parker, Esq.
DALJO CORPORATION	George Rubsch
DAVIS, Paul	Same
DAVIS, RONALD & DONNA	Same
DEJONG, ALAN L	Therese Parker, Esq.
DELPERDANG, ROBERT H	Same
DENNISON, QUENTIN c/o Clegg, Frizell & Joke	Same

PRODUCER	DESIGNEE
DESERT DAWN MUTUAL WATER COMPANY	Same
DESERT LAKES CORPORATION - (LAKE DOLORES)	Terry Christianson
DESERT COMMUNITY BANK	Same
DEVRIES, NEIL	Robert Dougherty, Esq.
DEXTER, CLAIR F	Same
DEXTER, J P	Same
DIBERNARDO, JOHN	Same
DOCIMO, DONALD P & PATRICIA J	Terry Caldwell, Esq.
DOLCH, ROBERT & JUDY	Same
DOMBROWSKI, MICHAEL W & SUSAN M	Same
DONALDSON, JERRY & BEVERLY	Same
DOSSEY, D A	Same
DOWSE, PHILIP	Same
DURAN, FRANK T	Therese Parker, Esq.
ELLISON, SUSAN	Same
EVENSON, EDWIN H & JOYCELAINE	Same
EVKHANIAN, JAMES H & PHYLLIA	Same
FAWCETT, EDWARD C	Same
FELIX, ALAN E & CAROL L	Same
FERRO, DENNIS & NORMA	Same
FISHER, DR DOLORES	Same
FISHER, JEROME	Same
FITZWATER, R E	Robert Dougherty, Esq.
FRIEND, JOSEPH & DEBORAH	Same
FUNDAMENTAL CHRISTIAN ENDEAVOR	Betty Brock
GAETA, TRINIDAD C/O BLUE BEAD FARMS	Therese Parker, Esq.
GAINES, JACK & MARY	Same
GARCIA, DANIEL	Same
GARCIA, SONIA L	Same
GAYJIKIAN, SAMUEL & HAZEL	Same
GESIRIECH, WAYNE	Therese Parker, Esq.
GILBERT, HERBERT & BERNICE	Same
GOLD, HAROLD	Therese Parker, Esq.

PRODUCER	DESIGNEE
GOMEZ, CIRIL - LIVING TRUST	Therese Parker, Esq.
GORMAN, VIRGIL	Robert Dougherty, Esq.
GRACETOWN INVESTMENT CO - JETCO PROP FUND	Same
GRAVES, CHESTER B	Same
GREEN ACRES ESTATES	Susan Zutavern
GRIEDER, RAYMOND H & DORISANNE	Same
GRILL, NICHOLAS P & MILLIE D	Therese Parker, Esq.
GROEN, CORNELIUS	Robert Dougherty, Esq.
GUBLER, HANS	Same
GULBRANSON, MERLIN	Therese Parker, Esq.
HAIGH, WHILLDYN & MARGARET	Same
HAL-DOR LTD	Russ Jones, Owner
HALL, LARRY	Same
HANDLEY, DON R & MARY ANN	Same
HANIFY, DBA - WHITE BEAR RANCH	Same
HARALIK, BESS & ROBERT	Same
HARDESTY, LESLIE E & BECKY J	Same
HARESON, NICHOLAS & MARY	Same
HARPER LAKE CO;UC OPERATING/HARPER DRY LAKE	David J. Cooper, Esq.
HART, MERRILL W	Same
HARTER FARMS	Richard Slivikin, Esq.
HARTER, JOE & SUE	Richard Slivikin, Esq.
HARTLEY, LONNIE	Same
HARVEY, FRANK	Same
HELENDALE SCHOOL DISTRICT	Patricia Bristol
HENDLEY, RICK & BARBARA	Same
HERT, SCOTT	Therese Parker, Esq.
HESPERIA GOLF AND COUNTRY CLUB	Michael Davis, Esq.
HESPERIA WATER DISTRICT	James Markman, Esq.
HI DESERT MUTUAL WATER CO	Stanley Derryberry
HI-GRADE MATERIALS	Robert E. Hove
HI-GRADE MATERIALS CO.	Robert E. Hove
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EXHIBIT F

TRANSFERS OF BASE ANNUAL PRODUCTION RIGHTS.

EXHIBIT F

TRANSFERS OF
BASE ANNUAL PRODUCTION RIGHTS

1. Transferability. Any Base Annual Production Right, including any Carryover Right (Right) or any portion thereof may be sold, assigned, transferred, licensed or leased subject to the rules set forth in this Exhibit "F".

2. Consumptive Use Adjustments. A transferred Right shall be adjusted so as not to cause an increased Consumptive Use of water. For either inter Subarea or intra Subarea transfers, if the transferee's Consumptive Use of water Produced under the transferred Right would be at a higher rate than that of transferor, the transferred Right shall be reduced by Watermaster to a level that equalizes the Consumptive Use to that of transferor. Any such adjustments by Watermaster shall be made using the following Consumptive Use rates. If a transfer would cause the same or a decreased Consumptive Use, no adjustment shall be made.

Type of Water Use	Consumptive Use Rate
Municipal	50%
Irrigation	50%
Industrial	case by case
Lakes or Aquaculture	surface acres x 7 ft.

For mixed or sequential uses of water excluding direct reuse of municipal wastewater, the total acre-feet of Consumptive Use shall be the sum of Consumptive Uses for each use.

3. <u>Notice to Watermaster</u>. No transfer shall become operable until the Parties to the transfer have jointly notified Watermaster of the terms and conditions of the transfer, the price to be paid by the transferee, the name of the Responsible Party and the name of the Person who will pay any applicable Assessments. Intra-Subarea transfers shall not require Watermaster authorization after giving notice. No inter-Subarea transfer shall become operable until authorized by Watermaster after giving notice. Watermaster shall authorize such transfers in the order of the date of notice, provided that funds are available as set forth in Paragraph 4 of this Exhibit "F".

4. <u>Inter Subarea Transfers of Rights</u>. A Party's Right in a (Source) Subarea may be transferred (by lease only) to a Party in another (Use) Subarea provided that in any Year the resulting unconsumed water in the Source Subarea due to all such transfers shall not be greater than the Replacement Water requirement of the Source Subarea in the preceding Year. Watermaster shall replace the resulting Consumptive Use in the Use Subarea that is attributable to the transfer, utilizing Replacement Water Assessments from the Source Subarea.

5. <u>Transfers to Meet Replacement Water or Makeup Water Obligations</u>. Watermaster may use Assessment proceeds to purchase or lease Rights in a Subarea in order to obtain water to meet an Obligation. The water so obtained shall be equal to the Consumptive Use portion of the transferred and unproduced Rights. No such purchases of leases of Rights in the Harper Lake Basin may be used to satisfy Obligations in other parts of the Centro Subarea.

6. Inter Subarea Transfers of Water. Water Produced in one (source) Subarea and exported to another Subarea for use or disposal shall bear a Replacement Water Obligation equal to the sum of the Production in excess of the Producer's share of the Free Production Allowance in the source Subarea plus the amount of water exported that would normally have been returned to the source Subarea. Such exported water shall be credited to the appropriate Subarea Obligation unless it has been purchased or leased as Replacement Water pursuant to a transfer agreement.

7. Verde Ranch Producers. Together the Spring Valley Lake Country Club ("the Country Club"), the Spring Valley Lake Association ("the Association"), the California Department of Fish and Game (DFG) Mojave Narrows Regional Park ("the Park") the Kemper Campbell Ranch ("the Ranch") comprise a group herein called the Verde Ranch Producers. Each Verde Ranch Producer has the ability physically both to Produce Groundwater and to Produce water that originated as tailwater flowing from the DFG Mojave River Fish Hatchery. DFG Producer Groundwater to supply the Hatchery, and Hatchery tailwater can be discharged in part or entirely to the Mojave River or in part or entirely to a lined channel that conveys tailwater to points where the Verde Ranch Producers can Produce it. The present flow regimen is as follows: Hatchery Production flows through the Hatchery and is then discharged to the River and/or the lined channel. Water discharged to the lined channel flows to a Country Club lake. The Country Club Produces Groundwater that is discharged to the Country Club lake. The Country Club property is irrigated by pumping from the Country Club lake. Water overflowing from the Country Club lake flows through a lined channel and

through other Country Club lakes, and finally is discharged to Spring Valley Lake. The Association Produces Groundwater that is discharged to Spring Valley Lake. Water overflowing from Spring Valley Lake flows to lakes in the Park. The Park Produces Groundwater that is discharged to the lakes in the Park. The Park also Produces Groundwater that is used directly for irrigation of the Park. The Park is also irrigated by pumping from the lakes in the Park. Water overflowing from the lakes in the Park is discharged to the Mojave River. Some water from the lakes in the Park also flows to a lake on the Ranch. The Ranch also Produces Groundwater. The Ranch is irrigated from the lake on the Ranch. No water flows on the surface from the Ranch property to the Mojave River.

In order to continue the present arrangements among the Hatchery and the Verde Ranch Producers while assuring that they participate fairly in the Physical Solution the following rules shall apply:

a. Total Production by the Country Club will be calculated as the sum of Country Club Groundwater Production plus inflow of Hatchery tailwater minus outflow to Spring Valley Lake. The Country Club shall monitor and report to Watermaster the amounts of such Groundwater Production, inflow and outflow.

b. Total Production by the Association will be calculated as the sum of Association Groundwater Production plus inflow from the Country Club minus outflow to the Park. The Association shall monitor and report to Watermaster the amounts of such Groundwater Production, inflow and outflow.

c. Total Production by the Park will be calculated as the sum of Park Groundwater Production plus inflow from the Association minus outflow to the Ranch minus outflow to the Mojave River. The Park shall monitor and report to Watermaster as to such Groundwater Production, inflow and outflows.

d. Total Production by the Ranch will be calculated as the sum of Ranch Groundwater Production plus inflow from the Park. The Ranch shall monitor and report to Watermaster the amounts of such Groundwater Production and inflow.

e. Hatchery Production up to 10,678 acre-feet per Year will be permitted free of any Assessments against the Hatchery. The Hatchery shall monitor and report to Watermaster its Groundwater Production and the amounts of tailwater discharged to the River and to the artificial channel. In any Year the Hatchery may Produce more than 10,678 acre-feet free of any Assessments against the Hatchery, provided such Production in excess of 10,678 acre-feet is reported as Groundwater Production by one or more of the Verde Ranch Producers in the same Year pursuant to operating agreements by and between the Hatchery and such Producer(s) filed with the Watermaster. The operating agreement shall specify the responsibility for payment of assessments. In the operating agreement, the Verde Ranch Producers may elect to have assessments be based on the aggregate Production of the Verde Ranch Producers, and may freely transfer Base Annual Production Rights internally, provided that the aggregate consumptive use of the Verde Ranch Producers shall not be increased. In the absence of such operating agreements, or if the operating agreements do not otherwise allocate responsibility for payment of Assessments, the Hatchery shall be liable for Administrative, Replacement Water and Biological Resource Assessments on the amount of water Produced by the Hatchery in excess of 10,678 acre-feet in any Year. In the event that Verde Ranch Producer who is allocated responsibility for payment of Assessments pursuant to an operating agreement is delinquent in making any such payment, the Hatchery shall not be liable therefor.

f. In any Year, if the total discharge to the River from the Hatchery and the Verde Ranch Producers exceeds the Groundwater Production by the Hatchery, such excess discharge shall be subject to Administrative, Replacement Water and, except for the Park, Biological Resource Assessments. Such Assessments shall be levied against individual Verde Ranch Producers in proportion to the extent that outflow from each Producer exceeds inflow to that Producer.

g. The Hatchery and the Verde Ranch Producers shall install all stage recorders, meters or other measuring devices necessary to determine inflows, outflows and Production that they are responsible for monitoring and reporting to Watermaster. Such stage recorders, meters or other measuring devices shall be installed, calibrated and operated in manner satisfactory to Watermaster.

h. Any change in the flow regimen described above will be subject to the same general rules set forth in this Paragraph 7. Any such change shall be reported to Watermaster in advance.

8. Harper Lake Basin. No Producer in the Harper Lake Basin may transfer any Base Annual Production Right or any portion thereof to Producers outside of Harper Lake Basin except by

physically conveying the water in compliance with the rules set forth in this Exhibit "F".

EXHIBIT G

SUBAREA OBLIGATIONS

EXHIBIT G

SUBAREA OBLIGATIONS

1. Subarea Obligations. Producers in the respective Subareas shall have the obligation to provide the following average Annual and minimum Annual Subsurface Flows and/or Base Flows per Year:

a. Este Subarea Producers--200 acre-feet per Year of Subsurface Flow to the Alto Subarea, except that in any Year the Subsurface Flow obligation shall be not be less than 160 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 200 acre-feet.

b. Oeste Subarea Producers--800 acre-feet per Year of Subsurface Flow to the Alto Subarea, except that in any Year the Subsurface Flow obligation shall be not less than 640 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 800 acre-feet.

c. Centro Subarea Producers--1200 acre-feet per Year of Subsurface Flow to the Baja Subarea, except that in any Year the Subsurface Flow Obligation shall be not less than 960 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 1200 acre-feet.

d. Baja Subarea Producers--400 acre-feet per Year of Subsurface Flow toward Afton across the MWA eastern boundary, except that in any Year the Subsurface Flow Obligation shall not be less than 320 acre-feet plus one-third of any cumulative debit plus any additional amount of water required to reduce the cumulative debit to 400 acre-feet.

e. Alto Subarea Producers--an average Annual combined Subsurface Flow and Base Flow of 23,000 acre-feet per Year to the Transition Zone. For the purposes of Paragraph 6 of this Exhibit G, the Subsurface Flow component shall be deemed to be 2,000 acre-feet per Year. In any Year Alto Subarea Producers shall have an obligation to provide to the Transition Zone a minimum combined Subsurface Flow and Base Flow as follows:

i. If the accounting pursuant to Paragraph 5, below, reflects a net cumulative credit at the beginning of the Year, the combined minimum flow obligation shall be 18,400 acre-feet minus any net cumulative credit, but shall be not less than 15,000 acre-feet.

ii. If the accounting pursuant to Paragraph 5, below, does not reflect a net cumulative credit at the beginning of the Year, the combined minimum flow obligation shall be 18,400 acre-feet plus one-third of any net cumulative debit plus any additional amount of water required to reduce the net cumulative debit to 23,000 acre-feet.

2. Obligation for Transition Zone Replacement Water.

a. Until the Court approves Groundwater levels to be established and maintained pursuant to Subparagraph 2b of this Exhibit, Watermaster shall provide Replacement Water in the Transition Zone equal to Production in the Transition Zone that is in excess of the Transition Zone Producers' share of the Alto Subarea Free Production Allowance for that Year. All such Replacement Water shall be provided as soon as practicable during the next ensuing Year.

b. As soon as is practicable, the MWA shall establish key wells to be used to monitor Groundwater levels in the Transition Zone and, subject to approval by the Court, Watermaster shall establish minimum water levels to be maintained in the key wells.

c. After water level elevations have been established pursuant to Subparagraph 2b of this Exhibit, Watermaster shall provide Replacement Water in the Transition Zone as necessary to maintain the minimum water levels. Water purchased with Replacement Water Assessments paid by Producers in the Transition Zone in excess of the quantity of water needed to maintain said water levels shall be provided elsewhere in the Alto Subarea.

3. Other Water. "Other Water" that may be credited to a Subarea Obligation may include water conveyed and discharged across a boundary or Free Production Allowance water that is not Produced. Water other than Base Flow, Subsurface Flow or Storm Flow that is conveyed and discharged across a boundary between Subareas other than pursuant to a transfer agreement, shall be credited or debited, as appropriate, to the pertinent Subarea Obligation during the Year in which it is so conveyed and discharged. Any portion of the Subarea's Free Production Allowance that is allowed to remain unproduced in a Subarea pursuant to transfer agreements in order to satisfy a Subarea Obligation shall be credited to the pertinent Subarea Obligation in accordance with the terms of the transfer agreements.

4. Makeup Water. Assessments for Makeup Water shall be paid in accordance with the time schedule set forth in Exhibit D.

Makeup Water shall be credited to the Subarea Obligation at the end of the Year in which the Makeup Water Assessment is paid.

5. Accounting. Watermaster shall Annually not later than February 1 cause to be prepared a report of the status of each Subarea Obligation as of the end of the prior Year. The report shall set forth at least the following information for each Subarea Obligation:

a. The cumulative total of the average Annual Subarea Obligations since the Judgment was entered as of the beginning of the prior Year;

b. The cumulative total of all water credited to the Subarea Obligation since the Judgment was entered as of the beginning of the prior Year;

c. The net cumulative credit or debit [the difference between (a) and (b)] as of the beginning of the prior Year;

d. The amounts of water credited to the Subarea Obligation during the prior Year including, as appropriate, Base Flow, Subsurface Flow, Other Water and Makeup Water;

e. The cumulative total of the average Annual Subarea Obligations as of the end of the prior Year;

f. The cumulative total of all water credited to the Subarea Obligation as of the end of the prior Year;

g. The net cumulative credit or debit as of the end of the prior Year;

h. Any Makeup Water Obligation;

i. The Minimum Subarea Obligation for the current Year.

6. Subsurface Flow Assumptions. Some Subarea Obligations are expressed as average Annual or minimum Annual Subsurface Flow.

In all cases the Subsurface Flow obligations have been established initially at amounts equal to the estimated historical average Subsurface Flow across Subarea boundaries. Not later than two Years following entry of this Judgment MWA shall begin to install monitoring wells to be used to obtain data to enable improved estimates of Subsurface Flow at each Subarea boundary where there is a Subsurface Flow obligation and to develop methodology for future determinations of actual Subsurface Flow. Not later than ten years following entry of this Judgment Watermaster shall prepare a report setting forth the results of the monitoring program and the future methodology. Following opportunity for review of Watermaster's report by all Parties, Watermaster shall prepare a recommendation to the Court as to the likely accuracy of the estimated historical Subsurface Flows and any revision of Subarea Obligations that may be indicated. Pending Watermaster's report to the Court, Subsurface Flows shall be assumed to be equal to the Subsurface Flow obligations for purposed of accounting for compliance therewith.

7. Example Calculation. Table G-1 sets forth an example of Subarea Obligation accounting procedures using hypothetical flows.

TABLE G-1

HYPOTHETICAL EXAMPLE

ACCOUNTING FOR COMPLIANCE WITH SUBAREA OBLIGATIONS

OBLIGATION OF SUBAREA A TO SUBAREA B

AVERAGE ANNUAL: 23,000 AFA (21,000 AFA BASEFLOW + 2,000 AFA SUBSURFACE FLOW)

MINIMUM ANNUAL: 18,400 AFA + 1/3 OF ANY NET CUMULATIVE DEBIT; OR 18,400 AFA - ANY NET CUMULATIVE CREDIT, BUT NOT LESS THAN 15,000 AFA

	YEAR 1 AF	YEAR 2 AF	YEAR 3 AF	YEAR 4 AF	YEAR 5 AF	YEAR 6 AF	YEAR 7 AF	YEAR 8 AF	YEAR 9 AF	YEAR 10 AF
STATUS AT BEGINNING OF YEAR										
CUMULATIVE OBLIGATION	0	23,000	46,000	69,000	92,000	115,000	138,000	161,000	184,000	207,000
CUMULATIVE FLOW	0	17,000	32,600	50,800	69,067	87,067	107,111	139,978	168,378	198,978
NET CUMULATIVE CREDIT (DEBIT)	0	(6,000)	(13,400)	(18,200)	(22,933)	(27,933)	(30,889)	(21,022)	(15,622)	(8,022)
FLOW DURING THE YEAR (HYPOTHETICAL)										
BASE FLOW	8,000	5,000	4,000	4,000	2,000	2,000	15,000	18,000	20,000	23,000
SUBSURFACE FLOW	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
OTHER WATER	7,000	7,200	7,400	7,600	7800	8,000	8,200	8,400	8,600	8800
MAKEUP WATER PURCHASED	0	1,400	4,800	4,667	6,200	8,044	7,667	0	0	0
TOTAL FLOW	17,000	15,600	18,200	18,267	18,000	20,044	32,867	28,400	30,600	33,800
MINIMUM OBLIGATION DURING THE YEAR	18,400	20,400	22,867	24,467	26,044	27,711	28,696	25,407	23,607	21,074
MAKEUP OBLIGATION INCURRED	1,400	4,800	4,667	6,200	8,044	7,667	0	0	0	0
STATUS AT END OF YEAR										
CUMULATIVE OBLIGATION	23,000	46,000	69,000	92,000	115,000	138,000	161,000	184,000	207,000	230,000
CUMULATIVE FLOW	17,000	32,600	50,800	69,067	87,067	107,111	139,978	168,378	198,978	232,778
NET CUMULATIVE CREDIT (DEBIT)	(6,000)	(13,400)	(18,200)	(22,933)	(27,933)	(30,889)	(21,022)	(15,622)	(8,022)	2,778
FOLLOWING YEAR MINIMUM OBLIGATION										
18,400 + 1/3 OF NET CUM. DEBIT	20,400	22,867	24,467	26,044	27,711	28,696	25,407	23,607	21,074	0
ADDITIONAL TO REDUCE DEBIT TO 23,000	0	0	0	0	0	0	0	0	0	0
18,400 - CUM. CREDIT, BUT NLT 15,000	0	0	0	0	0	0	0	0	0	15,622
MINIMUM OBLIGATION	20,400	22,867	24,467	26,044	27,711	28,696	25,407	23,607	21,074	15,622

EXHIBIT H

BIOLOGICAL RESOURCE MITIGATION

EXHIBIT H

BIOLOGICAL RESOURCE MITIGATION

1. Protection of and Description of Existing Riparian Habitat. In arriving at a Physical Solution, the Parties have taken into consideration the water needs of the public trust resources of the Mojave Basin Area, including but not limited to, those species listed in Table H-1 within each of the areas as shown on Figure H-1 and the riparian habitat areas shown on Figure H-1 and described generally as follows:

a. The area which extends, south to north, in the Alto Subarea, from the intersection of the north line of Section 36, Township 5 North, Range 4 West with the Mojave River channel to the United States Geological Survey gauging station at the Lower Narrows;

b. The Lower Narrows to the Helendale Fault (Transition Zone);

c. The Harvard/Eastern Baja Subarea reach of the Mojave River that extends west to east, from Harvard Road to the Iron Ranch/Iron Mountain area (0.5 miles east of the west line of Section 20, Township 10 North, Range 4 East).

2. Protection Pursuant to Physical Solution. The following aspects of the Physical Solution must be implemented to seek to achieve the water table standards set forth in Table H-2 which were proposed by DFG as being necessary to maintain and converse the riparian resources in the areas shown on Figure H-1, including the species listed in Table H-1:

a. Pursuant to Paragraph 24(o) of the Judgment, the Watermaster in recommending an adjustment in Free Production

Allowance, shall compare the Free Production Allowance with the estimated Production Safe Yield. In the event the Free Production Allowance exceeds the estimated Production Safe Yield by five percent or more, Watermaster shall recommend a reduction of the Free Production Allowance equal to a full five percent of the aggregate Subarea Base Annual Production. In considering whether to increase or decrease the Free Production Allowance in a Subarea, Watermaster shall, among other factors, take into consideration for the areas shown on Figure H-1 the Consumptive Use of water by riparian habitat, the protection of public trust resources, including the species listed in Table H-1 and the riparian habitat areas shown on Figure H-1, and whether an increase would be detrimental to the protection of public trust resources.

b. If, pursuant to Paragraph 27, Watermaster buys or leases Free Production Allowance in the Baja Subarea below the Calico-Newberry Fault to satisfy the need for Replacement Water, priority shall be given to purchases or leases that will result in reducing Production in or near the area described in Subparagraph 1(c) of this Exhibit.

c. Pursuant to Paragraph 2 of Exhibit "G", Watermaster shall purchase Replacement Water to maintain Groundwater levels in the Transition Zone.

3. <u>Additional Protection Pursuant to Trust Fund Established by Watermaster Using the Proceeds of Biological Resource Assessments</u>.

a. Watermaster shall establish a Biological Resources Trust Fund account for the benefit of the riparian habitat areas shown on Figure H-1 and the species listed on Table H-1. To establish and maintain the Trust Fund Watermaster shall levy against each acre-foot of Production within the Basin Area, other than Production by the California Department of Fish and Game (DFG), a Biological Resource Assessment of fifty cents ($0.50) (1993 dollars) to be collected at the same time and in the same manner as the Administrative Assessment, except that no Biological Resources Assessment shall be levied whenever the Trust Fund account balance exceeds $1,000,000 (1993 dollars).

b. Watermaster shall make funds held in the Biological Resources Trust Fund available to DFG only in the event that Groundwater levels are not maintained as set forth in Table H-2. Watermaster shall take action to acknowledge any proposed expenditure from the Biological Resources Trust Fund by DFG. Such Watermaster action shall be subject to the review procedures set forth in Paragraph 36 of the Judgment, provided that any motion made pursuant thereto and any Court disapproval of such Watermaster action and proposed DFG expenditure may be based only: 1) on the ground that the Groundwater levels set forth in Table H-2 are being maintained; and/or 2) the ground that the proposed expenditure is not for any of the purposes set forth in Subparagraphs 3.b.(i), (ii), or (iii) below in this Exhibit. The Biological Resources Trust Fund may be used only for the following purposes and only in the three areas identified on Figure H-1:

i. not to exceed $100,000 for the preparation by DFG of a DFG habitat water supply management plan, which plan shall include the water needs of the species listed in Table H-1 and the riparian habitat areas shown on Figure H-1.

ii. the purchase or lease by DFG of Supplemental Water or the lease or purchase of DFG of Base Annual Production Rights to be used to meet riparian habitat water needs of the species listed in Table H-1 and the riparian habitat areas shown on Figure H-1.

iii. the construction, repair and replacement of wells or other facilities identified in the plan prepared pursuant to Subparagraph (i), above, and/or any other measures necessary to implement the plan.

DFG shall not prepare or make any expenditure from the trust fund for the payment of administrative overhead or staff of DFG.

4. DFG agrees that absent substantial changed circumstances, DFG shall not seek to modify the provisions of this Judgment in any way to add to or change the above-stated measures to protect the referenced species or habitat. Nothing stated in this Judgment or in this Exhibit "H" is intended nor shall be deemed to relieve any Party hereto from any obligation or obligations not specifically referenced in this Exhibit H. Nothing in this Judgment or in this Exhibit H is intended or shall be construed to be a waiver by the State or any of its departments or agencies, including DFG, of its rights and obligations under the common law, the public trust doctrine, the constitution, statutes and regulations to preserve, protect or enhance the natural resources of the State including rare, threatened or endangered species or species of concern.

TABLE H-1

LIST OF SPECIES

SPECIES	ALTO			CENTRO		BAJA		
	Forks Dam to Upper Narrows	Upper Narrows to Lower Narrows	Lower Narrows to Helendale	Helendale to Hodge	Hodge to Barstow	Barstow to Harvard Road	Harvard Road to Mannix Wash	Afton Canyon
Purple Monkeyflower	6							
Mohave Monkeyflower	6		6	6	6	6		
Mohave Tarweed	5							
Desert Cymopterus	6							
Barstow Woolly Sunflower					6	6		
Victorville Shoulderband	6	6						
Mohave Tui Chub							1, 3	
California Red-legged Frog	6	6	6	6				
Southwestern Pond Turtle	6		6	6		6	6	6
Desert Tortoise	2, 4		2, 4	2, 4	2, 4	2, 4		
San Diego horned Lizard	6							
Cooper's Hawk	8	8						
Ferruginous Hawk	8	8						
Swainson's Hawk	4	4						
Bald Eagle	1, 3	1,3						
Merlin	6, 8	6, 8						
Prairie Falcon	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8		
Western Yellow-billed Cuckoo	3, 7			3, 7	3, 7			
Southwestern Willow Flycatcher	8							
Brown-crested Flycatcher		8						
Vermillion Flycatcher	8					8	8	8
Le Conte's Thrasher	8							
Least Bell's Vireo	1, 3							1, 3

TABLE H-1

LIST OF SPECIES
(CONT'D)

SPECIES	ALTO			CENTRO		BAJA		
	Forks Dam to Upper Narrows	Upper Narrows to Lower Narrows	Lower Narrows to Helendale	Helendale to Hodge	Hodge to Barstow	Barstow to Harvard Road	Harvard Road to Mannix Wash	Afton Canyon
Yellow Warbler	9							
Yellow-breasted Chat	8	8			8	8		
Summer Tanager	8	8						8
Pale Big Earred Bat	8							
Mohave Ground Squirrel	4, 6		4, 6	4, 6				
Mohave Vole			6	6				
Nelson's Bighorn Sheep					10	10		10
TOTAL NUMBER OF SPECIES = 30 TOTAL NUMBER OF SPECIES IN EACH AREA:	25	11	7	8	7	8	3	5

1 = Federally Endangered
2 = Federally Threatened
3 = State Endangered
4 = State Threatened
5 = Federal Category: 1
6 = Federal Category: 2
7 = Federal Category: 3b
8 = State: Special Concern
9 = State: Sensitive
10 = State: Fully Protected

TABLE H-2

RIPARIAN HABITAT MONITORING WELL
WATER LEVEL CRITERIA

ZONE	WELL NUMBER	MAXIMUM DEPTH BELOW GROUND
Victorville/Alto	H1-1	Seven (7) Feet
Victorville/Alto	H1-2	Seven (7) Feet
Lower Narrows/Transition	H2-1	Ten (10) Feet
Harvard/Eastern Baja Riparian Forest Habitat	H3-1	Seven (7) Feet
Harvard/Eastern Baja Surface Water Habitat	H3-2	Plus One (1) Foot (1705 Ft msl)*

* Surface Water Habitat water surface elevation of 1705 ft. msl is approximate pending ground elevation survey.

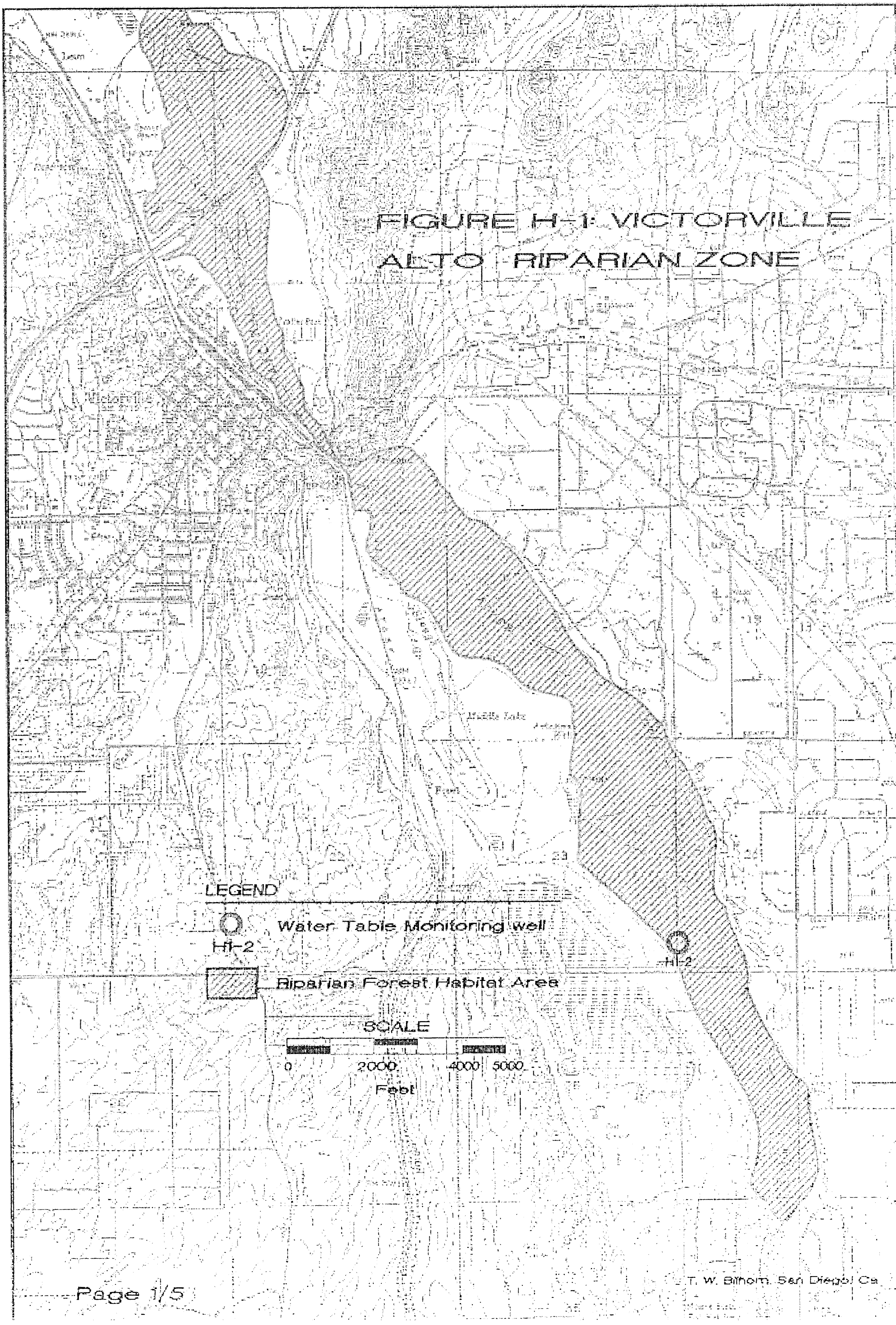


FIGURE H-1: VICTORVILLE - ALTO RIPARIAN ZONE
LEGEND
Hi-2
Water Table Monitoring well
Riparian Forest Habitat Area
SCALE
0 2000 4000 5000
Feet
Hi-2
Middle Lake
T. W. Bilhorn, San Diego, Ca
Page 1/5

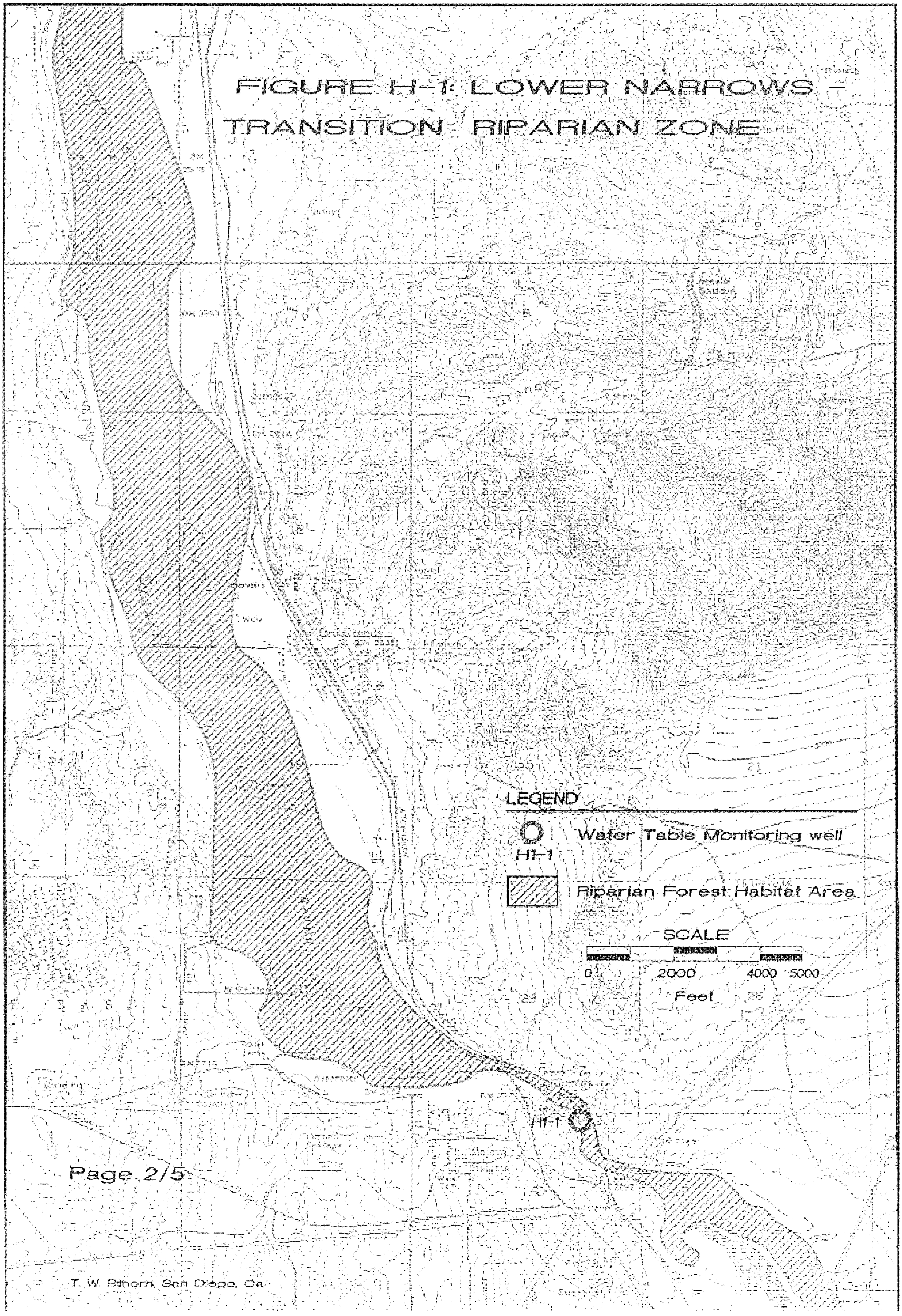


FIGURE H-1: LOWER NARROWS - TRANSITION RIPARIAN ZONE

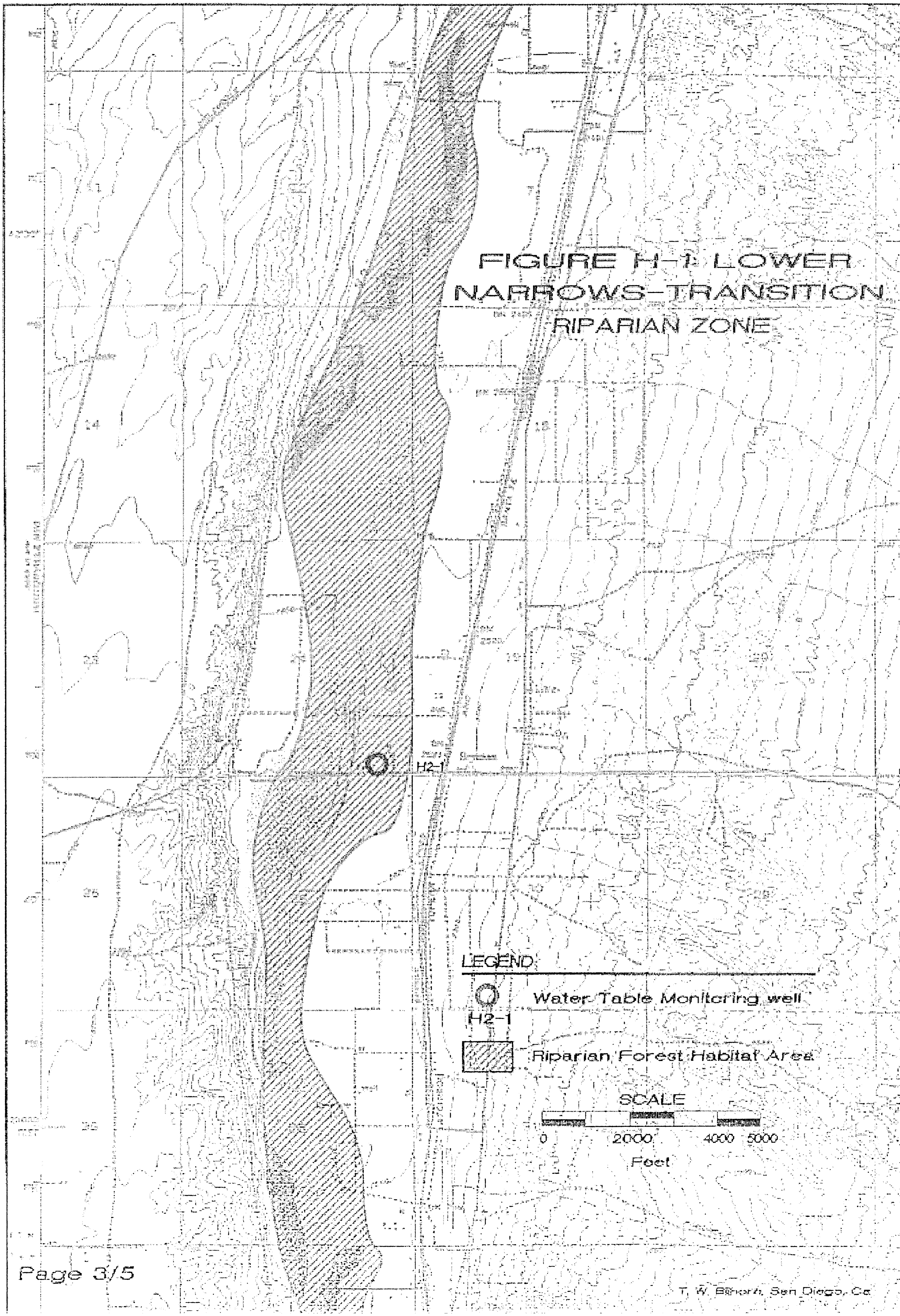


FIGURE H-1 LOWER
NARROWS-TRANSITION
RIPARIAN ZONE
H2-1
LEGEND
Water Table Monitoring well
H2-1
Riparian Forest Habitat Area
SCALE
0
2000
4000
5000
Feet
T. W. Shorh, San Diego, Ca

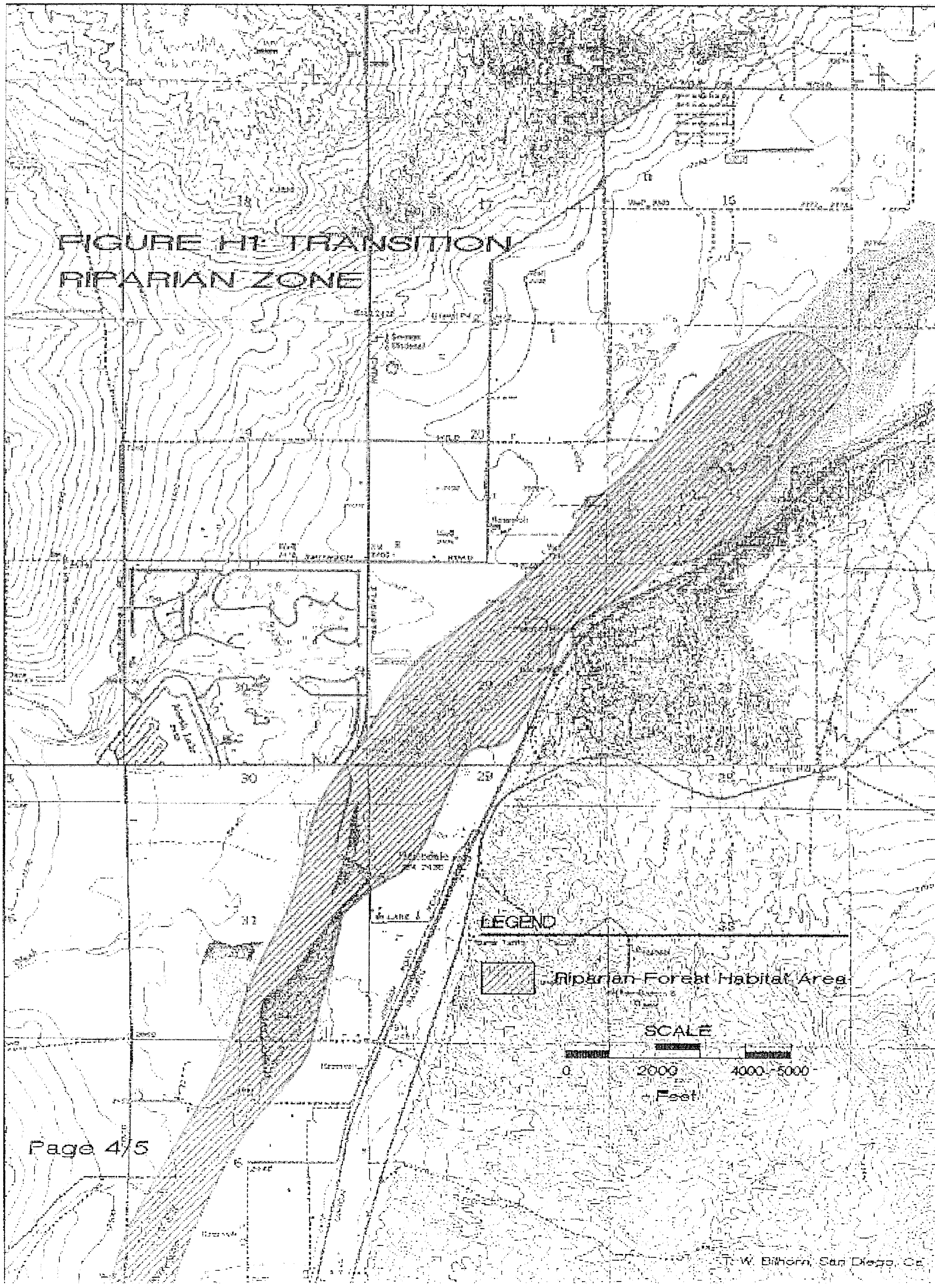
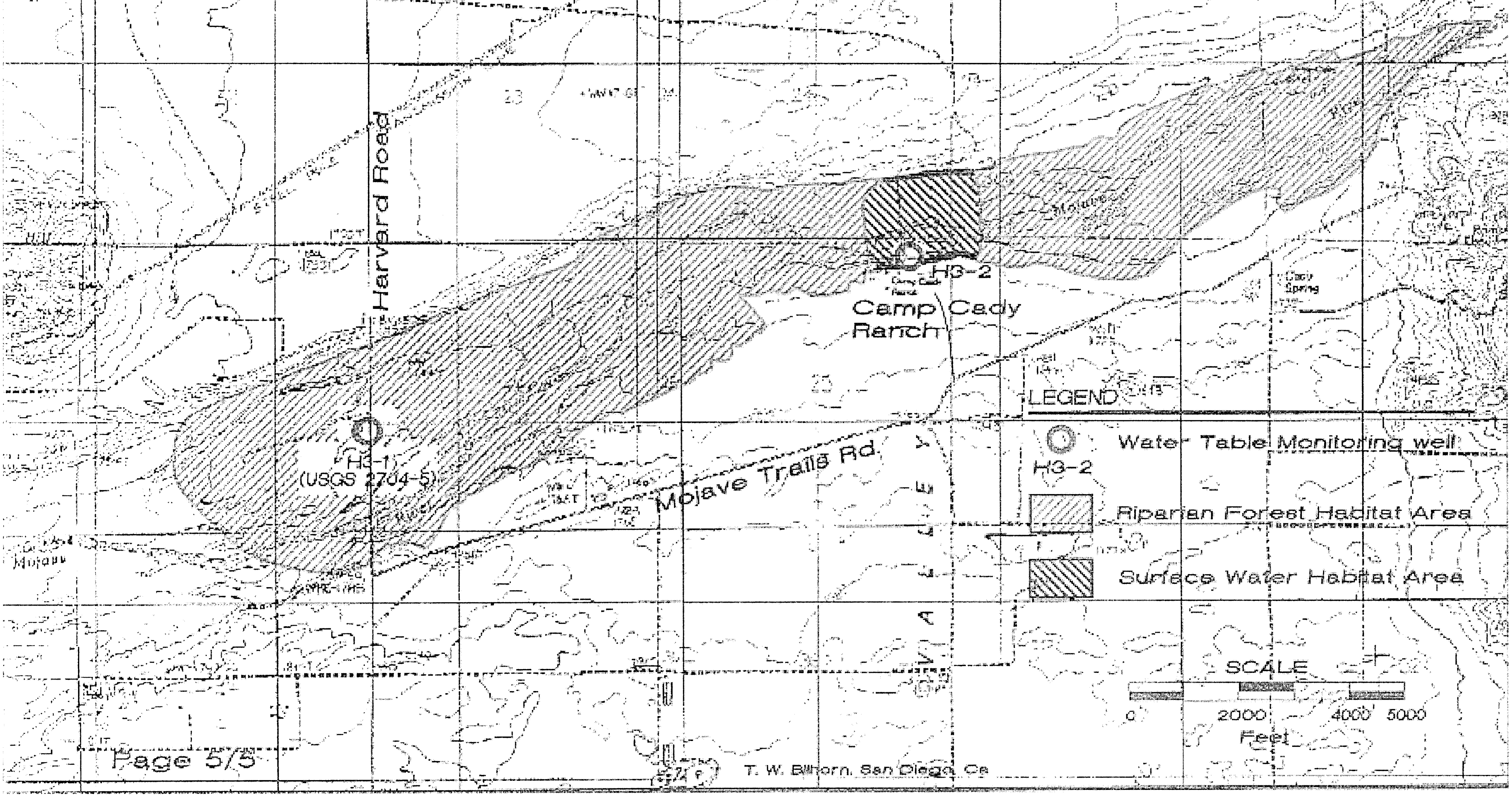
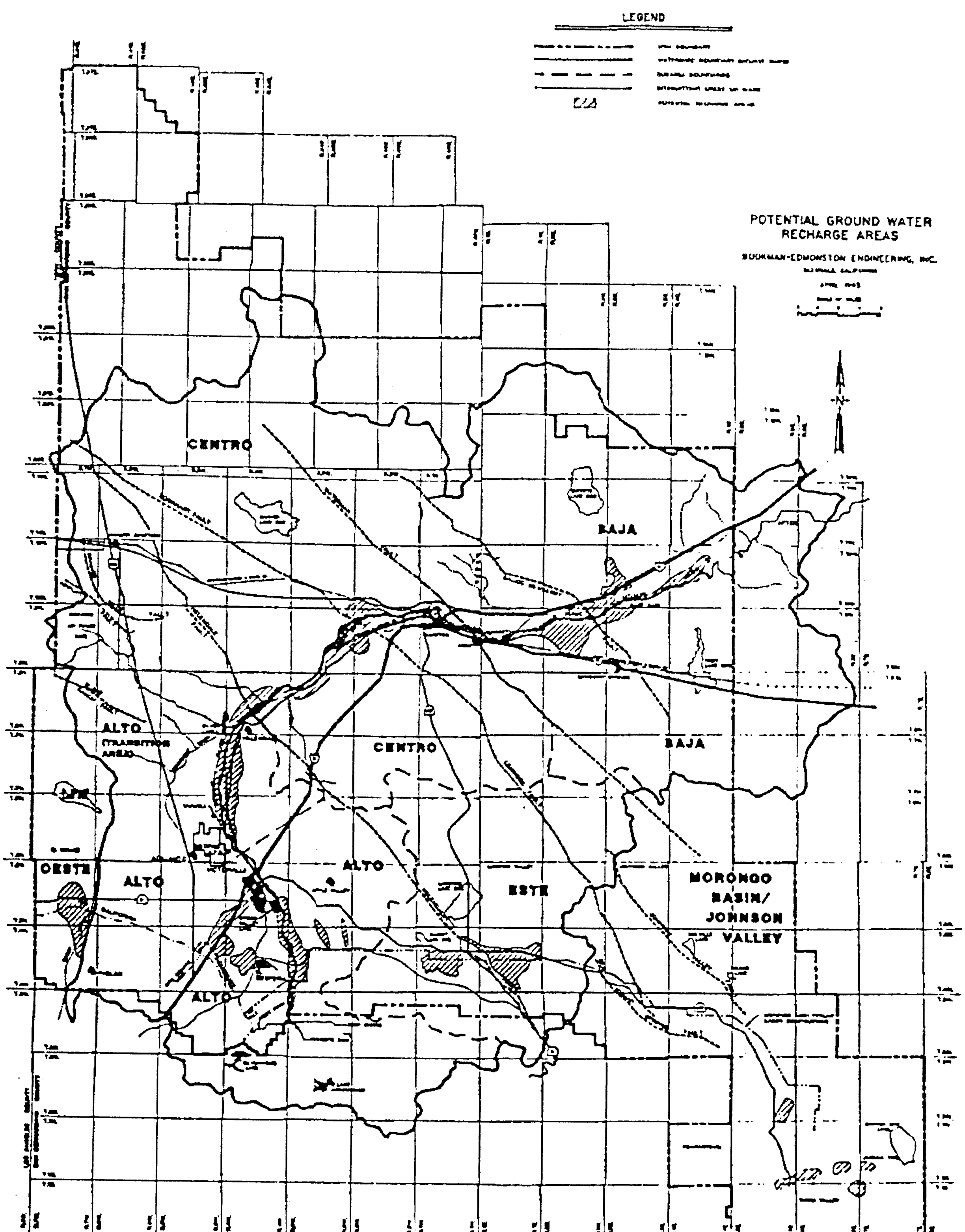


FIGURE H1 TRANSITION
RIPARIAN ZONE
LEGEND
Riparian Forest Habitat Area
SCALE
0
2000
4000 5000
Feet
Page 4/5
T. W. Bilhorn, San Diego, Ca.

FIGURE H-1: HARVARD/EASTERN BAJA RIPARIAN ZONE





MOJAVE WATER AGENCY

REGIONAL WATER MANAGEMENT PLAN

APPENDIX B

TECHNICAL MEMO 3

TECHNICAL MEMO 3

ALTERNATIVES EVALUATION

MOJAVE WATER AGENCY REGIONAL WATER MANAGEMENT PLAN UPDATE

PHASE 2

APRIL 24, 2003

Introduction

The Phase 1 Report for the Regional Water Management Plan (RWMP) Update identified six key water management issues facing the Mojave Water Agency (MWA) service area. These issues are:

- Current demand exceeds supply; future demand will also exceed supply unless corrective actions are taken
- Naturally occurring water quality problems affect drinking water supplies
- Many of the groundwater basins are in overdraft
- All but two of the subareas have riparian ecosystem maintenance issues
- Wastewater infrastructure issues affect the two subareas with the largest water demands
- Many subareas within MWA are impacted by activities in other subareas

The RWMP Update Phase 1 Report also identified unique sets of each of these key issues contained within each subarea and provided an array of projects and management actions that could be used to mitigate one or more of these issues. In the Projects and Management Actions Technical Memorandum specific parameters for these projects and management actions were estimated.

The projects and management actions were grouped into alternatives that were then evaluated to determine how well they mitigated the key management issues identified above. This evaluation was performed using a simulation model developed in this phase using the Stella 7.0 software. Using the results of the evaluation, two recommended alternatives have been selected and the projects and management actions included in those alternatives that have the highest priority for implementation have been identified.

The MWA Screening Model

The MWA Screening Model has been developed to simulate the changes to groundwater hydrology, Mojave River flows, and pumping and return flow patterns that would result from implementation of the projects and management actions identified in the Phase 1 Report. The model was developed using the Stella 7.0 software, a simulation modeling package that allows model parameters to be changed and new results obtained quickly and easily.

To model the water system, the Mojave River Basin floodplain and regional aquifers have been subdivided into 14 distinct but inter-connected aquifer units. The Lucerne Valley, Copper Mountain Valley, Means/Ames Valley, and Warren Valley aquifers are modeled independently.

The aquifer breakdown is shown in Figure 1. The model simulates groundwater storage and levels within each aquifer unit, groundwater flow between aquifer units, and leakance from the Mojave River into the aquifer units for the hydrologic period 1931-2001 using equations derived from the output of the USGS Modflow model of the Mojave River Basin (Stamos et al. 2001).

For each alternative, pumping and return flow quantities are determined for each sector within each subarea based on the amount of State Water Project (SWP) import and the Mojave Basin Area Judgment rules and are disaggregated among the subarea's aquifer units based on current pumping patterns and year 2020 population projections. The computed consumptive use is subtracted from the storage within each aquifer. MWA's SWP supplies are distributed to the alternative's SWP projects according to an algorithm that takes into account each project's demand and capacity and the capacities of the Mojave River and Morongo Pipelines.

The model is flexible enough to simulate a wide variety of proposed projects and management actions. For each new alternative, the input data can be modified and the model run in an hour or less, allowing for the easy evaluation of new alternatives.

Alternatives Overview

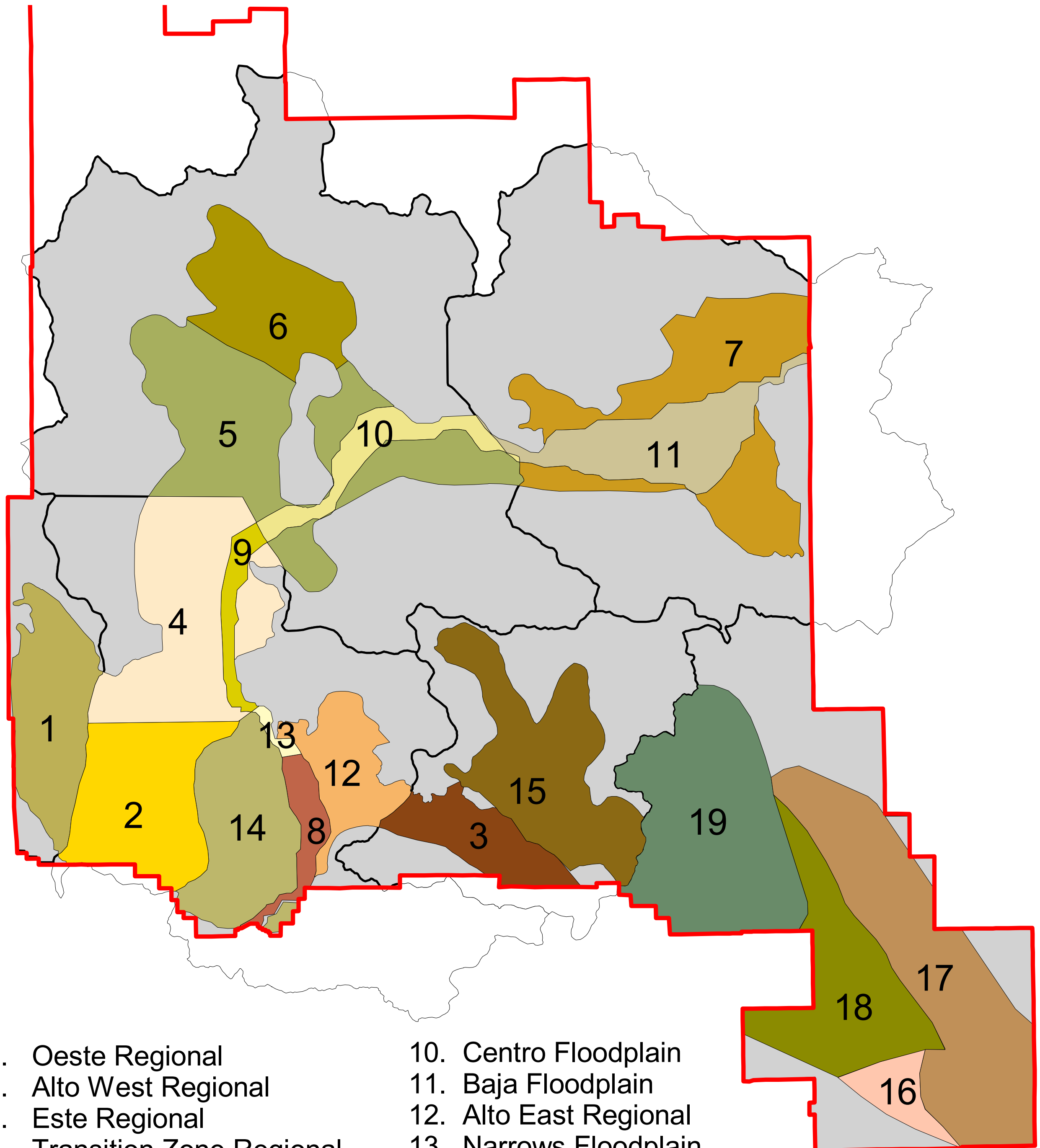
A total of 18 alternatives were evaluated in the course of this study. These include eight initial alternatives presented at the Technical Advisory Committee (TAC) meeting on February 19, 2003, eight revised alternatives presented at the TAC meeting on March 19, 2003, and two final alternatives developed based on the recommendations made at the March 19 TAC meeting. The initial alternatives are labeled 'A' and 'B', and the revised and final alternatives are labeled 'C' and 'D'. The alternatives are further described below.

The following assumptions were common to each of these alternatives:

- 2020 demand assumptions from the Phase 1 report
- Implementation of the Mojave Basin Area Judgment (1996)
- Delivery of SWP water to the Antelope Valley-East Kern Water Agency (AVEK), to the Warren Valley subbasin for use by the Hi-Desert Water District (HDWD), and to the Hodge and Lenwood recharge ponds to meet Alto makeup obligations to Centro under the Judgment

The following seven additional primary factors can be used to distinguish between the alternatives:

- Representation of the Transition Zone
- Level of Judgment Implementation
- Agricultural demand (Scenario 1 or Scenario 2 from the Phase 1 Report)
- Amount of municipal conservation
- Presence and size of a regional water treatment plant in Alto
- Amount of Victor Valley Water Reclamation Authority (VVWRA) discharge that is used for reclamation
- Amount of SWP discharge into the Mojave River at Rock Springs



1. Oeste Regional
2. Alto West Regional
3. Este Regional
4. Transition Zone Regional
5. Centro Regional
6. Harper Lake Regional
7. Baja Regional
8. Alto Floodplain
9. Transition Zone Floodplain
10. Centro Floodplain
11. Baja Floodplain
12. Alto East Regional
13. Narrows Floodplain
14. Alto Mid Regional
15. Lucerne Basin
16. Warren Valley Subbasin
17. Copper Mountain Valley Subbasin
18. Means/Ames Valley Subbasin
19. Johnson Valley Subbasin

Saracino·Kirby·Snow
A Schlumberger Company

Screening Model Aquifer Units

Mojave Water Agency
Regional Water Management Plan Update
Phase 2: Alternatives Technical Memorandum

Figure 1

Date: April 2003

Prepared By: BCW

The ‘A’ and ‘C’ alternatives assume Agricultural Scenario 1 while the ‘B’ and ‘D’ Alternatives assume Agricultural Scenario 2. Alternatives A0, B0, C0, and D0 are year 2020 No Action alternatives, in which the only SWP imports are those that go to AVEK, HDWD, or to the Hodge and Lenwood recharge ponds for Alto Makeup to Centro.

Initial Alternatives

The initial alternatives include A0, A1, A2, B0, B1, B2, B3, and B4. Table 1 shows the principal characteristics that define each alternative. All of these alternatives assume full implementation of the Judgment by 2020, with consumptive use set to equal natural supply plus imports.

Alternatives A0 and B0 are No Action alternatives, which do not utilize any projects or management actions other than those in current use. Alternatives A1 and B1 attempt to meet each subarea’s demands with SWP imports, including a large Rock Springs release. Alternatives A2 and B2 include a 56,000 AF/year capacity treatment plant in Alto. Alternatives B3 and B4 are similar to Alternative B1 except that they include 5% municipal conservation as well. All of the alternatives other than B4 assume that the first 9,700 acre-feet of VVWRA’s discharge is released to the Mojave River, with the remaining being allocated to reclamation to golf course and municipal users. In Alternative B4 it is assumed that all VVWRA discharge is released to the Mojave River.

Table 1 shows the demands met under each alternative. Alternative A0 meets only 45% and Alternative B0 meets only 51% of the total MWA demand. In each of these No Action Alternatives, the Alto Baja, and Oeste subareas have less than 40% of their demands met.

Alternative:	A			B				
	A0	A1	A2	B0	B1	B2	B3	B4
Common	AVEK, Hodge, Lenwood, Warren Valley							
Judgement Implementation	Full			Full				
Ag demand scenario	Ag Scenario 1			Ag Scenario 2				
Municipal Conservation	0%						5%	
Regional WTP			56K			56K		
Alto Reclamation		5.7K	11.0K		9.3K	11.0K	9.3K	
Rock Springs release		40K			40K		40K	40K
Demands Met (KAF/yr)								
Total	113	207	209	110	206	202	205	204
Percent Total	45%	82%	83%	51%	95%	93%	96%	98%
Agricultural	33	52	38	20	20	20	20	20
Municipal	68	129	154	70	153	162	152	152

Table 1: Initial Alternative Assumptions and Results

Because they are trying to meet full municipal and agricultural demands under Agricultural Scenario 1, Alternatives A1 and A2 show significant shortages. Alternative A1 meets only 82% of total MWA demand, while Alternative A2 meets only 83%. Thus, these results indicate that it is impossible to meet full 2020 demands under Agricultural Scenario 1 with no conservation even while importing MWA's entire SWP supply. Conservation of almost 30 percent of municipal consumptive use would be required to avoid significant shortages under this scenario.

Alternatives B1, B2, B3, and B4 all meet at least 93% of total MWA demands. However, because SWP deliveries to the treatment plant in Alto are given priority, Alternative B2 has significant shortages in Baja, Oeste, and Este. Alternatives B3 and B4 have fewer shortages because they assume 5% municipal conservation.

The initial alternatives are formulated to balance supply and demand at the subarea level, but no attempt was made to select recharge projects that would balance each individual aquifer unit. As a result, although each subarea is in balance as a whole, many aquifer units show significant declines. In addition, the Transition Zone floodplain region shows unreasonable increases in elevation because no cap was placed on its available storage in the initial alternatives. This limitation in aquifer unit elevation has been resolved in the revised and final alternatives.

Revised and Final Alternatives

In response to the comments received at the February 19 TAC meeting, eight new alternatives were developed and presented at the March 19 TAC meeting: C0, C3, D0, D2, D3, D5, D6, and D7. Table 2 shows the principal characteristics that define these alternatives. All of these alternatives except for C3 assume full implementation of the Judgment by 2020, with consumptive use set to equal natural supply plus imports. Alternative C3 assumes that the rampdown of agricultural producers will remain at 80% in 2020. In Alternative C3, agricultural production is permitted to continue even if it results in drawdowns in the groundwater aquifers.

Alternative:	C		D							
	C0	C3	D0	D2	D3	D5	D5r	D6	D6r	D7
Common	AVEK, Hodge, Lenwood, Warren Valley									
Judgement Implementation	Full	80% Ag	Full							
Ag demand scenario	Ag Scenario 1		Ag Scenario 2							
Municipal Conservation	0%		0%	5%		20%*	10%*	20%*	10%*	20%*
Regional WTP				46K		26K	12K			
Alto Reclamation		6.3K		9.9K	8.7K	6.8K	8.7K	6.8K	8.7K	6.8K
Rock Springs release		10K			10K	10K	10K	10K	10K	40K

*Municipal conservation in the Morongo Basin/Johnson Valley Area is 5% in these alternatives

Demands Met (KAF/yr)										
Total	102	216	101	198	200	182	199	185	198	185
Percent Total	40%	85%	47%	95%	96%	98%	99%	100%	98%	100%
Agricultural	30	56	20	20	20	20	20	20	20	20
Municipal	59	138	63	153	148	131	146	131	145	131

Table 2: Revised and Final Alternative Assumptions and Results

The revised alternatives build off of the initial 'A' and 'B' alternatives. In these alternatives, the problem of unreasonably high elevation increases in the Transition Zone has been resolved by limiting the amount of recharge into the aquifer from the Mojave River such that the aquifer elevation could not exceed 2,510 feet. In addition, an attempt has been made in each alternative to select a combination of recharge projects for SWP water that would result in reasonable balance in each of the aquifers units.

Alternative D2 is a revised version of B2, with a 46,000 acre-foot/year regional water treatment plant in Alto and with 5 percent municipal conservation. Alternative D3 also has 5% municipal conservation but does not include a regional treatment plant. Alternatives D5, D6, and D7 include 20% municipal conservation in the Mojave River Basin. Alternative D5 includes a smaller 26,000 acre-foot/year regional treatment plant. Alternative D7 is the only new alternative with a large Rock Springs release.

After presentation of the results of these alternatives at the TAC meeting, it was decided to create two final alternatives that would be revisions of the D5 and D6 alternatives. D5r is similar to D5 except that it includes only 10% municipal conservation in the Mojave River Basin and the size of the Regional Treatment Plant has been reduced to 12,000 acre-feet/year capacity. D6r is similar to D6 except that the amount of municipal conservation is reduced to 10 percent. The principal characteristics that define Alternatives D5r and D6r are shown in Table 2.

Table 3 shows the projects and management actions that were modeled in each of the revised and final alternatives. The following sections briefly describe each alternative's performance under different performance measures.

Demands Met

Table 2 shows the demands met under each revised and final alternative. Alternative C0 meets only 40% and Alternative D0 meets only 47% of the total MWA demand. In each of these No Action Alternatives, Alto, Baja, and Oeste have 50% or less of their demands met. The results of Alternative C3 demonstrate that it is not possible to meet 2020 demand levels while keeping agricultural free production allowance at 80% rampdown levels. In this alternative, only 85% of total MWA demands are met, and significant overdraft of the Baja subarea occurs.

Alternatives D2, D3, D5, D5r, D6, D6r, and D7 all meet at least 95% of total MWA demand. However, Alternative D2 has significant shortages in Baja and Oeste due to the lack of flexibility offered by the inclusion of a large treatment plant in Alto. With 20% municipal conservation, Alternatives D5, D6, and D7 are able to meet very close to 100% of total MWA demand. At the intermediate level of 10% municipal conservation, Alternatives D5r and D6r are each able to meet at least 98% of total MWA demand, with no significant shortage in any subarea.

All action alternatives meet significantly more demand than do the No Action Alternatives. Alternative C3 supplies the most total demand because it is not constrained to achieve balance in the groundwater aquifers. Alternatives D2 and D3 meet more total demand than the other 'D' alternatives because they include less municipal conservation, while Alternatives D5, D6, and D7 meet the least demand of all the non-No Action Alternatives because they include the greatest municipal conservation.

Project/Management Action	Subarea	C0	D0	C3	D2	D3	D5	D5r	D6	D6r	D7
		Alternative									
		(volume is in average annual acre-feet)									
Additional Recharge Facilities South of Rock Springs Outlet	Alto				**1,408**	**11,956**	**3,555**		**7,280**		
Alto wellhead treatment	Alto			**0***	**0***	**0***	**0***	**0***	**0***	**0***	**0***
Antelope Valley Wash Recharge Ponds	Alto			**7,702**	**1,665**	**5,231**	**5,688**	**5,640**	**6,471**	**7,157**	**3,458**
Cedar Street Detention Basin Recharge	Alto			**7,702**	**1,665**	**4,857**		**5,640**	**6,471**	**7,157**	
Hesperia Lakes Recharge	Alto					**2,242**		**6,345**		**7,885**	
Mojave River Pipeline Extension - Transition Zone	Alto			**5,602**							**2,527**
Oro Grande Wash Recharge Ponds	Alto			**11,203**	**3,805**	**11,956**	**5,688**	**8,601**	**12,133**	**12,015**	**6,762**
Recharge Ponds South of Apple Valley	Alto			**4,201**		**4,110**	**711**	**2,820**	**4,044**	**3,755**	
Regional Surface Water Treatment Plant	Alto				**40,670**		**24,559**	**11,963**			
Silver Lakes In-Lieu Recharge	Alto								**2,427**	**2,253**	**2,527**
Rock Springs Release	Alto			**7,348**		**7,444**	**7,256**	**7,155**	**8,164**	**7,591**	**31,762**
Baja Stormflow Retention	Baja			**2,000**		**2,000**	**2,000**	**2,000**	**2,000**	**2,000**	**2,000**
Daggett/Newberry Springs Recharge Ponds	Baja			**6,337**							
Kane Wash Recharge Ponds	Baja				**2,671**	**3,449**	**2,510**	**2,604**	**2,855**	**2,800**	**2,984**
Alto Makeup (to Hodge and Lenwood)	Centro	**1,984**	**1,984**	**890**	**1,369**	**915**	**909**	**909**	**909**	**908**	
AVEK	Centro	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**	**1,372**
Hinkley water supply	Centro			**0***	**0***	**0***	**0***	**0***	**0***	**0***	**0***
Cushenbury Wash Stormflow retention	Este			**400**				**400**	**400**	**400**	**400**
Lucerne Valley Recharge Ponds	Este			**1,190**							
Recharge Ponds West of Helendale Fault	Este			**342**	**450**	**708**	**496**	**343**	**241**	**369**	**252**
Hi-Desert WD: Warren Valley	MBJV	**1,557**	**1,557**	**1,557**	**1,450**	**1,450**	**1,450**	**1,450**	**1,450**	**1,450**	**1,450**
Joshua Basin District Recharge and Pipeline	MBJV			**445**	**393**	**393**	**393**	**393**	**393**	**393**	**393**
Means/Ames Recharge Ponds	MBJV						**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
Pioneertown water supply	MBJV			**0***	**0***	**0***	**0***	**0***	**0***	**0***	**0***
Sheep Creek Recharge Ponds	Oeste			**2,485**	**1,459**	**2,293**	**1,881**	**2,109**	**2,140**	**2,260**	**2,236**
SUBTOTAL IMPORTS		**4,913**	**4,913**	**60,777**	**58,377**	**60,374**	**59,467**	**60,744**	**59,750**	**60,762**	**59,122**
Urban Conservation		**0**	**0**	**0**	**8,142**	**8,142**	**31,417**	**15,900**	**31,417**	**15,900**	**31,417**
VVWRA Reclamation		**0**	**0**	**6,335**	**9,925**	**8,841**	**6,826**	**8,656**	**6,826**	**8,437**	**6,826**
*This project does not represent a new water supply											

Table 3: Projects and Management Actions Included in each Revised and Final Alternatives

Groundwater Storage

Table 4 shows the average annual change in groundwater storage in each subarea under each alternative. The Centro subarea shows a surplus in all alternatives. In Alternative C3 there is a significant reduction in groundwater storage in Baja because there is not enough supply available to meet the agricultural production at 80% rampdown levels. Alternative D7 includes a large Rock Springs release, which is not effective in overcoming deficits in the Alto Regional aquifer and causes greater surpluses in Centro and Baja due to increased Mojave River flow downstream.

Alternatives D5 and D6 perform the best under this measure, with total net increases of 15,800 and 13,500 acre-feet/year, respectively and no deficits in any subarea. This occurs because the high 20% municipal conservation reduces the need for SWP supply to meet demand and allows a certain amount of SWP water to be imported for the purpose of replenishing the groundwater basins.

	Performance Measure S1							
	Average Annual Change in Groundwater Storage (acre-feet per year)							
	Morongo	Este	Oeste	Alto	Centro	Baja	Total	Rank
No-Action Alternative C0	0	0	0	0	7,200	0	7,200	**7**
No-Action Alternative D0	0	100	0	0	6,600	0	6,700	**9**
C3	0	0	400	2,500	5,800	(10,900)	(2,200)	**10**
D2	0	100	500	1,100	5,400	(300)	6,800	**8**
D3	0	0	500	1,500	5,400	100	7,500	**6**
D5	1,000	600	500	2,600	10,000	1,100	15,800	**1**
D5r	1,000	100	500	1,300	7,400	200	10,500	**3**
D6	1,000	200	600	2,400	8,600	700	13,500	**2**
D6r	1,000	0	500	500	6,700	100	8,800	**5**
D7	1,000	(200)	400	(10,900)	12,800	6,400	9,500	**4**

Table 4: Average Annual Change in Groundwater Storage

Groundwater Levels

In all of the alternatives following the initial alternatives, an effort has been made to select recharge projects in locations that would achieve relative balance in all subareas in the aquifer. This has been achieved in all alternatives except for Alternatives C3, D2 and D7.

In Alternative C3, the floodplain and regional aquifers in Baja are significantly depleted because agricultural production is allowed to remain at levels that cannot be supported by the available supply. Figure 2 shows the groundwater levels in the Baja Regional aquifer under each

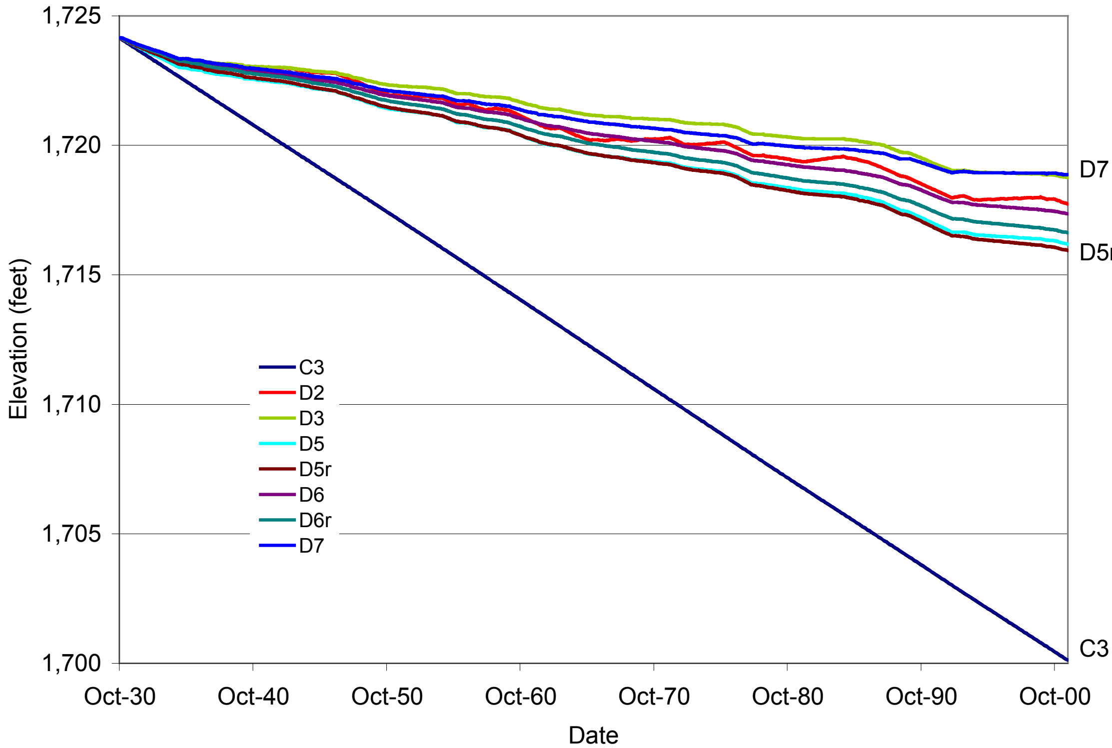


Figure 2: Time Series of Elevations in the Baja Regional Aquifer

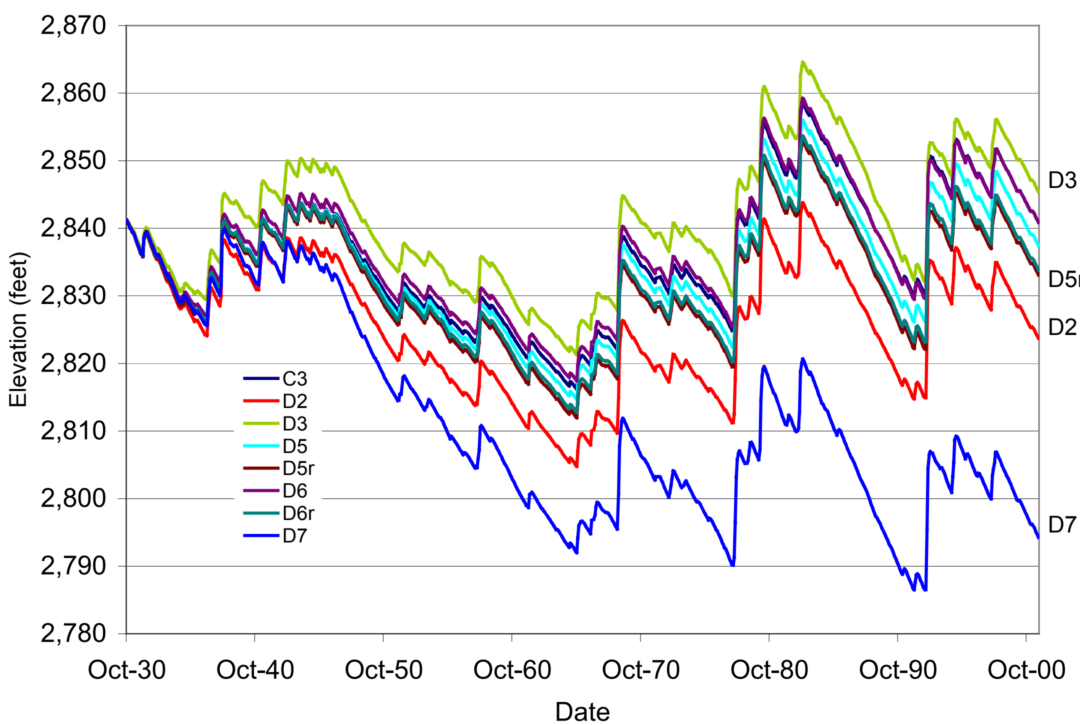


Figure 3: Time Series of Elevations in the Alto Floodplain Aquifer

alternative. In Alternative C3, the groundwater elevations drop 24 feet in this alternative, compared to 8 feet or less in each of the other alternatives.

In Alternative D2, there is not enough flexibility to balance all of the aquifers because such a large portion of the SWP supply is allocated to an Alto Treatment Plant. Figure 3 shows the groundwater levels in the Alto Floodplain Aquifer under each alternative. The groundwater levels in Alternative D2 drop 18 feet over the course of the model period compared to a decline of less than 8 feet for every alternative other than D7.

In Alternative D7, the Alto West Regional, Mid-Regional, East Regional, and Floodplain aquifers are significantly depleted. This occurs because of the heavy reliance in this alternative on a Rock Springs release into the Mojave River to meet Alto's supply needs. In Alternative D7, the Alto Floodplain aquifer drops 47 feet in elevation over the course of the modeled period.

Subarea Interaction

Subarea interaction is measured by the amount of Mojave River flow and groundwater flow that passes from one subarea to another. Figure 4 shows the average annual Mojave River flows in each alternative. Alternative D7 has significantly higher river flows in all river reaches compared to the other alternatives because a large Rock Springs release has been included in the alternative. Several thousand acre-feet of additional outflow from the basin through Afton Canyon would occur annually due to this operation. All of the other alternatives have similar magnitude Mojave River flows on average.

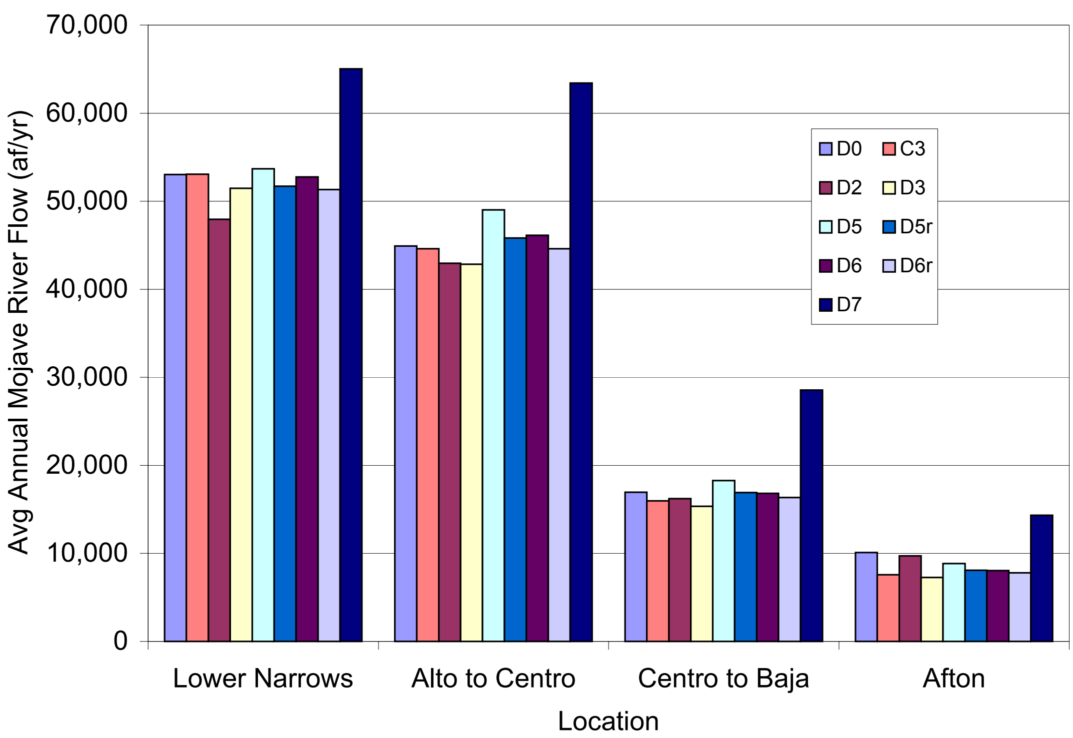


Figure 4: Average Annual Mojave River Flows

Figure 5 shows the average annual groundwater flows between subareas in each alternative. In Alternative D7 there is additional groundwater flow from Este and Oeste into Alto because the Alto regional aquifer has been depleted due to insufficient SWP recharge. Alternative C3 has the highest groundwater flows from Centro to Baja because Baja's aquifers are depleted. The other alternatives have similar magnitude groundwater flows.

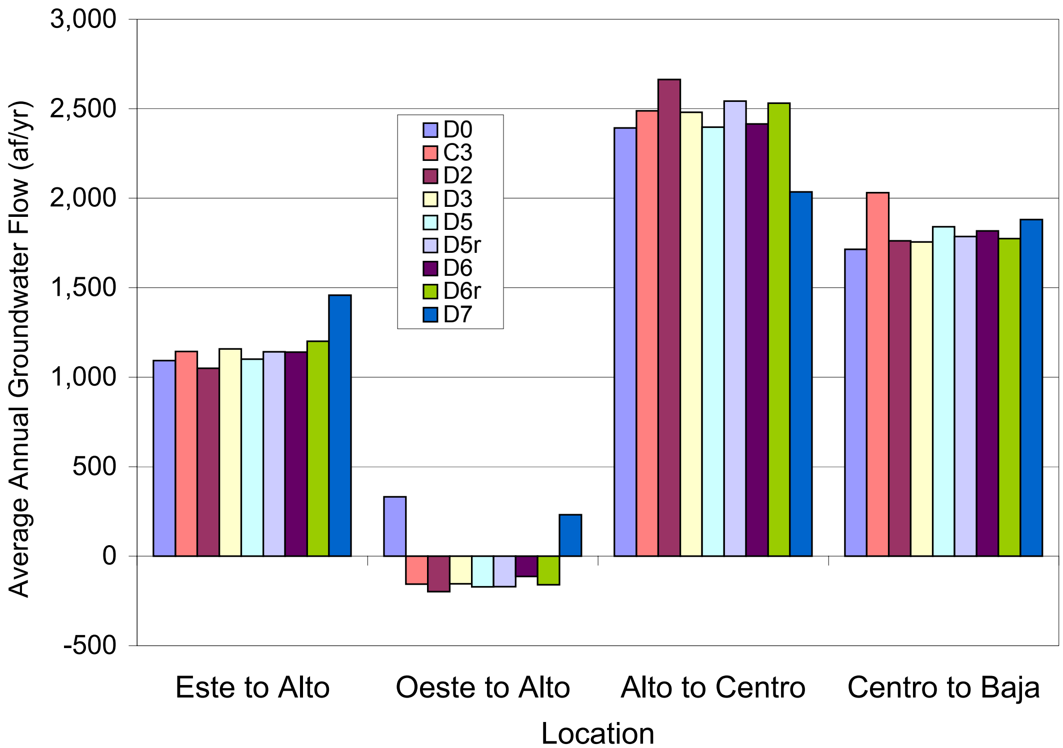


Figure 5: Average Annual Groundwater Flows

Water Quality

All of the alternatives were evaluated to estimate the effects that the proposed imports of SWP water would have on the water quality of each subarea. For each constituent, the estimated quality of SWP water was compared to the quality of the existing water and to the constituent's drinking water standard to determine the degree of improvement or detriment caused by the introduction of SWP water. SWP water is of higher quality than drinking water standards for all constituents.

For most constituents and in most subareas, the quality of SWP water was superior to the existing water quality. However, constituent concentrations in the SWP water were slightly higher than the existing concentrations of boron, nitrates, and TDS in Alto and of boron and nitrates in Oeste.

Alternative Cost

Table 5 shows the total estimated annualized capital and operating cost for each alternative. The alternatives that include an Alto Regional Treatment Plant (D2, D5, and D5r) have the highest costs.

Alternative	Annualized Cost ($ millions/year)
C3	$14.6
D2	$22.9
D3	$14.1
D5	$21.3
D5r	$20.8
D6	$15.9
D6r	$16.1
D7	$14.6

Table 5: Annualized Cost of Each Alternative

Recommendations

Alternatives D5r and D6r have been identified as recommended alternatives to be evaluated in greater detail in Phase 3 of the RWMP Update. Each of these alternatives provide the following benefits:

- 99% of total MWA demand is met with no significant shortage in any subarea or demand sector
- Include an attainable level of 10% municipal conservation
- Provide water quality improvements over existing conditions
- All groundwater aquifer units are in balance
- Each alternative provides benefits to all subareas without negatively impacting other areas

Common Features

A complete list of projects and management actions included in Alternatives D5r and D6r was shown in Table 3. These alternatives have many common features, including:

- 10% Municipal conservation in the Mojave River Basin, 5% in the Morongo Basin/Johnson Valley area
- Agricultural Scenario 2
- Reclamation of VVWRA discharge above 9,700 acre-feet/year
- Recharge of SWP water into the Alto Mid-Regional, East Regional, and Floodplain aquifers, and into the Baja Regional, Este Regional, Oeste Regional, Warren Valley, Copper Mountain Valley, and Means/Ames Valley aquifers
- Baja and Cushenberry Canyon stormflow retention or equivalent pond recharge projects
- Water supply augmentation for Hinkley and Pioneertown
- Alto wellhead treatment

The primary difference between the two alternatives is that Alternative D5r includes a 12,000 acre-foot/year capacity regional treatment plant in Alto. Alternative D6r includes in-lieu supply of SWP water to Silver Lakes (or the equivalent pond recharge projects) and larger sized recharge facilities in all Alto aquifers.

Project and Management Action Priorities

An important goal of Phase 2 of the RWMP Update was to identify those projects and management actions that would have the highest priority for consideration in Phase 3. For this purpose, each project and management action included in Alternatives D5r or D6r has been categorized as having High, Moderate, or Low Priority. The designation of priority for each project or management action was determined using the following criteria:

- Whether it is an existing project or is already being pursued by MWA
- The level of current overdraft that the project attempts to mitigate
- Expected growth in the subarea where the project will be applied

Table 6 shows the recommended priority of each project and management action. The projects that have the highest priority include implementing 10% municipal conservation, VVWRA wastewater reclamation, Alto wellhead treatment, a new water supply for Pioneertown, and the recharge of SWP water into the Warren Valley and into the Floodplain, West Regional, and Mid-Regional aquifers in Alto. Municipal conservation is considered to have the highest priority because measures will need to be initiated immediately in order to achieve 10% conservation by 2020. Recharge of SWP water into the Alto Floodplain, West Regional, and Mid-Regional aquifers will require feasibility studies to determine the optimal locations for building the necessary recharge facilities. Many such projects have been proposed, including projects at Oro Grande Wash, Antelope Valley, and Cedar Street in the West and Mid-Regional aquifers, and an Upper Mojave Wellfield Distribution System utilizing Rock Springs or Hesperia Lakes or other additional recharge facilities South of Rock Springs in the Floodplain aquifer.

References

Mojave Basin Area Judgment (1996) *Judgment After Trial, City of Barstow et al. Vs. City of Adelanto et al.* Superior Court Case No. 208568, Riverside County, CA.

Saracino-Kirby-Snow (2002) *Mojave Water Agency Regional Water Management Plan Update Phase 1 Report.* Saracino-Kirby Snow, Sacramento, CA.

Stamos, C.L., Martin, P., Nishikawa, T., and Cox, B.F. (2001) *Simulation of Ground-Water Flow in the Mojave River Basin, California*. Water-Resources Investigations Report 01-4002 Version 3, U.S. Geological Survey, Sacramento, CA

<u>**Table 6: Recommended Priority for each Project or Management Action**</u>

Project or Action	Aquifer	Existing or Being Pursued?	Amount of Current Overdraft in Aquifer?	Expected Subarea Growth?	New Projects (not in 1994 plan)	Designed or Complete EIR	Comments	Priority
10% Municipal Conservation	All	No	High	High			5% in Morongo/Johnson ;Needs to start immediately	High
Wastewater Reclamation	All of Alto	Yes	High	High	√		VVWRA is actively pursuing	High
Alto Regional Treatment Plant	All of Alto	No	High	High	√		High expected cost	Moderate
Alto Wellhead Treatment	All of Alto	Yes	N/A	N/A	√		Addresses localized water quality problems; arsenic standard implementation by 2006	High
Recharge	Alto Floodplain	Yes	High	High		√	Rock Springs existing; feasibility studies needed	High
Recharge	Alto Mid-Regional	Yes	High	High	√		Feasibility studies needed	High
Recharge	Alto West-Regional	Yes	High	High	√		Feasibility studies needed; Oro Grande tests proceeding	High
Recharge	Alto East Regional	No	Moderate	High	√		Feasibility studies needed	Moderate
Recharge/ In-lieu Recharge	Transition Zone Floodplain	No	Low	High	√		Recharge not needed; assumes continued VVWRA recharge; limited drought buffer	Moderate
Recharge or Stormflow Retention	Baja Floodplain	No	High	Low	√		Feasibility studies needed	Moderate
Recharge	Baja Regional	Yes	High	Low		√	Feasibility studies needed	Moderate
Hinkley Water Supply	Centro Regional	No	N/A	N/A	√		Addresses water quality and quantity problems	Moderate
Recharge or Stormflow Retention	Este Regional	No	Moderate	Moderate			Feasibility uncertain; Judgment limitations for stormflow retention; listed County flood control project	Moderate
Recharge	Lucerne Valley	No	Low	Moderate		√	Feasibility studies needed; no current demand	Low
Recharge	Oeste Regional	No	Moderate	Moderate			Feasibility studies needed	Moderate
Recharge	Copper Mtn Valley	Yes	Moderate	Moderate			Feasibility studies in progress	Moderate
Pioneertown Water Supply	Means/Ames Valley	No	High	N/A			Addresses water quality and quantity problems; no potable water currently available	High
Recharge	Means/Ames Valley	No	Moderate	Moderate			Feasibility studies needed	Moderate
Recharge	Warren Valley	Yes	Low	Moderate			Existing facility, new facilities being investigated	High

APPENDIX C

WATER DEMAND ESTIMATION

WATER DEMAND ESTIMATION

Population

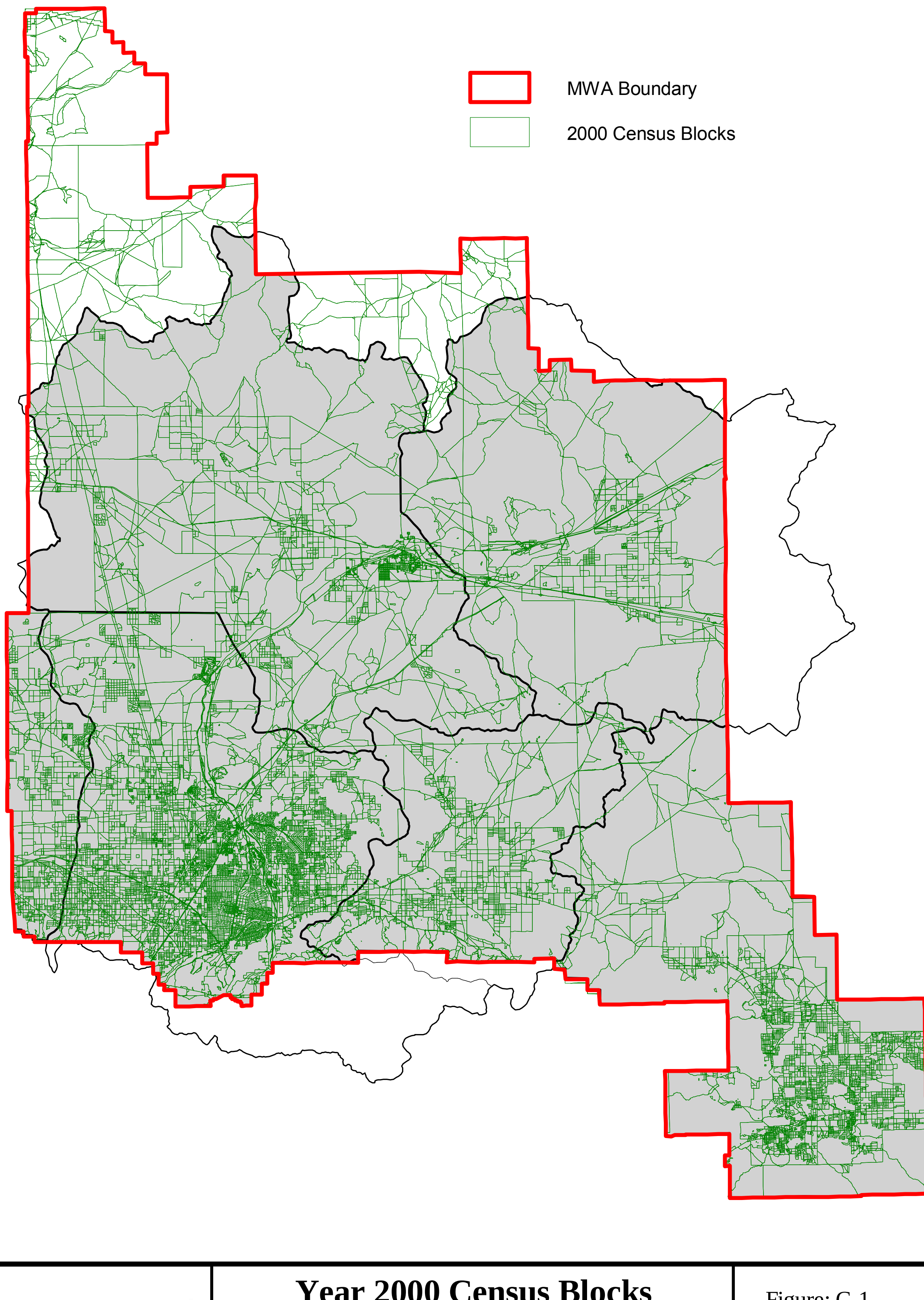
Current

Year 2000 population data within the Mojave Water Agency (MWA) boundary was obtained from the Southern California Association of Governments (SCAG). This data was used to estimate population distribution over the five subareas in the Mojave Basin Area and the population served by each of the four subbasins in the Morongo Basin/Johnson Valley Area. The following data was obtained from SCAG:

1. Distribution of population by census block within the MWA boundary for 2000.
2. Geo-referenced spatial distribution of census blocks within the MWA boundary for 2000. The census blocks for 2000 can be seen in Figure C-1.

To estimate the 2000 population for each subarea in the Mojave Basin Area, the geo-referenced spatial data for each census block was overlain with geo-referenced spatial data for subarea and MWA boundaries. Every block that fell within one or more subareas and MWA boundaries was analyzed to determine the percentage of area it contained in each subarea. If a particular census block overlapped more than one subarea, the population was distributed in direct proportion to the area of each subarea within the block. The resulting population estimates can be seen in Table 5-1 in Chapter 5 of this Plan.

In the Morongo Basin/Johnson Valley Area, the population totals represent the population that is served by each groundwater subbasin, rather than the population that overlies the subbasin. For the Johnson Valley subbasin, this population was assumed to equal the population overlying the subbasin and was determined using the method described above for the Mojave Basin Area. The proportion of the remainder of the population served by each subbasin were determined for two regions within the remainder of the Morongo Basin/Johnson Valley Area – those



Schlumberger Water Services

Year 2000 Census Blocks (from SCAG)

Mojave Water Agency
2004 Regional Water Management Plan

Figure: C-1

Date: February 2004

Prepared By: KTW

living within the High Desert Water District (HDWD) boundaries, and those living outside of HDWD. HDWD was determined separately because it has production wells in both the Warren Valley and Means/Ames Valley subbasins that jointly provide water to population overlying both subbasins. In the remainder of the Morongo Basin/Johnson Valley Area, it was assumed that water would be used in the same subbasin from which it was extracted.

The total population in the Morongo Basin/Johnson Valley Area and the population within HDWD were determined by the same method described above. Using the year 2000 municipal production data provided by MWA, the percent of production from each subbasin that served both the HDWD and non-HDWD areas was determined. These percents were then applied to the total population estimates for within and outside of HDWD to determine the total population served by each subbasin. Table C -1 shows the population served by each subbasin within and outside of HDWD and the resulting totals.

Table C-1: Breakdown of Year 2000 Population in the Morongo Basin/Johnson Valley Area

	Within HDWD	Outside of HDWD	Total
Copper Mtn. Valley	0	9,600	9,600
Johnson Valley	0	400	400
Means/Ames Valley	3,900	3,600	7,500
Warren Valley	14,700	0	14,700
Total	**18,600**	**13,600**	**32,200**

Future

Projected population data for the years 2000-2020 was obtained from the Southern California Association of Governments (SCAG). The data provided by SCAG was based on 1990 population tract data because projections based on year 2000 data were not yet available. Figure C-1 shows the 1990 census tracts. Using this data, the percent growth for each 1990 census tract within each subarea in the Mojave Basin Area was determined for each five-year interval from 2000 to 2020. The data provided by SCAG was also used to estimate the population growth rates in the Morongo Basin/Johnson Valley Area for the Johnson Valley and the portion of the Means/Ames Valley outside of HDWD.

By overlaying the 1990 census tracts onto the 2000 census blocks, the total population in the year 2000 was determined for each 1990 census tract. Using these data and the growth rates determined for each tract, future projected populations were estimated for each tract. However, the growth rates were modified in certain cases in order to obtain more reasonable growth rates for the areas in question. These modifications are outlined below:

- All tract areas within Baja were assumed to grow at a constant rate of 1.0% per year. When a tract overlapped Baja and another subarea within MWA, the growth rate for the portion of the tract in the other subarea was increased so that the growth rate for the entire tract was equal to the SCAG projected rate.
- Census tract 9704, which covers the southwestern portion of Este and the southeastern portion of Alto, had a projected growth rate of 2.2% per year. The growth rate for the Este portion of this tract was adjusted to 1.1% per year. The growth rate within Alto was increased to 2.3% per year to make the growth rate of the entire tract equal to the SCAG projected rate.
- Census tract 10405, which covers the eastern portion of Este (about 8% of Este's 2000 population) and the northern portion of the Morongo Basin/Johnson Valley Area (including the Johnson Valley and the portion of the Means/Ames Valley outside of HDWD), had a projected growth rate of 3.5% per year. The growth rates in both Este and the Morongo Basin/Johnson Valley portions of this tract were reduced to 2.0% per year. It was assumed that the growth rate would be increased in the portion of the tract that falls outside of the MWA boundary so that the growth rate for the entire tract would equal the SCAG projected rate.
- Census tract 9104, which covers the northern portions of Alto and Oeste (and includes about 13% of Oeste's 2000 population), had a projected growth rate of 4.0 % per year. It was assumed that population in Oeste within this tract would not increase between 2000 and 2020. The growth rate within Alto was increased to 4.1% per year to make the growth rate for the entire tract equal to the SCAG projected rate.

Once the projected populations for each subarea within each tract had been determined and allocated to the appropriate subarea, the individual tract populations were summed together to determine the estimated total population for each subarea.

The results of this exercise are population projections for each subarea from 2000 to 2020 that are based on SCAG projected growth rates (based on 1990 census tract data and growth rate adjustments noted above) and on 2000 population figures estimated from the 2000 census blocks. Table 5-7 in Chapter 5 shows the projected future populations for each subarea in the Mojave Basin Area and for the Morongo Basin/Johnson Valley Area.

The population growth rates used for HDWD and the Copper Mountain Valley subbasin were determined using data provided by HDWD and by the Joshua Basin Water District (JBWD), respectively. HDWD projects a growth rate of 2.4% per year. This rate was applied to the population overlying the Warren Valley subbasin and to the portion of the Means/Ames Valley within HDWD overlying the Means/Ames Valley subbasin. JBWD projects a growth rate of 1.4% per year, which was used to project the future population to be served by the Copper Mountain Valley subbasin.

Current Water Demand

Mojave Basin Area

The following data was available for use in estimating consumptive use in each subarea within each sector from 1995 to 2001:

1. Consumptive use and production for each sector in each subarea in 1997 (Webb 2000).
2. Production by sector in each subarea from 1995-2001 contained for each year in the annual Engineer's Report on Water Supply (MWA 1996-2002). The data contained in these reports were tabulated according to the following sectors: agricultural, municipal, industrial, golf courses and parks, and recreational lakes. These data have been revised in certain cases as indicated below.

For the Regional Water Management Plan (RWMP) Update, water demand was separated into the same sectors referred to in the Engineer's Report. The above data was used to develop estimates of consumptive use for each sector in each subarea in the Mojave Basin Area using the following steps:

1. Determine the consumptive use rate in each sector within each subarea.

2. Estimate the production in each sector within each subarea.
3. Estimate consumptive use by sector for each subarea using the consumptive use rates calculated in Step 1 and the production estimates developed in Step 2.

Each of these steps is described in detail below.

Step 1: Determine Consumptive Use Rates

Webb (2000) contains the results of a detailed study of production and consumptive use in each subarea in the Mojave Basin Area in 1997. For the RWMP Update, the consumptive use and production estimates from Webb (2000) were used to estimate the proportion of each sector's production that was used consumptively. It was assumed that these rates remained constant between 1995 and 2001 and will remain constant through 2020. These consumptive use rates are shown for each subarea and for the Mojave Basin Area as a whole in Table C-2.

Table C-2: Consumptive Use by Sector For Each Subarea

Sector	Alto	Baja	Centro	Este	Oeste	Total Mojave Basin Area
Agriculture	62%	63%	62%	60%	57%	62%
Industrial	100%	100%	100%	100%	100%	100%
Municipal	50%	50%	50%	50%	50%	50%
Golf Courses	60%	N/A	56%	N/A	N/A	60%
Recreational	100%	100%	N/A	N/A	N/A	100%

Step 2: Estimate Production in Each Subarea

Production data provided in the Engineer's Report includes production estimates for each subarea from 1995 through 2001. The demand sectors reported include agriculture, municipal, industrial, golf courses and parks, and recreational lakes. For 1998-2001, these data have been used as is. From 1995-97, however, the municipal production estimates have been adjusted to account for new estimates of minimal user production contained in Webb (2000) that replace the estimates contained in the Mojave Basin Area Judgment (1996). In addition, the agricultural production in Oeste in 1995 and in Este in 1996 has been adjusted to correct errors made in the previous calculations.

Step 3: Estimate Consumptive Use in Each Subarea

The consumptive use for each sector within each subarea in the Mojave Basin Area was determined by multiplying the production in each sector determined in Step 2 by the consumptive use rates calculated in Step 1. In Alto and Oeste, these estimates were adjusted in order to account for the operation of County Service Area (CSA) 70L, in which approximately 80% of the production occurs in Oeste but which has approximately 50% population in each subarea. It was therefore assumed that 50% of the return flow in CSA 70L would occur in each subarea. This had the effect of increasing the municipal consumptive use rate to higher than 50% in Oeste and of lowering the rate to below 50% in Alto. The resulting consumptive use estimates are contained in Table 5-4 in Chapter 5.

Morongo Basin/Johnson Valley Area

Production within each subbasin in the Morongo Basin/Johnson Valley Area for each sector from 1995-2000 was provided in a table by MWA. Because production data was not available for all wells for 2001, the analysis in the Morongo Basin/Johnson Valley Area only covered 1995-2000. No production data was provided for the Johnson Valley subbasin. All of the production in the Morongo Basin/Johnson Valley Area was for municipal uses except for two wells in the Warren Valley subbasin that supplied water for a golf course.

Consumptive use data was not available for the Morongo Basin/Johnson Valley Area. Therefore, the consumptive use rates were assumed to be the same as those shown for the total Mojave Basin Area in Table C-2.

For the RWMP Update, the water demand was separated into the same sectors as for the Mojave Basin Area. The above data was used to develop estimates of consumptive use for each sector in each subbasin in the Morongo Basin/Johnson Valley Area using the following steps:

1. Estimate the production in each sector within each subbasin.
2. Estimate consumptive use by sector for each subbasin using the consumptive use rates from Table C-2 and the production estimates developed in Step 1.

Each of these steps is described in detail below.

Step 1: Estimate Production in Each Subbasin

The table provided by MWA included production estimates by water district and by sector within each subbasin in the Morongo Basin/Johnson Valley Area. Because HDWD included both municipal production and population in both the Means/Ames Valley and the Warren Valley subbasins, the production for HDWD was tabulated separately for these two subbasins. All other production was assumed to be used in the same subbasin from which it was extracted.

Step 2: Estimate Consumptive Use in Each Subbasin

With the exception of production by HDWD, the return flow from all wells was assumed to return to the same subbasin from which it was extracted. Consumptive use outside of HDWD therefore was determined by applying the total Mojave Basin Area consumptive use rates for each sector from Table C-2 to the production for each sector in each subbasin.

Within HDWD, however, the percentage of the total municipal return flow that returned to the Means/Ames Valley or Warren Valley subbasins was not necessarily the same as the percentage that was extracted from each subbasin. Table C-1 shows the HDWD population that lived over each subbasin in 2000. In 2000, 81% of HDWD's population lived over the Warren Valley subbasin, with the remainder overlying the Means/Ames Valley subbasin. It was assumed that this ratio remained constant from 1995-2000 and therefore that throughout this period 81% of the HDWD production would return to the Warren Valley subbasin regardless of where it was extracted.

In 1995 and 1996 the Bighorn Desert View Intertie transferred water that was pumped outside of HDWD in the Means/Ames Valley subbasin to HDWD. This had the effect of reducing the non-HDWD return flow in the Means/Ames Valley and increasing the total HDWD return flow during these years. As an example, Table C-3 shows the calculations that were used to estimate municipal consumptive use in each subbasin in 1995. Table 5-5 in Chapter 5 shows the consumptive use estimates for each sector within each subbasin from 1995-2000.

Table C-3: Morongo Basin/Johnson Valley Area Consumptive Use Calculations for 1995 (acre-feet/year)

	Municipal Production	BH Intertie Transfer (1)	Applied Production (2)	Return Flow (5)	Consumptive Use (6)
HDWD					
Copper Mtn. Valley	0	0	0	0	0
Means/Ames Valley	670	N/A	540	270	400
Warren Valley	1,720	N/A	2,320	1,160	560
Total	**2,390**	**470**	**2,860 (3)**	**1,430**	**960**
Non-HDWD					
Copper Mtn. Valley	1,500	0	1,500	750	750
Means/Ames Valley	1,110	-470	640 (4)	320	790
Warren Valley	0	0	0	0	0
Total	**2,610**	**-470**	**2,140**	**1,070**	**1,540**
Total					
Copper Mtn. Valley	1,500	0	1,500	750	750
Means/Ames Valley	1,780	N/A	1,180	590	1,190
Warren Valley	1,720	N/A	2,320	1,160	560
Total	**5,000**	**0**	**5,000**	**2,500**	**2,500**

Notes:

(1) In HDWD, the inflow from the Bighorn Desert View Intertie was added to the HDWD total production because it was considered a system-wide input and not an input to any particular area within HDWD.

(2) Applied production is the amount of production used in areas that overly a particular subbasin.

(3) Total applied production in HDWD equals municipal production plus deliveries from the Means/Ames Valley via the Bighorn Desert View Intertie. 81% of the HDWD total applied production was assumed to be used in the Warren Valley subbasin and 19% was assumed to be used in the Means/Ames Valley subbasin.

(4) In the Means/Ames Valley subbasin, applied production equals municipal production minus deliveries to HDWD via the Bighorn Desert View Intertie.

(5) Return flow equals 50% of the total applied production.

(6) Consumptive use equals the municipal production minus the return flow.

Year 2000 Consumptive Use

The year 2000 is the most recent year for which population data is available in each subarea and is therefore used as the base year for the purposes of projecting future consumptive use. The year 2000 consumptive use quantities for the Mojave Basin Area can be seen for each sector in Table 5-4 in Chapter 5. The year 2000 consumptive use quantities for the Morongo Basin/Johnson Valley Area can be seen for each sector in Table 5-5 in Chapter 5.

Future Water Demand

Future consumptive use for each sector within each subarea in the Mojave Basin Area and each subbasin in the Morongo Basin/Johnson Valley Area was estimated using the year 2000 consumptive use amounts shown in Tables 5-4 and 5-5 of Chapter 5 as a starting point. Agricultural consumptive use was estimated by two different methods, representing low and high estimates of future consumptive use. These are explained below. For the other sectors, the following assumptions were used to estimate the future year demand projections for each sector:

- Industrial and recreational lakes water uses were assumed to remain constant at year 2000 levels. The one exception was industrial use in Alto, which was assumed to increase by 4,000 acre-feet to account for the expected operation of the new High Desert Power Project.
- Municipal water use was assumed to change in direct proportion to the population in each region. Using the year 2000 population amounts calculated from the census data and the municipal production quantities for year 2000, a per capita water use was estimated for each subarea in the Mojave Basin Area and each subbasin in the Morongo Basin/Johnson Valley Area. These per capita water use quantities were multiplied by the population estimates contained in Table 5-7 in Chapter 5 to estimate municipal production in each subarea in each year. In Alto and Oeste, the population was projected and the per capita use rate applied separately for the areas within and outside of CSA 70L. In the Means/Ames Valley subbasin, the population was projected and the per capita use rate applied separately for the areas within and outside of HDWD. The consumptive use amounts were then calculated by assuming a consumptive use rate of 50%. Per capita water use rates for each subarea are shown in Table C-4.
- Golf course consumptive use was assumed to change in direct proportion with the change in municipal consumptive use. It is assumed that the water use in these sectors would increase at the same rate as the increase in population.

Table C-4: Per Capita Municipal Water Use (gallons/capita-day)

Mojave Basin Area						Morongo Basin/Johnson Valley Area			
Alto	Baja	Centro	Este	Oeste	Total	Copper Mtn. Valley	Means/ Ames Valley	Warren Valley	Total
267	879	334	267	230	284	147	142	137	140

Agricultural Consumptive Use Estimation

Future agricultural water use was estimated by the following two methods:

Agriculture Scenario 1: assumes that there is no reduction in agricultural water use from year 2000 levels in the future. The agricultural consumptive use in each future year would be the same as those shown for 2000 in Tables 5-4 and 5-5 in Chapter 5.

Agriculture Scenario 2: assumes that the rampdown stipulated in the Mojave Basin Area Judgment (1996) resumes in 2002 and that water demand in the non-agricultural sectors that cannot be met by the non-agricultural free production allowance are first supplied by voluntary transfers of free production allowance from agricultural production. (Note that the Morongo Basin/Johnson Valley Area contains no agricultural production and is outside the boundaries of the Mojave Basin Area adjudication, and is therefore not included in this analysis). The rampdown was simulated by the following method:

- The Base Annual Production (BAP) for each subarea was stipulated in the Judgment. The BAP for each subarea can be seen in Table C-5. These values were used to estimate the Free Production Allowance (FPA) for each subarea in each year. In 2001, the FPA equaled 80% of the BAP. In subsequent years, it was assumed that the FPA would be reduced by 5% of the BAP each year.

Table C-5: Base Annual Production and Year 2000 Production Safe Yield for each Subarea (acre-feet/year)

	Alto	Baja	Centro	Este	Oeste
Base Annual Production (BAP)	113,137	66,558	49,371	19,251	6,857
Production Safe Yield (PSY)	59,287	12,205	30,304	6,538	3,356

- The Production Safe Yield (PSY) was determined for each subarea each year. The PSY in each subarea was assumed to equal the average net natural water supply (as presented in Chapter 4) plus the expected return flow (flow that was not consumptively used) from the previous year's water production. The initial year 2000 PSY for each subarea can be seen in Table C-5. As production in the subarea increased or decreased, the PSY would also increase or decrease in response to changes in estimated return flow.
- The FPA was not permitted to be less than the PSY. If the expected reduction in FPA would cause the FPA to be less than the PSY, then the FPA would be set equal to the PSY. The FPA would then continue to be equal to the PSY in subsequent years.
- In each year, each subarea was allowed to pump any amount up to the FPA from that year plus any carryover from the previous year. The carryover consists of any unused FPA from the previous year, and is only available to be used for one year.
- The demand in each year was assumed to equal the year 2000 agricultural production plus the projected production in the non-agricultural sectors. If this amount was less than the available FPA and carryover, the entire demand would be supplied and any excess FPA would be designated as carryover for the following year. If the demand was greater than the FPA and the carryover amount, agricultural production would be reduced until the total production equaled the available supply or until the amount of agricultural production was reduced to a pre-set minimum. The pre-set minimum was established to reflect the agricultural production anticipated that could afford to purchase replacement water. The assumed minimum possible agricultural production amounts can be seen in Table C-6.

Table C-6: Minimum Thresholds on Agricultural Production (acre-feet/year)

Alto	Baja	Centro	Este	Oeste
2,100	900	N/A	N/A	500

- Once the agricultural production had been determined in each year, it was converted to consumptive use using the rates shown in Table C-2.

APPENDIX D

Issues Questionnaire
Summary of Responses to the Issues Questionnaire

Mojave Water Agency
Regional Water Management Plan Update
Issues Questionnaire

July 26, 2001

Please return this questionnaire to the Mojave Water Agency no later than August 30, 2001. Your responses may be added directly to the space provided below each question, or you may receive an electronic version (MS Word) via e-mail by sending your request and e-mail address to Gloria Golike (gloriag@mojavewater.org). If you believe that specific questions do not apply to you, indicate "not applicable" or "n/a". Questions regarding the survey should be directed to Norm Caouette at (760) 240-9201.

1. How important is it to reverse the trend and recover from the current groundwater overdraft?

2. If the current Water Management Plan were fully implemented, how effectively would it meet your current and future needs? How would you improve the plan?

3. Do you think the current adjudication will solve the region's water supply problems in the short-term (1-5 years) and the long-term (6-20 years)? Why?

4. How will you measure the success of this plan update process?

    a. From your perspective?

    b. From a basin-wide perspective?

    c. For the short-term (1-5 years)?

    d. For the long-term (6-20 years)?

5. What is your confidence level that your expectations will be met in the short-term (1-5 years) and the long-term (6-20 years)? Why?

6. What potential barriers or key issues do you see that will need to be addressed in order for this plan update process to be a success?

7. If the update doesn't address your water supply needs, what do you think is the most likely way that you will be able to meet your water needs?

8. What do you think are the primary interests of the other stakeholders?

9. What is your confidence level that the region's water resources can be managed to meet the region's anticipated water needs?

10. If you represent a water utility, what land use planning data do you use for your future water demand projections?

11. If you represent a water utility, what are your current and projected (5-year increments through the Year 2020) water supply needs?

12. Do you gather and maintain groundwater level or groundwater quality data? What data do you have and what format (manual tabulation, electronic) is it in?

13. To what extent should the MWA be involved in regional use of recycled water?

14. To what extent should the MWA be involved in water conservation efforts?

15. Do you have any specific water quality concerns?

16. Introduction of imported water into our groundwater basins may result in some changes to the to the native water quality. Assuming that changes will not exceed State or Federal health standards, should the maintenance of existing water quality take precedence over measures to reverse the existing overdraft and enhance long-term water supply reliability?

17. What are your thoughts about MWA entering into groundwater storage agreements with outside agencies?

18. What are your thoughts about the MWA and/or the Mojave Basin Area Watermaster entering into groundwater storage agreements with water users within MWA?

19. Should the MWA consider purchasing new State Water Project entitlement whenever it might become available?

20. Do you think there is potential for regional projects that would delay or offset proposed local projects?

21. Are you willing to consider delaying local projects in order to develop the regional projects?

22. Are you willing to work with MWA to jointly finance regional capital facilities?

23. How should the purchase of water and construction of facilities needed for the region to recover from the current groundwater overdraft be financed?

24. How should the purchase of water and the construction of facilities needed for future water supply reliability be financed?

25. Should the MWA offer “degrees of reliability” for wholesale imported water purchases with attendant cost differential (i.e. higher water supply reliability at a higher cost)?

26. Should the MWA commit entitlement to State Water Project water by specific region or area and how should it be done?

27. Should the Plan update consider a financing program where everyone pays for regional projects, but new development pays more than the established community?

28. What should be the guiding principle(s) of the Mojave Water Agency?

29. Do you believe there is input from individuals or groups that may be missed by this process? Please identify them.

30. Please provide any additional input you believe pertinent to the Plan update.

Mojave Water Agency
Update of the Regional Water Management Plan
Summary of Responses to the Issues Questionnaire
Last Revised 4/11/02

MWA Questions	Responses					
	Alto	**Centro**	**Este**	**Oeste**	**Johnson Valley / Morongo Basin Area**	**Regional / Multiple**
1. How important is it to reverse the trend and recover from current groundwater overdraft?	**City of Adelanto:** It is impossible to recover. **Victor Valley WD:** Stabilizing the overdraft so that water consumption does not exceed the combined use of imported water, reused water, and natural inflow/return flow is critical for long term sustainable growth of the High Desert. **Jess Ranch:** If the MWA is to fulfill its obligations under the act and the physical solution approved by the court,	**City of Barstow:** Very important.	**Chuck Bell:** It is absolutely important to reverse the trend of the current groundwater overdraft; however, the term "recover" does not reflect reality. What condition in what year at what water table level in what area do we "recover" to? Achieving some semblance of safe-yield is the most we can expect. **Norm Nichols:** It must be done.	**Paul Davis:** It seems to be our only option if we are to realize growth, in any manner, for this high desert area. Water is life – water is the future and hopefully the MWA will have a leading role. An ultra conservative approach would be dangerous. Positive thinking for the future with a reaching out to all.	**Joshua Basin WD:** Joshua Basin Water District is addressing the overdraft for the Joshua Tree sub-basin. Our plan is to shift pumping with new wells in the Copper Mountain sub-basin. State project pipeline is needed to deliver water to J.B.W.D. to insure that we do not return to over drafting either of the above basins. It is important but not critical at this time as long as the above plan can be implemented. **Hi-Desert WD:** Reversing the trend and recovering from an overdraft of any groundwater basin is	**SBCSDD:** Since groundwater is the primary source of potable water for all the County Service Areas, it is very important to reverse the current overdraft trend to prevent long term damage to the aquifer. **DFG:** It is the first priority for the Departments properties at Victorville and Camp Cady and for its Public Trust interests above and below the Mojave Narrows. **RWQCB:** Ground water overdraft in aquifers of the

	the issue is one that is critical in nature. **City of Victorville:** It is very important that the continuing overdraft be halted. Regarding the replacement of the water previously overdrafted, we are not aware of a benefit versus cost analysis. The appropriate maintained level of the basin should be based on factors such as adequate storage, well-pump efficiency, environmental concerns, downstream impacts, and economic efficiencies. **Joe Monroe:** Very important. **Victor Valley WRA:** Since groundwater is the only natural supply of potable water in the Victor Valley, it is imperative that the overdraft of the region's aquifers must be stopped,				important to assure a long term water supply. Within the Warren Valley basin, the process of reversing the overdraft began in 1995 with the importation of State Water Project water. **Bighorn DVWA:** Important.	Mojave Desert is of serious social and economic concern to all who live and work here. It is very important to reverse the current trend in ground water decline to prevent subsidence and a loss of potential aquifer storage capacity. Long-term growth will be seriously impeded if there are insufficient quantities of water. Without growth the economy may become stagnant, and worse, fall into decline. **SCWC:** It is not only important, it is critical. It is clear that without, at the very least, a stabilization of the current overdraft situation, the long-term viability of groundwater supplies, particularly in the lower basins, will be jeopardized. **Unknown:** 100%

	and if possible, reversed. **City of Hesperia:** The current extent of overdraft in the basin may be irreversible. However, due to the fiduciary responsibility we have to our community and its future we have supported the physical solution and its implementation. Sustainability of the lifestyle and financial investments made by our residents dictates that we work toward a reliable, sustainable supply of water. The physical solution, however, needs to be tempered with economic realism and active participation with the major stakeholders. While it may not be economically viable to attempt to restore the millions of acre feet of overdraft hypothesized by engineering studies,					

	prudent maintenance and implementation of the physical solution is acceptable to prevent any further deterioration of the groundwater supply.					
2. If the current Water Management Plan were fully implemented, how effectively would it meet your current and future needs? How would you improve the plan?	**City of Adelanto:** There is no plan that has a physical solution. Our current and future needs depend on the recharging of the transition zone at the lower narrows. **Victor Valley WD:** The current Water Management Plan makes certain assumptions about methods of replenishing groundwater that does not meet our needs. The plan needs to include alternatives for placing groundwater close to its points of withdrawal within the regional aquifer. **Jess Ranch:** Jess Ranch's needs for water have been fully reserved	**City of Barstow:** If it were implemented uniformly, I think it would benefit everyone in the basin.	**Chuck Bell:** I don't have a copy of the current Water Management Plan, so I cannot respond to its effectiveness to date. **Norm Nichols:** The current plan will finally stabilize the water area.	**Paul Davis:** Outlying areas – try Este and Oeste, - have not been fully included within the current Regional Water Management Plan. The major population is on the Mojave River, thus the political course, but, for a successful plan all areas should be included.	**Joshua Basin WD:** As indicated above, the pipeline project was never completed for JBWD to take delivery of state project water. **Hi-Desert WD:** Many areas identified in MWA's current Water Management Plan are consistent with the practices of H-Desert Water District. The District has taken many steps to manage the Warren Valley Basin in a responsible manner to meet our current and future needs. The existing plan is very comprehensive and provides a good foundation for responsible water management. An update of events and additional goals to utilize existing technology such as GIS would be recommended.	**SBCSDD:** The District has not studied the current plan and therefore cannot comment on how to improve the plan or what needs it covers; however, there are new issues to be addressed by the update. **DFG:** It lacks specificity. Needed are injection, infiltration sites, and the distribution system from them. Need to find money/mechanism to import water ASAP. **RWQCB:** Improve the plan by incorporating for direct water use along with conjunctive water use. **SCWC:** A fully implemented plan would allow for the best

	for its build out, the more important issue to this stakeholder is how it can participate in the plan, by providing a well field to store and recover water that is anticipated to be spread at the Rock Springs Outlet. Further to provide the high quality water rights that it owns to users in the Regional Aquifer who have a need from the water at a reasonable and competitive price. Jess Ranch believes that the most cost effective means of recharging the MRB in the Alto sub-area is at Rock Springs as is currently defined in the Regional Plan. The issue of water quality is of prime concern and needs to continue to be monitored. If the conclusions in the previous EIR are correct that the spreading of water will not degrade water quality and that natures process of				**Bighorn DVWA:** Little effect. More study.	management of the water basin. The Alternative 2 facilities that have been installed, particularly the Mojave River Pipeline to the Centro Subarea and recharge sites at Hodge and Lenwood, are providing a strong base infrastructure system to ensure that a water supply in this area can be met. With the completion of Alternative 3 recommended facilities the MWA should be able to further meet the needs of the area. We do not have any specific recommendations regarding the improvement plan other than continuing to get purveyor input and buy-in to the work that needs to be done. **Unknown:** Isn't more information needed to let people know that the wells are raising because of the water being discharged now?.

	filtration in the Flood Plain works, MWA could easily spread and store all of its annual entitlement on average of 50,000 acre-feet per year at the Rock Springs Outlet. Of course that would leave no water for any other recharge basins. Currently it is anticipated that the Rock Springs Outlet will only recharge between 17,000 to 24,000 acre-feet per year. Assuming the entire Morongo Basin Entitlement was stored in the Alto Flood Plain, recovery wells could be located at Jess Ranch to pump and send treated water through the Morongo Basin Pipeline. This would allow for direct use of the water or injection into aquifers along the way. Water Districts that could benefit such as Mariana Rancho's Water District and the Lucerne Valley could enter into wheeling					

	agreements with Morongo Basin to offset the costs. **City of Victorville:** I don’t believe the Plan adequately addresses the use of recycled water. We are in the process of finalizing a feasibility study on recycled water and there needs to be an element in the Plan that acknowledges and addresses this issue. Additionally, the MWA needs to implement a water conservation ordinance. **Joe Monroe:** Unable to say without a thorough review of the Plan. **VVWRA:** VVWRA as an Agency has not studied or considered the current Water Management Plan, and therefore cannot comment on this question.					

	City of Hesperia: As outlined in Section X of the 1994 Regional Water Management Plan (pg 113), the seven objectives remain viable options for addressing the areas growing demands. Implementation of item #6 (water conservation) has not been addressed by the Agency. It is important that the solutions be balanced with cost-effectiveness. The Alto sub-area expends that greatest amount of financial resources in assessments, make up obligation and replacement water but yet receives minimal recharge benefit. A greater focus needs to be placed on the unique needs in the individual sub-areas. Deviation from a basin-wide solution may be in order.					
3. Do you think the current adjudication will solve the	**City of Adelanto:** No. It does not put any new wet water back into the	**City of Barstow:** Short term No, long term Yes. The allocations and	**Chuck Bell:** The current adjudication is a long-term solution, with some minor	**Paul Davis:** The basics are there. Fine tuning is needed in the	**Joshua Basin WD:** NA to JBWD	**SBCSDD:** The existence of the adjudication itself indicates the regions desire

region's water supply problems in the short-term (1-5 years) and the long-term (6-20 years)? Why?	system. **Victor Valley WD:** In the short-term, rampdown must be implemented until "paper water" is eliminated. The judgment can work long-term if cooperative planning can be implemented. **Jess Ranch:** Only if the tenants of the adjudication are followed: 1. Return Flow is a key component to basin balance, if water agencies are allowed to use water from the Regional Treatment Plant this is a major potential for destroying balance, at least until there is surplus flow. 2. If water agencies are allowed to buy SWP water for direct use in Power Plants, this will prevent the agency	rampdowns compel conservation or pay for make-up water. Both ultimately help the overdraft situation.	short-term benefits; the most productive of which will likely be just setting the long-term solution in place and allowing the open market to allocate water to the highest bidder. (Am not sure that will induce the "most beneficial" land-uses. I might prefer in the Mojave Basin, but life isn't always fair). However, with the public willing to pay as much if not more for store-bought bottled water than for gasoline, who knows what other goofy market forces might prevail. The Judgment provides a tool box for some long-term repairs, but is absolutely dependant on securing "wet" water. With even our entitlement in doubt, I am not sure we can answer that question now. **Norm Nichols:** It will take a long time. The problem developed over a period of time, and the fix will take time also.	short term. Long term policy should include other water entities - state etc. Along with conservation efforts – water storage within aquifers for future needs.	**Hi-Desert WD:** NA to the Warren Valley Basin area. **Bighorn DVWD:** Will help.	to solve the current shortage and plan for the future needs of a growing community. However, the current water levels do not indicate that the adjudication as yet is solving all the short-term supply problems. To achieve the long-term solution that is needed, the plan update should be carefully planned and accepted by all of the water producers. **DFG:** In the short-term, clearly not happening. In the long-term yes, IF rampdowns are implemented, issues are solved regarding non-stipulators and newcomers, and imported SWP water is distributed to reach safe yield, offsetting growth. **RWQCB:** The question is difficult to answer without knowledge of water supply problems facing the region. **SCWC:** Short-term, no;

	from having water available for recharge. 3. If politics is the guiding principal instead of pragmatic reality, then the adjudication will not work. 4. If the MWA is compelled to recognize the legitimate water rights of the farming community along the Mojave River and places the burden of the overdraft on the municipal producers in the regional aquifer, all of the entitlement water will be purchased and placed in storage. If only 50% of the water is consumed, then the basins will be receiving a 50% benefit and over time the adjudication will work to cure the overdraft. **City of Victorville:** No					long-term, yes. The basin just completed the first five years under the judgment and is now looking at future rampdown needs for each subarea. Anything that is done now will take at least five years to show meaningful benefits. The judgment will work if given time and once significant imported water begins to flow. **Unknown:** It must work for the long term. You have nothing if no water.

	to both. Increasing the cost of water does not motivate users to conserve. For the most part, the users (public) are ignorant of the facts concerning the current overdraft and issues relating to the adjudication. A comprehensive public outreach program is needed in order to educate the users' and get their "buy-in" and commitment to help with the current overdraft. Also, the MWA needs to address the issue of a water treatment facility if it will be considering bringing in imported water. **Joe Monroe:** Not able to do so – not comprehensive enough. **VVWRA:** The legal basis for the adjudication reflects the collective agreement that is necessary to solve the					

	area's water shortage. However, the physical solution, which is a component of the current adjudication, does not appear to be solving the region's short term or long term problems, as evidenced by the continuous increase in the overdraft of the region's aquifers. It would appear that the physical solution may need to be revised in order to adequately protect the region's water supply. **City of Hesperia:** The issues within each of the sub areas are diverse and require a dynamic solution. What may work to bring one sub area into balance may not be the proper remedy for another sub area. A varied yet well-orchestrated approach to basin-wide water management will be crucial to the end result					

	desired by the physical solution. The adjudication in its current form is a static document. Establishment of recharge basins is a critical component.					
4. How will you measure the success of this plan update process? a. From your perspective? b. From a basin-wide perspective? c. For the short-term (1-5 years)? d. For the long-term (6-20 years)?	**City of Adelanto:** By how much new wet water goes back into the system. **Victor Valley WD:** The plan will be successful if it assures stakeholders that they will have water available to them as they need it. Our agency and many others wish to retain their independence and, therefore, are seeking alternatives that enable us to plan and manage our own water supply. Success will mean offering options without dictating required solutions. Long term success will be measured by sustainable water supply. Short term success will mean capital	**City of Barstow:** (a) Are all the producers being treated the same? (b) Is water available for new development? (c) Is make-up water being purchased? (d) Re-measure the water table and the amount of overdraft.	**Chuck Bell:** A successful process only gets us a plan update, which will mostly consist of "feel good" words on a lot of paper that might look better as trees back in the forest. The success of the plan update itself should be measured on how realistically it guides the agency to the ultimate solution; which is importing even more than just its entitlement water – probably to the detriment of California agriculture – which supplies me enough energy to write these responses. Any benefits associated with the update will likely surface over the long-term, and probably only as a complement to the benefits of the Judgment; and probably		**Joshua Basin WD:** (a) Joshua Basin Water District will measure the success of this plan update process if it addresses some of our immediate water deliveries. (b) Same as above. (c) Short-term success will be determined by our joined efforts to obtain grant funding to construct the extension of the pipeline for state water deliveries. (d) Long-term success will be determined if additional entitlements are considered for MWA to provide additional state water to Morongo Basin residents. **Hi-Desert WD:** If a consensus is reached by all the members and they buy-in to the proposed policies and recommendations.	**SVCSDD:** (a) The success of the plan can be measured by carefully monitoring groundwater levels throughout the Agency, and the success of the process can be measured by the success of the plan. (b) A slowing down of or stop to the overdraft process measured by reductions in annual production by all water producers, including non-stipulated interests and interests with prescriptive water rights. (c) A plan update that accommodates all groundwater systems including systems not perceived to be connected to the Mojave River system with a monitoring program to record water levels and quality for all the systems

	projects to bank water or increase the use of imported water. **Jess Ranch:** (a) When municipal production pays for the 80,000 acre feet of water they are over drafting from the basin and the MWA uses these funds to buy all of the annual allotment available. (b) When water levels stabilize and come up, using a "Key Well" analysis. (c) Same as "a". (d) Same as "b". **City of Victorville:** The goal of the plan is to provide clean and adequate water supply to everyone within the MWA boundaries and, at the same time, provide a cost-effective supply for future development. **VVWRA:** The plan update must consider wastewater reclamation as a beneficial resource, which must be		more beneficial to the main stream basin than to its eddies like ESTE and OESTE. **Norm Nichols:** We are working on all the fronts.		**Bighorn DVWA:** Will it be better.	within the Agency. (d) The update should identify alternative water supply programs, including regional treatment facilities, as contingencies against unanticipated growth or continued overdraft. Additional sources of recharge, including recycled wastewater, should be included in the study. **DFG:** (a) Specificity of recharge basins, their location and their operation which aids or does not negatively impact DFG ownerships and public trust responsibilities. (b) Quiets issues with small, low volume users, off-stream suppliers, does provide facilities and mechanisms in support of Judgment to provide safe yield and meet Exhibit H criteria. (c) Gets a plan in place that can be quickly implemented. (d) Plan is implemented – recharge/storage operations functioning, safe yield

	considered as an integral element of water management for the region. It is important that the regional wastewater authority be involved in this process. **City of Hesperia:** (a) The plan must be dynamic. It must also allow the purveyors options to meeting the demands of the physical solution through creative means. (b) A successful plan will not play to individual stakeholders or "squeaky wheels", but will fairly mete out projects that are scientifically sound that will serve to meet the over-arching goal of providing a long-term water supply for the area. Stakeholder consensus for each rampdown or other major consideration is important since we, the stipulator, have chosen to take a "share the pain" approach. (c) Continued					accomplished, Exhibit H criteria met. **RWQCB:** Our perspective is from a basin-wide point of view that looks at both short-and long-term outcomes of your plan. A plan that addresses water quality as well as water quantity for both short- and long-term perspectives would be regarded as successful from our viewpoint. **SCWC:** (a)The plan update will need to provide for a continuation of the commitment on the part of MWA and Watermaster to provide adequate supplies of water to each area of the basin pursuant to and in conjunction with the terms of the adjudication. (b) Same. (c) Provide a program(s) under which the current annual overdraft is mitigated, if not altogether halted, for most, if not all the basin. (d) Provide a program(s)

	implementation of the ramp-downs only as necessary. Exploration of alternatives to include imported and recycled sources. Conjunctive use arrangements including imported and recycled sources. (d) Future growth is dependant upon a reliable water supply. Steps must be taken to store adequate supplies for use during time when aqueduct water is unavailable.					under which the basin overdraft is reversed and provision is made to allow for growth in the basin as well as providing more reliable supplies during drought conditions. **Unknown:** Always long-term population growth is now using more in all areas.
5. What is your confidence level that your expectations will be met in the short-term (1-5 years) and the long-term (6-20 years)? Why?	**Victor Valley WD:** Given our current Board and management team, we are very confident that Victor Valley Water District will develop a multitude of water supply options in the next five years. We have a high level of hope that the RWMP can be a cooperative method of assisting us in our water	**City of Barstow:** Low short-term. Greater long-term. Why? Political interference.	**Chuck Bell:** My expectations will most likely be met in the long-term for reasons expressed above. **Norm Nichols:** It will take a long time. The problem developed over a period of time, and the fix will take time also.	**Paul Davis:** High confidence level – the demand factor, waterwise, will get the job done. Whether the Mojave Water Agency in its current form will still be in charge depends on their abilities to solve the problems coming up in the future.	**Joshua Basin WD:** Past experience with the pipeline project was only completed to Warren Basin. Joshua Basin Water District spent an additional $300,000 to extend pipeline to the west district boundary. However, the pipeline needed is still not completed to deliver any state water to Joshua Basin Water District.	**SBCSDD:** The District is confident that the expectations of all water producers can be addressed in the plan update. Current expectations, based on the existing plan, are low requiring that the update raise the expectations of all interested parties through a comprehensive management plan for both the short and long term.

	supply goals. Likewise, we feel the options we are pursuing can have regional benefits that can be shared with our neighbors. **Jess Ranch:** Stronger as each day goes by. The Supreme Court has recognized that farmers have water rights; the USGS has defined graphically where the overdraft is. Men of common sense can see that it is not the farmers production along the Main Stem of the Mojave River [at least in the upper reaches] that have caused the overdraft. As the court establishes who has the responsibility, it should be a short step to implement a plan that assesses the cost to cure. In the end, it is only a matter of money – who will pay for the fix.				**Hi-Desert WD:** NA **Bighorn DVWA:** Hopeful.	**DFG:** Short term – 50/50; long term – better than 50/50. Because of many existing present day conflicts and lack of public perception of problem. In long term, water shortage problem should become more of catalyst. The basic problem here, as in many such planning issues, is the overcoming of short-term profit interests. For water, is it to be mined or provide a sustainable resource? **RWQCB:** Confidence that our expectations will be achieved with the plan is predicated upon a reliable and available source of water. In periods of drought there would be a potential for water quality to degrade. **SCWC:** We believe that it is entirely realistic for our short- and long-term expectations to be met. The judgment provides a framework for the

	City of Victorville: Not good. It would depend upon the cooperation of all the various water purveyors and communities working together to implement the plan. **Joe Monroe:** High, because of the effort GM Brill is putting into it. **VVWRA:** VVWRA is confident that this process will result in an updated management plan that will meet the area's short-term and long-term needs. MWA's desire to update the plan demonstrates their commitment to properly manage the region's water resources. **City of Hesperia:** We will remain optimistic.					accomplishment of the short-term goals This, combined with other avenues, as discussed in answers to later questions, provide the opportunity for the long-term goals to be accomplished. This will, however, only occur if the parties work together for the good of the basin rather than focusing solely on their own interests. **Unknown:** In the long-term it may be possible, and must work to control water usage - even if building and population must be controlled.
6. What potential barriers or key issues	**Victor Valley WD:** The MWA needs to develop a	**City of Barstow:** (a) Lack of understanding of	**Chuck Bell:** The primary barrier to just adopting an	**Paul Davis:** Political – selfish interests.	**Joshua Basin WD:** Maintain balance in state	**SBCSDD:** Key issues to be dealt with are the

do you see that will need to be addressed in order for this plan update process to be a success?	fair method allocating State Water Project entitlement. In our opinion, in the event of shortages, it should be proportioned based on taxes paid over time by various areas. If our entitlement and groundwater basin storage is used to broker water deals with entities outside our basin, a fair method of allocating the benefits needs to be devised. **Jess Ranch:** The Plan mandates an update every five years. The framework of the plan is being implemented at least as to infrastructure. The capital costs in the plan to build the Rock Springs outlet and the Mojave River Pipeline have been or are being spent and these infrastructure projects will soon be complete. The Morongo Basin Pipeline is complete and	the physical situation and the physical solution. (b) Keep attorneys out of it.	updated Plan could be our current unwillingness to acknowledge the future, bottom-line, very harsh realities of severe water shortages; which is understandable when we turn the tap and water comes out. Voids don't get filled until they are created. Pumping from greater depths might be more expensive, but it still provides water, usually cheaper that other alternatives. Recent attacks on the adjudication will definitely cloud the plan update process, since the Judgement is the only real tool box at our disposal now. If the Judgement's fate is not resolved before the Plan is drafted, the Plan might have to include alternatives. A State-legislated requirement for developers to obtain real water for new development (a de facto moratorium) could be a reality;		water deliveries to meet priorities in major quality and overdraft issues. (Warren Basin upstream from the Joshua Basin Water District has quality issues that need to be acknowledged and addressed.) **Hi-Desert WD:** The key issue is how the allocation of State Water Project water will be administered by MWA. **Bighorn DVWA:** Human nature. Fairness.	continued overdraft conditions in the region and the diversity of opinions as to the best solution to the problem. This diversity of opinions and the motivation for this diversity is the barrier that needs to be removed for the success of the plan. **DFG:** Equity with the many off-stream users. Flexibility to handle imbalances within basins caused by transfer of FPA. **RWQCB:** Full consideration and incorporation of both short and long-term water quality implications due to the importation and storage of potentially lower quality State Water Project (SWP) into aquifers of the Mojave River. **SCWC:** In order for any plan to work, the competing interests of the various parties to the plan must be melded and

	operational. These major components allow MWA to provide water to the majority of its territory where water will be needed in the future. The Pipeline infrastructure is based on "Recharge" and "Storage." The capacity of the pipelines can easily handle double the full entitlement of the MWA. The MWA has no funds to put any water in the pipeline. The issue is how to collect funds and from who. So our memories are not short, the Plan should recognize the "conditions" imposed on the MRPL. The grant funds were initially sought from the farm home loan administration to prevent the farmers from being squeezed out of business. There are probations on its use.		obviously having major effects. The Plan's ultimate success will depend on how well it accommodates a wide range of options, mechanisms, recharge locations, financial incentives, etc. **Norm Nichols:** The farming issue.			molded such that the greatest good of the group is met. This may mean that not everyone gets everything that they would want. Compromise and cooperation will be needed. If parties doggedly hold to their provincial desires, the opportunity for success is reduced dramatically or, worst case, eliminated. **Unknown:** Control of water usage.

	For instance there is no provision that this pipeline can be used for Power Plants. The sole purpose shown in the grant applications is for "Recharge." Even the specific "Recharge Basins" are shown on the Plan. If water is to be used in Power Plants for cooling, it must conform to the Regional Plan – and it is not currently addressed. The consumptive use allocation described in the Physical Solution must be addressed so that all new production for new development is treated equally. If power plants can use either natures water or water purchased from the SWP it must be consistent with the 50% consumptive use policies that all other producers are held to. In other words if water is to be used for cooling and men of wisdom approve					

	this use as a priority over domestic consumption, then the cost should be at least equal, power producers should but two acre feet of water for each acre foot consumed returning one acre foot to the basin to cure the overdraft as was stated as the reason for the grant money. **City of Victorville:** The commitment and cooperation of every water purveyor and user is needed in order for this plan update process to be a success. Again, the recycled water element needs to be added using information from the WateReuse Association and examples from other cities and agencies that have successfully implemented a recycled water program. Additionally, it will also take the cooperation of everyone involved working together towards					

	implementing the plan and not spending money on attorneys. **Joe Monroe:** Resistance by some stakeholders. **VVWRA:** The cost of water will increase in the region, which many will use as a reason to resist updating or changing the plan. The physical solution to the adjudication must also be revised, which will require a considerable effort by all of the stipulated parties. It is imperative that the plan clearly identify the consequences of the current rate of overdraft if no changes are made, and it is equally important that the plan identify the positive aspects of proper water management in this arid region. **City of Hesperia:**					

	Commitment from the stakeholders to the physical solution is a key element in maintaining the current course of action. MWA must not get in a position of making "deals" with each of the different entities, but rather must take a sub-area or regional approach.					
7. If the update doesn't address your water supply needs, what do you think is the most likely way that you will be able to meet your water needs?	**City of Adelanto:** By recharging the Transition Zone up stream of our well field. **Victor Valley WD:** We are not relying solely on the MWA to meet our long-term water supply needs. We are seeking a measure of independence by seeking supply from multiple sources such as conservation, re-use and groundwater storage. **Jess Ranch:** N/A **City of Victorville:** By	**City of Barstow:** This is an unacceptable scenario.	**Chuck Bell:** If the update doesn't address (my) water supply needs (obviously I don't know that yet), it will likely be due to a predominant focus on mainstream issues; a predictable outcome since fewer options are available in the fringe ESTE sub-area. Our agricultural production is declining, our water market is of low to zilch value, and we can probably live off groundwater longer than most of the other basins. If the update doesn't work for us, we will just continue	**Paul Davis:** The courts, or, in Oeste interests, update the water management plan.	**Joshua Basin WD:** I would expect that the update would meet our major water supply as noted above. If water deliveries are reduced, we can meet our water needs through other alternative plans. **Hi-Desert WD:** A great portion of our future water supply needs relies on MWA's ability to provide State Water Project water through the Morongo Basin Pipeline. Without that water or a different source of supplemental water, overdraft of the Warren	**SBCSDD:** It is the District's opinion that the plan update must address all the out-standing issues and that there is no recourse through the Mojave Water Agency (MWA). If the plan is not successful then the water producers must individually and collectively find a source independent of the MWA. **DFG:** Unknown at this time. **RWQCB:** N/A

	implementing a recycled water program whereby large-end water users (i.e., greenbelts parks, golf courses, cemeteries, and large factories) use recycled water to maintain the greenery. **Joe Monroe:** By my purveyors efforts to find source(s). **VVWRA:** This question does not apply to VVWRA. **City of Hesperia:** Undecided.		pumping. Delivery of imported water via the Morongo pipeline is certainly an advantage. All we need is a recharge basin and some water; both of which would be components in a successful Plan, assuming we or a grant can pay for it. **Norm Nichols:** It will take a long time. The problem developed over a period of time, and the fix will take time also.		Valley Basin is likely to occur once again. Exploration of other sources would be necessary to avoid this. **Bighorn DVWA:** Local.	**SCWC:** Presently, available water pursuant to the judgment is sufficient to meet virtually all of our current needs within the basin. Should further rampdowns occur and/or should significant growth occur within our service areas, then additional supplies, most probably imported, would be needed. An alternative would be to acquire additional rights within the basin. **Unknown:** Move where more water is available.
8. What do you think are the primary interests of the other stakeholders?	**City of Adelanto:** Bringing new wet water into the region. The economy is the driver for new development, that makes it difficult to determine a growth rate. **Victor Valley WD:** Quantity – Quality – Cost. Sufficient quantities of water for future growth. A supply	**City of Barstow:** Being able to continue to produce water, being able to continue to issue “will serve” letters, being treated equitably under the plan criteria.	**Chuck Bell:** The primary interest of just about everyone involved is probably new sources of affordable water, or access to deep aquifers we haven't tapped yet. **Norm Nichols:** Failure to see a dry desert.	**Paul Davis:** Hopefully – the same as ours!	**Joshua Basin WD:** I would think that other stakeholders would want to acquire as much water as they can to meet their anticipated growth projections. Adjudication has been a major issue for most agencies. So far our AB3030 program is being implemented to manage our basins. **Hi-Desert WD:** Equity to	**SBCSDD:** The District cannot speak for the other stakeholders, however, it is our opinion that all the stakeholders interests should include the fair and equitable solution to the protection of the regional water resources. **DFG:** M&I interests - growth; small farmers, landowners - sustainability;

	plan that protects water quality (as defined by drinking water standards). Plans to minimize cost while meeting quantity and quality requirements. **Jess Ranch:** A. For agriculture interests who have the God given right to nature's water, to ensure that they are charged for production in the regional aquifer and curing an overdraft they did not create. B. For municipal producers to make decisions that ensure that there is a reliable water supply for existing will serve letters and future will serve letters and face the reality that the cost of water is going to dramatically increase. Board Members need to stop being lied to by the lawyers. **City of Victorville:** It is				all divisions during the re-districting process of MWA. When and how they will be able to use SWP water. Banking allocation for the future. Term of the IDM agreement. Others buying into the MB Pipeline. The 1/7 allocation. **Bighorn DVWA:** Individual and social interests.	some alfalfa growers - delay of cost imposition (rampdown, makeup water) for period long enough to cover operations and provision of capital to move on to cheaper water or sell land for profit. **RWQCB:** Most likely water quantity and sustained use for the long-term. **SCWC:** While we would not purport to speak for any other entity, we would expect that the general interest of other stakeholders in the basin is similar to ours – i.e. ensure adequate supplies of water at reasonable prices on a continuing basis (including during drought events). **Unknown:** Sell - Sell – Money- Money – No care for the future.

	not politically correct to say so, but unfortunately, political issues drive many stakeholders while other are driven by the goal of increased profits from the sale of water. **Joe Monroe:** Getting sufficient supplies. **VVWRA:** The cost of providing water to their customers, and their ability to continue providing this service. **City of Hesperia:** Ability to meet production demands, water quality issues, and affordability of the physical solution.					
9. What is your confidence level that the region's water resources can be managed to meet the region's anticipated water needs?	**Victor Valley WD:** A high level of confidence for the currently urbanized areas. **Jess Ranch:** Very high if the municipal producers recognize that they are responsible for the overdraft and	**City of Barstow:** Good.	**Chuck Bell:** MWA has been telling us that the "region's water sources" can't meet the "region's anticipated water needs," at least over the long term. In ESTE, we can probably remain self-sufficient for quite a long time under our "anticipated" needs,	**Paul Davis:** Confidence level? Being a positive thinker, I believe that if <u>all</u> stakeholders will address <u>all</u> issues with an eye on the future of this region – all will go well. Not having an extensive water	**Joshua Basin WD:** Difficult to say at this time, but if you know the history of managing water resources I have some concerns that not everyone is responsible to help manage both water needs and quality issues. **Hi-Desert WD:** With	**SBCSDD:** If the MWA can obtain the necessary level of trust by consistently addressing the issues throughout the entire Agency, then the regions water resources can be managed to meet the current and long-term needs.

	immediately start a method of paying for it. A $15.00 per month surcharge on each water bill would begin to ensure water for the future. **City of Victorville:** Not very high. The high desert is experiencing rapid growth and increased population every year. This is a boon for the pro-growth cities in the high desert. It would be unacceptable to see a moratorium placed on building because of the diminished water supply. **Joe Monroe:** High. **VVWRA:** The cost of providing water to their customers, and their ability to continue providing this service. **City of Hesperia:** Optimistic.		especially with the current decline of agricultural pumping. Regionally, there is still FPA (paper water) to move around. Much depends on what demand is "anticipated." Developers having to literally bring in their own water could prolong the viability of our local regional groundwater sources. **Norm Nichols:** It has to work!	background, I, like many others, have to rely on MWA's expertise to lead the way. And as I have noted before, it is the responsibility of the agency to put forth these issues to the public so that they too will accept responsibility for proper decisions.	continuous growth within the boundaries of MWA and the difficult balance between domestic and agricultural uses, additional sources of water for MWA will be necessary. The State Project Water system has already proven to be somewhat interruptible source because of its dependency on yearly rainfall and snowmelt. **Bighorn DVWA:** Hopefull.	**DFG:** Legal, agency mechanisms mostly exist. Technical ability available, need implementation of rampdowns and water importation. **RWQCB:** We believe the potential to solve the region's anticipated water needs while maintaining water quality objectives is very high. **SCWC:** We are confident that if parties to the judgment allow it to work, without attempting to twist it to meet their own parochial needs, then the region's existing water resources will not only be managed, but also augmented through the importation of state water. As noted earlier, effectively implementing this part of the basin plan is critical to the long-term future of the basin. **Unknown:** Very low if

						regulation's and control are not enforced.
10. If you represent a water utility, what land use planning data do you use for your future water demand projections?	**Victor Valley WD:** We utilize both County and City planning documents, including the General Plan, zoning, and growth projections. We develop water use coefficients by land use type and use these factors to estimate total water demand at saturation density. We use a rolling 2-5-20-40 year window for capital facilities. **Jess Ranch:** N/A **City of Victorville:** Victorville currently oversees the water utility at SCLA and is currently working on a master plan for water, sewer and storm drain usage. **Joe Monroe:** We don't have control of the variables. **VVWRA:** This question does not apply to	**City of Barstow:** N/A	**Chuck Bell:** I do not represent a water utility. Not much "future water demand projecting" going on here. A new house being built here is usually the "talk of the town." Most of the water purveyors and their wells are located south of the Helendale Fault in the so-called "Fifteen Mile" basin; water levels of which have remained fairly constant over the years due to the fault barrier, minimal agricultural pumping, etc. The bulk of the overdraft is in the "Lucerne" basin north of the fault; non of which drains to the Mojave River – actually a closed basin that if filled would flow to the Colorado River. (Of course a lot of us would drown first)! **Norm Nichols:** N/A	**Paul Davis:** N/A	**Joshua Basin WD:** We are in the unincorporated area of the San Bernardino County and have been using the county's zoning plans for our District water needs. **Hi-Desert WD:** Our future water demand projections are derived from the General Plan of both the Town of Yucca Valley and the County of San Bernardino. Hi-Desert Water District provides water service to both the incorporated and unincorporated areas. **Bighorn DVWA:** Varied.	**SBCSDD:** Water demand projections for the District are based on figures provided by the County of San Bernardino Planning Department, who in turn is provided figures by the United States Census Bureau. **DFG:** N/A **RWQCB:** N/A **SCWC:** We have used the City of Barstow General Plan, as modified by later information and our own experience, to forecast growth in the number of customers and our historical consumption records to determine water use per customer. In other areas in the basin where we serve, we consult with the local planning departments and utilize our knowledge of available growth opportunities within the area (partly driven by past

	VVWRA. **City of Hesperia:** Land use and zoning maps, historic and project growth rates, sphere of influence, per capita consumption, Urban Water Management Plan and Water Master Plan.					growth patterns) to determine probable future growth patterns. **Unknown:** N/A
11. If you represent a water utility, what are your current and projected (5-year increments through the Year 2020) water supply needs?	**City of Adelanto:** 2005 = 10 MGD, 2010 = 16 MGD, 2015 = 20 MGD, 2020 = 25 MGD **Victor Valley WD:** See the *VVWD Long Range Water Supply Plan* dated January 2001. Our current annual demand is between 17,000 and 18,000 acre feet. The 2020 projection for demand is 28,0000 acre feet. **Jess Ranch:** N/A **City of Victorville:** No answer. **Joe Monroe:** Unable to project needs adequately.	**City of Barstow:** N/A	**Chuck Bell:** (Same as #10) I do not represent a water utility. Not much "future water demand projecting" going on here. A new house being built here is usually the "talk of the town." Most of the water purveyors and their wells are located south of the Helendale Fault in the so-called "Fifteen Mile" basin; water levels of which have remained fairly constant over the years due to the fault barrier, minimal agricultural pumping, etc. The bulk of the overdraft is in the "Lucerne" basin north of the fault; none of which drains to the Mojave River – actually a closed basin that if filled would	**Paul Davis:** N/A	**Joshua Basin WD:** Our current new DRAFT Water Master Plan projects the following water needs: 2000 = 1,550 AF; 2005 = 1,639 AF; 2010 = 1,773 AF; 2015 = 1,905 AF; 2020 = 2,037 AF **Hi-Desert WD:** 2005 – 2,835 AF 2010 – 3,484 AF 2015 – 3,753 AF 2020 – 4,043 AF **Bighorn DVWA:** 2% to 7% (guestimate).	**SBCSDD:** The District has not generated projections for all the County Service Areas, however, has recently contracted with consulting professionals to provide detailed studies on those service areas that have not been analyzed. The following are the projections (in acre feet) for those areas where studies have been completed: CSA 70 L (Pinion Hills Phelan Area) 2005 = 3,632; 2010 = 4,272; 2015 = 5,026 CSA 70 J (Oak Hills) 2005 = 3,710; 2010 = 4,512 CSA 64 (Spring Valley) 2005 = 3,468; 2010 =

	 VVWRA: The question does not apply to VVWRA. **City of Hesperia:** Year — Acre Feet 2000 — 15,635 2005 — 17,093 2010 — 19,815 2015 — 22,971 2020 — 26,630		flow to the Colorado River. (Of course a lot of us would drown first)! **Norm Nichols:** N/A			3,829; 2015 = 4,191; 2020 = 4,552 **DFG:** N/A **RWQCB:** N/A **SCWC:** Barstow (Centro Basin): 2005: Cust=8634, 10404 AF; 2010: Cust=8897, 10720 AF; 2015: Cust=9167, 11046 AF; 2020: Cust=9445, 11381 AF Apple Valley (Alto Basin) 2005: Cust=2251, 1029 AF; 2010: Cust=2411, 1101 AF; 2015: Cust=2582, 1176 AF; 2020: Cust= 2767, 1259 AF Apple Valley (Este Basin) 2005: Cust=272, 162 AF; 2010: Cust=285, 170 AF; 2015: Cust=298, 177 AF;

						2020: Cust=313, 186 AF **Unknown:** N/A
12. Do you gather and maintain groundwater level or groundwater quality data? What data do you have and what format (manual tabulation, electronic) is it in?	**City of Adelanto:** We have both and it is in manual form. **Victor Valley WD:** We maintain extensive records of groundwater levels and water quality. All our existing wells are currently equipped with automatic water level sensing equipment which can gather water levels in real time. Water levels are captured on our telemetry system and also recorded in Excel spreadsheets. Various water quality constituents are measured at well heads per a sampling plan approved by the Department of Health Services. Samples are taken weekly and evaluated by an independent lab. Hard copies of the results are	**City of Barstow:** No, but our purveyor, Southern California Water, does.	**Chuck Bell:** I have sporadic groundwater level and quality data for this property. Ed Stringer has significant data on numerous well levels (including mine) over many years throughout much ESTE, with consistent and standardized measurements, on graphs, etc. Either MWA or Bob Wagner has copies. If Judge Kaiser accepts ESTEs proposed alternative to immediate rampdown, this data will have to be brought up to date. **Norm Nichols:** See Ed Stringer in ESTE.	**Paul Davis:** Local – El Mirage Area – I do record some individual wells in the area regarding groundwater levels and have information through Lahontan as to water quality. My data is collected with a electronic unit. There has been studies by Lahonton as to water quality.	**Joshua Basin WD:** We have been gathering both manual and electronic data working with USGS during our four-year ground water basin study. A dozen monitoring wells have been installed throughout our two basins. This second year we will put together our basin's computer program with USGS. **Hi-Desert WD:** We gather both water levels and water quality information. Currently this data is manual tabulation but is scheduled to be converted to a computer database by the end of the year. **Bighorn DVWA:** Yes. General. Manual.	**SBCSDD:** The District does gather data and maintain records on both the water levels and quality as required by the Department of Health Services (DHS). The District's records have been charted manually in tabular form, however, the DHS has converted recent records to digital format. **DFG:** Water level data at Cady, hatchery - in Excel spreadsheets **RWQCB:** Yes, we have collected water quality data from a number of monitoring wells in the Mojave River watershed from the Mojave River floodplain aquifer, our regulated discharges, El Mirage, and Ivanpah Valley. Our intent is to incorporate groundwater

	maintained in files and some digital water quality data is also maintained. **Jess Ranch:** N/A **City of Victorville:** No. **Joe Monroe:** We do both, in both formats. **VVWRA:** VVWRA gathers and maintains groundwater level and water quality data for One (1) upgradient and three (3) downgradient monitoring wells. The data is available in Microsoft Excel format. **City of Hesperia:** We have well level data and hydrographs per well per month and per well per year from 1983 to the present. Other raw production data is available from the 1970s. We maintain weekly water quality data. This data is available from					quality data provided by facilities we regulate into our existing database. The ground water database is maintained using Microsoft Access software. **SCWC:** SCWC maintains groundwater level and groundwater quality data at each of its active production wells. The data is maintained in hard copies as well as in internal database spreadsheets. Electronic copies of Title 22 monitoring data are available from the Department of Health Services. **Unknown:** N/A

	1990 in the form of lab reports and Title 22 reports.					
13. To what extent should the MWA be involved in regional use of recycled water?	**City of Adelanto:** It is important to put recycled water to beneficial use. **Victor Valley WD:** I don't see MWA having a role in the development of recycled water. The jurisdiction for this water source seems to belong to the sewer agencies and water retailers. **Jess Ranch:** To the extent that it is calculated to provide balance to basins, keeping the transition zone full and water quality issues. If at some point in the future there is surplus water, then the use of reclaimed water should be allocated equally to all stakeholders. **City of Victorville:** MWA could oversee and monitor the distribution of recycled water	**City of Barstow:** I don't think they should. There are other agencies that already regulate gray water and secondary water systems.	**Chuck Bell:** Generally, MWA should have a role in the regional use of recycled water in its jurisdiction. A lot of the region's groundwater has been "recycled" from upstream users for the past 100+ years. The most likely issue will be, per the adjudication – whose water is it and would its management put MWA into a different role? Recycled water that is recharged becomes part of the system. Recycled water held in ponds for subsequent uses might be a different matter. (That's a long way of saying "I don't know"). **Norm Nichols:** Totally involved.	**Paul Davis:** N/A	**Joshua Basin WD:** We do not see any sewers installed for another 5-10 years in our area. If recycled water in the Victor Valley area would help reduce using state water then I would say MWA should be involved in recycled water. **Hi-Desert WD:** It could be an additional water source and should be explored. Additionally, MWA should encourage agencies to utilize this commodity when available and where feasible. HDWD is currently designing a wastewater facility for long term future construction. Included in the design is the use of recycled water for supplemental recharge into the Warren Valley Basin. **Bighorn DVWA:** Interesting, but no opinion.	**SBCSDD:** Recycled water should be considered as a beneficial resource to the region, and further regarded as an alternate to potable water for non-potable usage. The MWA should consider this resource in the water management plan update as well as future potential sources of recycled water. **DFG:** As pertains to meeting Judgment conditions. May have to become a permitting agency if intra-basin imbalance will result. **RWQCB:** Use of recycled water within MWA should be encouraged to defray use of fresh water. MWA should provide regional leadership and incentives for the appropriate use of recycled water. **SCWC:**

	throughout all the high desert cities to ensure compliance with State standards. Recycled water should not be dominant in any one agency, but the benefits shared equally by all. MWA should be responsible for insuring that recycled water is either used for make up of downstream obligation or resold to member entities of the VVWRA. **Joe Monroe:** That must be part of the physical solution. **VVWRA:** MWA must address recycled water as a beneficial resource for the area, and as a mechanism to reduce the current overdraft of the region's aquifers. It is clear that the physical solution to the adjudication serves to discourage reclamation as a means to reduce the use of potable					MWA should act as a coordinator/facilitator/ financier of such projects for the good of the basin, so long as so doing does not upset its existing obligations under the judgment (e.g. redirection of recycled water used for river recharge to other purposes). **Unknown:** Be 100% that it is used for crops and land and not household.

	groundwater for non-potable uses. For this and other reasons the physical solution should be revised. **City of Hesperia:** As a regional entity responsible for the groundwater basin, it is a natural fit to be involved in recycled water projects. Such projects will reduce the demand on potable water for irrigation purposes. MWA is the common denominator between the municipal entities producing recycled water and the purveyors pumping groundwater.					
14. To what extent should the MWA be involved in water conservation efforts?	**City of Adelanto:** It is very important to implement water conservation on a regional basis. **Victor Valley WD:** MWA should actively promote water conservation to extend the usefulness of SWP	**City of Barstow:** Water conservation should be one of the criteria used in the decision to sell additional water to a purveyor.	**Chuck Bell:** The water market and future higher costs will eventually induce greater conservation, but MWA should be involved. A combined effort involving the Mojave Desert Resource Conservation District might be the most productive.	**Paul Davis:** 100% involvement in water conservation! By whatever measures – the MWA has to get the public more involved as to the conservation factor. My observation is that the MWA falls short as to informing the public in this	**Joshua Basin WD:** This is an important issue that to further make best use of our water needs we all need to be involved in water conservation including MWA. **Hi-Desert WD:** Conservation efforts should be adopted by the individual	**SBCSDD:** The MWA should support and encourage water conservation efforts, however, it is the responsibility of the water producers to individually and collectively enforce water conservation through their ordinance, resolutions and other legal methods

	entitlements. **Jess Ranch:** In an educational format only – MWA's role is to provide supplemental water from the SWP, as a wholesaler. MWA did agree to establish water pricing policies within the conditions for the MRP Grant for users who conserve water. This could be a tool to establish a pricing policy that requires 2:1 replacement use for Power Plant Cooling. **City of Victorville:** This is extremely important. MWA should undertake a comprehensive public education and outreach program to connect with every demographic in the high desert regarding the seriousness of the water issues affecting the high desert and its residents. The "conservation"		**Norm Nichols:** Total.	regard.	agencies as they believe is appropriate for their individual areas and constituents. At the most, MWA's involvement with conservation efforts should be to encourage agencies to adopt policies and ordinances where feasible and appropriate. **Bighorn DVWA:** Large extent.	available. **DFG:** Probably only as needed to cover occurrences/areas outside of local jurisdictions (cities, water districts). **RWQCB:** Here also, MWA must provide the leadership, long range planning, and conservation incentives to bring water users to implement conservation measures. The MWA needs to partner with community governments and water purveyors to establish a tangible conservation program that results in an economic saving for those who implement conservation efforts. **SCWC:** Again, MWA should participate in such efforts as a clearinghouse/coordinator/ financier of such projects, much the same as is done by other entities in other basins (e.g. Orange County

	message needs to be taught like a habit. **Joe Monroe:** It should have an ordinance for that. **VVWRA:** MWA must become active in water conservation efforts. Without conservation, much of the area's water resources will be wasted. **City of Hesperia:** MWA has the opportunity to assist entities throughout the region in the development of water conservation programs. This was a key component identified in the 1994 Water Management Plan and never implemented. Water conservation has even greater relevance today as the Agency seeks further rampdowns of free production allowance. As a regional entity, MWA can					Water District, Three Valleys MWD, Upper San Gabriel Basin MWD, Central and West Basin MWD's, etc.) **Unknown:** They should be sure its taught in classrooms. A required subject.

	develop programs, adopt BMPs, host workshops and act as a clearinghouse for conservation-related information.					
15. Do you have any specific water quality concerns?	**Victor Valley WD:** Arsenic is a significant problem for several municipal pumpers. Specifically the VVWD and BMWD must find solutions to this problem no later than January 2006 in order to be in compliance with proposed drinking water standards. Assuming the MCL is set at 10 ppb, BMWD will have 90% of its supply affected and VVWD will have 33% of its supply at risk. Nitrates in our wells are increasing as a result of local septic tanks. **Jess Ranch:** Yes – As provided herein – MWA needs to be concerned that the water placed in spreading basins does not	**City of Barstow:** Increases in arsenic and chromium.	**Chuck Bell:** My personal water quality concern is minor – mostly a slight TDS increase over the years. The ESTE basin has some nitrate and volatile organics showing up, mostly south of the fault. Leaking fuel tanks are always a problem. Continued depressions in the center of the valley could cause infiltration of high TDS groundwater from under Lucerne Dry Lake from the north, but recent increases or stabilization of groundwater levels in these central areas may dilute this possibility. **Norm Nichols:** Saline	**Paul Davis:** Water quality concerns – you bet! While Lahonton (State Regional Water Quality Board) is the agency concerned with water quality, the MWA should be working much closer together with them. We have some potential (serious) water quality concerns in Oeste that should be addressed in the near future.	**Joshua Basin WD:** To my knowledge with very limited information available for our two sub-basins there is some evidence of fluoride issues out in the east area of the Copper Mountain sub-basin (also known as the Coyote basin). **Hi-Desert WD:** Currently the District is facing a nitrate problem as a direct result from recharging SWP water into the Warren Valley Basin. A nitrate removal facility is being constructed. **Bighorn DVWA:** General consensus.	**SBCSDD:** The District has a variety of water quality issues including: CSA 70 J (Oak Hills) – Chromium VI CSA 42 (Oro Grande) – Iron & Magnesium CSA 70 W-4 (Pioneertown) – Uranium & Arsenic CSA 70 W-3 (Morongo) – Uranium CSA 70 F (Morango) – Uranium CSA 70 G (Oak Springs) – MTBE CSA 64 (Spring Valley) – Nitrate CSA 70 C (Helendale) – Arsenic, Fluoride, Iron, TDS & Magnesium **DFG:** Yes. With hatchery supply water, and the potential for translocated pathogens from State Project water. Aquatic

	degrade existing water quality. The water quality differs significantly throughout the MWA territory. It has been stated that higher TDS water from SWP is not a significant impact, but this should be studied and findings of overriding considerations such as curing the overdraft should be made if degradation is determined significant. **City of Victorville:** Yes, we have concerns regarding the new rule on acceptable arsenic levels; Chromium 6 levels spreading in the Hinckley sub-region, and increased water chlorination. MWA needs to work more closely with Lahontan to address these water quality concerns. **Joe Monroe:** Not in my area.					biota in the river can be sensitive to high TDS, high nutrient levels, and pollutants. Riparian habitats are much less sensitive to usual variations in water quality until they reach brackish conditions. **RWQCB:** Yes. The Regional Water Quality Control Board is concerned for a number of water quality issues affecting ground waters of the Mojave Desert region. In particular, we are concerned that there is no long-term evaluation of the potential for engineered ground water recharge via spreading basins in the region to increase salt loading as SWP of lower quality is introduced into aquifer storage. All drainages and tributaries to the Mojave River add some salt loading impact to the floodplain aquifer that will eventually build up over time. There is no mechanism to remove

	VVWRA: MWA should work closely with the Lahontan Regional Water Quality Control Board to monitor and address water quality concerns, specifically pertaining to groundwater. **City of Hesperia:** No					these salts from the Mojave River watershed. **SCWC:** Artificial recharge of a previously dewatered portion of a basin can cause contaminants that have been previously "locked" in soils to liberate and contaminate the groundwater. The phenomenon is most common in urban versus rural settings, where contamination of soil is more likely to occur. Nevertheless, the potential should be evaluated at specific known soil contamination sites. See also comments on recharge with imported water below. **Unknown:** "Safe" by any means.
16. Introduction of imported water into our groundwater basins may result in some changes to the native water quality. Assuming that	**City of Adelanto:** If the overdraft continues the water quality will deteriorate on its own. If the standards are met some changes should be acceptable.	**City of Barstow:** No.	**Chuck Bell:** This question assumes that existing groundwater quality could be maintained. Probably not. Continued overdraft of native groundwater could and probably would	**Paul Davis:** Lets maintain – or keep an eye on water quality but balance that out with the need to reverse the existing overdraft. Again – let the MWA	**Joshua Basin WD:** Our ground water levels average between 250’ in the east area to 450’ in the western areas. Our anticipated future state water recharge site will be at the 350’ above ground water	**SBCSDD:** The use of imported water for recharge will in fact change the quality of the native groundwater, however, is an acceptable solution compared to other

changes will not exceed State or Federal health standards, should the maintenance of existing water quality take precedence over measures to reverse the existing overdraft and enhance long-term water supply reliability?	**Victor Valley WD:** The beneficial use of our groundwater storage could be greatly curtailed by requiring all imported water to meet or exceed current groundwater quality. For example, a degradation of water quality for salts (TDS) is acceptable as long as the level is below drinking water standards. Especially when considering that the standard for TDS is not based on a health risk, but on aesthetics of water for consumption. Also, the benefit of imported water not only assists with sustainable growth, but may also reduce real health risks by diluting the arsenic concentrations in native supplies. The money that would be required to improve water quality to background levels for items like TDS would be a waste of community		result in quality deterioration (particularly TDS), possibly even exceeding state or federal health standards. Minor groundwater quality degradation resulting from recharge of imported state project water is probably more acceptable to the general public than the inherent downside of over-pumping a basin to the point of expensive well deepening, subsidence, even worse quality, etc. **Norm Nichols:** Ditch water needs to be cleaned up for direct use.	do its duty and cultivate the citizens' interest. The MWA needs more input from the people.	levels. We don't know of any quality concerns at this time. Possible maintenance should be considered for water quality issues that arise. **Hi-Desert WD:** Although water quality is very important, the recharge and reversal of overdraft situations should take precedent, providing however all State and Federal health standards are being met. **Bighorn DVWA:** Awareness and care necessary.	extremely costly alternatives. **DFG:** No, generally current and imported water quality is acceptable, particularly if water is first filtered through strata. **RWQCB:** Some degradation to local ground water in consideration of the benefit to the people of the state may be warranted. However, an anti-degradation analysis should be performed by the project proponent wherein the long-term effects of salt loading to the Mojave watershed are evaluated. The Mojave watershed is a closed basin with no where for salts to exit other than to collect over time resulting in a degradation of ground water quality. **SCWC:** This is not a "black and white" question. At a minimum, maintenance of existing water quality should be

	resources. We have much higher priorities for the use of our customers' money such as reducing real potential health risks such as arsenic and purchasing larger volumes of imported water. **Jess Ranch:** Perhaps – but these limits need to be clearly established and determined what happens when, what is acceptable and where. **City of Victorville:** Both issues are equally important and go hand-in-hand with each other. While we want to maintain the current water quality level – which is well above State and Federal health standards – we also recognize the importance of reversing the existing overdraft for long-term water supply reliability. **Joe Monroe:** Both are					considered when evaluating options for reversing the existing overdraft. Obviously meeting State or Federal health standards is paramount, but is certainly not the only measure that should be utilized in determining the best management of the basin. Degrading water quality may adversely impact water utilities ability to use such water for blending purposes, regardless of its meeting State or Federal drinking water standards. Additionally, there are many contaminants of concern (e.g. NDMA) that may not have a State or Federal drinking water standard that are present in imported water. Drinking water utilities must also report on findings of contaminants below State or Federal standards, but above Public Health Goals determined by the Office of Environmental Health Hazard Assessment.

	concurrent. **VVWRA:** It is unfortunate, but unavoidable, that the quality of the water in the groundwater basins will change if imported water is introduced into the basins. The only way to avoid changing the quality of the water in the groundwater basins would be to prohibit the introduction of imported water. The latter would require tremendous expenditures for imported water treatment and distribution systems, and it is unlikely that funding could be obtained for all of the required facilities. In most cases the natural supply of water is thousands of years old, which can never be replaced with water of equal quality. **City of Hesperia:** Although there may be a					Introduction of imported water containing contaminants above the Public Health Goals puts the utility at risk of drawing these contaminants into the drinking water supply. Finally, use of imported water may introduce emerging contaminants that otherwise are not found in native waters. These emerging contaminants do not have State or Federal standards, but may pose a health risk and treatment cost nonetheless. These comments are not meant to indicate that imported groundwater should not be brought in, but are meant to highlight areas that need to be considered. Ultimately, the water quality and water supply reliability compatibility conundrum can be solved. **Unknown:** Water has a way of purifying as it seeps through the ground. But

	change in the native groundwater quality, the crucial issue for municipal interests is that the water quality meets the State and Federal standards. There are already constituents of concern in many of the region's wells (arsenic, nitrates, etc.)					by all means keep it as clean as possible.
17. What are your thoughts about MWA entering into groundwater storage agreements with outside agencies?	**City of Adelanto:** If it will benefit the existing groundwater basin by maintaining higher groundwater levels. **Victor Valley WD:** Storage for parties outside the basin are acceptable under the following conditions: - Local entities have the priority for use of MWA facilities and groundwater storage. - The benefits of such an agreement are equitably distributed, preferably resulting in	**City of Barstow:** Go for it. Need criteria. Exactly what criteria will be applied is crucially important. We do not want to see any outside, regional or local agency usurp or take over the functions, powers or responsibilities of MWA.	**Chuck Bell:** MWA's participation in groundwater storage agreements with outside agencies is a valid concept to explore, as long as we receive "principle plus some interest," we don't agree to "pay back" more than a basin's annual recharge for a set period of time, and we don't skew our own local solutions. **Norm Nichols:** Water should be stored in our area.	**Paul Davis:** Let's get more information. Feed this into the public relations factor.	**Joshua Basin WD:** It depends on the benefits that are derived from the agreements versus the needed security to receive needed water in drought or emergency conditions. I am not opposed to good agreements with outside agencies. **Hi-Desert WD:** There are advantages to groundwater storage agreements. Storage agreements, if negotiated well, can prove to be very beneficial for all parties. Storage agreements can provide a means for the	**SBCSDD:** Mining of native water and quality issues aside, the District would not be opposed to outside agencies storing water for short terms in local basins provided the terms of the agreement do not adversely impact the operation of the District. **DFG:** If there is a benefit of keeping some of the water, or money to support importation to meet overdraft, and does not create flow/water level imbalance within river riparian areas – yes.

	lower costs for the purchase of imported water. **Jess Ranch:** The concept is excellent provided that we do not "give away the farm" in the process. We need to prioritize our water issues – look at the worst case [draught] and have a plan that takes care of our population. Storing water for the future is a great plan, but we are overdrafting more water than we can import now. **City of Victorville:** On the surface, this sounds like a feasible option that should be investigated further by MWA. However, there isn't enough detailed information with which to make a decision at the present time. **Joe Monroe:** Good idea, overdue.				storage of additional water which otherwise could not be stored in a local groundwater basin due to lack of capacity. A basin with sufficient capacity could also be recharged utilizing water belonging to another agency. **Bighorn DVWA:** Fine.	**RWQCB:** It is probably a good idea. **SCWC:** The storage capacity of the basin should first be used for the benefit of the entities within the basin. Once this is done, use of excess storage capacity within the basin by outside entities could be entertained, again to the extent that it provides some benefit to the basin (i.e. $$$). Such agreements would need to be carefully evaluated, monitored and managed to prevent damage to the basin, either short- or long-term **Unknown:** There shouldn’t be a problem. This works with other materials and liquids.

	VVWRA: VVWRA has no comment on this issue. **City of Hesperia:** If there is no detriment to the region or major groundwater degradation we would not object.					
18. What are your thoughts about the MWA and/or the Mojave Basin Area Watermaster entering into groundwater storage agreements with water users within MWA?	**City of Adelanto:** Any means of adding imported water should be a benefit to the region. **Victor Valley WD:** The judgment requires such agreements to be made available and to assure equal terms for all parties. Terms that encourage groundwater storage will benefit the region by increasing the volume of water available locally. **Jess Ranch:** This is an essential part of the existing plan and the adjudication. Storage agreements must have 50% average consumptive use	**City of Barstow:** Go for it. Need criteria. Exactly what criteria will be applied is crucially important. We do not want to see any outside, regional or local agency usurp or take over the functions, powers or responsibilities of MWA.	**Chuck Bell:** Storage agreements with water users within MWA may be acceptable if we have the physical ability to move water from one basin to another and resolve thorny "inter-basin transfer" issues. Resource interdependence can actually promote community bonding. Or, remember Mark Twain's observation "water's for fighting, whiskey's for drinking." **Norm Nichols:** Water should be stored in our area.	**Paul Davis:** Get the information out – lets get a show of hands!	**Joshua Basin WD:** Joshua Basin Water District is one of the few basins that are not adjudicated. I think agreements within MWA should be considered. However, there may be some concerns depending on the location and conditions of both the benefits and adverse effects of the proposed groundwater storage agreements. (Example: Hi-Desert Water Agency had an agreement with MWA and unfortunately created a high nitrate problem due to the program. More studies may be needed to prevent this again.) **Hi-Desert WD:** Same as No. 17	**SBCSDD:** The District encourages groundwater storage agreements between users within the MWA, however, the benefit of the storage locations should be fair and equitable to all users, whether connected to the river system or not. **DFG:** Possibly necessary to have jurisdiction and control to maintain water level/quantity balance within basins. **RWQCB:** N/A **SCWC:** Absolutely, yes. In order to coordinate such activities with the production and recharge capabilities of the basin,

	provisions. **City of Victorville:** Victorville agrees with the policy of groundwater storage agreements for users within the boundaries of MWA. **Joe Monroe:** Should be done. **VVWRA:** VVWRA has no comment on this issue. **City of Hesperia:** We each must have the flexibility to manage our production demands and supplies within the constraints of the physical solution. MWA and the Watermaster should not foster an environment of competition among the agencies where each entity is trying to negotiate the best deal. It is important to maintain a				**Bighorn DVWA:** Fine.	Watermaster would seem to be the most likely entity with which to have such agreements. Such agreements can provide for near-term physical assistance to the basin (a form of overdraft stabilization) as well as provide users with the opportunity to create a measure of drought protection in the long run. **Unknown:** This may be a good conserving way plus maybe a training method.

	more regionalized focus.					
19. Should the MWA consider purchasing new State Water Project entitlement whenever it might become available?	**City of Adelanto:** Yes, but it also has to be put into the groundwater system. **Victor Valley WD:** It depends. The agency is currently underutilizing its current entitlement. The fixed costs of entitlement are an ongoing operational cost burden. It seems that we should first seek a high utilization of entitlement before seeking to acquire more. However, options to purchase entitlement do not occur with great frequency and analysis should be undertaken to consider the timing of such purchases, including adequate safety factors. **Jess Ranch:** No. Not without a means of fully importing the water each and every year. By way of example, taxpayers are paying for the Brenenda Mesa entitlement, with	**City of Barstow:** Yes.	**Chuck Bell:** Purchase of new State Water Project entitlement should be the #1 priority whenever available, but at a level of affordability consistent with the economic value of our most likely future land uses. **Norm Nichols:** Yes.	**Paul Davis:** When available – absolutely. Question – Where are the funds?	**Joshua Basin WD:** Yes, I would support increasing MWA's entitlement so that all of us can increase our water supplies for future needs. **Hi-Desert WD:** As our desert communities continue to grow, the need for an increased water supply will be needed is obvious. MWA should do everything possible to acquire additional SWP entitlements if growth dictates and if feasible. **Bighorn DVWA:** Consider yes.	**SBCSDD:** The District feels that the MWA should purchase State Water Project entitlement whenever available for recharge, however, it should not exceed the capacity of the regions basins to store the water. **DFG:** Certainly. **RWQCB:** N/A **SCWC:** If it is at the right price, this should always be a consideration. However, the overriding question should be the need/utilizability of such supplies. Much of MWA's existing entitlement is not now being used for the benefit of the basin (again, the judgment must be allowed to work to bring such supplies into the basin). In any case, any such purchases by MWA should be for the benefit of the basin as a whole and not to fill the "special

	principal, interest and re-allocated costs in the SWP the mere carry cost is approaching $200.00 per acre-foot per year, without even one drop of water reaching us. If and when MWA can deliver all of the water entitlement it has, then it should consider buying additional allocations if the end user is identified and agrees to pay the cost. **City of Victorville:** Yes. **Joe Monroe:** Yes, whenever fiscally advantageous. **VVWRA:** The plan should identify the quantity of water that the area must import to meet current and future demands. Therefore, the update of the plan should answer this question for MWA.					interest" needs of any particular party or parties in the basin. **Unknown:** Always.

	City of Hesperia: Yes.					
20. Do you think there is potential for regional projects that would delay or offset proposed local projects?	**City of Adelanto:** Yes. **Victor Valley WD:** We are interested in how regional projects may integrate into our own plans, especially in the long-term. Given the time constraints of the arsenic rule our agency will not be able to wait for regional projects to meet our water supply needs in the short-term. **Jess Ranch:** With the main infrastructure in place – all new projects should be considered direct benefit or zone of benefit projects. MWA should be a facilitator to assist end users and find financing methods that charge only the users benefited. **City of Victorville:** This should be considered on a case-by case basis. **Joe Monroe:** Yes, but	**City of Barstow:** Only if MWA uses its financial resources for regional projects only, so that local projects cannot be financed.	**Chuck Bell:** The potential for regional projects to delay or offset local projects will always be a reality, i.e.: more water for fish or whatever. But when our society gets really thirsty, we top-of-the-food-chain homo sapiens will prevail; maybe not in the best interests of the future of the earth, but in the reality of the here and now. **Norm Nichols:** Who knows?	**Paul Davis:** NA	**Joshua Basin WD:** Some concerns for a major water treatment plant that may not be needed but is requesting commitments for locking up state project water for the proposed project. **Hi-Desert WD:** Don't understand this question. **Bighorn DVWA:** Potential yes.	**SBCSDD:** The District is not aware of proposed MWA projects and therefore cannot provide a specific answer to this question, however, any project with regional impacts should be thoroughly discussed with the representative stakeholders prior to commitment by the MWA. **DFG:** Not aware of this issue. **RWQCB:** N/A **SCWC:** The basin is fragmented and separated in such a way that the potential for truly regional projects (with the exception of any for the Victorville/Apple Valley area) might well be limited. Such regional projects, however, might include recycle water projects (although a conveyance system would need to be developed) or water

	that's part of the evaluation process. **VVWRA:** Because it is unclear what types of local and/or regional projects are suggested by this question, VVWRA has no comment on this issue. **City of Hesperia:** Yes.					treatment facilities. However, we do not see any such projects as presently delaying or offsetting local projects that we would undertake – such as the drilling of new wells or the construction of storage facilities. **Unknown:** Only greedy water districts and their law suits.
21. Are you willing to consider delaying local projects in order to develop the regional projects?	**City of Adelanto:** Yes, if there is a commitment on regional projects. **Victor Valley WD:** Not for our needed short-term goals (see question (20), but definitely for long-term goals. **Jess Ranch:** NO. Not unless the specific project is approved in the Regional Plan has prior CEQA analysis and is prioritized. **City of Victorville:** Again, this would depend on a case-by-case basis.	**City of Barstow:** Need to define local and regional.	**Chuck Bell:** Question should be: Do we have a choice in not deferring local projects to regional projects? Who knows? Regionalism usually prevails. That's only one of many bridges to cross. **Norm Nichols:** Need work.	**Paul Davis:** More information	**Joshua Basin WD:** Yes, the pipeline project needed for the Copper Mountain sub-basin to receive state water would be important to us to delay other local projects. **Hi-Desert WD:** Same as above. **Bighorn DVWA:** Possible.	**SBCSDD:** All projects should be evaluated on their own merit. The District recommends that MWA develop a prioritized list of local and regional projects that meet the needs of all the regions within the Agency. **DFG:** If regional projects means pipelines and spreading basins and “local projects” means housing or other M&I development, yes - IF purpose is to provide safe yield and other requirements of Judgment.

	Joe Monroe: Yes. **VVWRA:** Because it is unclear what types of local and/or regional projects are suggested by this question, VVWRA has no comment on this issue. **City of Hesperia:** Possibly. This will depend upon stakeholder consensus.					**RWQCB:** N/A **SCWC:** At present, we would plan to continue with the well and storage projects that we deem necessary. Notwithstanding this, however, we remain open to considering other viable, cost-effective alternatives. **Unknown:** No way. This MWA project supersedes. How can others develop without water?
22. Are you willing to work with MWA to jointly finance regional capital facilities?	**City of Adelanto:** Yes, if there is a direct benefit. **Victor Valley WD:** Yes, if governance and operational issues can be agreed upon. **Jess Ranch:** NO. Not unless the specific project is approved in the Regional Plan has prior CEQA analysis and is prioritized. **City of Victorville:** Yes. We would be more than	**City of Barstow:** Yes.	**Chuck Bell:** Most of us would be willing to work with MWA to jointly finance regional capital facilities. The honest question is: are we willing to pay our fair share? If its close to fair and we are running out of water, what choice do we have? **Norm Nichols:** Need work.	**Paul Davis:** N/A	**Joshua Basin WD:** Yes, we want to continue our joint application and any other efforts with MWA to receive grant funding, matching funds, and consider other methods to finance the necessary project. **Hi-Desert WD:** If those regional projects benefit multiple agencies, those agencies benefiting should be partly responsible for a portion of the financing. **Bighorn DVWA:** Possible	**SBCSDD:** The District would be willing to work with MWA on joint financed projects depending on the type of project, the benefits of the project and the merit of the project in regards to the relief of the current overdraft conditions. **DFG:** Not a role for DFG. **RWQCB:** N/A **SCWC:** Due to our status as a Public Utilities

	willing to put our in-house resources together to work with MWA staff for the purpose of researching and obtaining grants to fund regional capital facilities. **Joe Monroe:** If able. **VVWRA:** VVWRA has already discussed jointly funding expansions of the area's wastewater collection system, which are regional capital facilities. **City of Hesperia:** Possibly. This is a policy issue.				(and visa versa).	Commission regulated entity, our ability to participate directly in financing regional projects, the cost of which would be borne by customers outside of the Mojave basin, is problematic. However, to the extent that regional projects are viable, cost effective and provide benefit to the basin or a subarea of the basin as a whole (and not to one or a small group of beneficiaries), we would consider participation, to the extent possible. **Unknown:** The public should have complete information about capital facilities before an answer is asked for.
23. How should the purchase of water and construction of facilities needed for the region to recover from the current groundwater overdraft be financed?	**Victor Valley WD:** Water should be purchased by those that need it. Facilities should be built for those that are willing to buy water. MWA's revenue is largely from property taxes. Those that pay	**City of Barstow:** <u>All</u> alternatives should be considered, of example, user fees, connection fees, assessments, loans, grants, etc.	**Chuck Bell:** Financing for the purchase of water and construction of facilities should be a long-term benefit of the Judgment. If not, soon cometh another pump tax proposal, development fees, etc. Remind me not to attend	**Paul Davis:** N/A More information.	**Joshua Basin WD:** Prop. 13 funds, 303 monies, EPA or USDA possible grants or matching funds should be considered for construction of projects that would qualify. Currently we can address and correct our overdraft for the present	**SBCSDD:** The projects should be selected based on a cost-benefit ratio analysis and applications for financing should be sought beginning with the most economical option (grants) and progressing through other available

	into the MWA should receive benefits in proportion to their payments. Grants should be pursued at the State and Federal levels for capital facilities. **Jess Ranch:** Overdraft is principally in the Regional Aquifer – caused by municipal production. Charge the municipal producers for the water they pump with a mark-up and MWA will generate "Cash Flow" – Cash Flow will provide the source of funds to buy water and assist in providing well fields and pipelines from the River Aquifer to the Regional Aquifer. **City of Victorville:** There should be many different sources of financing sought, not just rely on any one revenue source. **Joe Monroe:** By a		that hearing! (Unless of course I am running out of water). **Norm Nichols:** Good question.		time. (See item #1 on shifting well production) **Hi-Desert WD:** N/A- Mojave project **Bighorn DVWA:** Perhaps loans and grants.	options (loans). **DFG:** By conditions already in Judgment. **RWQCB:** There are mechanisms for specific types of water quality-related projects, watershed planning, and studies that may qualify for funds under Proposition 13. **SCWC:** The judgment provides some of the framework for this with the replacement water requirement. Implementation of a "wet" water replacement program is, to say the least, paramount to curbing further overdraft in the basin. Beyond that, the implementation of storage agreements, as discuss above (if properly managed), would assist in reversing some of the overdraft condition. These types of programs bring with them their own financing. As to providing

	MWA. **VVWRA:** VVWRA has no comment on this issue. **City of Hesperia:** Grants, assessment districts, low-interest loans, user fees.					for further reversal of the overdraft outside of these programs, we believe that the financing for such should be borne on a proportional (e.g. some type of fee be it fixed or per acre foot) basis by all within the basin if dealing with the current overdraft or solely by growth should such place additional strains on the existing water supply capability of the basin. **Unknown:** Part of sales tax so all can contribute.
24. How should the purchase of water and the construction of facilities needed for future water supply reliability be financed?	**Victor Valley WD:** Same as question 23. **Jess Ranch:** Charge the end user a fair price – ask the folks in the Morongo Valley. **City of Victorville:** Through as many available State and Federal grants as possible. As a second alternative, the option of pursuing low-cost loans	**City of Barstow:** Again, all alternatives should be considered.	**Chuck Bell:** Same as #23. **Norm Nichols:** Good question.	**Paul Davis:** N/A	**Joshua Basin WD:** Same as above (see item 23) purchase of future water supply may be levied through property taxes within the MWA boundaries. **Hi-Desert WD:** N/A-Mojave project **Bighorn DVWA:** Good question!	**SBCSDD:** The answer to this question is the same as the answer to question number 23 above. **DFG:** As, above and with cost sharing by new projects – a development fee. **RWQCB:** There are mechanisms for specific types of water quality-related projects, watershed planning, and studies that

	should be considered. Lastly, a financing program could be developed whereby everyone pays a pro-rata portion of the costs for new facilities. **Joe Monroe:** See 23 **VVWRA:** VVWRA has no comment on this issue. **City of Hesperia:** Grants, assessment districts, low-interest loans, developers' fees.					may qualify for funds under Proposition 13. **SCWC:** The answer here is the same as the last sentence of the answer to number 23. In other words, if such supplies are for existing needs, then some type of fixed fee or per acre foot feet for all parties would be appropriate; if for growth, such should be covered by the growth. **Unknown:** Same as above.
25. Should the MWA offer “degrees of reliability” for wholesale imported water purchases with attendant cost differential (i.e. higher water supply reliability at a higher cost)?	**City of Adelanto:** There needs to be a feasibility and cost benefit study. **Victor Valley WD:** It depends. It seems clear that the existing entitlement has been and continues to be purchased with property tax revenues. Therefore, this entitlement should be distributed in proportion to payments made. However, if additional	**City of Barstow:** Should be considered. Need to evaluate criteria.	**Chuck Bell:** "Higher water supply reliability at a higher cost" is a concept consistent with free market mechanisms. But when directly orchestrated by government, it runs the risk of being accused of favoring a particularly lucrative land-use over others, forcing the MWA into the role of playing God – deciding what is good for society and what isn't, significantly altering	**Paul Davis:** N/A	**Joshua Basin WD:** Yes, this maybe necessary in the event of an extended long drought and no availability of reasonable water costs. **Hi-Desert WD:** If those types of guarantees could be made, the District would be able to make better water purchase decisions. **Bighorn DVWA:** No.	**SBCSDD:** The District does not support the tiered approach. The reliability of water supply must be fair and equitable to all water producers. **DFG:** Seems too complex a process. **RWQCB:** N/A **SCWC:** While this may sound good in concept, it holds the potential for

	entitlements were purchased by other means, a two-tier pricing structure might be feasible. A higher price for “non-interruptible” supply and a lower price of “interruptible" supply. **Jess Ranch:** No, because the state has set the water priority and all taxpayers contribute to the MWA, many of those for over 40 years. The priority should be: 1. Domestic 2. Agriculture 3. Industrial **City of Victorville:** Yes. **Joe Monroe:** I'd want to see details. **VVWRA:** VVWRA has no comment on this issue. **City of Hesperia:** How can reliability be offered to an unreliable supply?		community characteristics and customs, plus upsetting a whole lot of voters, board recalls, etc. But, even with all that, if the market-place indicates readiness, it is a likely option. (Remind me not to attend that hearing too)! **Norm Nichols:** Big question.			creating a schism among parties in the basin, particularly in times of drought or reduced supplies. Rather, MWA should focus more on providing for the base needs of its constituents through the concepts discussed above. However, if there are parties that wish to have a higher degree of reliability beyond the base needs provided, then that party should bear the total cost of such. **Unknown:** This would lead into a price war which no one can survive.

	MWA should offer all water at cost.					
26. Should the MWA commit entitlement to State Water Project water by specific region or area and how should it be done?	**City of Adelanto:** MWA should take every step to ensure there is enough water for everyone**.** **Victor Valley WD:** The fairest method would seem to be allocate entitlement in proportion to payments. This method would consider both density and assessed value over the time period for which records are available. This allocation would vary over time based on future property tax payments. **Jess Ranch:** Great question: BY NEED Soon the water districts that provide water for public consumption will require all the MWA entitlement, except perhaps if we get a major change in weather patterns. Based on	**City of Barstow:** Each area of MWA needs to have a fair-share reserved for them in any given period of time. Each area would need to exercise their options by specific cut-off dates.	**Chuck Bell:** Commitment of MWA's entitlement by specific region will be best accomplished by a free market if we let it work. If government tries to do it, albeit with the best of angelic intentions, it probably won't work. The American public is predictably peculiar. If it happens, it happens. If government does it, it shouldn't happen. (The later it gets, the more philosophical I get). **Norm Nichols:** Big question.	**Paul Davis:** N/A	**Joshua Basin WD:** Originally it was thought that the 1/7 rule for dividing the 7 divisions should also be used for assuring appropriate shares of MWA entitlements for each division. **Hi-Desert WD:** SWP water should be allocated on an annual basis according to a reached agreement between MWA and a participant that is ready to use the water. By creating additional permanent allocations based on area, an inequity is created among agencies that have the ability to take the water and those that do not. **Bighorn DVWA:** Not sure.	**SBCSDD:** The District is unclear as to the intent of this question and cannot answer without further clarification. **DFG:** The MWA should control entitlement distribution only to satisfy conditions and priorities of Judgment. Those basins, subareas, locales with worst overdraft, water quality problems should be given priority. **RWQCB:** N/A **SCWC:** Again, while conceptually this may have appeal, it opens up the potential for discord among the parties (we have seen some of this already with respect to the High Desert Power Plant). As well, the needs for given areas will likely change over time and a commitment of entitlement would not easily address this.

	history and the retirement of agricultural production and the placing of 50,000 acre-feet of water in storage with 50% consumption factor we should have water for the foreseeable future. The bigger question is where to place the water. The water needs to be placed where the water quality of the "background water" will not degrade the water stored. Monitoring wells should address this issue and is discussed in the RMP. Equity dictates that all uses should have equal access based on the priorities set above. In other words, if the MWA receives annual applications for 50,000 acre-feet of water all for domestic purposes and only 40,000 is available, then the MWA would allocate the water all to					Instead, the MWA's entitlement should be used as needed based on a prioritization of the basin needs on a year-to-year basis (and looking out several years into the future). The key is to use the entitlement to provide the maximum benefit to the basin. **Unknown:** No – you wouldn't survive a war.

	domestic users at 80% of their request. If reversed, the MWA should bank the remaining allocation for times of shortage. Industrial uses, such as Power Plants, should always have the last priority. **City of Victorville:** Again, certain projects that require State Water Project water should be negotiated on a case-by-case basis. However, MWA should be obtaining as much State Water Project water as possible. **Joe Monroe:** No, not with the current Division/Basin setup. **VVWRA:** VVWRA has no comment on this issue. **City of Hesperia:** Undecided.					
27. Should the Plan update consider a	**City of Adelanto:** There needs to be a feasibility	**City of Barstow:** Consider, yes. Need	**Chuck Bell:** It is political and economic reality that	**Paul Davis:** N/A	**Joshua Basin WD:** Yes, this method has been used in	**SBCSDD:** Again, the District's perception of the

financing program where everyone pays for regional projects, but new development pays more than the established community?	and cost benefit study. **Victor Valley WD:** Financing projects will most likely need to be conducted on a case-by-case basis. Foreseeable variables include grant availability, benefit of the project by area, extent of local control, etc. I'm not sure how the MWA, as a wholesale entity, would have a vehicle to charge new development a different rate. It seems that the only entities that collect a connection fee related to water are the retailers. **Jess Ranch:** Until you clarify what regional projects that you are anticipating, this question is impossible to answer. **City of Victorville:** No. This will inhibit the pro-growth philosophy of the high desert cities. New developments will think twice before building in	criteria.	the new guy moving into a crowded neighborhood bears a greater financial burden than should those of us already here. Current residents (and current voters by the way), having paid years of taxes and fees, attending countless hearings, spending our time and resources trying to work out solutions, fighting the good fight; are probably not willing to overly subsidize the new guy who is screwing up our lifestyle. That may not be consistent with the concept of "freedom of movement," but it is fact (I could have just answered "yes," but this response was more fun). **Norm Nichols:** Reads like a possible plan.		development fees, whereas residents have been paying the expense for many years. Why not increase the costs for new development to pay what is reasonable. **Hi-Desert WD:** This should be determined on the basis of a benefit level. New developments should pay their fair share of current and future infrastructure. **Bighorn DVWA:** No - No.	plan is that it should be fair and equitable to all water producers and consumers. The question of new development paying a higher proportionate share requires further discussion with all the stakeholders contributing. **DFG:** Yes. **RWQCB:** N/A **SCWC:** In large part, whether this works or not depends on why the regional facility is needed and timing. If a regional facility is needed to meet both current and growth needs, then the cost of such should likely be borne by all equally. However, if the facility is largely, if not totally, needed to facilitate growth, then growth should bear the cost of such. Timing comes into play insofar as the construction of new facilities to handle projected needs.

	this region if the infrastructure costs are exorbitant and not cost effective. **Joe Monroe:** Yes – those who add to the demand should bear the burden they bring. **VVWRA:** VVWRA has no comment on this issue. **City of Hesperia:** It is important that those who benefit pay their fair share, new development or existing communities. Basically, existing development should pay for the existing overdraft, and new development should pay based upon their projected impact.					**Unknown:** Every one should pay a fair cost.
28. What should be the guiding principle(s) of the Mojave Water Agency?	**City of Adelanto:** Putting as much wet water in the Basin as possible. **Victor Valley WD:** The mission statement	**City of Barstow:** As the original charter provides: To procure State aqueduct water for the High Desert.	**Chuck Bell:** The guiding principles of the MWA should be "what ever works – whatever is reasonably fair and equitable." But, that aside, why not use the statement we recently worked out?	**Paul Davis:** To be the leading agency in the high desert concerning all water matters. Distribution, water quality, water quantity, establishment of a public relations	**Joshua Basin WD:** To oversee that the MWA's Regional Groundwater Plan will meet the short and long range water needs of the Mojave River and the Morongo Basin/Johnson Valley areas.	**SBCSDD:** The MWA should demonstrate fairness and equity to all the communities it serves. **DFG:** Meet safe yield, support sustainable growth.

	currently under development is a good beginning. **Jess Ranch:** The MWA ACT – as passed by the legislature did a pretty good job of that: a. The agency may do any and every act necessary to be done so that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants of the agency, including, without limiting the generality of the foregoing, irrigation, domestic, fire protection, municipal, commercial, industrial, and recreational uses. b. Without limiting the generality of the authority given under subdivision (a) or under any other section of this act, the agency has the following additional powers:		**Norm Nichols:** Establish an unending water source.	program that will get the attention of all users and have them realize just how vital water is to their lives, both now and in the future. Work with all agencies regarding future storage plans; purchase of imported water, both county and state entities.	**Hi-Desert WD:** To do everything necessary to assure a long term water supply to its member agencies at a fair and reasonable cost. **Bighorn DVWA:** Do no harm.	**RWQCB:** Seek to sustain ground water resources for both short-term and long-term uses without compromising the ground water quality. **SCWC:** Not to sound trite, but the overall guiding principle of MWA should be to provide reliable, cost-effective service to all of its constituents while spreading the cost of such in a fair and equitable manner. **Unknown:** Always be fair and just to all.

	1. To make surveys and investigations of the water supply and resources of the agency, to gather data on water use, to plan water projects, and to publish and distribute reports thereof. 2. To develop, protect, conserve, and reclaim water, reduce the waste of water, control and prevent the intrusion of salinity in water, and replenish underground water supplies within the agency, including the collection, treatment, and disposal of sewage, waste, and storm water, in those areas within the agency where no reclamation authority currently					

	exists and to fix and collect rates and charges therefore. 3. To store, regulate, control, transport, divert, and distribute water for use within the agency by any reasonable means, including, without limitation, the construction, maintenance, alteration, purchase, and operation of works and improvements and the spreading and sinking of water into underground storage basins. 4. To appropriate water and acquire and protect water rights for any beneficial purpose. 5. To commence, maintain, appear before, intervene in, defend and					

	compromise, in the name of the agency, and to assume the costs of, any action, hearing or proceeding before any court of the United States or of the State of California, involving or affecting the ownership, use or supply of water, water rights or water service within or without the agency which is or may be used or useful for any purpose within the agency, or involving or affecting the interference or diminution of the natural flow of any river or stream or subterranean water supply, which is or may be used or useful for any					

	purpose within the agency. 6. To enter into any contract with any person, corporation, utility, district, public corporation, the United States, or the State of California, as the board determines to be proper or advisable or in the interest of the lands and inhabitants of the agency, to carry out or to execute any of the purposes of this act. 7. To promote and coordinate existing and planned water service facilities in the agency with the operations of the California Water Plan and Aqueduct System. 8. To join with one or more persons,					

	corporations, utilities, districts or other public corporations, the United States, or the State of California, for the purpose of carrying out any of the powers granted by this act. 9. To make application to the State of California, the Department of Water Resources, or any other appropriate department or agency of the State of California for the department's or agency's share of water made available by the State Water Resources Development System or any other supplemental water source. 10. To construct, operate, and					

	maintain works to develop hydroelectric energy as a means of assisting in financing the construction, operation, and maintenance of works for other beneficial uses and purposes, and to enter into contracts for the sale of that energy for a term not to exceed 50 years. The energy may be marketed only at wholesale rates to any public agency or private entity engaged in the sale or use of electric energy. 11. To gather data for, and to develop and implement, after consultation and coordination with all public and private water entities who are in any way affected,					

	management and master plans to mitigate the cumulative overdraft of groundwater basins, to monitor the condition of the groundwater basins, to pursue all necessary water conservation measures, and to negotiate for additional water supplies from all federal, state and other sources. **City of Victorville:** To insure that there is an adequate supply of clean, inexpensive, high quality water to sustain future growth within the MWA boundaries. **Joe Monroe:** 1. Adequacy 2. Equity 3. Reliability **VVWRA:** This is most appropriately a question					

	for the representatives elected to the Governing Board of the Mojave Water Agency. **City of Hesperia:** - Prudent oversight of the limited groundwater resources available in the Mojave River Groundwater Basin. - Fair and consistent application of consumptive use issues. - Focus on water supply issues not the politics of economic development - Working to provide regional solutions that benefit the entire basin.					
29. Do you believe there is input from individuals or groups that may be missed by this process? Please identify them.	**Victor Valley WD:** It seems the major interests are all represented. **Jess Ranch:** I believe that when the	**City of Barstow:** BIA, all cities, and Community Services Districts.	**Chuck Bell:** Whatever "input from individuals or groups that may have been missed by this process" will surface when the draft plan update is circulated. We probably "missed" a lot	**Paul Davis:** Minimal users – approximately 8,000 well owners in the upper desert. They should have input but also pay their fair share. The current	**Joshua Basin WD:** There are ongoing groundwater studies that could provide new water information that would be pertinent to the proposed MWA Groundwater Plan such as	**SBCSDD:** There is the possibility that input from other individuals and/or groups may be missed, and the District recommends that the completed responses should be

	amendments to the Plan are clear, they should be put before the public at large in the newspaper so they may be commented on. **City of Victorville:** Yes. The Desert Communities Water Awareness Expo is a volunteer coalition of representatives from high desert water purveyors and public agencies promoting water awareness and getting the water conservation message out to the schools and the public. **Joe Monroe:** MDRCD Municipalities, such as Apple Valley, which dot not control its water supply although it does contribute to VVWRA. **VVWRA:** VVWRA has no comment on this question. **City of Hesperia:** No.		of good input. It is too late to go after it now. If I don't deliver this tomorrow, I might "get missed." **Norm Nichols:** Always possible.	minimal user program passed by the Board but not yet ruled on by Judge Kaiser was a joke. My thoughts on this is that the Board "caved" in. My guess is that they didn't want to get run out of town. One hundred dollars a year assessment per well owner (minimal) would raise in the neighborhood of eight hundred thousand dollars a year. Initially, the organizing would create problems, but long term would put money into the "pot" for the purchasing of water. Complications yes, but who said it would be easy!	the USGS, and private firms such as Geoscience etc. **Hi-Desert WD:** This was provided previously. **Bighorn DVWA:** Yes – statistical..	circulated and published for public comment to ensure that this is not the case. **RWQCB:** I am not aware of the various individuals and groups you contacted. **SCWC:** Based on our understanding of the process, we are not aware of any parties that have been or might have been missed. **Unknown:** If you are fair and just to all, no one would be different.

30. Please provide any additional input you believe pertinent to the Plan update.	**City of Adelanto:** Recharge the transition zone at the Lower Narrows. **Victor Valley WD:** MWA's role as Watermaster produces some inherent conflict of interest issues. This dual role can work if Watermaster is perceived as neutral in carrying out the requirements of the judgment. In our opinion, Watermaster has recently acted more as a political body than an administrative arm of the court (e.g., Makeup Obligation location). **Jess Ranch:** In the forty years the MWA has existed, all it has done is do studies – millions upon millions of dollars have been spent. Over a hundred million has been spent on a		**Chuck Bell:** "Additional input" – You guys sure ask a lot of questions! **Norm Nichols:** None to add.	**Paul Davis:** Despite some of my comments that seem to be on the critical side, I do have faith in both the MWA and the adjudication process. The "M" word is not in my vocabulary and, "bottom line," I don't think any body that lives up in the high desert feels that way either. However, and again, the staff and board of the agency have a job to do. I hope I can be of help!	**Joshua Basin WD:** A periodic schedule to assure that the plan objectives and guidelines are being followed and met. I believe the previous plan was adopted, but was someone verifying that the plan was considered when MWA decisions were made. **Big Horn DVWA:** Patience.	**SBCSDD:** The District is of the opinion that the Plan update needs to be a living document that is consistently reviewed and revised in order to react to the changing economy and population in this region. The previous document was circulated but never revisited and little or nothing resulted from its publishing. The District maintains an optimistic outlook that there is a solution and that MWA will devise a plan to deal with the complex water management problems of the desert communities. **RWQCB:** No further input is required from this agency. **SCWC:** The plan will only be as good as the commitment of the parties to make it work. Building consensus and gaining commitment among the various parties in the basin will be the keys to the

	backbone system to deliver MWA entitlement; with Grant Funds that were requested to "Recharge" the basins. The priority must be to put this water in the ground. The Municipal Producers must have a clear recognition of who must pay for it. They have put the farmers out of business, when will someone tell them they are at the end of the free ride? **City of Victorville:** No answer. **Joe Monroe:** Take the time to get it right. This includes provision for future fine tuning. **VVWRA:** VVWRA commends the Mojave Water Agency for embarking on this process to update the Regional Water					successful implementation of this update. On behalf of Southern California Water Company, thank you for this opportunity to participate in the update process. Should you have any questions about any of the comments included in this response or regarding any other matter, please contact Mr. Perry Dahlstrom at (760) 247-3391 ext. 700. **Unknown:** Above all prove its working. We do not see enough evidence, facts or information that dump basins are working.

	Management Plan. The problems associated with water management in the Mojave Desert are complex, and interconnected with a great number of other social and physical issues. The cost of water will undoubtedly increase, although as this happens the increasing cost of water will encourage conservation, and conservation should be an integral aspect of the updated plan. The consequences of failing to maintain adequate supplies of water for this region are far more serious. **City of Hesperia:** - Urban Water Management Plan - Hydrographs with potential recharge locations highlighted - Water Master Plan - Water System Map (on CD) - Zoning Map					

	- Proposed Recharge Basins (3 copies) – excerpts from Master Drainage Plan					

APPENDIX E

Technical Advisory Committee
To The
Mojave Water Agency

MINUTES

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

January 7, 2004
9:00 a.m.

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1. **CALL TO ORDER**: Chairman Clarke called the meeting to order at 9:05 a.m.

2. **INTRODUCTIONS**: Introductions of 35 members in attendance were made.

3. **APPROVAL OF AGENDA**: Chairman Clarke asked for any amendments to the agenda. Barring none, the agenda was approved as mailed.

4. **APPROVAL OF MINUTES FROM NOVEMBER 5, 2003 MEETING**: Motion was made and seconded to approve the minutes. Motion was carried by unanimous vote of the TAC.

5. **PREVIEW FINAL REGIONAL WATER MANAGEMENT PLAN**

   Mr. Brill introduced Mark Williamson, Schlumberger Water Services, (previously Saracino-Kirby-Snow). Mr. Williamson began the presentation by stating that the final Regional Water Management Plan (RWMP) is the culmination of the Phase 1, Phase 2 and this phase of studies put into a comprehensive package. The RWMP will cover the Groundwater Management Plan and the Integrated Resources Plan. A draft final RWMP will be distributed to the TAC prior to the March 2004 meeting. An outline of the final plan will be reviewed at this meeting. Mr. Williamson requested input from the TAC on the presentation.

   The RWMP will consist of 11 chapters. Chapter 1 will be the introduction which will incorporate an Integrated Water Management Plan, Groundwater Management Plan and Urban Water Management Plan. Mr. Williamson reminded that the RWMP will comply with SB 1938 even though it is not required of adjudicated areas such and the Mojave Basin.

   Chapter 2 will include the Mojave Water Agency's background such as the agency being a wholesaler for the State Water Project contract supplies. Responsibilities will include pipeline construction, distribution facilities, and recharge facilities. Adjudications in the Mojave Basin area will be addressed and include a listing of water supply agencies and stake holders within the basin.

Chapter 3 will encompass the physical setting such as the boundaries, geology, groundwater basins and the water supply agencies (38 agencies including mutuals and CSAs).

Chapters 4 and 5 will address the supply and demand forecast. The focus will be on Agricultural Scenario 2 which is the lowered projected agricultural demand. As determined in Phase 2 of the RWMP update, supply and demand will be equal in this scenario if full utilization of the State Water Project water is utilized to meet the projected 2020 demand. The adoption of 10% municipal conservation will allow some flexibility with this projection.

Chapter 6 will describe the water shortage contingency plan. This chapter will cover the large storage reserves within the Agency boundary. These storages will allow for utilization of groundwater in case the State Water Project entitlement is reduced to as little as 25%. Most urban agencies have contingency plans which will also be summarized in this chapter.

Chapter 7 will cover water conservation. This chapter will address the efforts of the Alliance for Water Awareness and Conservation (AWAC) Memorandum of Understanding (MOU).

Chapter 8 is a summary of stakeholder assessment and public outreach which will include efforts of the Mojave Water Agency such as: Technical Advisory Committee; AWAC MOU; Annual Symposia; Speakers Bureau, Community Liaison Officer; Subarea Advisory Committees; Newsletter; and Website. This chapter will reflect on these activities for bond application purposes to establish community involvement.

Chapter 9 will include basin management objectives and alternatives. The objectives are to balance future water demands with available supplies and to maximize the overall beneficial use of water throughout the Agency boundary. This chapter will discuss how meeting each basin management objective will increase supply reliability. The project alternatives and management actions will also be addressed.

Chapter 10 is the management action plan which is what the Agency proposes to commit to for managing the water resources. This chapter includes the following 7 principle management actions:

1. Monitoring
2. Improving Basin Understanding
3. Continue Long-term Planning
4. Groundwater Protection
5. Construction and Implementation
6. Financing
7. Public Participation

Mr. Williamson reviewed each of these items in depth. Refer to the Powerpoint presentation for further detail of this chapter.

The Regional Water Management Plan update will be available for review a week or two prior to the next TAC meeting on March 3, 2004.

In response to a question posed by Mr. Woods, Mr. Clarke stated that last year all water purveyors were required to submit a source assessment of any potential contaminants in their areas. This was a very thorough document. Mr. Brill added that the Regional Water Quality Control Board monitors leaky underground tanks and other areas under investigation. This data exists in a database which the current GIS database is capable of merging the data. Mr. Brill anticipates that this will be accomplished in the future but at present doesn't exist.

An unidentified individual asked what would happen in the population projections for 2020 were reached in seven years. Mr. Williamson replied by stating that the continued monitoring of what is happening on the ground versus the projections is an important part of maintaining the viability of this plan. If this was the case, existing programs would need to be accelerated or possibly revised.

Mr. Pearl inquired about a maximum number of septic systems to be placed in an area. Mr. Clarke stated that the Regional Board currently has a MOU with the County in the Lahontan Region which limits septic tanks to only ½ acre or larger lots other issues are also taken into consideration with regard to septic systems. Since Mr. Pearl's region is within the Colorado Region he was advised to approach them with his concerns.

In response to a comment by an unidentified individual, Mr. Kirby clarified that Mojave Water Agency does not have jurisdiction over many of the topics which are in the Regional Water Management Plan. Mojave Water Agency is a large-scale regional planning entity that helps to consolidate all of these issues into one place. It is not Mojave Water Agency's responsibility to see that the standards are being met, but to facilitate coordination and raise awareness to help further cooperation.

6. **PUBLIC AND AGENCY ENVIRONMENTAL IMPACT REPORT SCOPING COMMENTS**

Mr. Barns reviewed the comments received at the Scoping Meetings. The first meeting was held during the last TAC meeting on November 5, 2003. This meeting was the best attended with 23 persons signing-in. The next meeting was held that same evening in Barstow. There were only 4 people in attendance at this meeting. The third meeting was held the following morning at Hi Desert Water District where 15 people attended. The total number of comments received was 12 verbal and 9 written prior to the closing of the comment period on November 24, 2003.

Mr. Barns reviewed the questions which are outlined in the Powerpoint presentation which are attached to the minutes on-file. With regard to the comment received from the California Department of Fish and Game, Mr. Barns stated that they will be contacted early and often as requested.

Mr. Wayne Snively representing the Newberry Springs Harvard Real Property Owners Association referred to the minutes of the November 5th meeting, page 4/3-7, and wanted to emphasize the importance of Mr. Bilhorn's request to consult Exhibit A of the Adjudication and Victor Valley Water Reclamation Authority. Mr. Snively's concern is that these comments were not included in the CEQA process. His main concern is with the possibility of over-pumping prohibiting water from proceeding down river. Mr. Barns replied that these comments will be discussed in the project description.

Mr. Barns proceeded to explain the process being that the comments which were received help to guide the scope of the EIR. Therefore, the Programmatic Environmental Impact Report (hereinafter EIR) will include the comments received. A scoping report has been prepared will a summary of all comments. Copies of this report and also of the comment letters themselves are available upon request. There will be no formal response to these comments, but they will be addressed in the EIR.

The key environmental issues addressed in the EIR will include groundwater quality, the river resource, biological resources, land use restraints, treatment plant alternatives, and pipelines.

The Notice of Preparation (NOP) has been completed and the scoping process is also concluding. The next step is to prepare the Draft EIR which will be released to the public for review. The comments received on this document do require a formal response. At the end of the process, the official findings will be approved by the Board and a Notice of Determination (NOD) that the EIR has been certified will be submitted to the state. Mr. Barns presented a slide with the milestones for this aspect of the process. The plan is to certify the EIR in early 2005 which will be followed by Board approval. Mr. Davis clarified with Mr. Barns that when he is referring to an EIR it is a programmatic EIR as opposed to a project level EIR. Mr. Barns confirmed this and added that the program level EIR will assess the potential environmental affects or physical changes that could likely occur from the implementation of such a broad program.

In response to a question presented by Mr. Woods, Mr. Barns replied that the comment period is officially closed; however, this does not mean that comments will no longer be accepted. He asked that any comments be placed in writing and submitted as soon as possible.

7. **ALTERNATIVES PRE-SCREENING** – There was no direct reference made to this item.

8. **POST-2020 SUPPLY OPTIONS**

Mr. Kirby explained that the post 2020 supply options is not part of the Regional Water Management Plan Update or the Environmental Review Process. This is a separate document being prepared. The goal is for long-term planning. Mr. Kirby added that emphasized that it is important to remember that the focus should be on the near future more than the post 2020.

The possible supplemental supply options that Mr. Kirby mentioned were more State Water Project water; water banking and exchanges; water transfers; conservation and desalination credits; and aggressive management.

Mr. Kirby illustrated the 2050 demand versus supply with a bar graph which showed that the need of 2020 could be met with natural supply and State Water Project water supply. The needs of 2050 showed a deficit of 60-100 KAF.

New appropriations or increased State Water Project yield may be available north of the Delta. It is however very difficult to find water that someone isn't already using. Building new storage reservoirs does not work because the water needs to exist there already. Water banking and exchanges can help, but it may not solve the long-term problem. Pooling of existing supplies is a good opportunity to exchange with other State Water Project Contractors. There is some potential of importing reclaimed water and purchase of water districts but it is somewhat limited.

Mr. Kirby feels that desalination credit is where the future is going. Aggressive management will help to offset what is needed in the future. Aggressive conservation includes mandatory conservation measures, regulated landscaping water use, water waste ordinances, water efficient fixtures, and water use reduction incentives. Mr. Kirby stated that water reclamation does not increase the supply. Delta pumping has several issues which make it not very promising. Conveyance capacity and wheeling with the California Aqueduct/East Branch or Colorado Aqueduct do not seem viable options. Water quality is a concern which Mojave Water Agency is undergoing a study on this issue.

The actions which can be done now to improve the future are to use the total entitlement of State Water Project water for banking and pursue aggressive conservation measures. Mr. Kirby added to look toward long and short-term transfers and exchanges. Mr. Brill informed the committee that the Mojave Water Agency is currently pursuing a demonstration project with the Metropolitan Water District which allows over the next 2 years up 75,000 acre-feet from their entitlement to be brought in to our basin and then transferred back from our unused entitlement in the future. Over the last 3 months, 20,000 acre-feet has been released from our various facilities throughout the Agency boundary. It is not known whether this is something that will continue in the future. It is dependent on the amount of allocation of State Water Project distributed for 2004.

Mr. Kirby stated that looking ahead 10 to 20 years, conservation and desalination credits is the direction that we need to head. These methods have been proved and as technology improves the costs will decrease.

9. **OTHER BUSINESS**

Mr. Clarke mentioned that the Technical Advisory Committee By-laws state that to be a member of the Executive Committee, you may not be an elected official. Mr. Beatty is an elected official and was inadvertently elected to represent the Morongo Basin Area. Nomination of Martha Ostrander to represent the Morongo Basin Area was made and seconded. There were no oppositions presented therefore Ms. Ostrander will represent the Morongo Basin Area for 2004.

Mr. Clarke plans to call a meeting of the Executive Committee in February.

Mr. Woods approached the Committee regarding storage basins in Lucerne Valley. The concern of some of the citizens is that if a storage basin is established in Lucerne Valley, high-density development will increase and they will loose their rural life-style which they desire. Mr. Kirby stated that these comments have been heard and this project is not on the high-priority list. It has not been dropped from the list due to the fact that there are some individuals in this area that would like to see a treatment plant in Lucerne Valley.

Another concern of Mr. Woods is regarding an EIR report from the Mitsubishi plant which he said will affect the water table dramatically. Mr. Kirby said that he will review the report. The comment period for this EIR report ends on January 30. Mr. Woods plans to request that this date be extended until the Mojave Water Agency staff has the opportunity to review and comment on the report.

10. **ADJOURNMENT**

Motion to adjourn was made and seconded at 11:20 a.m.

Jack Clarke – Chairman

1.12.04
TAC
minutes

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

November 5, 2003
9:00 a.m.

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1. **CALL TO ORDER**: Chairman Cox called the meeting to order at 9:00 a.m.

2. **INTRODUCTIONS**: Introductions of 34 members in attendance were made.

3. **APPROVAL OF AGENDA**: Ms. Cox stated that agenda item number 9 needed to be removed from the agenda. The committee approved the amended agenda by unanimous vote.

4. **APPROVAL OF MINUTES FROM AUGUST 20, 2003 MEETING**: Motion was made and seconded to approve the minutes.

5. **ELECTION OF OFFICERS FOR 2004** – Ms. Cox stated that due to the results of the recent election, she would no longer be eligible to chair the TAC. Nomination of Mr. Jack Clarke was made by Mr. Steve Older. Barring any other nominations, Mr. Clarke will serve as Chairman of the TAC for 2004. Mr. Steve Older nominated Mr. Mike Davis for Vice-Chairman of the TAC 2004. Mr. Davis was also unopposed and will serve as Vice-Chairman for 2004.

6. **APPOINTMENTS TO TECHNICAL ADVISORY COMMITTEE EXECUTIVE COMMITTEE FOR 2004** – Appointments were made as follows:
   - Upper Mojave River Basin – Paul Johnson
   - Middle Mojave River Basin – Wayne Soppeland
   - Lower Mojave River Basin – Karen Gray
   - El Mirage Basin – Paul Davis, Jr.
   - Lucerne Valley Basin – Chuck Bell
   - Morongo Basin – Rick Beatty
   - At Large – Harold Singer (Hisam Baqai – alternate)

   Ms. Karen Gray nominated Mr. Wayne Snively in addition to a nomination for Mr. Harold Singer to remain the At Large representative. An anonymous vote was taken in which Mr. Singer was determined to continue to represent this area.

7. **REGIONAL WATER MANAGEMENT PLAN ENVIRONMENTAL IMPACT REPORT SCOPING SESSION**

Mr. Kirby Brill gave a brief summary of what is to be accomplished at this meeting. In order to meet the requirements of the Environmental Impact Report (EIR) several public meetings will be held in different areas throughout the basin. This TAC meeting serves two purposes, one as a publicly noticed Scoping Meeting. These meetings were publicly noticed in local papers as well as distribution of a Notice of Preparation for the programmatic EIR to approximately 150 recipients expressing interest in this phase. The other Scoping Meetings are to be held on November 5, 2003, in the Barstow Council Chambers, at 6:30 p.m. and the third meeting in Morongo Valley at the Hi-Desert Water District on November 6, 2003 at 10:30 a.m. Mr. Brill referred to these meetings as being the "opening bell" where the California Environmental Quality Act (CEQA) process begins. Mr. Brill encouraged comments from the members of the TAC.

Mr. Mark Williamson reviewed the materials which have been developed in Phases 1 and 2 of the Regional Water Management Plan Update with the assistance of a Powerpoint presentation (copy of which is contained in the minutes on-file).

A question was asked by Mr. Tom Bilhorn as to whether the plan was to meet the future demands or recover from the deficit. Mr. Williamson's response was that the plan is to balance supply with demand no recovery of the aquifer is explicit in the objective.

Mr. Williamson stated that the next phase of the preparation of a programmatic environmental document will signify the beginning of the plan.

Mr. Tom Barns with Environmental Science Associates began the Scoping Meeting portion of the TAC meeting by defining the objectives of the California Environmental Quality Act (CEQA). The same process is going to be done as was for the 1994 development of the Regional Water Management Plan. A Program-level Environmental Impact Report (EIR) which addresses "Big-Picture" issues. Mojave Water Agency is the lead agency due to the fact that they will be adopting the plan. Mr. Barns identified key environmental issues (refer to Powerpoint on-file).

The key steps of the EIR process begin with scoping sessions to attempt to get as much local agency and public feedback as possible. The comments received will be incorporated into a draft EIR which will be followed by another comment period and hearing. The final EIR will then be taken to the Mojave Water Agency Board for consideration and certification of the EIR and approval of the plan. The plan will include a mitigation monitoring and reporting plan which is required by CEQA. The official findings and Notice of Determination is filed with the County and State. Mr. Barns illustrated the milestones with a timeline in the presentation. Final EIR is expected to be completed by January or February 2005. Comments were encouraged either in writing through forms provided at the meeting, verbally, or in writing to the MWA prior to November 24, 2003. Mr. Barns stressed that comments are to be related to an individual's jurisdiction and a program-level EIR is the issue of consideration. Specific projects will be considered at a later date once a project-level EIR is being addressed.

Mr. Hisam Baqai asked what would be the result if the mitigated measures are not being properly implemented. Mr. Barns replied that it is dependent on the impact and the monitoring program. The regional board could comment and enforce additional monitoring. Generally, it is up to the lead agency to comply with the Mitigation Monitoring Program. Ms. Leslie Molton added that if there were any observation on non-compliance of mitigation implementation, MWA would be notified of the observation. The lead agency retains responsibility and authority for mitigation implementation. The MWA board's adoption of the Mitigation Plan is a commitment to implement the monitoring plans.

Mr. Wayne Snively asked a question regarding the potential for this projects relationship with growth and the impacts of growth. This question will be addressed at the next TAC meeting.

Mr. Rick Beatty requested the alternative of above-ground storage considered as an alternative to recharge.

Mr. Tom Bilhorn stated that the plan should look at Exhibit H of the Adjudication. An agreement with Victor Valley Wastewater Reclamation Authority was referred to as a way to mitigate the issues.

Mr. Chuck Bell asked if it is now thought that Old Woman Springs is included in the watershed in Lucerne Valley, since it is listed under this category on page 10 of the Notice of Preparation. Mr. Brill stated that it is categorized in this group but it does not reflect a determination of the supply. Mr. Caouette added that the connection was that there is some surface supply from Old Woman Springs over to Lucerne Valley. Mr. Bell next asked if the alternative of a north-slope natural recharge option would be included in the EIR. Mr. Barns replied that a more broad Subarea designation is being considered at this point. Ms. Molton stated that there will be room for additional projects as long as they fit within the program of the anticipated accomplishment. Mr. Bell suggested the assistance of County Flood Control. Mr. Bell suggested the use of biological fees to preserve and protect the riparian locations.

Mr. Matthew Woods added to Mr. Bell's suggestion for using the natural watershed methods of recharge by stating the cost benefits. Mr. Woods asked if the costs associated specific projects would be addressed in Phase 3. Mr. Brill's response was that as this process is a more broad regional scale of impacts. Some conceptual level of cost estimating has been done for comparison purposes. Projects will then be developed. Mr. Brill stated that the costs will then be communicated to the public. Mr. Woods asked how a citizen would best present their comments or concerns. Mr. Brill stated that attending the TAC meeting is one of the best means to provide comments. In addition, the MWA board meetings have an opportunity for public comments to be heard with the decision making process. Mr. Woods commended the MWA board for past consideration of comments from the public. Mr. Brill added that once a project specific level is reached, environmental documentation will be required. Mr. Woods also added that they have appreciated the fact that MWA representatives have come to their community in an effort to keep them informed.

Mr. Lou Kershberg stated that he has concerns with the water quality in Lucerne Valley. He feels the situation cannot wait until after an EIR can be processed. Mr. Kershberg suggested the MWA provide assistance such as discounts on water purification systems or water testing to those individuals with wells pumping poor-quality water.

Ms. Dianne Gehling expressed concern with the water quality of the State Water Project water being imported into the ground near Southern California Water Company's extraction wells. Southern California Water Company does not want to have problems with the Stage 1 and Stage 2 DBP rules especially with THM's and the H85's.

Mr. John Leveillee requested that reclaimed water be addressed in the EIR. Mr. Leveillee suggested that Victor Valley Wastewater Reclamation Authority be contacted since they have hired a sub-consultant to perform a CEQA EIR on this matter.

Mr. Barns expressed his appreciation for the comments which were presented at the meeting. The comments received either verbally or in writing will be addressed in the EIR. Mr. Barns re-emphasized that the deadline for comments is November 24, 2003.

Mr. Barns indicated that the schedule shows a draft EIR to be completed by late summer and then finalized and adopted by January 2005.

8. **DISCUSSION OF GROUND WATER MANAGEMENT PLAN**

Mr. Kirby Brill stated that the purpose of this document is to be of use to the community.

Mr. Ken Kirby began the discussion by stating that the goal is to finalize the Regional Water Management Plan Update but there are other components which go along with it. The phase 3 schedule has been divided into two areas: Task A includes Final Regional Water Management Plan, Programmatic EIR, Identification and Application for Financial Assistance, Post 2020 Water Supply Options, and Bi-Monthly TAC Meetings; and Task B includes Programmatic EIR, Finance Strategies, Identification and Application for Financial Assistance, and continuation of Bi-Monthly TAC Meetings.

The Regional Water Management Plan will comply with the requirements of an AB3030 plan but without going through the formal process. Mr. Kirby stated that since this is an adjudicated area it is not necessary to have the authority of an AB3030 plan. In terms of grant funding or low-interest loans, the State will see that everything required of a Groundwater Management Plan has been done. An Urban Water Management plan is not likely required for this project; however, Mr. Brill has expressed a desire to proceed with the requirements anyway. The plan will be SB1938 compliant which will require a groundwater management plan and monitoring protocols.

In response to a question presented by Mr. Lee Pearl, Mr. Kirby stated that their area would want to have a 3030 plan for the area which is not adjudicated. MWA's regional plan would most-likely not cover this area in terms of having the groundwater management plan specifically for this area. This will be clarified with the Department of Water Resources.

Mr. Kirby reviewed the water balance objectives and beneficial use objectives which were determined during a previous phase of the development of the Regional Water Management Plan update. (See list of objectives in Powerpoint presentation on-file.) The Committee was asked if these objectives meet the needs of a groundwater management plan. Any additions to the lists presented were asked to be provided in writing.

Mr. Brill stated that the primary focus of the State is that there is a plan in place for the region.

There was much discussion regarding projected population growth and meeting the needs of the population. Mr. Kirby cautioned against too much focus being placed on the post-2020 issues such as these due to the fact that there is much work to be done in the near future.

Mr. Kirby stated that in order to comply with the Groundwater Management Plan, the Urban Water Management Plan and the Integrated Resource Planning documents, there are some additional information needed. The needed information includes monitoring protocols, water conservation measures, wastewater recycling, riparian habitat protection, and floodwater management. Mr. Kirby stated that the MWA is currently involved with a newly-organized group of purveyors involved with water conservation. This group will be contacted to determine their findings to include in the draft document as far as objectives and actions likely to be taken. Victor Valley Wastewater Reclamation Authority will be contacted to incorporate information regarding wastewater recycling into the document. The County has been consulted and their comments related to floodwater management will be incorporated.

Mr. Kirby reviewed the requirements of SB1938. Most of the requirements are already being met by MWA or other agencies within the MWA boundaries. The purveyors were requested to forward any monitoring protocols which need to be included in the document.

Mr. Brill stated that the Alliance for Water Awareness and Conservation (AWAC) group consists of approximately 25 local entities which have been meeting for the last 4 months. There is currently an MOU being circulated for approval from the appropriate policy-making individuals. The MOU consists of 3 primary goals: Goal #1, create awareness for the need for conservation; Goal #2, to empower the community with the appropriate tools; and, Goal #3, to establish a measurement for measuring conservation with the goals of achieving a 15% gross reduction in production by 2020. The Morongo Basin has a somewhat different goal of a 5% gross reduction which is an acknowledgement of the advances already achieved in this area.

Mr. Kirby stated that a draft document will be available at the January TAC meeting. The environmental work will then take priority in this process. At this point the document will be of use and available in draft form. Once the environmental work is completed, it will be included in the document and brought to the MWA board for adoption.

The next meeting in January will include the post 2020 water supply options.

~~9. **POST-2020 WATER SUPPLY OPTIONS**~~

10. UPDATE ON THE METROPOLITAN WATER DISTRICT WATER BANKING PROJECT

Mr. Norman Caouette stated that last July or August, Metropolitan Water District (Metropolitan) proposed a short-term demonstration project for MWA to take up to 75,000 acre-feet of Metropolitan's available State Water Project supply for storage in our groundwater basins. The water would then be returned to them from our available State Water Project supplies over 5 years. An agreement is currently in the process of being approved by the appropriate boards and executed by MWA and Metropolitan. A CEQA document, in which MWA is the lead agency, has been completed. The necessary papers have also been filed with the Clerk of the Board. Currently in the process of attempting to obtain a nationwide 404 permit from the Army Corps of Engineers. This is necessary due to the large amounts of water being released in a short period of time. Due to this, a series of berms in the Mojave River channel will be necessary to help capture and slow the water so as it can easily percolate into the groundwater system. Mr. Caouette expressed his gratitude to both Hissam Baquai and Harold Singer with the Lahontan Regional Water Quality Control Board for providing the necessary 401 Certification letter which was a key component to the Army Corps of Engineers.

The Department of Water Resources (DWR) is working on an agreement between DWR, MWA, and Metropolitan regarding how the exchange program fits into the different contracts and also address the details of water deliveries and billing.

Once all the documents are processed, the near-term objective is to receive 45,000 acre-feet from Metropolitan to MWA. If the 404 permit is not executed, delivery can continue with limitations on deliveries from Silverwood Lake.

11. **OTHER BUSINESS**

Results from a vote for the at-large representative were addressed at this time. By majority vote, Mr. Harold Singer will remain the at-large representative for 2004.

12. **ADJOURNMENT**

Motion to adjourn was made and seconded at 11:15 a.m.

Kimberly Cox - Chairman

12-1-03
TAC
minutes

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

August 20, 2003
9:00 a.m.

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1. **CALL TO ORDER**: Chairman Cox called the meeting to order at 9:00 a.m. Ms. Cox encouraged the committee to stress the importance of public participation in upcoming meetings.

2. **INTRODUCTIONS**: Introductions of 35 members in attendance were made.

3. **APPROVAL OF AGENDA**: Motion was made and seconded to approve the agenda.

4. **APPROVAL OF MINUTES FROM APRIL 16, 2003 MEETING**: Motion was made and seconded to approve the minutes.

5. **INTRODUCTION OF TASK MANAGERS AND RESPONSIBILITIES**

Mr. Brill welcomed everyone to the third phase of the Regional Water Management Plan (RWMP). The Committee was informed of the future process of development of the RWMP. Mr. Saracino, Saracino-Kirby-Snow, approached the Committee with an introduction of staff and including their responsibilities. The firm of Environmental Science Associates (ESA) has teamed up with Saracino-Kirby-Snow for Phase 3. ESA will primarily be working on the environmental aspects of this phase of the RWMP.

Mr. Kirby, Saracino-Kirby-Snow, acknowledged comments received related to the Phase 2 update from Edward Riddle, Hinkley resident. The comments have been noted and are relative to development of recharge sites or water delivery into the Hinkley or Pioneer Town area.

Mr. Kirby reviewed the process beginning with the Phase 1 report where historical information was updated; key issues were identified; and long list of projects were identified. Phase 2 included a very involved process of scenarios and alternatives. The result was a selection of priorities. We are currently in Phase 3 which involves environmental review and moving toward adoption of a plan which follows all of the guidelines mandated by the legislature.

6. OVERVIEW OF PHASE 3 PROCESS

Mr. Williamson outlined the events to come in the next two years with the adoption of the final plan. The first eight months will involve very intensive activity. The programmatic EIR will consist of additional pre-screening, developing additional information of current activities within the Agency boundaries either by the Agency or by another entity. Environmental scoping will begin in the initial portion (Task A) of this phase and then development of the EIR document in Task B. A finance strategy will be developed approximately 18 months into this phase. Ongoing tasks will include the monitoring of grant funding to determine available funding. Mr. Williamson informed the Technical Advisory Committee (TAC) that participation will be necessary on a by-monthly basis until July, 2005.

7. APPROACH TO FINAL REGIONAL WATER MANAGEMENT PLAN

Mr. Williamson stated that a combined document will be developed which includes a Groundwater Management Plan (GMP), Urban Water Management Plan (UWMP); and Integrated Water Resource Plan (IRP). This document will still be referred to as the Regional Water Management Plan, but will serve multiple purposes such as grant application or approval of development. Mr. Williamson reviewed the elements in an IRP, GMP, and UWMP by presenting a table contained in the Powerpoint Presentation on file. Grant funding such as AB 303, Prop. 13, and Prop 50 will be pursued; all of which require or give priority to areas which have a current GWP. Mr. Brill referred to fairly new legislations which make any future funds require a GMP or IRP. Mr. Williamson stated that notices will be posted in local newspapers for two weeks. The anticipated adoption of the GMP is scheduled for February, 2004. In reply to a request for clarification, Mr. Williamson stated the difference between a GMP, UWMP, and IRP. A GMP statute was meant to promote looking at all aspects of the groundwater--basin-wide planning for example. UWMP is directed to water utilities, making sure the appropriate planning process has been performed, and assured that there is going to be water supply for planned growth. This plan will include multiple-drought contingencies such as development of additional supply or ration water and impose conservation measures. An IRP is a broader look at every aspect of water supply such as surface water, groundwater, supply, and demands. Much of these elements are taken from the UWMP and GMP with the addition of management of riparian corridors and flood water management. Mr. Kirby added that a groundwater management plan is not necessarily limited to a basin, but intended to be regional. The focus of an urban water management plan is on urban use, whereas a groundwater management plan is broader. Most of the work has been completed as far as preparing the package for the Regional Water Management Plan. A checklist of events now needs to occur. The focus is now on strategy as to timing such as formal adoption. This will occur after the environmental work which is a major time constraint. However, it is possible to adopt the groundwater management plan prior to completion of the environmental work. This may also have some advantages in terms of application for funding on other grants. Due to the Mojave Basin being adjudicated, it is not required to have an AB3030 plan or a 1938 plan. It is advantageous to complete these requirements anyway for responsible regional planning.

8. **POST-2020 SUPPLY, DEMAND, AND SHORTFALL**

Mr. Williamson stated that the goal is to estimate the demands into 2050. Extending the current growth rate will be examined. In gross terms, 80-120 thousand acre-feet of water will be required to meet demands of 2050. These numbers are preliminary. If an agency-wide reduction in municipal use is effective, 60-100 thousand acre-feet of water will be required to meet the demands of 2050. Mr. Kirby added that 60-100 thousand acre-feet is almost triple the natural supply. Mr. Williamson stated that new contracts or entitlements; water transfers; water banking and exchanges; and conservation and desalination credits are a number of potential water supplies. The Mojave and Morongo Basin are closed systems and therefore reclaiming water within the agency boundary may result in stretching supplies but doesn't add water to the system. The supply needs to be increased. Desalination is a viable means of supplementing the water system.

9. **PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT**
   - **ENVIRONMENTAL PROCESS OVERVIEW**
   - **ADDITIONAL PRE-SCREENING OF ALTERNATIVES**
   - **PROJECT OBJECTIVES**
   - **MILESTONES AND TECHNICAL ADVISORY COMMITTEE INPUT**

Ms. Moulton of Environmental Science Associates presented an overview of the environmental review process. The California Environmental Quality Act's (CEQA) main objectives are to disclose environmental impacts to make sure there is a review and public disclosure of the environmental issues and consequences of an action may be. Identification and prevention of environmental damages through mitigation or choices of possible alternatives are presented. The Agency's decision-making process is also disclosed to the public. CEQA is a very public-oriented process with relation to disclosure as well as mitigating effects. CEQA is required for discretionary actions made by public agencies in the state of California. The first discretionary action is the Mojave Water Agency's adoption of the Regional Water Management Plan (RWMP) update which sets the near-term and long-term roadmap for actions taken and projects implemented. Second in the approval process is the approval of specific projects from the RWMP. National Environmental Policy Act (NEPA) is similar to the state environmental review process and is required if the plan or project has federal involvement. The MWA RWMP does not require NEPA since it is a regional endeavor and does not have federal involvement. However, at the project level it is likely that a federal NEPA review may be required due to federal funding, partnership, or permitting.

MWA is the lead agency responsible for implementing the CEQA process. In some cases there are other agencies with authority to adopt the plan. In this case, MWA is the main authority for adoption of the RWMP. Implementation of particular projects will include the involvement of other agencies will have responsibilities such as encroachment permits. The relevant resource agency for this process will be the

California Department of Fish and Game as the key trustee agency. This responsibility will include involvement in the process being that they have regulatory authority over resources in California. This involvement will include critiquing of impacts and development of mitigation measures relevant to their jurisdiction. The public is a key participant and a main focus of the outreach through the CEQA process.

Ms. Moulton reviewed the CEQA steps (listed in Powerpoint presentation included in minutes on file) which include three kinds of Environmental Impact Reports (EIR): Program, Staged or Master EIR for plans, programs that involve a series of actions or projects over time and/or geography; Project EIR is if there is a specific project to be implemented including details; Subsequent or Supplemental EIR is used when a project EIR requires revision. In this case, a program EIR is required which allows the coverage of several projects over a broad geography which will be implemented over time. This type of plan is designed when there are not many details of specific projects but information of how the overall plan can be accomplished. Water Resource areas will be one of the key issues addressed in CEQA. CEQA's interest is on the environmental perspective. The CEQA tiering process will include a program EIR which will tier into several projects EIR's. Mr. Brill asked the reason for this process rather than just development of project EIR's only. Ms. Moulton responded that this method has the advantage that the big picture issues are able to be addressed at one time rather than each time a project EIR is developed. The result is a streamlining of future CEQA requirements the focus is then directed toward specific issues. There may be a need for updating but in the long-run, the process is greatly simplified. Five to ten years is a general rule of thumb so that the current information is maintained accurate. There is a lot of strategy and legal appropriateness involved with determining whether a project should be included in this CEQA document or include in a separate document. Mr. Brill added that this would be dependent on the priority of the project.

Ms. Moulton stated that the focus of the analysis will be on the preferred alternatives selected in the Phase 2 process of the RWMP update. If there are any significant environmental effects resulting from these projects, alternatives will then be determined. Not all projects require EIR. It may be possible that a Mitigated Negative Declaration would be appropriate if no significant impacts are determined.

It is necessary to update the CEQA review due to the fact that the document is now almost 10 years old and there have been significant changes in the area. These changes include land use planning, growth projections, and groundwater conditions.

The CEQA process will begin with the Notice of Preparation (NOP) this October. Public scoping meetings will be held at that time. There is a 30-day official review period to allow for public comments.

The next few months will consist of development of additional project description. The list of projects will be better defined by the end of the year. After this is accomplished the EIR workplan will be well-defined for implementation. The environmental impact analysis will be drafted at the beginning of the year, which an administrative draft will be presented to the Mojave Water Agency in May. A public draft will be available in August which will allow for a 45-day review period. Following the review period, a formal response and final EIR will be prepared (Jan. 2005).

Ms. Moulton pointed out that use will be made of the project objectives which were defined in the Phase 2 process of the RWMP update. Key environmental issues include Water Resources; Biological Resources; Land Use Effects; Growth inducement and secondary effects; and Agricultural land conversion.

Mr. Williamson noted that there will be a number of additional topics in addition to the environmental issues which will be discussed at the upcoming TAC workshops. The October workshop will include the EIR Notice of Preparation and Scoping. The next meeting is tentatively scheduled for October 15. Once a definitive date is determined, the TAC will be notified.

Mr. Saracino re-emphasized the importance of this plan due to the fact that all its elements comply with the current legislation. This is a significant issue and due to Mr. Brill's foresight. Mr. Brill gave his and the Agency's commitment to continue to inform the public of their importance in the process.

Ms. Cox reiterated the importance of the Committee's involvement over the next year and a half. Active participation from the public is key to the success of this endeavor.

10. **OTHER BUSINESS**

Ms. Cox encouraged everyone to attend the Water Conservation Coalition which has been organized by Mr. Stevens, Community Liaison Officer of Mojave Water Agency. Mr. Stevens can be contacted for the next meeting date. This forum is designed to address some of the conservation components related to the RWMP.

Mr. Brill addressed concerns expressed by Mr. Hill and Mr. Bell related to the Metropolitan Water District (MWD) Water Banking program as follows: The terms are setup to utilize MWA's unused entitlement as far as return. This provides an alternative versus participating in the Turn-back Pool. Any water above our hard demands which otherwise would have been sent to the Turn-back Pool, is now on the books as available for exchange. The MWD water will be placed in areas based on the adopted interim guidelines for groundwater banking. These areas are targets based on projected potential future demands of a 3-year accumulative amount. The Agency is working closely with the County on levees within the river to contain the water so it is not just flushing downstream. Water will be released at Hodge, Lenwood, Daggett, Rock Springs, and Silverwood. Water will not be released from Oro Grande due to the pending expiration of the temporary siphon permit. In order to take full advantage of this opportunity, all available discharge locations will be utilized to full capacity. MWD would like us to take 75,000 acre feet; however, this is not possible within the 2-month time frame. The most we can anticipate releasing is about 30,000 to 35,000 acre feet. The current terms are then to transfer this amount out of our unused entitlement over the next 5 years. Ms. Cox noted that the MWA Board of Directors unanimously supported this project. The intent was not to bypass the TAC Committee on this issue; however, due to the time constraints, MWA Board approval was needed. Mr. Brill added that if this water is not used by the end of the year, it is basically lost. Strategically, moving quickly is necessary not only for this issue but to set the future potential for establishing ourselves as a viable partner with MWD. Mr. Brill encouraged questions related to this issue in order for all to have a comfortable level of understanding.

Ms. Cox requested an item added to the agenda of the next TAC meeting to update the committee on this project. Mr. Brill stated that he would be more than happy to provide this information.

11. ADJOURNMENT

Motion to adjourn was made and seconded at 11:00 a.m.

Kimberly Cox

Kimberly Cox - Chairman

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TECHNICAL ADVISORY COMMITTEE TO THE MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

April 16, 2003
9:00 a.m.

1. **CALL TO ORDER**: Chairman Cox called the meeting to order at 9:00 a.m.

2. **INTRODUCTIONS**: Introductions of 35 members in attendance were made.

3. **APPROVAL OF AGENDA**: Motion was made and seconded to approve the agenda.

4. **APPROVAL OF MINUTES FROM MARCH 19, 2003 MEETING**: Motion was made and seconded to approve the minutes.

5. **REVIEW RECOMMENDED ALTERNATIVES**:

Mr. Kirby of Saracino-Kirby-Snow reviewed the key findings that it is not possible to meet the future water needs through only natural and State Water Project water. There are a number of different projects required in order to accomplish this goal. Centro was in surplus in all alternatives which were modeled.

Comments from the following were reviewed by Mr. Kirby, in response to information which was presented at the March 19, 2003 meeting:

Tom Bilhorn – Department of Fish and Game
Ginger Hancock – Newberry Springs-Harvard Real Property Owners Assoc.
Randy Hill – Victor Valley Water District
Michael Davis – Silver Lakes Association
Terry Lyons – Joshua Basin Water District
Gary Ledford – Jess Ranch
Karen Gray – Baja Representative

Mr. Hill clarified one of his comments for Mr. Kirby stating that according to the USGS model also age dating of water wells indicate that of the 25 wells in the Victor Valley Water District service area; only two are under any influence of the Mojave River even though many of these wells are within a mile of the river. Mr. Kirby stated that this comment was related to the separation of the Regional Aquifer versus the Floodplain

Aquifer. Mr. Hill stated that according to this model it would take 1,000 years to reach these wells, which is too long. Mr. Kirby stated that in the modeling that they have done shows that water is needed in both the Floodplain and the Regional Aquifers in Alto. The results of the modeling show that much of the water is concentrated in the Victor Valley Water District service area.

In response to a question from Mr. Lyons, Mr. Kirby stated that the RWMP update will refer to the Warren Valley Basin Adjudication to the extent that the parameters will be outlined. All the rules have been incorporated into what is currently being used in the model. The Morongo Basin is given first priority for State Water Project water in the modeling. In all of the alternatives, Morongo Basin will receive 100% of whatever is being requested. The two refined alternatives will also include recharge into this area as discussed in the Community Meeting in Yucca Valley.

Mr. Bagai asked for the consumptive use factor being used for agriculture. Mr. Kirby replied that the Watermaster data and the WEBB report are being used for agricultural consumptive use projections. These amounts will be recommended for refinement in Phase 3.

Mr. Williamson stated that there has been a correction to the modeling of water levels in the Transition Zone which were presented at the last meeting as C and D alternatives. These were very similar to the A and B alternatives except for the correction. In the last TAC meeting, alternatives D5 and D6 were the alternatives of focus. Both of which assume 20% municipal conservation in the Mojave Basin with an additional 5% in the Morongo Basin. Alternative D5 had a regional water treatment plant included. Alternative D6 relied on recharge ponds and in-lieu supplies. The focus has been primarily on D5 and D6 alternatives with some variation. Alternative D5r has decreased municipal conservation target to 10% in Mojave Basin with a larger regional water treatment plant.

Project groupings and management actions were presented. Mr. Williamson stated that there are a variety of possible alternatives; whereas, the focus needs to be on supplying enough water to the particular aquifer units to balance supply with demand, rather than focusing on particular projects.

A selection of individual projects was made to determine the alternatives. The alternatives for the Flood Plain, Non-Flood Plain and Regional Aquifers were listed in the PowerPoint presentation as follows:

Floodplain Aquifer Recharge (11)	*Specific Zone*
Minneola Recharge	Floodplain Baja
Daggett Recharge	Floodplain Baja
Lenwood Recharge	Floodplain Centro
Hodge Recharge	Floodplain Centro
Recharge North of Helendale Fault	Floodplain Centro
In-Lieu Supply to Silver Lakes	Floodplain Transition Zone
Mojave River Pipeline Extension - Transition Zone	Floodplain Transition Zone
Rock Springs Release	Floodplain Alto
Hesperia Lakes Recharge	Floodplain Alto
Recharge Facilities South of Rock Springs Turnout	Floodplain Alto
Release SWP from Silverwood Lake	Floodplain Alto

Non-Floodplain Aquifer Recharge (12)	*Specific Zone*
Kane Wash Recharge Ponds	Regional Baja
El Mirage Recharge Ponds	Regional Oeste
Sheep Creek Recharge Ponds	Regional Oeste
Oro Grande Wash Recharge Ponds	Mid Regional Alto
Cedar Street Detention Basin	Mid Regional Alto
Antelope Valley Wash Recharge Ponds	Mid Regional Alto
Recharge Facilities South of Apple Valley	Right Regional Alto
Recharge Ponds West of Helendale Fault	Regional Este
Lucerne Valley Recharge Ponds	Lucerne Valley
Means/Ames Valley Recharge Ponds	Means/Ames Valley
Hi-Desert Water District Recharge Basin #3	Warren Valley
Joshua Basin District Recharge & Pipeline	Copper Mountain Valley

Water Treatment and Blending (10)	*Specific Zone*
Regional Surface Water Treatment Plant	Left Regional Alto
Injection Wells in Mesa Area of Adelanto	Mid Regional Alto
Injection Wells in Victorville Area	Mid Regional Alto
Blending local water with treated SWP	Mid Regional Alto
Blending local water with Floodplain Aquifer	Mid Regional Alto
Local Wastewater Treatment Plant (Alto)	Mid Regional Alto
HDWD Nitrate Removal Plant	Means/Ames Valley
Yucca Valley Wastewater Treatment	Means/Ames Valley
Individual Wellhead Treatment	Entire MWA
Hinkley Water Supply Augmentation by SCWC	Floodplain Centro

Conservation and ***Storage Agreements (11)***	***Specific Zone***
Land Purchase to Protect Riparian Habitat	Floodplain Baja
Eradication of Non-native Plant Species	Floodplain MWA
Agricultural Conservation Programs	Entire MWA
Urban Conservation Programs	Entire MWA
Pricing Changes	Entire MWA
Storage agreements with agencies inside MWA	Entire MWA
Banking water agreements with outside agencies	Entire MWA
Pre-delivery SWP Water	Entire MWA
Water (entitlement) exchanges	Entire MWA
Baja Storm Flow Retention - 2 locations	Floodplain Baja
Cushenbury Flood Detention Basin	Lucerne Valley

All alternatives included full implementation of the Judgment; Warren Means/Ames, and Copper Mountain given first priority SWP deliveries; State Project supply to AVEK and make-up water to Hodge/Lenwood ponds; Operation of Victor Valley Water Reclamation operation up to the first 9,700 acre-feet per year (additional reclaimed to irrigate golf courses); and alternative supply to Hinkley, Pioneertown, and wellhead treatment in selected areas in Alto subarea.

Mr. Williamson noted that the natural supply in the Warren Valley was estimated at 900 acre-feet per year. Recent work by the Geological Survey suggests that this could be as low as 200 acre-feet per year. In this case, the supply would drop, but with additional recharge being modeled, the areas should continue to be in surplus.

A graph was shown to illustrate the quantity of State Water Project water needed to balance the Copper Valley supply in 2020.

It was determined that in Alternative C0 only 40% of MWA demand would be met; 62% of agricultural demands met in Alto and 29% of agricultural demands met in Baja; and 24% of municipal demands met in Alto. Alternative D0 29% of demand met in Alto and Oeste; 51% of demand met in Baja; 74% of demand met in Este; 26% of municipal demands met in Alto; and 100% of agricultural demands met without import.

Mr. Williamson reminded the TAC that at the prior meeting, Alternatives D5, D6, and D7 were determined to be the most promising alternatives. Revised Alternatives D5r and D6r incorporate a 10% municipal conservation. Alternative D5r includes a 12,000 acre-feet regional treatment plant. Both D5r and D6r performed well in the modeling—meeting all the demands within the Agency boundary. Ms. Cox requested an explanation on the additional costs related to the revised alternatives. Mr. Williamson replied that the treatment plant would be smaller and the demand would be increased, the assumption being less conservation. Mr. Kirby added that none of these costs include conservation actions.

Alternative D5r

- Agricultural Demand Scenario 2
- 10% Municipal Conservation in the Mojave River Basin; 5% Municipal Conservation in the Morongo Basin/Johnson Valley Area
- 13 Projects Including:
  - Regional Treatment Plant in Alto (12,000 AF/yr capacity)

Alternative D6r

- Agricultural Demand Scenario 2
- 10% Municipal Conservation in the Mojave River Basin; 5% Municipal Conservation in the Morongo Basin/Johnson Valley Area
- 16 Projects Including:
  - Up to 38,000 AF/yr Recharge into the Alto Regional Aquifers

Alternative D6r requires more projects due to the absence of the regional treatment plant. Both alternatives result in a balanced sub-basin.

Mr. Williamson stated that Alternatives D5 and D6 have the largest positive net change in storage. Alternatives D5r and D6r show improvements in all subareas. Alternative D5r increases total Agency-wide storage by 10,500 acre-feet; and Alternative D6r illustrated an increase by 8,800 acre-feet per year. Alternative D7 showed a decline. Alternatives D5, D5r, D6, D6r and D7 met the greatest percentage of demands. Alternative D3 meets more than 90% of demand in each subarea and Alternative D2 has significant shortages in some subareas.

In the alternatives which were devised, there was not a significant interaction within the Mojave River between subareas. With the exception of Alternative D7 which includes a 40,000 acre-fee per year release from Rock Springs.

In response to Mr. Davis's question to water supply performance south of Rock Springs, Mr. Kirby referred to the spreadsheet titled "Water Supply Performance", stating that since the areas are in close proximity, it was modeled as Hesperia Lakes. This modeling was based on achieving balance within the Alto Floodplain Aquifer. In the modeling, this would take advantage of the longer distance in the Floodplain Aquifer in making an active discharge further south which is a benefit to the Alto Floodplain Aquifer. Mr. Kirby added that the more locations there are to put water into the ground, the better response is achieved from the aquifers. Mr. Brill added that there are also projects on the east side of the river which affect the Regional Aquifer.

Mr. Williamson reviewed a chart which indicated that the majority of State Water Project water recharge will need to occur in the Alto subarea due to this being the major demand center.

Mr. Williamson reviewed the water quality assessment. Seven constituents were evaluated: arsenic; boron; fluoride; iron; manganese; nitrates; and total dissolved solids (TDS). These constituents were compared in native water quality and State Water Project imported water. On average, State Water Project water is a benefit to the basin due to the higher quality of water in all areas. Although the water supply would be improved, over a period of several hundreds or thousands of years, there would be additional salt entered into the basin.

6. **STEPS TO A COMPREHENSIVE WATER MANAGEMENT STRATEGY**

Mr. Kirby reviewed the objectives of Phase 3 of the Regional Water Management Plan update. Phase 3 will require a programmatic level review for all of the alternatives being carried forward. This document will be consistent with SB610, SB221 and SB1938. In addition, full implementation of the Judgment will continue. There will continue to be a number of different public processes implemented.

Mr. Kirby stated that Mojave Water Agency has indicated interest in developing a strategic plan for Regional Water Conservation which targets a 10% reduction in consumptive use.

A working draft Summary (Table 1) of Alternatives D5r and D6r for presentation to the Mojave Water Agency Board was distributed for review and revision by the TAC. Projects and management actions included in Alternatives D5r and D6r were evaluated to determine recommended priority for further evaluation. The criteria for evaluating priority included: whether it is an existing project or is already being pursued; the level of current overdraft that the project attempts to mitigate; and the expected growth of the subarea where the project will be applied. Each project and management action was designated as having high, moderate or low priority. Mr. Kirby stated that when evaluating the use of reclaimed water, there is no consumptive savings by reclaiming water. Water quality can benefit and balance particular regions.

Mr. Kirby noted that the reference made to Municipal Conservation of 16,000 acre-feet per year in terms of production or 8,000 acre-feet in terms of consumptive, 12,000 acre-feet from the treatment plant in Alternative D5r is included in the average recharge in the Mojave Regional Aquifer. In terms of water supply, a surface treatment plant in the Victorville area is being considered an in-lieu recharge project as well as having a potential for water quality benefits. Percolation ponds are considered as having a half-foot per day of continuous recharge with a two times peaking factor which allows for capacity to be maintained. Mr. Kirby explained that there are three methods in which to get water into the ground: natural recharge; active recharge which is usually percolation ponds or injection wells; and in-lieu. In-lieu is defined as an area which water is currently being extracted from which in-lieu of pumping groundwater, water is therefore being left in the ground. In a sense, this is a form of recharge because the demand of the natural supply or artificially recharged supply is being reduced. The plant will receive a direct connection from the State Water Project water supply. The treatment is of a size so that a reliable supply can be expected in most years for the capacity. If there was a disruption, groundwater would then be utilized.

A Priority List (Table 2) was distributed to the TAC for comments to be presented to the Mojave Water Agency Board. Mr. Kirby clarified that a high, low, or moderate priority does not reflect importance. It signifies which projects require focus over the next 2-3 years. All projects are important and will not be removed from the list. The significance is related to timing. Overdraft conditions and highest rate of growth were also considered to develop priority.

Conservation was placed high at the top of the list due to the fact that it will take time to fully implement and immediate benefits can be expected.

The two alternatives which will be presented to the Mojave Water Agency Board will allow for a variety of different perspectives. The priority list is also necessary for CEQA requirements. There is another alternatives process necessary for CEQA.

Mr. Hill indicated a need to revise the priority for the Alto Wellhead Treatment project to high. Another recommendation from Mr. Hill was to add the Alto West Regional location to the table with a high-priority status. The table was subsequently adjusted to reflect these comments.

Mr. Brill added that the purpose is to meet 2020 needs and does not necessarily take operational needs that may be required. Priorities can be adjusted but the focus needs to be on the big picture.

Mr. Davis requested and the Committee agreed that a moderate priority status should be placed on the recharge into the Transition Zone Floodplain.

Mr. Brill referenced the term used for the Baja Floodplain being referred to as Regional--if it is Regional, then it is being pursued with the terminus of the Mojave River Pipeline in Newberry Springs. Mr. Kirby stated that there is some disagreement as to whether Newberry Springs is in the Regional or Floodplain Aquifer. The USGS map indicates that the Floodplain is quite wide in this region which would indicate that it is in the Floodplain, however, some disagree. Mr. Brill added that the only thing that would change is whether it is existing or being pursued with the priority still being moderate.

Mr. Bell requested the definition of Este Regional versus Lucerne Valley. Mr. Williamson replied that Este Regional would be west of the Helendale Fault. Mr. Williamson further clarified for Mr. Bell that the Cushenbury Fault is the Helendale Fault and that the water flowing from the mountains can be diverted either west or east. The modeling has been done with the flow directed west. Mr. Bell does not feel that this area is the Mojave Regional Aquifer. It was determined that this would be referred to as the Lucerne Basin. In response to Mr. Bell's comments, Mr. Kirby suggested that the Este Regional and Lucerne Valley categories be combined into one. It was decided that the identification and classification of the project can be addressed at a future time. With reference to the priority listing, the determination was that they were appropriate as presented with Este Regional having a moderate priority and Lucerne a low priority.

Mr. Lyons stated that there are currently feasibility studies underway in the Copper Mountain Valley. The table was therefore revised to reflect that recharge projects in Copper Mountain Valley are being pursued and the overdraft in the aquifer is moderate with a moderate priority assignment.

The amount of overdraft for Pioneertown Water Supply was revised to reflect a high rating as a result of a comment from an unidentified individual.

Mr. Kirby noted that with regard to recharge in Means/Ames Valley, Bighorn Desert View commented that some of their water is being produced outside of this area. In the past, Bighorn Desert View has been treated as part of Means/Ames Valley.

In response to a comment by Mr. Pearl, overdraft in the Means/Ames Valley was revised to reflect a moderate standing. Mr. Pearl also added that on Table 1 there needs to be an "x" added to the column D5r next to Warren Valley. This sub-basin is also in an overdraft and needs to be revised to reflect a moderate standing.

Mr. Brill revised Table 1 to reflect the removal of "x"s next to Kane Wash Recharge Ponds and the addition of "x"s next to Newberry Springs Recharge Ponds. Mr. Kirby added that this is due to recent discussions to refer to Newberry Springs as part of the Floodplain Aquifer. Mr. Brill suggested that the delineation line be looked at to determine whether Newberry Springs is located in the Floodplain or Regional Aquifer. The "x"s were then added to Newberry Springs which is to remain in the Floodplain Aquifer until further research can be done. If it is determined to be located within the Regional Aquifer, it will be moved on the table.

Mr. Pearl requested the addition of a column in Table 2 to indicate whether a project has occurred as a result of the Phase 1 or Phase 2 process. Mr. Pearl referred to the Yucca Valley Waste Water Facility which is expected to be constructed in the next 20 years, that is not on the list of projects and is a priority. Mr. Kirby responded that the reason that this project is not on the priority list is because it was not considered an alternative solution to the issues which were outlined. The priority list does not address all projects that every entity is involved with on their own. The list is more related to the common projects with common solutions.

Mr. Davis expressed concern with the difference of projects on the D5r and D6r list being considered as a whole rather than separately. Mr. Kirby assured Mr. Davis that the Mojave Water Agency Board will be informed that these are not the only two combinations of projects and management actions. Due to the fact that these were the ones that were modeled, time restraints do not permit any revisions at this point. However, since these were the projects that made the list, the ultimate choice can be any combination. Mr. Kirby suggested that the two columns on Table 1 be combined into one. This would reinforce the fact that there a number of combinations rather than only two.

Mr. Hill requested that the currently available injection wells be included in the table in the West Regional Mojave sub-aquifer. This would not change the modeling since 12,000 acre-feet has already been considered. Mr. Hill reminded that when average annual recharges are being referred to, it takes into account that more will be necessary to achieve the annual average. Mr. Kirby agreed and added that these are target amounts. These amounts will vary once a more detailed feasibility is performed.

Mr. Bell asked if the priorities of the plan could be adjusted based upon unusual supply circumstances. Mr. Brill stated that the plan is intended to be flexible; adding that it is a roadmap to allow the allocation of resources in a resourceful manner.

7. ACTION BY THE TECHNICAL ADVISORY COMMITTEE RECOMMENDING ALTERNATIVES TO THE MOJAVE WATER AGENCY BOARD FOR PHASE 3

The list of projects and management actions will be presented to the Mojave Water Agency Board on April 24, 2003. The Board will be requested to adopt the recommendation with which to carry forward into Phase 3. Mr. Brill emphasized that this is not being brought to the Board for a selection of projects. This is something that legally cannot be done at this point in the process. The request is going to be for the approval to move into the next phase of the process which will be the feasibility and recombining of alternatives, which is the environmental documentation phase. The result will provide a much smaller focus.

Ms. Cox requested a motion to approve the package which will be presented to the Mojave Water Agency Board for approval on April 24. Noted was the revision to "draft" Attachment "A" of the current memo format being changed to a letter format. In addition, a participation list will be added to the package. Motion was made by Mr. Hill to accept the revisions as stated. The motion was seconded by Mr. Davis and unanimously approved.

8. OTHER BUSINESS

Ms. Cox reminded the participants of the Water Symposium scheduled for May 1, 2003. Mr. Brill added that the conference will be held at Victor Valley College. The conference is directed toward the elected officials to clear up any misconceptions, also to inform them of the critical role that water holds for the future. Considering the interrelationship of the water system, it needs to be addressed that the solution requires a broad focus.

Mr. Brill thanked everyone for their participation in Phase 2. He looks forward to continued involvement of the TAC with Phase 3.

Copies of the presentation of this meeting were made available as noted by Ms. Cox.

9. ADJOURNMENT

Motion to adjourn was made and seconded at 11:50 a.m.

Kimberly Cox - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — March 19, 2003
Apple Valley, CA 92307 — 9:00 a.m.

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1. **CALL TO ORDER**: Chairman Cox called the meeting to order at 9:00 a.m.

2. **INTRODUCTIONS**: Introductions of 39 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

3a. **SPECIAL PRESENTATION**: Chairman Cox presented Jack Clark with a plaque in appreciation for his past three years of service to the Technical Advisory Committee. Mr. Clark commended the Mojave Water Agency Board of Directors and Staff for the advances that have been made over the years. He added that the many improvements in the region are especially due to the involvement of the Technical Advisory Committee members and supporters.

4. **APPROVAL OF MINUTES FROM FEBRUARY 19, 2003 MEETING**: The minutes were approved with the following revision noted on page 4-3, second paragraph should read "…Scenario 1 Agriculture is a continuation of the **2000** level…"

5. **PRESENT FINAL SCREENING RESULTS**: Mr. Brill expressed his appreciation to those in attendance for taking the time out of their busy day to participate in this process. Due to the complexity of the development of the Regional Water Management Plan, participation is the vital to the success of this Plan.

   Mr. Kirby reviewed the difference in the Phases. The current status is the development of Phase 2 which involves the development of objectives, evaluation of alternatives and selection of alternatives. With the aid of a PowerPoint presentation, Mr. Kirby reviewed a systems approach to screening. (A complete copy of the PowerPoint presentation is attached to the minutes on file.) This meeting is nearing the conclusion of Phase 2.

With regard to the alternatives being presented for the development of the Regional Water Management Plan (RWMP), it is presumed that the terms of the Judgment will be implemented. The data from the Phase 1 report is what will be used in order to meet the 2020 needs. There has been some disagreement with the demand levels reported in the Phase 1 Report, in particular Morongo Basin/Johnson Valley. At this point, there is no new data that can be substantiated or that everyone can agree on. Therefore, the levels reported in the Phase 1 Report will be used and it is understood that updating will be required when it comes to long-term planning. There were two agriculture scenarios reviewed. Scenario 1 is considering year 2000 level agriculture. Scenario 2 is a substantially reduced level of agriculture. This scenario will allow agriculture to continue to produce the water for the level of demand without having to pay to import water. The presumption is that 4900 acre feet of State Water Project water will be imported to AVEK, Hi-Desert, and make-up water to Hodge and Lenwood. A comparison of year 2000 levels with demands of 2020 with Scenario 1 cannot meet the demands. Scenario 2 comes close to meeting demands of 2020. State Water Project water estimates 78% reliability in 2020.

An aggressive approach to the impact of 20% conservation of municipal use was considered. There is some question as to whether or not this would be possible; however, it was considered to determine the likely impacts. The possible occurrence of Base Annual Production (BAP) transfers from lower value to higher value uses were also considered in the model by using historical data to determine trends. At 80% Rampdown levels, Scenario 1 demand indicates some areas are below; however, Alto can be expected to indicate the greatest rise under both scenarios. In order to obtain balance in 2020 by implementation of the Judgment, Este would need to rampdown to 22%, Oeste 18%, Alto 44%, Centro 71%, and Baja 12%, to meet the Sustainable Free Production.

It is presumed that production between Warren Valley and Means/Ames Valley can be exchanged between the basins to balance this area. This is based on current methods being performed and comments received.

The alternatives which were preferred by the TAC at the last meeting were refined and are being presented for consideration at this meeting. Alternatives B3 and B4 appear promising in meeting close to 100% of the demands for the entire service area in 2020.

Based on comments received at the last meeting revisions to the way the model operates relative to groundwater elevations especially in the Transition Zone. It was determined that due to the use of an extraction of the MODFLOW model in which this scenario was different than the MODFLOW model, the result was an overfilling of the groundwater basin beyond capacity. Revisions have been made to limit the ability to hold water which results in more river flow.

The modeling determined that a subarea obtaining balance does not necessarily result in all aquifers within this area being in balance. This will require internal refinement. Another finding was that the river and groundwater flow into Baja does not change with supply or demands upstream. The Centro subarea is in surplus with all the alternatives.

Mr. Kirby addressed the comments received from the following:

John Leveilee & Michael Podegracz, City of Hesperia
Randy Hill, Victor Valley Water District
Patrick Lendway, City of Barstow
Chuck Bell, citizen
Spike Lynch, Ginger Hancock, et al.,
Newberry Springs-Harvard Real Property Owners Association
Hildamae Voght,
Newberry Springs-Harvard Real Property Owners Association
Matthew Woods, citizen, Lucerne Valley
Gary Ledford, Jess Ranch
Terry Lyons, Joshua Basin Water District
Lee Pearl, Hi-Desert Water District
Kimberly Cox, City of Victorville

Summaries of the comments are included in the PowerPoint presentation and original documents are attached to the minutes on file.

Mr. Kirby stated that the list in which the TAC is working to establish is a priority list, not an exclusionary list. This will help gain focus on accomplishing the most important projects first.

Mr. Hill from Victor Valley Water District added that when an average recharge is referred to at a particular location, it is important for everyone to understand that these are averages and any facilities that are constructed would have to be capable of releasing more than the average. This will allow for years in which State Water Project water is available can be banked to balance years when water may be unavailable. Mr. Kirby agreed stating that the maximum amount will be greater than the average amount of water demonstrated.

In response to a comment from Mr. Bell regarding the RWMP including funding for water and sewer service for Lucerne Valley, Mr. Brill stated that this is more of a water quality issue which needs to be addressed.

Mr. Brill responded to a question raised by Mr. Woods regarding the relationship of groundwater banking to the RWMP. The guidelines for water banking which were adopted by the Board state that they are interim guidelines until the RWMP has been concluded. They are basin wide and allow the Agency to move forward immediately to begin banking in areas which fit the criteria of available water; facilities to recharge; and projected demands.

In response to a comment from Terry Lyons, Joshua Basin Water District, material being distributed prior to monthly meetings, Mr. Kirby stated that this is impossible given the aggressiveness of the schedule. Phase 3 may not require as much time to evaluate and work the data as is necessary in Phase 2.

There was a comment from Lee Pearl regarding transfer of water from Ames/Means basin to Warren Basin. Mr. Kirby stated that according to historical data which has been gathered, this is already taking place and will continue.

In response to a comment presented by Ms. Cox, City of Victorville, Mr. Kirby disagreed that a regional treatment plant is impractical due to unpredictability of State Water Project water supply. Mr. Kirby stated that this may be true when considering a large treatment plant, but a small plant makes much sense.

Mr. Williamson demonstrated the differences in alternatives by use of a graph which was distributed at this meeting and included with the PowerPoint presentation. This graph listed Alternatives A and C together since they are considered high-demand scenarios with Alternatives B and D considering low-demands. There has been a correction made to the water levels in the Transition Zone related to C and D scenarios. As noted earlier, Mr. Williamson stated that the model had represented the flow in groundwater from the Transition Zone floodplain aquifer to the Centro basin in terms which were determined to be unrealistically high relative to the average ground surface elevation. The correction has been made to the model. The average elevation was determined to be 2,510 feet above sea level. Any flow which exceeds this elevation will be demonstrated as surface flow in the stream channel into the Centro basin. The result will be greater river flows from Alto to Centro. Based on the Phase 1 report and the Watermaster report which indicate an average annual river flow of approximately 34,000 acre-feet per year, the modeling was run on 37,000 acre-feet per year under 2020 conditions. The finding is that this flow was underestimated by about 8,000 acre-feet a year, primarily due to the reclamation discharges to the Transition Zone floodplain aquifer which is currently 9,700 acre-feet per year. Mr. Kirby added that this does not resemble base flow. The model is demonstrating that due to the fact that the Transition Zone is fairly full many of the years, when peak water flow exists, the water is able to flow through. The low points still signify a decrease in water level, but when a high flow exists, there is more water in the river.

Mr. Williamson presented the new alternatives which represent the new Transition Zone relationship. As a reminder, Mr. Williamson stated that there are various categories of projects: Supply Enhancement Projects, includes State Water Project and non-State Water Project supplies including Baja storm retention, and an analysis of the Cushenburry Canyon recharge project in Este; and Management Actions. A new numbering system to signify the various projects was presented with the following letter designations prior to the project number:

“F” - Floodplain Aquifer Recharge Projects
“N” - Non-floodplain Aquifer Recharge Projects
“W” - Water Treatment Management Actions,
“C” - Conservation and Storage Agreements (Management Action)

Mr. Williamson defined the F10 project for Mr. Hill, stating that F10 is a recharge project to the south of the pipeline. This will allow conveyance to some of the mountain-front areas.

Mr. Williamson mentioned that some projects such as Hinkley and Pioneertown have been omitted from the list. However, there is an assumption that an alternative water supply for the Hinkley area would be implemented for any alternative primarily for water quality reasons. This would include pumping from the floodplain aquifer to Hinkley which is in the regional aquifer. The same scheme exists for Pioneertown.

The significant variations in the alternatives are: recharge options; regional treatment plant; urban conservation, 0%, 5%, 20%; and storm flow retention (Baja and Cushenburry). In response to a comment made by Mr. Bilhorn, Mr. Caouette clarified that the storm flow retention is primarily related to the Baja area since this is the end which is different from impeding storm flow in Alto which would affect Centro and Baja. These projects would exist in the lower Baja area.

There are some common assumptions for all the projects: full implementation of the Judgment; State Water Project supply to AVEK and make-up water to Hodge/Lenwood ponds; Victor Valley Wastwater Reclamation Authority operation; supply to Hinkley, Pioneertown, Alto wellhead treatment. Mr. Hill provided the information that there is a motion pending before the court which would signify that make-up water from Alto would be released to the Transition Zone rather than the Hodge/Lenwood basins. Mr. Williamson was unaware of this pending motion, but would take it into consideration.

Alternatives List –
C0 - No action with Agricultural Scenario 1
C3 - Agricultural demands at 80% Rampdown levels with no municipal conservation
D0 - No action with Agricultural Scenario 2
D2 - 46,000 AF/yr treatment plant with 5% municipal conservation
D3 - No treatment plant with 5% municipal conservation
D5 - 26,000 AF/yr treatment plant with 20% municipal conservation
D6 - No treatment plant with 20% municipal conservation

D7 - No treatment plant with 20% municipal conservation, with 40,000 AF/yr release from Rock Springs Outlet

Mr. Williamson added that Pioneertown is common to all action alternatives.

Mr. Hill asked if the recharge facility south of Rock Springs being considered to support entitlement swap. Mr. Williamson clarified that this was not the case. There is a water supply deficit in this eastern portion of the regional aquifer. This eastern portion includes the area from the mountain front to the eastern portion of Apple Valley. The location of the recharge facility is necessary within this vicinity, whether at Rock Springs or some other comparable facility. Mr. Bilhorn was under the impression that a facility was more needed toward the southern portion of Hesperia. Mr. Williamson stated that there a number of facilities south of Hesperia such as Antelope Wash and Oro Grande Wash. Mr. Brill stated that this planned recharge facility south of Rock Springs needs further review, since it seems that it would be difficult to get the water into the regional system. Mr. Williamson stated that he would check into this and report back to the TAC.

Mr. Bell inquired as to the differences between the Lucerne Valley Recharge Ponds and the Recharge Ponds west of Helendale Fault. Mr. Williamson clarified that the Lucerne Valley Recharge ponds are east of the fault. It has been determined that most of the deficit lies west of the fault. Mr. Bell suggested that Mr. Bob Wagner, Watermaster Engineer, be consulted with regard to this issue.

Alternative C0 Summary –

- 40% of total MWA demand met
- 62% of Agricultural demands met in Alto and 29% of Agricultural demands met in Alto and 29% of Agricultural demands met in Baja
- 24% of municipal demands met in Alto

Alternative C3 Summary –

- 100% of Agricultural demands met
- 85% of total MWA demand met
- 41% of Agricultural demands met in Alto and Baja
- Between 70% to 78% of municipal demands met in Alto, Baja, Este, and Oeste
- Baja Regional aquifer declines 24 feet
- Baja Floodplain aquifer declines 28 feet

Mr. Kirby responded to a comment by an unidentified individual that there are not 3 recharge projects included in Alternative C3 was due to there not being enough water to spread to all 3 projects. The goal is to meet the demands in 2020 with looking at the variability and what agricultural demand could be. In this case, with the available water, there is not enough water to go around. Therefore, only the number of projects was used to justify the distribution of available water.

The result of Alternative C3 is the Baja floodplain and regional aquifers continue to exist in overdraft condition.

Mr. Brill added that this is the alternative presented at the last meeting which was prompted by the current knowledge of the direction the Court is heading with relation to the Mojave River Basin. However, this does assume 0% conservation which is an option. Mr. Bell clarified that this also assumes that there will be no transfer from Agriculture to Municipal & Industrial production. Mr. Kirby stated that this scenario was used to determine if it would even be possible. It was determined that it is not possible. Mr. Brill clarified that these issues are related sub-basin by sub-basin, specifically when referring to agricultural remaining and the burden taken upon by others not overall.

Alternative D0 Summary –

- 29% of total demand met in Alto and Oeste
- 51% of total demand met in Baja
- 74% of total demand met in Este
- 26% of municipal demands met in Alto
- 100% of agricultural demands met without import water

Mr. Williamson pointed out that 100% of all agricultural demands are met in all the "D" alternatives, using existing base annual production credits and no State Project water.

Alternative D2 Summary –

- 95% of total MWA demand met
- Less than 80% of municipal demands met in Baja, Este, and Oeste
- Although Alto is in balance overall, there is not enough flexibility to balance all sub-aquifers

This alternative is a variant of Alternative B2. Mr. Williamson did confirm during a break at this meeting that the recharge facilities south of the Rock Springs turn-out does recharge to the floodplain aquifer. Mr. Davis asked for clarification of the reference to "less than 80%". Mr. Williamson replied that it is within the 70% - 80% band.

Alternative D3 Summary –

- 96% of total MWA demand met
- Between 93% and 96% of municipal demands met in Alto, Este, and Oeste
- No sub-aquifers are significantly declining

Variation of Alternative B3. Mr. Williamson noted that Baja was modeled using two aquifers for the entire subarea, floodplain and regional aquifers. It was recognized that there are two significant faults within this area that further sub-divides the basin. Taking this into consideration, it may make sense to perform smaller projects in these areas that are divided by the faults. For the purpose of this assessment, the entire regional and floodplain aquifer were aggregated.

Alternative D5 Summary –
- 98% of total MWA demand met
- 96% of municipal demands met in Oeste and 98% met in Este
- No sub-aquifers are significantly declining

This alternative is different from the other 20% conservations alternatives due to the inclusion of a regional water treatment plant which possess a 26,000 acre-feet per year capacity.

Alternative D6 Summary –
- 100% of total MWA demand met
- No sub-aquifers are significantly declining
- 1000 AF unused SWP supply

This alternative does not include a regional water treatment plant.

Alternative D7 Summary –
- 100% of total MWA demand met
- There are significant declines in groundwater elevations in the Alto Floodplain and Regional Aquifers
- 1700 AF unused SWP supply

The significant difference in this alternative is that a large release from the Rock Springs turn-out into the Mojave River would result in some effect downstream. Mr. Williams provided additional information that on average, releasing 40,000 acre-feet per year of State Water Project supply in addition to natural flow, there is an increase of the water which travels downstream.

Key Findings –
- When Agricultural demand is at 80% Rampdown levels, there are significant shortages even at full SWP allocation
  - Baja Regional Aquifer declines 24 feet
  - Baja Floodplain Aquifer declines 28 feet
- Possible to meet demands under Agricultural Scenario 2 with 20% municipal conservation
- Large Regional Surface Water Treatment Plant limits operational flexibility
- High Rock Springs Outlet release does not balance Alto groundwater levels

Mr. Kirby stated that it is not possible to meet more than agricultural scenario 2 and a projected urban level of development in 2020 with the available water. Considering aggressive conservation, lowering the level of agricultural demand and projection of growth in 2020 will allow full utilization of available water.

The regional aquifer in the Transition Zone indicates an increase in elevations over time due to the fact that there is not significant production in this area and return flow exists. Wastewater return flow exists in the floodplain aquifer which provides water to the regional aquifer. Even under the no action alternative, an increase in elevations can be expected in the regional aquifer in 2020. Mr. Kirby added that a no action alternative does consider implementation of the Judgment.

Alto Regional Water Levels –

- Alternatives that reasonably balance the Alto subarea typically demand at least 80% of MWA's current State Water Project water.
- Balance can be achieved in the Alto regional aquifer with or without a large capacity (46,000 acre-feet per year) Surface Water Treatment Plant.
- Large releases (40,000 acre-feet per year) from Rock Springs does not balance Alto groundwater levels.

Mr. Williamson clarified for Mr. Davis that when referring to 20% municipal conservation assumes that a 20% conservation is reached by 2020, not an immediate reduction. Mr. Williams also noted that the best performing alternatives have the 20% municipal conservation assumption.

Referring to the subarea interaction of the Mojave River, Mr. Williamson stated that with exception of the case of a large Rock Springs release, river flow between Centro and Baja does not significantly change between the alternatives.

Mr. Kirby noted that the numbers that are referred to in the Water Supply Performance relate to average performance not the capacity of the recharge facilities which would be larger. Mr. Williamson also mentioned that the supply to the AVEK Power Plant, make-up water to Hodge, Lenwood and Warren Valley are common to Alternatives C0 and D0.

Alternatives D2 and D5 have a larger capital cost due to the inclusion of large treatment plants. Mr. Kirby added that the costs do not include conservation costs and presumes that there will be very aggressive recharge into the regional aquifers. The costs are to be lightly considered; since, it may be required to implement well injections rather than ponds which will increase the costs. These costs do not reflect the fact that 20% conservation will impose additional costs. Mr. Kirby added that the graph depicts that there is no one alternative which clearly stands out as superior in terms of cost.

Mr. Kirby stated that his involvement with CalFed to determine the goals of the future. A large focus of the Delta is regarding water quality. Water quality is measured at various locations along the California Aqueduct. Water from the State Water Project has lower concentration levels of arsenic than the average native groundwater in the Mojave Basin. It is not expected that the arsenic levels of the State Water Project will increase in the years to come, however, native groundwater levels of arsenic are expected to rise. The Arsenic Index graph presented by Mr. Kirby indicates a variance in arsenic levels per subarea for each alternative. This variance is due to the volumetric difference. The higher number on the graph indicates a improvement in water quality by comparison. In terms of arsenic, the State Water Project water is better than the native water. Boron concentrations are mixed. In some cases native water is lower than State Water Project water. Fluoride levels are lower in State Water Project water than the native concentrations. Iron is mixed depending on the subarea. Manganese is lower in State Water Project water in all areas except for Alto and Oeste. Nitrate concentrations are also mixed. In terms of a change in the State Water Project water, it is expected that nitrate concentrations will increase. Lowering the TDS levels in the State Water Project water is one of the primary objectives of the Delta. It is likely that this level will decrease in the future, which it is already lower than the native groundwater except in Alto. Mr. Kirby noted that this is a very broad look which is based on averages and that there is much variance within the basins. There was some discussion on methods which can be used to inject water so as not to contaminate it with the existing water.

Mr. Kirby summarized the key findings stating:

- Cannot meet demand under Agricultural Scenario 1 with natural and State Water Project water
- State Project water supplies are variable – DWR predicts average 78% delivery of contract amount
- When subarea is in balance, portions of aquifer can still be in overdraft
- Numerous projects required in all alternatives
- River/groundwater flow into Baja does not change significantly in alternatives modeled
- Centro in surplus in all alternatives

Mr. Brill stated that this plan is designed to be from a system wide perspective and may include project which may not be fully implemented by Mojave Water Agency alone. Projects will be considered along these lines.

Mr. Davis stated that he would like the focus to be on Alternatives 5 and 6, which provide the greatest potential for long-term gain in storage and the most likely to meet the needs of the projected growth of 2020. Mr. Snively agreed and added that these project alternatives also meet the needs of all the basins. Ms. Gray stated that D6 is preferable due to the prudence of allowing a buffer of the extra water being available if for any reason state water is not available. Mr. Kirby clarified that this is not actually a buffer due to the fact that this reflects an unbalance in Alto. It is an increased river flow with a surplus condition in some of the basins downstream and a continuing decline in the regional aquifers in Alto. Ms. Gray replied that this alternative is preferred. Mr. Hill asked for additional modeling of conservation. He does believe that 20% conservation is possible, but would like to have 10% illustrated. Also, an analysis of a water treatment plant included at 12 rather than 46 or 25. Mr. Hill feels that the in-lieu exchange for a treatment plant is extremely beneficial especially with the pending arsenic resolution. This may be extremely cost-effect when compared to the costs involved with building small treatment plants on each well. Victor Valley Water District wells would then be taken off-line when State Water Project water is available. Mr. Hill and Mr. Bilhorn would like more information on the Rock Springs recharge project.

Preferred Alternatives-

- D3
- D5 (with refinement)
- D6
- D7

Mr. Brill asked that a provision in the Judgment of a 21,000 acre-feet surface base flow be used as a performance objective. Mr. Kirby stated that this stipulation is a 21,000 or a balanced condition which is already being taken into account. Mr. Brill suggested that the surplus from Centro be used to help achieve balance. Mr. Kirby responded that he thinks that this is already being done, but he will verify with his staff.

Mr. Hill presented a long-term water supply operation of the possibility of “Entitlement Swapping” with other State Water Project Contractors. As an example, Mr. Hill stated that the Mojave Water Agency could enter into an agreement with the Metropolitan Water District to store water locally in order to allow them to meet their interim surface water requirements. This could generate addition revenue to purchase water or as Mr. Hill suggested a 2 for 1 trade. This is an option which can be considered in Phase 3.

6. **EQUITY AND IMPLEMENTABILITY**

As part of the initial objectives of this phase of the plan, the solutions were to be implementable and equitable.

Mr. Kirby presented a chart which rated the alternatives implementability due to the following criteria:

a) Utilized existing facilities
b) Number of permits required is minimized
c) Environmental impact is low

d) Solves more than one problem
e) No secondary or redirected impacts
f) Does not limit resources management flexibility
g) Does not significantly limit implementation of other solutions

Mr. Kirby clarified for Mr. Davis that the reference of “No secondary or redirected impacts” is relative to a project being beneficial to one area but harming another.

Everyone agreed that there is not a significant difference in implementability between Alternatives D3, D5, and D6.

Equity Chart Criteria-
a) Unbiased and objective, reasonable and consistent
b) Likely to result in few claims or grievances
c) Allows people to meet reasonable goals
d) Preserves a mix of livelihoods
e) Solution is in the best interests of all concerned
f) Magnitude of benefits provided is acceptable
g) Willingness to pay for the applied solution

Mr. Kirby stated that beginning this next fiscal year, Prop. 50 will be releasing quite a bit of money which may be available. The goal is for this report to be 100% in compliance with what the Department of Water Resources needs to see to qualify for grant funding.

There was some discussion among Mr. Brill, Mr. Kirby, Mr. Hill, and Mr. Davis with regard to “Swap” versus “Sales” of entitlement and other possible options.

Project Ranking Criteria-
a) Capital Cost
b) Operation Cost
c) Annualized Cost
d) Demands Met (total)
e) Demands Met (%)
f) Change in Storage
g) Water Quality
h) Implementability
i) Equity

Ms. Gray requested that it is necessary to review more detail of the costs involved with implementation of the different projects. Mr. Brill agreed and stated that this would occur more in the Phase 3 process.

Phasing will be looked at the next meeting now that the focus has been narrowed down to only a few alternatives.

Mr. Kirby stated that the large recharge facilities will most likely require utilizing perk-ponds and injection wells which will increase the cost of the recharge program. If the annualized cost of these alternatives is reviewed with the uncertainty and the cost of the conservation plan, a number of alternatives are indistinguishable at this point. The capital cost to build a treatment facility does not preclude it from being a viable alternative due to the flexibility of not counting on a very massive recharge project. It will also contribute a water quality issue. It may be a considerable expense, but when the annual cost given the uncertainty of the other issues, there really is not much difference. Especially, if a smaller size or in-lieu of pumping decided upon.

Ms. Cox concluded the meeting by requesting that any written comments be submitted by Wednesday, March 26, 2003. Ms. Cox stated that the Committee has determined that Alternatives D3, D5, D6 and what is being referred to as Randy's D5 Prime.

7. **OTHER BUSINESS**

Ms. Cox informed the Committee of the Rampdown Hearings taking place on Friday, March 21, 2003, at the Superior Court at 9:30 a.m. for anyone interested. In addition, noted were the Community Meetings on April 7, 8, and 9. Ms. Cox emphasized the importance of these meetings to involve others with encouraging their involvement with this process.

Mr. Brill stated that there is a Water Symposium scheduled for May 1 at Victor Valley College. This is somewhat related to the Regional Water Management Plan, but also includes the various different water issues. This will be geared primarily at the elected officials to give them the opportunity to receive relative information and provide a dialogue with them and other constituents.

8. **ADJOURNMENT –** 1:30 p.m.

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Kimberly Cox - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — February 19, 2003
Apple Valley, CA 92307 — 9:00 a.m.

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1. **CALL TO ORDER**: Chairman Cox called the meeting to order at 9:00 a.m.

2. **INTRODUCTIONS**: Introductions of 42 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM NOVEMBER 20, 2002, AND DECEMBER 18, 2002 MEETINGS**: The minutes were approved as submitted.

5. **APPOINTMENT OF REPRESENTATIVE FOR LOWER MOJAVE RIVER BASIN AREA 2003 TAC EXECUTIVE COMMITTEE -**

   Ms. Karen Gray and Mr. Wayne Snively were nominated to represent the Lower Mojave River Basin Area. Chairman Cox called for an oral vote in which Karen Gray received 12 votes and Wayne Snively received 2 votes. Therefore, Karen Gray will represent the Lower Mojave River Basin Area for 2003.

6. **PROMISING PROJECT COMBINATIONS –**

   Mr. Ken Kirby of Saracino-Kirby-Snow began by making note that the views expressed at this meeting are not necessarily the views of the Mojave Water Agency. The information presented is designed to provoke discussion in which to learn about the system. The decisions will ultimately be made by the Mojave Water Agency Board. Mr. Kirby stated that there will be two alternatives presented to the Board in April.

   The process of modeling was reviewed by Mr. Kirby. The modeling process is a tool designed to attempt to foresee the needs of 2020, based on information from the USGS modflow model in addition to understanding the physical system.

Mr. Kirby received comments from the following constituents (details to comments are included with the PowerPoint Presentation on file):

- **Patrick Lendway, City of Barstow**
- **Ginger Hancock, Newberry Springs-Harvard Real Property Owners Association** – Mr. Wayne Snively added that they would like to make sure that these comments are considered in the final model. Particularly, the concern that the water is to be spread once released in their area. There are also the concerns that this basin is going to be used as a storage basin for other areas. Mr. Kirby stated that most of these issues are not going to have an impact on the current modeling due to the level of focus being taken at this time.
- **Terry Lyons, Joshua Basin Water District** – Mr. Terry Lyons stated that, as with most of the area, overdraft conditions exist; however, a pipeline exists in this district which needs to be extended to deliver water into their district.
- **Lee Pearl, Hi-Desert Water District** - Mr. Lee Pearl added that there are other agencies that would like to see the Ames/Means recharge project constructed and that Hi-Desert Water District is not alone in this endeavor.
- **Daniel Gallagher, Victor Valley Wastewater Reclamation Authority** – Mr. Kirby commented in response to one of the comments from Mr. Gallagher that the reason for the aggressive schedule is due to the funding requirements and scheduling from mandated by the Department of Water Resources.
- **Michael Duane Davis, Silver Lake Association** – Mr. Kirby stated that the project which was presented looks promising, however, is not in the current round of alternatives. More details are needed and the project may be considered for the next phase.

Mr. Kirby continued stating that the modeling process is based on the full implementation of the Judgment; therefore, each subarea needs to be in balance. Mr. Kirby stated that the key findings of the model determined that it was not possible to meet the agricultural demands of 2020 with only the natural recharge and State Water Project water. The State Water supplies are variable. Department of Water Resources has determined that delivery of an annual average of 78% of the contract right can be anticipated.

All alternatives require at least 10 projects and management actions to meet the needs of 2020. Mr. Kirby stated another notable determination which the model indicated was that the river and groundwater flow into Baja does not change significantly in any of the alternatives that were modeled. It is apparent that the only means in which to get water to this area is through recharge as opposed to naturally. In all the alternatives modeled, Centro had more water than was needed.

No-Action Alternatives -
Mr. Mark Williamson of Saracino-Kirby-Snow reviewed the no-action alternatives, specifically, future conditions which may have continuation of trends and reasonably foreseeable projects. This will include projects which are currently under construction.

The key assumptions being made in this process are that the Judgment is fully implemented including ramp-down to achieve balance of each subarea. Two alternatives were used in the modeling process. Scenario 1, Agriculture, which is a continuation of 2000 evels of agricultural water use, and Scenario 2, Agriculture, which reduces agricultural production by 36,000 acre-feet (60% reduction). This includes State Water imported water to the Antelope Valley/East Kern, power plant, make-up water at the Hodge and Lenwood recharge facilities, and to Hi-Desert Water District. These activities are currently taking 6,500 acre-feet per year. (Refer to PowerPoint presentation on file for more detail)

Each individual sector has been tracked to determine availability based on Base Annual Production (BAP). Transferring water from sector to sector assuming a surplus exists was reviewed. Mr. Williamson stated that an acre-foot of water applied to an agricultural operation will generally produce less economic output than that applied to an industrial operation. Therefore, transfers are moving from agricultural to industrial and municipal uses.

Production allowances were reviewed based on a no-action scenario. Transfers of BAP are estimated to be 58,000 acre feet in Scenario 1 and 116,000 in Scenario 2. Mr. Williamson added that from 1984 through September 2002 there has been 82,000 acre feet of water transferred. Mr. Kirby reminded that this is a prediction of the 2020 result of not taking any other actions other than ramp-down to balance the subareas. Transfers only occur within the subarea. Subarea boundaries are never crossed.

An unidentified individual commented that there is another adjudication and judgment stipulation involved with the Morongo Valley area. Mr. Williamson stated the alternatives for this area are designed to bring the basin in balance in the same way the Mojave River Basin Area is being considered. Any water available up to 7,200 acre feet is to be transmitted through the Morongo Basin Pipeline as a priority. Mr. Lee Pearl made clarification that the numbers which represent the natural recharge need to be updated on the chart. Also, there are various entities involved with this area namely County of San Bernardino and Bighorn Desert View not only Hi-Desert Water District. Mr. Williamson added that based on USGS estimation, the natural supply is considerably lower than that which was previously estimated.

In addition to consideration of imported water, also being considered in alternatives is the reduction of demand. Mr. Tom Bilhorn asked for a more detailed explanation of the storm flow capture in Baja which was mentioned in the slide titled “Supply Enhancement”. Mr. Williamson responded that there will be a technical memorandum to describe all the alternatives, which is not yet available. The reality of the over-taxed State Water Project systems is that there are more demands than supply and increasing environmental concerns through the Delta and other factors which will limit the delivery of the full contract amount in future years. This was illustrated with a series of slides (see PowerPoint presentation on file). A question was presented as to the possibility of loosing an entitlement of State Water Project water through non-use. Mr. Kirby stated that through his involvement at the state and federal level, there is no threat of contract right based on lack of use. Another consideration for use of State Water Project water is a regional water treatment plant in the jurisdiction of the Victor Valley Water District. This will need to be considered if such a plant could be operated with the amount of variability and supply.

Mr. Williamson reminded that there are six key water management issues to be addressed when considering the alternatives:

1. Demand Exceeding Supply
2. Water Quality Degradation
3. Groundwater Overdraft
4. Maintain Riparian Ecosystems
5. Address Issues of Wastewater Discharge and Infrastructure
6. Maintain Healthy Interaction Between Subareas

The eight basic management actions which can be taken to address these issues are:

1. Recharge Groundwater
2. Blend Supplies from Different Sources
3. Change Source of Groundwater Production
4. Change Demand
5. Use Surface Supplies
6. Develop Groundwater Banking Programs
7. Change Wastewater Infrastructure
8. Treat Source Water

Mr. Williamson reiterated that some of the aquifer units were divided to allow for more detail in the model. (Refer to the PowerPoint presentation included with the minutes on file for detailed divisions of aquifers.)

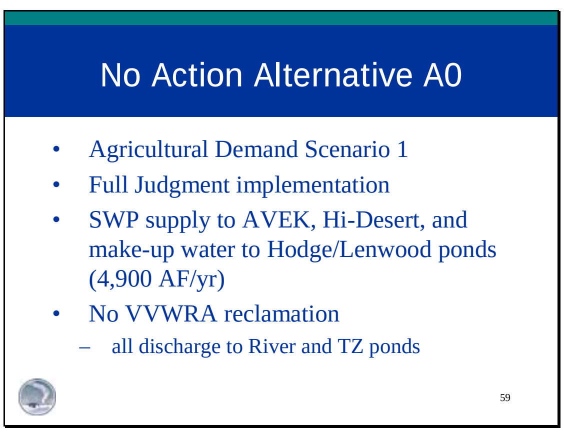
There were eight alternatives presented at this meeting. Three of which use the Agricultural Scenario 1 and five of which include Agricultural Scenario 2. Significant differences between the projects are the location of the recharge projects and whether a regional surface water treatment plant is included. Most alternatives include the assumption of reclamation of the Victor Valley Reclamation supply. Two of the alternatives include an assumption of 5% urban conservation and another two include storm-flow retention in the Baja area.

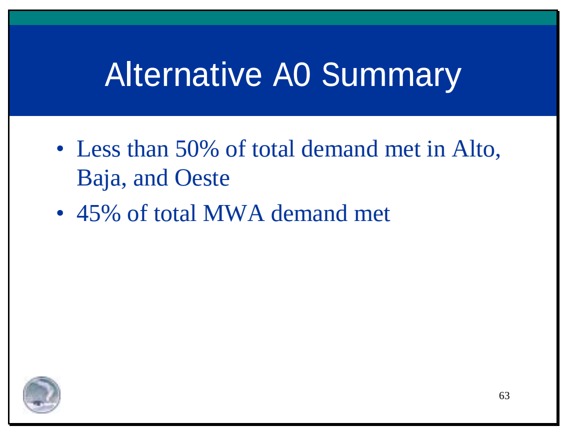
Mr. Kirby Brill asked if there was a more aggressive approach to the conservation management action assumption of 5% applied to reduce municipal demand. Mr. Brill's view is based on studies which indicate 40%-60% of urban use being outdoor use. Mr. Williamson replied that this was considered and due to the level of best management practice implementation that which made economic sense. There are more aggressive conservation measures which can be performed; however, 5% appeared to be most achievable. Mr. Brill would like response from the individual purveyors to determine where the goals can be set higher.

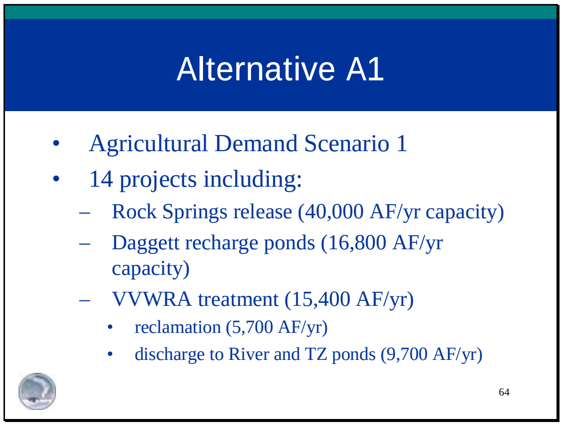
Lists of project alternatives were distributed at this meeting and are attached to the minutes of record and summarized as follows:

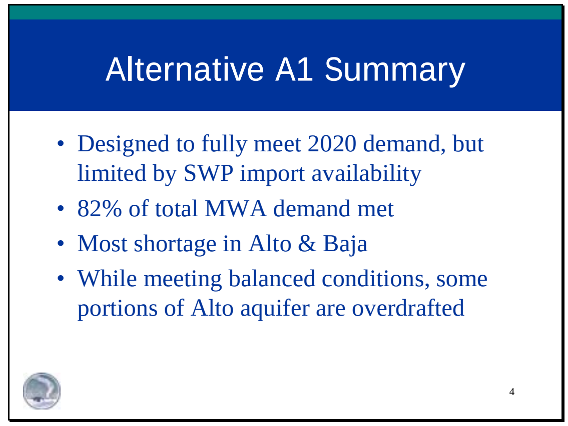
A0 alternative signifies the no-action alternative under Agricultural Scenario 1. B0 alternative is the no-action alternative for Agricultural Scenario 2. Under the no-action alternatives, less than 50% of the 2020 demands are capable of being met in Baja, Alto, and Oeste. In the Johnson Valley/Morongo Basin area, 80%-90% of demands are capable of being met. Centro is in surplus in all of the scenarios. Mr. Kirby clarified that whenever an alternative is illustrated with an "A", it is representative of the consumptive use for agricultural demands in the year 2000. The assumption is that they will remain constant from now until 2020. Urban demands are primarily based on expected population growth by region. Mr. Kirby added clarification to the no-action alternatives reflecting only the implementation of the terms of the Judgment with no additional facilities or additional State Water Project water.

"A" Alternatives reflect Agricultural demand Scenario #1.

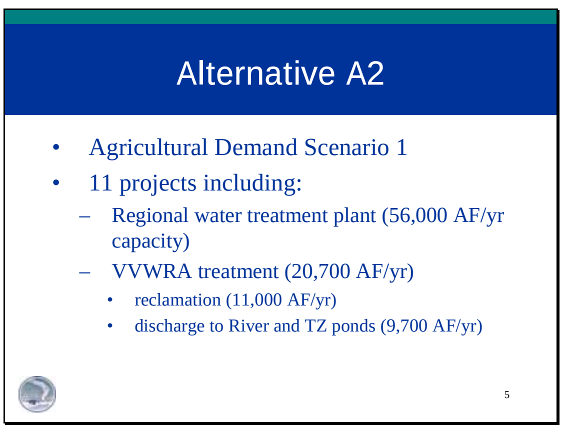


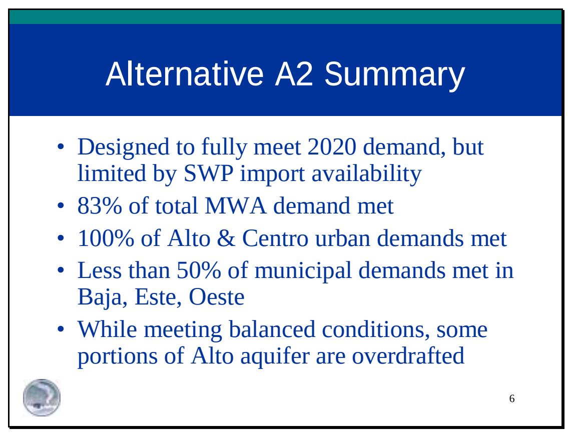




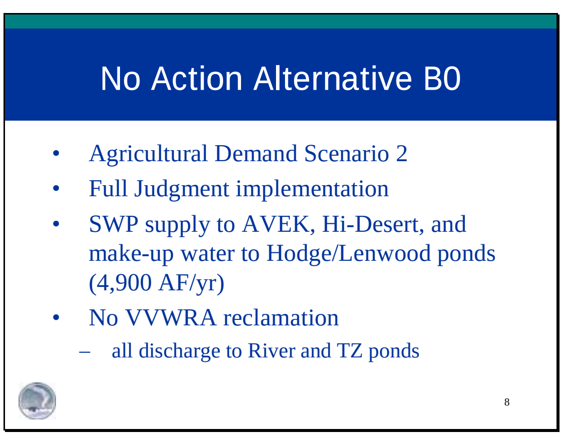


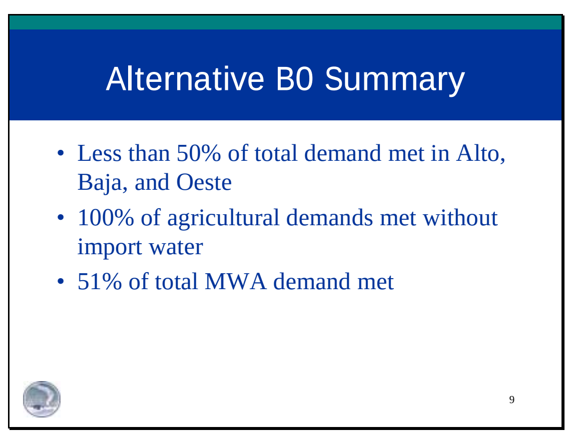
Mr. Chuck Bell asked whether the Cushenbury recharge ponds would be considered in the project alternatives. Mr. Williamson stated that it has not been included due to the lack of information with relation to the capacity of this facility. Mr. Kirby added that this does not mean that it has been excluded from the list. However, the projects about which we have the most information will be considered before those projects that are still in the developmental phase.





"B" Alternatives reflect Agricultural demand Scenario #2





Mr. Kirby compared the difference between A0 and B0, stating that if agriculture is reduced by 60% from 2000 to 2020, 50% of the demands are still not being met in Alto and Baja. In essence, removing agriculture out of production does not solve the problem.

Alternative B1

- Agricultural Demand Scenario 2
- 14 projects including:
  - Rock Springs release (40,000 AF/yr capacity)
  - VVWRA treatment (19,100 AF/yr)
    - reclamation (9,400 AF/yr)
    - discharge to River and TZ ponds (9,700 AF/yr)

10

Alternative B1 Summary

- 100% agricultural demands met
- 95% of total MWA demand met
- 92% of Alto municipal demand met
- 100% of Baja municipal demand met

11

Alternative B2

- Agricultural Demand Scenario 2
- 11 projects including:
  - Regional water treatment plant (56,000 AF/yr capacity)
  - VVWRA treatment (20,700 AF/yr)
    - reclamation (11,000 AF/yr)
    - discharge to River and TZ ponds (9,700 AF/yr)

12

Alternative B2 Summary

- 100% agricultural demands met
- 93% of total MWA demand met
- 100% of Alto municipal demand met
- 96% of total Alto demands met w/shortages to Golf Courses and Recreational
- Groundwater levels continue to decline in some portions of Alto
- 50% of Baja municipal demands met

13

Mr. Kirby added that from a water-balance stand point, modeling of the above scenario indicates that there is more water being placed in the Transition Zone and not enough in the Alto and mid-regional floodplain aquifers.

Alternative B3

- Agricultural Demand Scenario 2
- 14 projects including:
  - VVWRA treatment (19,000 AF/yr)
    - reclamation (9,300 AF/yr)
    - discharge to River and TZ ponds (9,700 AF/yr)
- 5% municipal conservation (8,100 AF/yr)

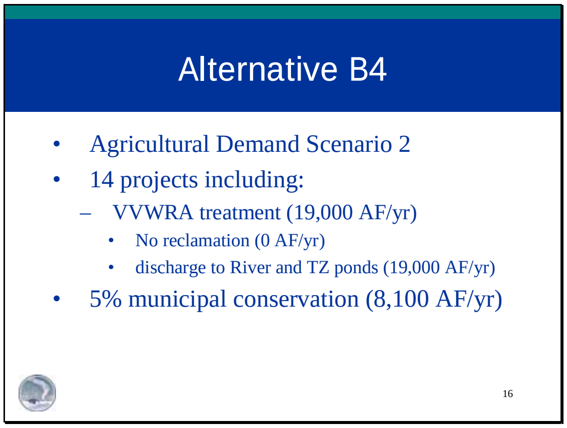
14

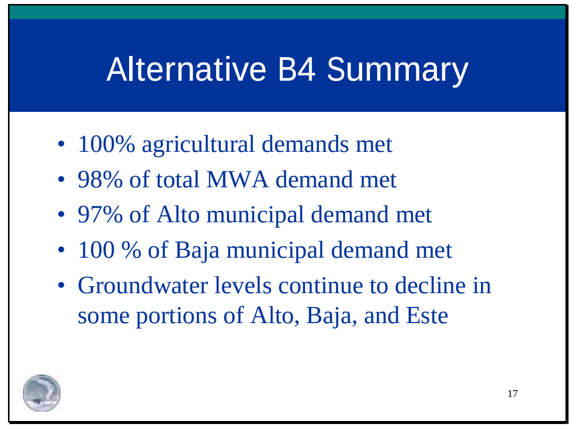
Alternative B3 Summary

- 100% agricultural demands met
- 97% of total MWA demand met
- 97% of Alto municipal demand met
- 100% of Baja municipal demands met
- Groundwater levels continue to decline in some portions of Alto, Este, & Baja

15

Mr. Williamson added that Alternative B3 also includes the capture of Baja storm flow average of about 2,000 acre-feet per year.





Mr. Williamson would be interested in comments on whether an increase in municipal conservation is possible. Alternative B4 also includes storm flow retention in Baja.

Mr. Snively asked if the above alternatives included the planned recharge facility in Newberry Springs. Mr. Kirby replied that if the project is planned in the next couple of years, than it has already been included in the base-case. Mr. Williamson stated that he will confirm that this has been included.

Mr. Williamson clarified that the B3 and B4 alternatives includes the assumption that the first 9,700 acre-feet of treated water would be supplied to the river or Transition Zone recharge ponds. If the plant produces more, then the excess water would be the available to reclaim. There are other possibilities but, at this time, this is what is being considered.

Mr. Williamson summarized the presentation by stating that the B alternatives seem to best meet the total demands by subarea. Most specifically, Alternatives B1, B3 and B4 are nearly meeting all of the demands with the exception of the Alto demand. Alternative B2 results in shortage in Baja and Oeste.

Mr. Williams presented an observation that the alternatives which reduce groundwater production in Alto appear to show the least drawdown in the Alto groundwater aquifers. Alternative B2 results in the most addition to groundwater storage. Alternative B1 results in the least addition to groundwater storage.

Minimum water elevations were reviewed in this process in order to determine that an area's wells did not suffer dewatering. It was determined that this was not an issue.

Mr. Williamson stated a key point demonstrated was that regardless of the actions that were modeled in the upstream areas, the amount of surface and subsurface flows did not reflect a significant change to the Baja subarea.

The Alto subarea is the area which has demonstrated the most growth and will require most of the State Water Project water.

Alternatives A2 and B2 which include the treatment plant show a significantly higher cost. Costs on the more favorable alternatives will be covered in more detail once this list is determined.

Mr. Kirby stated that the purpose of today's meeting was to present a wide list of alternatives based on the previously-determined problems developed by the TAC. Alternative A0 is a point of reference as to what can be expected to occur if nothing was done to plan for future needs. Mr. Kirby asked the attendees if any of the A alternatives could be implemented and the needs of 2020 met. It was agreed that these would not be feasible alternatives. Therefore, "A" alternatives would no longer need to be considered. Alternatives B1, B2, and B3 appear to be the most promising alternatives. An unidentified individual suggested B3 as the most promising alternative (refer to summary above). Mr. Davis clarified with Mr. Kirby that these alternatives still can be refined to best meet the needs of the area.

Mr. Kirby requested that all comments and/or ideas be presented in writing either by email, mail or fax before February 26, 2003. The TAC was asked if the goal of presenting two projects to the Mojave Water Agency Board would be accomplished. This effort would be accomplished by the focus being on alternatives B, Agricultural demand Scenario 2. Mr. Kirby asked if the focus needed to be in between Scenario 1 and 2. There was a concern that Scenario 2 did not include enough agriculture. Mr. Kirby stated that the concept detailed in the Phase 1 RWMP report is that, with implementation of the Judgment, presuming that most of the agriculture in operation today cannot afford to buy make-up water, a level will be reached to sustain their operation. Mr. Brill suggested an alternative of mining rather than balancing supply with demand. Mr. Kirby stated that the Judgment alone will not be the answer and more is needed to meet the future needs of the fundamental objectives. There was much discussion of possible alternatives which were requested in writing for consideration.

The next meeting will be held on March 19, 2003 from 9:00 a.m. to 1:30 p.m.

Ms. Cox emphasized the importance of this process to map the direction of the next 20 years. There was much information provided at this meeting which was made available on CD as requested also for review on the Mojave Water Agency's website. Responses due by February 26. Ms. Cox suggested email transmittal of comments to Joanne Lowrance (jlowrance@mojavewater.org) in order to expedite the process.

7. **OTHER BUSINESS** – None noted.

8. **ADJOURNMENT** at 12:05 p.m.

____

Kimberly Cox - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — December 18, 2002
Apple Valley, CA 92307 — 9:00 a.m.

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1. **CALL TO ORDER**: Kirby Brill chaired the meeting in Jack Clarke's absence.

2. **INTRODUCTIONS**: Introductions of 44 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **PRESENTATION OF EVALUATION MODEL FOR PHASE 2 OF THE REGIONAL WATER MANAGEMENT PLAN UPDATE**

   Ken Kirby of Saracino-Kirby-Snow reviewed the phasing of the development of the plan. Alternatives must be selected in March and April which will require an aggressive schedule. There will be two alternatives presented. An alternative was described as a combination of management actions and projects that are determined to be the most promising approach to meeting the fundamental objectives i.e. balance long-term water quantity in basin in an affordable and equitable manner. The model will illustrate the "what-ifs" that are presented in order to evaluate the impact. The Technical Advisory Committee will make a recommendation to the Mojave Water Agency Board of Directors to proceed with these alternatives into Phase 3. The concept of a model is the ability to represent the things that are important about the system. The importance of the system is the physical geology and the actions of how the water moves from within the system. The framework using mathematics will allow the representation of the actions of the system. Some actions that will be incorporated into the model will not change such as implementation of the Judgment. Another is the hydrology of the system. The variables that can change are assumptions such as where the water enters the system. The model will have the ability to demonstrate the change that can be expected. A systems model will take into consideration possible system changes in use and availability of water within Mojave Water Agency area. It will not have the ability to model consumer behavior. There will be some illustration of economics and other methods of cost allocations included.

The Mojave Water Agency service area encompasses a very large area. Therefore, Floodplain and Regional Aquifers have been divided into subareas and in some cases they have been subdivided when necessary. Based on what is understood of the system, the Morongo Basin/Johnson Valley area includes four aquifers since none of these aquifers communicate with each other. Chuck Bell asked if it is known that the aquifers do not affect each other. Mr. Kirby responded that as much as we have been to determine with previous reports from the USGS, they do not. In other words, they are self contained in that if the conditions are changed in one, another is not affected.

The model was demonstrated by Brian ______ or Saracino-Kirby-Snow. Mr. Kirby added to the presentation that this model is intended for a long-term planning not day to day. The model that will be used is the same conceptual model as is being used by the USGS with the exception of the further subdivision of the one of the Alto regional aquifers. The demonstration of the model included different scenarios in which changes were made to illustrate how the model was affected. Mr. Kirby stated that these are simply examples not meant to imply policy. In response to a question by Chuck Bell, Mr. Kirby stated that this is not a Watermaster operations model and would not be recommended for this use.

5. **DEVELOPMENT OF PRELIMINARY ALTERNATIVES**

Mark Williamson from Saracino-Kirby-Snow reviewed the sample alternatives being presented to the committee for consideration.

The following information was gathered during an open-forum discussion conducted by Ken Kirby and documented on flip charts by Mark Williamson:

6. **OTHER BUSINESS** - None

7. **ADJOURNMENT** at p.m.

____
Kirby Brill - Secretary

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

November 20, 2002
10:00 a.m.

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1. **CALL TO ORDER**: Chairman Clarke called the meeting to order at 10:05 a.m.

2. **INTRODUCTIONS**: Introductions of 52 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM AUGUST 29, 2002 MEETING**: The minutes were approved as submitted.

5. **SELECTION OF OFFICERS FOR 2003 -**

   - **Chairman** - John Leveillee from the City of Hesperia nominated Kimberly Cox from the City of Victorville for Chairman. Chuck Bell nominated Jack Clarke however, Mr. Clarke declined the nomination. There were no other nominations therefore **Kimberly Cox** will preside in the capacity of Chairman of the Technical Advisory Committee for 2003.
   - **Vice Chairman** – Chuck Bell nominated Jack Clarke for Vice Chairman. Mr. Clarke did accept this nomination. There were no other nominations therefore **Jack Clarke** will preside in the capacity of Vice Chairman of the Technical Advisory Committee for 2003.
   - **Secretary** – **Kirby Brill** (MWA General Manager as stipulated in the Bylaws)

6. APPOINTMENTS TO TAC EXECUTIVE COMMITTEE FOR 2003 –

Following are the results of nominations for the TAC Executive Committee for 2003:

- Morongo Basin: Terry Lyons
- Upper Mojave River Basin: Paul Johnson
- Middle Mojave River Basin: Wayne Soppeland

- Lower Mojave River Basin: Karen Gray was nominated but not present at this meeting to accept the nomination. Wayne Snively nominated himself. This appointment will be reconsidered once Karen Gray has been contacted.
- El Mirage: Paul Davis, Jr.
- Lucerne Valley: Chuck Bell
- Committee at Large: Harold Singer (Hisam Baqai - alternate)

Mr. Clarke commended the Mojave Water Agency staff and Board of Directors for their efforts to resolve some of the important issues in which the Committee has been involved.

7. **REVIEW DRAFT PERFORMANCE MEASURES –** Mr. Brill expressed his appreciation to those in attendance for their participation in the success of this process.

8. **DISCUSS DEVELOPMENT OF THE ALTERNATIVES SCREENING MODEL -** Mr. Ken Kirby from Saracino-Kirby-Snow gave an overview of the Phase 2 process with the aid of a PowerPoint presentation (attached to the minutes on file). Mr. Kirby stressed that the selection of alternatives to implement needs to be completed by April 2003. There will be two alternatives of projects and management actions that will be carried forward to the next phase with a priority list of implementation on the projects. The modeling process is useful to provide a comprehensive view of the projects which are being considered. This method will be used to find the most promising projects and management actions which are most likely to accomplish the fundamental objectives. Mr. Kirby commented that the desert climates have extreme variability in the quantity of water that is introduced into the basin. The use of historic traits and statistics of the outcome will be analyzed to give a reasonable representation of what might be faced in the future. Mr. Kirby responded to a concern of an un-identified individual that although the future supply and demands are unknown, using the 71 years of historical data (provided by the USGS) will provide enough information for the committee to base its decision. The screening model is not a physical groundwater model that doesn't really model the dynamics of water flow through the ground. It is more of a water budgeting model that illustrates statistics to meet 2020 demands. In an effort to simplify the representation of the system, the floodplains and aquifers have been divided by subarea and then the regional aquifers have been further been subdivided in some areas if needed. The Morongo Basin/Johnson Valley area has been divided into four aquifers all distinct from one another. Mr. Kirby presented a preliminary illustration of the mudflow model using a mathematical predictor. This model reports annual results (annual basis). The model will consider many aspects of water use such as: which aquifer unit is being pumped; where the return flow goes; and what are the different sectors demanding water. An unidentified individual asked if the aquifers are connected. Mr. Brill responded that based on the information provided from the USGS, the aquifers are interconnected systems. Mr. Kirby has

incorporated this concept into the model. Mr. Kirby demonstrated various sample results of the model.

Mr. Kirby reviewed the comments received on the Performance Measures (i.e., storage levels, supply-demand, economics, water quality, equity, and implementability). The Performance Measures address the objectives that were adopted at the previous meeting, namely to: stabilize the groundwater basin over long-term storage cycles; and limit the potential for well dewatering, land subsidence, and migration of poor quality water. This report is detailed in the PowerPoint presentation attached to the minutes on file. An unidentified individual questioned the user-friendliness of the model. Mr. Kirby clarified that the model would be easy to use for someone who is familiar with the modeling concept.

Comments received and responded to from the following:

- **Allen Dale Watson, President, Mariana Ranchos CWD –**

Many of Mr. Watson's comments were related to dissatisfaction to the way the Judgment is being applied. SKS feels that since the Judgment is in place and most-likely will be in place in 2020, the model will take the terms of the Judgment into consideration. Mr. Kirby disagrees with the comment that there is not proof that recharge measures work. At this meeting alone there were some examples where it can work in addition to other areas of the world where it has worked. The details can have a big effect on how it can work. The costs of recharge alternatives to the cost of supplying treated surface water will be compared.

- **Patrick Lendway, City of Barstow**

Explanation of Performance Measures was given in today's presentation. Mr. Lendway stated that he does not need any further explanation. Mr. Kirby gave a simple definition of "project" as something that requires physical construction and infrastructure. A "management action" is something that you can do without construction and capital costs such as conservation, pricing changes, and operational strategies. "Management alternative" is a mix of the above. Performance measures will not be applied to projects. Performance measures will be applied to alternatives. Not all projects will be modeled, only those which the Committee determines are the most promising. State Water Project water is to meet the needs of the basin. The ranking of Measures is determined by the variability of storage. Less variability will rank higher and greater fluctuations will be lower. Performance measures are required to be subjective.

- **Michael Davis, Silver Lakes Association**

Draft model of screening model was presented at today's meeting. It is currently a running model but not a working model. A working model of the base case conditions and a few alternatives will be presented at the next TAC meeting in December. Land fallowing and conservation can be modeled. There is not a problem with Measure E1 evaluating costs by sub-area. Energy costs are very volatile and the year 2000 may not have been the best choice. This issue will be reviewed for its accuracy. The wording change of EQ1(d) was agreed to by Mr. Kirby. Measure I1 will be re-evaluated for an estimate of whether it is a high, low or medium impact and use this for its ranking. Performance measures are a way to communicate that the concerns of the Committee are being heard by the Consultant. It is not a contract.

- **Randy Hill, Victor Valley Water District**

Benefit/cost ratios will be calculated but not with the overall view.

Costs will be evaluated based on multiple perspectives such as cost to the Mojave Water Agency and also from the overall regions.

Life cycle costs will be considered as well as can be predicted using standard methods.

Mr. Kirby disagreed that conservation should be categorized as a source rather than a management action. It is an action that it taken to adjust demand which also has implications on return flows.

In-lieu recharge is defined as in efficient way to recharge groundwater by providing surface water to those who primarily pump groundwater to meet their needs. This is beneficial in that the water is not being taken out and then natural recharge is still occurring to add to the groundwater. In other words, to supply surface water in place of groundwater to let the natural recharge accumulate.

Non-physical solutions will appear in the model as the impact to the hydrologic cycle.

- **Hisam A. Baqai, Lahontan RWQCB**

This model is not going to have the capability to give project specific sites as to quality migration issues. This issue will not be ignored and is covered in the previously-adopted Fundamental Objective.

This is not a water quality model which is a separate issue.

At this point, there are no recommendations being proposed as to the suggestion of arsenic removal.

9. DISCUSS PROJECT ALTERNATIVES CHARACTERIZATION

Sample projects were distributed at this meeting and Mr. Kirby requested that comments be returned within two weeks. It is imperative that these comments be submitted in a timely manner to allow time to review. There are only two more scheduled meetings to review these projects in order to meet the April deadline. The term “Recharge Capacity” refers annual capacity. Mr. Kirby requested that the committee members prioritize these projects individually.

Antelope Wash and Cedar Street were unintentionally omitted from the list. These projects are still being considered. Mr. Kirby reminded the committee that if a project is eliminated it simply means that it was not determined to be the most promising, short term actions to meet the needs in 2020.

Model will be presented in December.

10. **OTHER BUSINESS** – None noted.

11. **ADJOURNMENT** at 12:05 p.m.

Jack Clarke - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — August 29, 2002
Apple Valley, CA 92307 — 9:00 a.m.

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1. **CALL TO ORDER**: Chairman Clarke was absent at this meeting, therefore, Vice Chairman Bill Betterley called the meeting to order at 9:00 a.m.

2. **INTRODUCTIONS**: Introductions of 42 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM JULY 31, 2002 MEETING**: The minutes were approved as submitted.

5. **REVIEW RWMP UPDATE FUNDAMENTAL OJECTIVES DRAFT AND COMMENTS**: Mr. Ken Kirby with Sacacino-Kirby-Snow gave a brief explanation of what the Agency is attempting to accomplish with the establishment of a Regional Water Management Plan (RWMP) and the 3 phases that are involved with this process. Currently, we are in Phase 2 of the process which involves screening and selecting of possible projects to determine which are the most promising and effective in order to meet the objectives of the Agency. Fundamental Objectives of long-term water use was distributed to all TAC members on August 13, 2002. A number of comments were received and addressed at this meeting. (Copy of PowerPoint presentation in file with these minutes) Comment from Paul Warner, City of Barstow, to add "implementing projects" into the objectives was approved. Clarification was made on the definition of benefits as they can be provided to be limited to water and the money associated with water that MWA has jurisdiction over. Many of the comments which were received will be useful in preparing the alternatives to be determined at a later date. Objective statement was approved.

6. **ESTABLISH RWMP UPDATE PERFORMANCE MEASURES**: Mr. Kirby stated that the next step in the process is to predict the relative likelihood of success of the RWMP. There was much discussion on the method in which Saracino-Kirby-Snow used to determine the performance measures. Performance Measures were defined as a comparison of an indicator to some desired standard.

   Mr. Kirby clarified that this process is to evaluate and make a recommendation to the Mojave Water Agency Board of Directors.

The following information was gathered during an open-forum discussion conducted by Ken Kirby and documented on flip charts by Mark Williamson:

OBJECTIVES - - COMMENTS
- BENEFITS =WATER-RELATED SUPPLY + $
- AT THIS TIME, NO RELATIVE RANKING OF OBJECTIVES
- ADD "PROTECT IMPLEMENTABILITY"
- TODAY'S FOCUS ON OBJECTIVES (SOLUTIONS LATER)
- CONSIDER AT LEAST TABLE 7-1 ISSUES, ALLOW OTHERS

AUTO PURCHASE INDICATORS (EXAMPLE)
- PRICE, COST
- SIZE, COMFORT
- MAINTENANCE COST (LONG-TERM COST) OPERATING COST
- BRAND LOYALTY

SCALE
- INVITE UPLANDS TO PARTICIPATE (SAN BERNARDINO & SAN GABRIEL MOUNTAIN RANGES)
- UNDERSTAND PLANS
- WASTEWATER FLOWS
- COUNTY DWSAP (DRINKING WATER ____________)

TIMING
- DROUGHT FREQUENCY
- TREND
- HISTORICAL HYDROLOGY AS INDICATOR OF FUTURE (PERIOD OF RECORD)

BALANCE SUPPORT & DEMAND
- CONSERVATION (DEMAND REDUCTION)
- ACCESSIBILITY OF SUPPLY (AVAILABLE FOR USE) -- QUALITY
- VARIABILITY
- HISTORIC TRACE
- 10-YEAR AVERAGE?
- SENSITIVITY ANALYSIS

STABILIZE GROUDWATER STORAGE
- AVERAGES
- 10-YEAR MOVING
- ARITHMETIC
- GEOMETRIC
- PROBABILITY
- EXCEDENCE
- PROXIMITY OF STORAGE & USE
- SUB-BASIN OUTFLOW

QUALITY STANDARDS
- DRINKING WATER
- BASIN MANAGEMENT

BENEFICIAL USE
- DELIVERY
- PRODUCTION
- ECONOMICS
- SUBJECTIVE OPINION

FAIR (PUBLIC GOOD DOCTRINE)
- # RECALL PETITIONS
- AVAILABLE RESOURCES FOR GROWTH
- # ATTORNEYS
- # CLAIMS & GRIEVENCES
- # PEOPLE WITH REDUCED BENEFIT
- MAGNITUDE IN BENEFIT CHANGE
- DISTRIBUTION OF BENEFITS
- BASED ON PAYMENTS (ON MONIES AREADY PAID)
- RELATIVE DISTRIBUTION OF WATER COSTS TO FINAL CUSTOMER

EQUITY
- MIX OF LIFESTYLES/LIVELIHOODS
- PRESERVE MIX
- PRICE OF WATER
- BY SECTOR
- BALANCING PEOPLE'S ABILITY TO MEET THEIR GOALS
- WEIGHING VALUE

JUSTICE
- CONFLICT OF INDIVIDUAL VS. SOCIETAL GOALS
- COMPAIRED TO HISTORIC DISTRIBUTION

POLITICAL DECISIONS MADE BY POLICY BOARDS

FUNDING/COST
- WILLING PARTICIPATION (WILLINGNESS TO PAY)

TAC WORKSHOPS
- November 13, 2002 – Characterize Projects
- December 18, 2002 – Present Screening Model & Initial Alternatives
- February, 2003 - Explore Promising Project Combinations
- March, 2003 – Present Final Screening Results
- April, 2003 – Recommended Steps to Comprehensive Water Management Strategy

In addition to the above, there will be three community meetings in April, 2003. Meeting dates are subject to change.

7. **OTHER BUSINESS** - None

8. **ADJOURNMENT** at 11:50 p.m.

____
Bill Betterley - Vice Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — July 31, 2002
Apple Valley, CA 92307 — 10:00 a.m.

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1. **CALL TO ORDER**: Chairman Clarke called the meeting to order at 10:00 a.m.

2. **INTRODUCTIONS**: Introductions of 60 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM JUNE 27, 2002 MEETING**: The minutes were approved.

5. **REVIEW PHASE 1 CONCLUSIONS:**

   Mr. Glenn Mc Pherson of Saracino-Kirby-Snow ("SKS") reviewed the chain of events leading up to the current development of Phase 2 of the Regional Water Management Plan. The Regional Water Management Plan was first developed in 1994 and a programmatic Environmental Impact Report ("EIR") was adopted. Last year Phase 1 of the Regional Water Management Plan Update began which has lead into what now is being developed as Phase 2. Phase 1 identified the problems in the region by collecting background data. Phase 2 is more of a selection and screening process of alternatives to accomplish meeting the needs of the issues and problems. Phase 3 which will begin next summer will address implementing the alternatives and going through an environmental process to adopt another programmatic EIR and move toward implementation.

   Phase 1 identified six key water management issues:
   1. Demand Exceeds Supply
   2. Water Quality Degradation
   3. Overdraft of the Groundwater Basins
   4. Riparian Ecosystem Maintenance
   5. Wastewater Infrastructure
   6. Subarea Interaction

6. **OVERVIEW OF SCREENING PROCESS FOR PHASE 2 OF THE REGIONAL WATER MANAGEMENT PLAN UPDATE:**

Mr. Mc Pherson encouraged the committee's participation in the development of Phase 2. This meeting and the upcoming meetings will be an open forum in which everyone's ideas and concerns can be expressed.

Mr. Ken Kirby of SKS continued the presentation. Phase 2 consists of the review of the 29 potential projects which were identified in Phase 1 and determinations of those projects which best meet the needs of the Mojave Water Agency Area. Also included in Phase 2 is the development of a priority list for implementation that can then move the process forward into Phase 3. Phase 2 needs to be completed by April, 2003.

TAC workshops will be as follows:

1. Articulate fundamental objectives (July 31)
2. Establish performance measures (August 29)
3. Characterize projects (November 13)
4. Present screening model & initial alternatives (December 18)
5. Explore promising project combinations (February, 2003)
6. Present final screening results (March, 2003)
7. Recommended steps to Comprehensive Water Management Strategy (April, 2003)

7. **INTERACTIVE DEVELOPMENT OF FUNDAMENTAL OBJECTIVES FOR PHASE 2**

Mr. Kirby conducted an interactive discussion with the TAC members in attendance. Mr. Mark Nichols of SKS summarized the conclusions of the discussions on flip charts as follows:

SHEET #1

<u>OBJECTIVES</u>
- DEMAND EXCEEDS SUPPLY
- SUFFICIENT WATER FOR PRESENT & FUTURE NEEDS
- DENTIFY AVAILIBILE SOURCES
- RESTRICT USE
- IMBALANCE BETWEEN SUPPLY & DAMAND
- ADEQUACY FOR PARTICULAR USE

SHEET #2

<u>AFFORDABILITY/ FINANCIAL</u>
- AFFORDABLE/FAIR/EQUITABLE
- COST VS BENEFIT
- BASELINE

- WHO BENEFITS? FUNDING SOURCES
- WHO PAYS?
- COMPENSATION FOR DAMAGE
- EQUITY - EQUITABLE APPORTIONMENT
- DISTRUBUTION OF BENEFITS
- COLLECTION & ALLOCATION OF ASSETS
- FAIRNESS
- ALLOCATE TO HIGHEST BENEFIT
- MAXIMIZE AGREEMENT

SHEET #3

ECONOMY/GROWTH

- PRESENT USES
- PROTECT EXISTING USES
- ECONOMIC BASE
- GROWTH
- SUPPLY BENEFICIAL USES

SHEET #4

OVERDRAFT

- STABILIZE GROUNDWATER
- BRING IN SWP WATER
- WATER BANKING (STORAGE) TO SUPPLY FUTURE NEEDS

SHEET #5

ACCOUNTABILITY

- HOW WILL PROJECTS BE FUNDED?
- SUSTAINABLE WATER RESOURCES AT LEAST COST IDENTIFYING FUNDING

SHEET #6

ECOSYSTEM

- RESTORE WATER TO 1985 LEVELS
- RESTORE EXHIBIT H HABITAT LEVELS

SHEET #7

ADDRESS ISSUES IN ALL SUBAREAS

- OBJECTIVES BY AREA
- MAP
- TABLE 7-1
- MINIMAL USERS PROGRAM
- EXAMINE SOLUTION FROM OTHER AREAS
- PHASE 1 INPUT WILL BE INCLUDED

The above information will be used to develop an objective statement that will be presented at the next TAC meeting on August 29th from 9:00 a.m. to noon.

Mr. Brill pointed out that going forward in this process will not be primarily based upon the information gathered in this meeting. He mentioned that there were several key entities that were not able to attend this meeting but that there would be additional opportunities for all parties to provide their input. This meeting is only one of the necessary tools that the Agency will use in order to develop the overall plan.

8. **ADJOURNMENT** at 12:00 p.m.

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Jack Clarke - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

<u>MINUTES</u>

Mojave Water Agency
Board Room
22450 Headquarters Drive — June 27, 2002
Apple Valley, CA 92307 — 10:00 a.m.

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1. **CALL TO ORDER**: Chairman Clarke called the meeting to order at 10:05 a.m.

2. **INTRODUCTIONS**: Introductions of 21 members in attendance were made. Comment was made as to the decreased participation in attendance of TAC members.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM APRIL 24, 2002 MEETING**: The minutes were approved.

5. **REVIEW COMMENT LETTERS ON THE PHASE 1 DRAFT AND RESPONSES**:

   Mr. Kirby Brill, General Manager of Mojave Water Agency, began the meeting by thanking the TAC members for their participation in Phase 1 of the development of the Regional Water Management Plan. Mr. Brill also reaffirmed the agency's commitment to communicate to TAC members the importance of their participation in this process. The Agency plans to reach out to other members of the TAC for participation in Phase 2.

   Mr. Ken Kirby of Saracino-Kirby-Snow presented the comments received on the Phase 1 Draft report. Comments were received from the City of Barstow; City of Hesperia; California Department of Fish & Game; Hi-Desert Water District; Lahontan Region, Regional Water Quality Control Board; and a number of individuals from Lucerne Valley. Each comment was reviewed and a summary of the responses was prepared by Saracino-Kirby-Snow and distributed to members in attendance. Each response received was replied to by MWA and Saracino-Kirby-Snow. When appropriate, responses were incorporated into the Regional Water Management Plan update for Phase 1. If there were other issues that were not deemed appropriate for Phase 1, each issue was addressed as to how the comments would be addressed. This was also included in the summary packet distributed at the meeting. There were a number of water quality issues raised. Mr. Kirby stated that this is a very important area of concern and will be addressed in Phase 2 and through the environmental documentation process that follows.

Mr. Matthew Woods, resident of Lucerne Valley, approached the committee regarding Mr. Brill's comment to try to increase involvement from the community in this process. Mr. Woods asked what was meant by this comment. Mr. Brill explained that when this committee began there were approximately 30-40 attendees at each meeting, which has now decreased. Mr. Woods feels that a community seminar should be held to inform the community of the Regional Water Management Plan. Mr. Brill stated that the plan is to make contact with original list of approximately 100 TAC members and anyone else who has expressed interest in the plan. Notices of upcoming TAC meetings will be distributed with an emphasis on the importance of participation. In the later development of Phase 2 there are some community meetings planned in the various areas. Mr. Woods requested a meeting for Lucerne Valley be held. Mr. Brill stated that the request would be considered. Mr. Brill mentioned that he has been out to Lucerne Valley on four occasions in the last couple months to attempt to inform the community of the Regional Water Management Plan. Mr. Woods is concerned specifically with relation to the recharge basin in Lucerne Valley. Mr. Brill stated that he feels that the Agency has made a considerable attempt to inform the community of Lucerne Valley.

Mr. Randy Hill with Victor Valley Water District addressed the committee with concerns with the timing of the request for comments. Victor Valley Water District was not able to make written comments due to time restraints. Mr. Hill feels that there were other entities that were unable to provide comments for this same reason, but noted that it is not to be taken as though there were none. Mr. Hill also requested that the next phase allow for continued input from these entities. Mr. Hill questioned the in lieu reference of ground water recharge. He asked if in lieu included the direct treatment of State Water Project water for direct consumption as a method for in lieu. Mr. Kirby of Saracino-Kirby-Snow responded by affirming that it is a method of in lieu but much more specific than in general in lieu. Mr. Kirby acknowledged the benefit of doing direct surface treatment. Mr. Hill feels that there are other projects currently being constructed by a joint-effort of Victor Valley Water District and Baldy Mesa Water District that should be included in the Regional Water Management Plan. Mr. Caouette, Assistant General Manager Mojave Water Agency, stated that the intent of the document is to reflect the projects that the Agency plans to accomplish. This doesn't mean that there will not be benefits from projects performed by other entities. These projects were not included to avoid confusion. Mr. Hill feels that all stakeholders should work together in doing projects jointly.

Mr. Jehiel Cass from the Regional Water Quality Control Board (RWQCB) approached the board. He stated that he appreciated the response received regarding their comments. He would like to emphasize the continued involvement with the headwater stakeholders in the mountainous areas. Mr. Cass added that it is important to keep them involved due to the actions that they are proposing and issues they're dealing with will directly impact the basin area. Mr. Cass had a question regarding the response to one of their comments on the plan. The response in question was that the actions might be at odds with the provisions of the Judgment. Mr. Caouette stated that the point that was intended was that there is very specific language in the Judgment that prohibits the interference with storm flows. Mr. Cass feels that the fact that urbanization has increased, the natural storm water runoff patterns are being changed. Mr. Brill complimented the RWQCB in their thought-provoking comments.

Mr. Chuck Bell from the Este Sub-area Advisory Committee had a question regarding the mention of elevated nitrate levels reported in Lucerne Valley. Mr. Kirby stated that by looking at the data, there are some elevated nitrates in the region. This is meant to be a conceptual inventory of the situation. There are several possible treatments available if necessary. Mr. Bell thanked Mr. Brill for his attendance in Lucerne Valley over the few months. Mr. Bell feels that Mr. Brill explained the situation well and the people of Lucerne Valley need to understand that the Sub-area Advisory Committees are a product of the Judgment not necessarily responsible to represent the entire community. The responsibility of these committees is to represent those who have been stipulated.

6. **REVIEW OF THE COMPLETED PHASE 1, REGIONAL WATER MANAGEMENT PLAN UPDATE DOCUMENT** - Mr. Ken Kirby presented the approach in Phase 2 that will be proposed to the Mojave Water Agency Board this evening. Mr. Kirby then reviewed the different phases of developing a water management plan, which was illustrated in a PowerPoint presentation (attached to the minutes). Phase 2 needs to be completed by April 2003 in order to receive grant funds. Active participation is needed from the TAC and other interested stakeholders. There are seven meetings scheduled from July through April of 2003. The details of the meetings are outlined in the attached presentation.

   Mr. Jack Clarke, TAC Chair, requested that committee members assist in communicating the importance of participation to their colleagues in an effort to increase involvement.

7. **OTHER BUSINESS** – No other business was addressed.

8. **ADJOURNMENT** at 10:45 a.m.

Jack Clarke - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive April 24, 2002
Apple Valley, CA 92307 2:00 p.m.

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1. **CALL TO ORDER**: Chairman Clarke called the meeting to order at 2:00 p.m.

2. **INTRODUCTIONS**: Introductions of 25 members in attendance were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM FEBRUARY 13, 2002 MEETING**: The minutes were approved.

   Public comments were addressed at this time:

   Mr. Spike Lynch president of Newberry Springs Property Association expressed concern with water being sold and transported out of the basin. He stated that the property owners in the area are concerned with the fees that are being collected by Mojave Water Agency ("Agency") to purchase water to recharge the basin since there currently is not a recharge facility in the area. He would like to see the Kane Wash discharge facility added to the Mojave River Pipeline project. Mr. Brill would like to have the Technical Advisory Committee ("Committee") review this issue to help guide the Agency in identifying the needs and prioritize this project.

   Mr. Matthew Woods addressed the Committee as an individual also as a member of the Lucerne Valley Association. Mr. Woods asked how to best communicate the desires of the people in Lucerne Valley regarding the planned recharge facility from the Morongo Basin Pipeline. Mr. Brill explained that this Committee is the forum in which members of each area can gather and express the needs of the people in their area and welcomed Mr. Woods to continue to attend the meetings to represent his community.

5. **UPDATE ON THE REGIONAL WATER MANAGEMENT PLAN**: Mr. Kirby Brill, General Manager Mojave Water Agency, gave an overview of the1994 Regional Water Management Plan. This plan was the Agency's first attempt to review the projects necessary to the basin and identify and prioritize the necessary projects to be accomplished within a five-year period. During the time that this plan was being developed, the Adjudication was in the process of being implemented. Therefore, they worked hand-in-hand with each other. The 1994 Regional Water Management Plan was intended to be updated every five years as new information became available and also as the water supply issues changed. Mr. Brill stated that there have been many changes since 1994. We are looking more toward the supply of water from the California Aqueduct than ever before. The development of a Regional Water Management Plan is a three-phase process in which we are currently in the first phase. Phase one involves identifying the issues and needs of the community and addressing potential projects. The Department of Water Resources is providing technical and fiscal assistance in this process. Mr. Brill reported that the last several months have been spent collecting information from various stakeholders to determine the issues and we now have a draft document that is close to completing phase one of the process.

   Glenn McPherson, Ken Kirby and Anthony Saracino of Saracino, Kirby, Snow summarized the latest draft of the Regional Water Management Plan with a Power Point presentation a copy of which is attached. Various discussions involving clarification of issues such as average versus median flow; production versus consumptive use; and population projections, ensued during this presentation.

   An unidentified individual requested clarification of the numbers representing the amount of net average annual supply being reported for the Means Valley. Mr. Brill confirmed that the amounts will be verified to determine that the most current data is being reported.

   It was requested that the Hanson Report be used to gather the appropriate information in preparing the Regional Water Management Plan. Mr. Norm Caouette, Assistant General Manager Mojave Water Agency, confirmed that Bob Wagner, Consulting Engineer for Wagner & Bonsignore, reviewed the information in the Hanson Report and the that which was relative had been incorporated into the plan.

   Mr. Brill responded to a question regarding the process of integrating comments from various stakeholders. Mr. Brill stated that all comments will be reviewed for potential integration into the final plan. The intent of this phase of the process is to gather information from the various area stakeholders and incorporate them into the plan as seen fit.

Copies of the latest Regional Water Management Plan were distributed for stakeholder review and comment. It was requested that written comments be returned to the Agency by May 23, 2002 for review and implementation into the plan prior to the next TAC meeting.

6. **OTHER BUSINESS** – No other business was addressed.

7. **ADJOURNMENT** at 4:00 p.m.

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Jack Clarke - Chairman

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — February 13, 2002
Apple Valley, CA 92307 — 10:00 a.m.

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1. **CALL TO ORDER**: The meeting was called to order at 10:05 a.m. Secretary Brill chaired this meeting in Chairman Clarke's absence.

2. **INTRODUCTIONS**: Introductions were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM OCTOBER 24, 2001 AND DECEMBER 13, 2001 MEETINGS**: The minutes were approved.

5. **UPDATE ON THE REGIONAL WATER MANAGEMENT PLAN**: Anthony Saracino and Glenn McPherson of Saracino-Kirby-Snow gave a PowerPoint presentation (hereinafter referred to as PPP) to illustrate the purpose, approach and scope of work of the plan, a copy of which is attached to the minutes. Saracino began with a brief discussion of the purpose of the plan which he stated is to update data on supply and demand; update geology and physical characteristics in recent studies; identify key water management issues by stakeholder outreach questionnaire and meetings; and to develop plan alternatives. Mr. Saracino also reviewed the purpose of the Mojave Water Agency, the Adjudication, the current Regional Water Management Plan, and who all the major stakeholders are.

Mr. Saracino then described the physical setting relative to geology and groundwater. There are two main areas of surface water drainage -- the Mojave River area, which is about 3,800 square miles, and the Morongo Basin/Johnson Valley area which is much less studied than the Mojave River area. There are groundwater basins in each of these surface water drainage areas. The Mojave River basin is comprised of about 1,400 square miles now being divided into a Floodplain Aquifer and a Regional Aquifer. The Morongo Basin of about 1,000 square miles and divided up into about 17 sub basins. The geology in this area is comprised of rocks and sediments derived from water and wind erosion deposited in the area and bordered by igneous metamorphic rocks. He stated that the Mojave River Basin has been found to have a zone called the Floodplain Aquifer, which has a greater permeable area. Water in this area flows more quickly than in the Regional Aquifer by about 10 and 1,000 times. He indicated that it is very important to understand that this area is also more transmissive from the Floodplain versus the Regional Aquifer. Reference was made to the Geologic Cross-Section (PPP page 8). Mr. Saracino pointed out that the clay lenses would influence the recharge methods and there is a high degree of separation between the water table and the ground surface. If recharge basins are developed within the Regional Aquifer, it could take a considerably long time for the water to percolate down into the water table and it may not even reach there for hundreds of years because of the clay lenses. Mr. Saracino said that injection wells might be a more efficient method to recharge in some areas because of this situation. Reference was directed to the illustration of "Groundwater Movement" (PPP page 9). This illustrates that water flow is very complex within the aquifers and between the aquifers. This also shows a decline in groundwater levels in the Regional Aquifer as well as in the Floodplain Aquifer (see attached “Decline in Groundwater Levels”, PPP page 9). Mr. Saracino pointed out that groundwater flows along with the river system. However, it flows more quickly in the Floodplain than in the Regional Aquifer ("Groundwater Flow Direction" and "Time of Travel", PPP page10). Time of travel on this illustration is particularly relative to the Morongo Basin/Johnson Valley area. The final report will include many different contour maps, which will illustrate travel in the Floodplain and Regional Aquifer direction of flow. Also included in the final report will be maps on geology, physical setting and groundwater.

Glenn McPherson continued the presentation with the subject of water supply, in particular the amount of water that is coming into the region off the mountains and how much is being absorbed into the groundwater system within the basin area. The water that has entered the basin for the last 10 years was illustrated using Figure 4-2 (PPP page 13). This report indicates that between 1991 through 2001 significant wet periods were experienced. Mr. McPherson pointed out the extreme high and low periods of precipitation. Figure 4-2 also indicates that the bulk of the water that comes in at the Forks is absorbed into the groundwater system within Alto, Centro, and Baja and a relatively small percentage of it makes its way out of Baja by the Afton Gage. Mr. McPherson mentioned one alternative to be considered in more detail is to slow the water down in Baja so that there is additional recharge possibility. However, this method may not be cost-effective and needs to be reviewed further. Mr. McPherson reviewed average versus median flow. Average is the total flow divided by the number of years and Median is flow at which 50% of flows are greater and 50% are lower. A wide range of variation exists between average and median flow. At the Forks, the Annual Average Flow is 71,300 acre-feet whereas the Median Flow is 27,200 acre-feet. Mr. McPherson stated that over a 40-year period, this might be acceptable but when looking at certain riparian issues and other demands that may not be able to weather a 30-year decline in water supply. He stated that for specific projects, the median values will be used to set criteria and for others the average values will be used.

Mr. McPherson then proceeded to discuss the State Water Project (SWP). Mojave Water Agency's entitlement of SWP water is 75,800 acre-feet per year. There has been 149,000 acre-feet of water brought into the area from 1972 through 2001. Illustration of the deliveries was presented on the attached graph of "Deliveries of State Water Project Water to the MWA, 1978-2000" (PPP page 17). This is an indication that the need for SWP water delivery is expected to increase. There are more facilities available to deliver water now, and it is just a matter of figuring out how to pay for water to maximize the use of these facilities. Mr. McPherson stated that the system has been able to meet the requirements of what has been needed. There has been a series of years recently where the ability to meet the requested demands has been down, and it is anticipated that this will occur more in the future as the facilities reach their limits. Mr. McPherson expects the next report from the Department of Water Resources in 2003. This report should reflect about 60% on the short-term of the entitlement that would be accessible out of the State Water Project system.

Mr. McPherson next addressed the issue of water demand, particularly production versus consumptive use. Consumptive use rates are taken form the Webb Study (2000) as follows: Industrial, 100%; Municipal, 50%; Agricultural, 60% (varies by Subarea); Golf Course, 60% (varies by Subarea); Recreational (i.e. lakes), 100% (PPP page 19). Mr. McPherson mentioned that this does not include the water that is replacement water for the lakes, which goes back into the ground (zero consumptive use). A comparison of projected versus actual consumptive use was reviewed by Mr. McPherson and demonstrated with the attached line graph on page 21 of the PPP. Mr. Don Songer questioned whether the groundwater in the Morongo Basin/Johnson Valley area has increased. Mr. McPherson stated that the groundwater definitely has increased in this area due to the introduction of the water from the Morongo Basin Pipeline and a lesser than projected economic growth. The attached bar charts (PPP pages 22–25) were reviewed for each Subarea. The bar charts illustrate that the agricultural areas are where the most significant change has occurred.

Mr. McPherson addressed the issues related to water balance. Water balance for 2000 indicates that the basin is out of balance by the following acre feet: -17,200 in Alto; -22,600 in Baja; +1,200 in Centro; -1,500 in Este; -1,600 in Oeste. This information is based on only the year 2000 demands. Ms. Patricia Moser from the City of Barstow asked if these figures were annual averages over the period examined. Mr. Saracino replied that this is not an average, but considers the year 2000 demands for the consumptive use demands. Mr. Brill clarified that the average water supply was taken over a period from 1931 to 2001. This figure is an average; however, the other two figures are not only the condition in 2000. Mr. Brill added that the latest data is intended to be incorporated, but it is also important to be aware of what is meant by the numbers. Mr. McPherson stated that future consumptive use is expected to remain proportionate with the population with exception of Industrial Use, which should increase by 4,000 acre-feet in the Alto Subarea due to the High Desert Power Plant project. Population projections were demonstrated using the chart on page 27 of the PPP. This data indicates that from 2000 to 2020 the population in Alto is anticipated to increase by 67%; Baja, 113%; Centro, 59%; Este, 84%; and in Oeste, 109%. The total population in the Mojave Basin is projected to increase by 71%. The Morongo

Basin/Johnson Valley area should experience a 53% increase in population. The total population within the Mojave Water Agency jurisdiction is anticipated to increase by 69% within this time frame.

Mr. McPherson stated that attempting to project agricultural assimilations within the next 20 years tends to be a little more difficult. He then reviewed two scenarios for bringing the water in balance by 2020, indicating that the reality lies somewhere in between. Scenario #1 illustrated that consumptive use will remain the same, with the end-result being -76,800 acre-feet total deficit in the basin. Mr. Gary Ledford with Jess Ranch asked how this issue addresses replacement water by an over-producer as called for in the adjudication. Considerable discussion ensued between Mr. Ledford, Ms. Moser, Mr. Brill, and the consultants. Mr. Brill confirmed that for new producers water is to be replaced based on a production-for-production basis. Mr. Saracino stated that bringing the basin in balance from a purely technical standpoint and compliance with the adjudication, is two entirely different issues under this scenario. Scenario #2 reflects a 5% rampdown beginning in 2002 with the end-result by 2020 being -54,700 acre-feet water balance in the basin. Mr. Saracino confirmed that the more realistic projection lies somewhere in between these two scenarios. Director Weldy requested clarification on the 5% rampdown being yearly and still indicating a negative water balance reflected in 2020. Mr. Saracino confirmed that the rampdown is to a Production Safe Yield. Mr. Brill stated that these scenarios illustrate that there is clearly a potential demand that the Agency's entitlement has to fulfill. Patricia Moser from City of Barstow expressed concern with the amount needed to bring the basin into balance being higher that the Mojave Water Agency's entitlement from the State Water Project.

Mr. McPherson mentioned that the importance of the questionnaire that was completed by all of the TAC Members was to determine what direction we go from here. One of the questions asked was if it was important to remain the same or recover from the overdraft. The responses were mixed in this area. At this point, it is not being recommended what direction to follow, only to gather information. Mr. Brill stated that one main concern is that if we do have enough entitlement, how it is displaced. The assumption is that the basin is being overdrafted 70,000 acre-feet and that we need entitlement to buy it down. Mr. Brill stated that he is not sure that this is a valid assumption looking out 10 to 20 years, since there are no definitives that the demand will be there. Everyone will benefit if we give the judgement a chance to work by buying replacement water. Thus far, we have not been bringing in water because the market has not allowed it yet. As the amount of agricultural water decreases, there will be less to sell and State Water Project water can then be purchased.

A suggestion was made by an unidentified individual to provide an illustration of how the Judgment can really work rather than looking at just the hydrologic balance.

Mr. Brill replied that this data is needed to then determine where to go from here. It is important to know whether to bring the level back up and to what levels or whether we want to achieve a long-term balance.

Mr. McPherson said that the next phase of the report will be to see how the adjudication fits in to the needs of each of the Subareas. This phase requires identifying key issues in local areas, Subareas, and for the entire basin. Other issues to take into account are the demand exceeding the supply, quality problems, overdraft, maintenance of riparian ecosystem, wastewater infrastructure, and the interaction between Subareas. These issues need to be taken into consideration in an ultimate plan. Recharging of groundwater, blending supplies from different sources, changing location of groundwater production, changing demand use surface supplies, banking of groundwater, regional waste water treatment, local recycling, and source treatment are some of the possible solutions.

Committee members were given copies of tables for each Subarea, which illustrate the specific issues of each region. The members were requested to indicate additions and/or revisions on the tables for their specific Subarea and to return it by February 22nd. The more specific the issues can be defined within the Subareas, the more assistance there is in determining the types of alternatives that are needed for each Subarea. This will be used to determine problems within each Subarea and then each area will be evaluated to focus on solutions both localized and regional in Phase 2.

Mr. McPherson stated that Phase 1 will be completed in March or April of 2002, and Phase 2 will probably be a yearlong effort. The next presentation from Saracino-Kirby-Snow will include Regional Water Management Plan alternatives and financing options.

6. **OTHER BUSINESS** – No other business was addressed.

7. **ADJOURNMENT** at 12:00 p.m.

Kirby Brill, Secretary

SCANNED
3-7-02
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F minutes

TECHNICAL ADVISORY COMMITTEE TO THE MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

October 24, 2001
10:00 a.m.

1. **CALL TO ORDER**: The meeting was called to order at 10:06 a.m.

2. **INTRODUCTIONS**: Introductions were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **APPROVAL OF MINUTES FROM APRIL 4, 2001, JUNE 20, 2001 AND JULY 25, 2001 MEETINGS**: The minutes were approved.

5. **REVIEW OF RESPONSES TO STAKEHOLDER QUESTIONNAIRES**: Mr. Brill thanked everyone who took the time to complete the questionnaires, adding that responses will be helpful as the Plan is updated. He stated that this item is a summary of the questionnaire responses and the results of the individual interviews that took place.

Glenn McPherson, consultant with Saracino Kirby Snow, the firm working with the Agency on the Plan update, provided an overview through a Power Point presentation. He stated that topics for discussion today include ongoing activities, an overview of stakeholder issues assessment activities, projects mentioned during meetings with stakeholders and through the questionnaire process, and the next steps in the process.

Ongoing activities include the following:

- Data collection, review and organization
- Updated assessments of current and projected demand and supply
- Stakeholder issues assessments
- Plan alternatives
- Report preparation

In summarizing stakeholder issues assessments, staff and Mr. McPherson gained information through interaction at TAC meetings, through individual and group meetings, and by way of written questionnaires. Questionnaires were mailed to 26 entities, and others were sent to members of the TAC and distributed at other meetings. A total of 19 questionnaires were completed and returned. The majority of responses came from the Alto Subarea, with a total of seven. Responses were provided by each Subarea, with the exception of Baja. The responses to the questions were varied; however, they included some consistent themes. The questions were reviewed as follows:

1. <u>How important is it to reverse the trend and recover from the current groundwater overdraft</u>?

Everyone indicated that stopping the overdraft is very important to critical. Also, it was felt that it was crucial to maintaining economic vitality of the region and to prevent degradation of water quality. Recovering from the overdraft received varied response, including that it was impossible to recover from it, and that recovery is very important to critical.

2. <u>If the current Water Management Plan were fully implemented, how effectively would it meet your current and future needs? How would you improve the Plan</u>?

There was a general sense that the current plan is a good start, but that a greater focus needs to be placed on the unique needs in the individual Subareas. There was a feeling that water quality is of prime concern and that it needs to be monitored on a continual basis. Also, as to concerns on how things might be improved, there was an indication that water conservation has not been adequately addressed, that water reclamation was not concentrated on adequately, and that there needs to be a very specific plan for updating what's going on as a part of the Plan development.

3. <u>Do you think the current adjudication will solve the region's water supply problems in the short-term (1-5 years) and the long-term (6-20 years)? Why?</u>

This carried a varied response, including a statement that the adjudication does not match the physical solution and that individual recharge basins should be established as a critical element. A consistent response was that over the short-term the adjudication will not solve short-term problems. The responses as to solving long-term problems ranged from no, to maybe, to yes. As to the second part of the question regarding the adjudication matching the physical solution, it was stated that individual recharge basins need to be established in particular areas for particular needs more than on a regional basis. Another response was that it could work if the adjudication is allowed to be fully implemented.

4. How will you measure the success of this Plan update process? (a) From your perspective? (b) From a basin-wide perspective? (c) For the short-term (1-5 years)? (d) For the long-term (6-20 years)?

Responses received included that it could be successful if there is a sustainable and reliable water supply for the entire Agency, if there is stakeholder consensus for major water issues, if recycled wastewater and conservation are included in the strategies, and if everyone shares the pain.

5. What is your confidence level that your expectations will be met in the short-term (1-5 years) and the long-term (6-20 years)? Why?

Reponses included that the confidence level was low in the short term, but there was high confidence this would be accomplished in the long term. It was also stated that the expectations would be met only if the parties work together for the good of the basin rather than focusing solely on their own interests.

6. What potential barriers or key issues do you see that will need to be addressed in order for this Plan update process to be a success?

There was diversity of opinion. Some stated that lawyers and politics are possible barriers. Stakeholder commitment was listed as a critical element. Adequate consideration of farming interests was listed as crucial, as well as allocation of State Water Project (SWP) water and who pays for it, and the lack of ability to update and improve the "physical solution".

7. If the update doesn't address your water supply needs, what do you think is the most likely way that you will be able to meet your water needs?

A basic response was that this is an unacceptable scenario and that there needs to be some type of regional plan that everyone can work with. Other responses included seeking independence by seeking supply from multiple sources, reliance on recycling water programs and water conservation, expanded exploration and continued pumping, and moving to where more water is available.

8. What do you think are the primary interests of the other stakeholders?

Quantity, quality and cost were consistent responses. Being treated equitably under the Plan criteria, new sources of affordable water, failure to recognize constraints of the arid region, and political and financial benefits were listed as areas of concern.

9. What is your confidence level that the region's water resources can be managed to meet the region's anticipated water needs?

One specific concern is that the rapid growth and increased population is something that will not be able to be sustained within the Agency's ability to provide water. Some do not believe in either the short-term or the long-term that there will be adequate distribution of the supply or the Agency's allocation. Some were encouraged that this would be achieved if the public can be brought along to accept responsibility for decisions that need to be made.

10. If you represent a water utility, what land use planning data do you use for your future water demand projections?

Responses included using County and City planning documents and land use, zoning, historic and projected growth rates from various places.

11. If you represent a water utility, what are your current and projected (five year increments through the Year 2020) water supply needs?

For the entities responding, the growth rates identified were anywhere from 0.5% to just over 4%.

12. Do you gather and maintain groundwater level or groundwater quality data? What data do you have and in what format (manual tabulations, electronic) is it in?

There was a wide range of answers to this question, including sporadic and localized monitoring. Some data is available on water quality and water quantity, and records are in manual and electronic form. If some have electronic data, he suggested that this information be provided to the Agency so that it can be included in the Agency's database.

13. To what extent should the MWA be involved in regional use of recycled water?

Some said it should be considered as a beneficial resource to the region and that it should be considered in the context of the Plan update. As to the responses the Agency plays in the recycling arena, they ranged from no involvement at all, to the Agency providing a regional leadership role. Others felt that MWA should provide guidance for the groundwater basin.

14. To what extent should the MWA be involved in water conservation efforts?

Some felt this is extremely important and that MWA should actively promote this to extend the usefulness of SWP entitlements. Some felt that MWA should undertake a public education program, and that water purveyors have the responsibility as water producers to individually and collectively enforce water conservation efforts.

15. Do you have any specific water quality concerns?

Arsenic, nitrates, chromium, uranium, and MTBE were of concern. There was also a concern that water in spreading basins will degrade the existing water quality by leaching contaminants. There was encouragement to study the long-term impact of TDS from SWP water.

16. Introduction of imported water into our groundwater basins may result in some changes to the native groundwater quality. Assuming that changes will not exceed State or Federal health standards, should the maintenance of existing water quality take precedence over measures to reverse the existing overdraft and enhance long-term water supply reliability?

A consistent theme was that recharge and reversal of the overdraft should take precedence as long as current health standards are met. Responses also included an opinion that continued overdraft will deteriorate water quality on its own, and that increasing TDS is acceptable if below drinking water standards. There was some concern regarding long-term impacts to water quality.

17. What are your thoughts about MWA entering into groundwater storage agreements with outside agencies?

Many felt that it was acceptable, providing that terms of the agreement do not adversely impact local solutions. There was a feeling that the benefits must be equitably distributed throughout the entire Agency, and that local entities must have priority for use of the MWA facilities and groundwater storage.

18. What are your thoughts about the MWA and/or the Mojave Basin Area Watermaster entering into groundwater storage agreements with water users within MWA?

Many believe this is an essential part of the existing plan and the adjudication, and that the benefit of storage locations should be fair to all users and of benefit to the basin.

19. Should the MWA consider purchasing new SWP entitlement whenever it might become available?

Some said this should occur as long as it is needed and affordable, others believe that MWA should do everything possible to acquire all possible entitlement, and yet others believe that there should be no expansion in entitlement until we are making full use of what is already there.

20. Do you think there is potential for regional projects that would delay or offset proposed local projects?

Some felt it should be considered on an individual basis, and others expressed interest in how regional projects may integrate with individual plans. Some did not understand the question.

21. Are you willing to consider delaying local projects in order to develop the regional projects?

Some respondents felt this was necessary for short-term goals, but that it was definitely needed for long-term goals. There was a feeling that projects should be evaluated on their own merit. One felt that this should not occur unless approved in the Regional Plan and with a prior CEQA process in place for a particular regional project.

22. Are you willing to work with MWA to jointly finance regional capital facilities?

Some indicated that they are already doing this, and the overall view was that everyone was willing to consider this.

23. How should the purchase of groundwater and construction of facilities needed for the region to recover from current groundwater overdraft be financed?

Some said that those that pay should receive benefits proportional to payment. Some felt that municipal and industrial users should pay for all construction of regional facilities, and that alternatives should be considered, including user fees, connection fees, assessments, grants, loans and other types of mechanisms.

24. How should the purchase of water and the construction of facilities needed for future water supply reliability be financed?

Responses included the following:

- End user should be charged a fair price
- By State and Federal grants
- Grants, assessment districts, low interest loans, developer fees, etc.
- Good question
- Answers the same as question 23

25. Should the MWA offer "degrees of reliability" for wholesale imported water purchases with an attendant cost differential (i.e. higher water supply reliability at a higher cost)?

Some said this should be considered. Some said that if possible, it would make it a lot more flexible to make better water purchase decisions since it would be established by what people are willing to pay. Some disagreed, indicating that reliability must be fair and equitable to all water districts. Others expressed concern that it may favor particularly lucrative land use over others. There was also a feeling that there was a need for a feasibility and cost benefit study. One individual felt that the priority should be on domestic, agricultural and industrial uses, in that order.

26. Should MWA commit entitlement to SWP water by specific region or area and how should it be done?

Suggestions include ensuring adequate water for everyone, and allocation of entitlement in proportion of payments that have been made or are anticipated to be made in the future. Some indicated that locales with the worst overdraft or water quality problems should be given priority, and that priority should be issued based on need and not on ability to pay. Others believe that this should be accomplished by a free market setting, and that MWA should annually allocate based on local needs.

27. Should the Plan update consider a financing program where everyone pays for regional projects, but new development pays more than the established community?

Some agreed with this, stating that this method has been used effectively elsewhere, and others felt it should be dealt with on a case-by-case basis. Others felt this type of approach would inhibit a pro-growth philosophy.

28. What should be the guiding principle(s) of the MWA?

- Maximize wet water put in the basin
- Procure State aqueduct water for the High Desert
- Make sure the Regional Plan will meet the needs of the entire area
- Provide reliable, clean, cost-effective service to all constituents in an equitable manner
- Enabling legislation does a good job of specifying what the Agency should be doing
- Establish an unending water source

29. Do you believe there is input from individuals or groups that may be missed by this process? Please identify them.

Most felt that major interests have been represented. There was a suggestion that amendments to the Plan, once developed, should receive widespread publication in the newspapers. Some felt that minimal users should have input and pay their fair share. There was suggestion that community services districts and the building industry may not be fully addressed at this point.

30. Please provide any additional input you believe pertinent to the Plan update.

These responses included the following:

- Recharge the Transition Zone at the Lower Narrows
- MWA's role as Watermaster produces some inherent conflict of interest issues
- Provide evidence that the Plan is working
- The plan needs to be widely circulated
- It is time to stop studying the issues and get water in the ground
- Periodic schedule to assure that the Plan objectives and guidelines are being followed in response to the changing economy and population
- Put water back into the ground without putting farmers out of business, while supporting municipal users
- Need for an Urban Water Management Plan, hydrographs, and potential recharge locations highlighted on a water systems map

In summary, Mr. McPherson encouraged everyone to review the responses provided and to advise him if their response as listed is different from the intent.

Mr. Brill opened the issue for questions or suggestions now that the responses have been reviewed, and if the perception of the process is useful and value-added.

Roy Hampson questioned the definition of the Plan. Mr. Brill said that in large part, the Plan is to be what the stakeholders need. The TAC was to help provide this definition. All entities and stakeholders were included in the process so they could provide input.

Gary Ledford said he believes this update is necessary and that the existing plan is not well enough defined on issues such as consumptive use and return flows. There is also a need to address policy issues and how they will work, as well as a need to address those issues so that specific issues are addressed in the future.

Steve Older feels it needs to be a living document and items addressed need to be verifiable.

Don Songer said he believes that MWA should be the lead group, and it needs to address the issue of tax dollars being collected for the purchase of water, as well as the benefits to the basin as a result of that. Issues of fairness and equity need to be addressed as far as what has occurred in the past and for the future.

Lee Pearl said the process was good and the ultimate outcome is dependent on input received. The process was open and public.

Don Bartz said individuals with a lot of money should not influence the MWA Board and that preference should not be given to specific projects. There needs to be a guarantee that this does not occur.

Paul Davis said he didn't feel that MWA did enough public outreach in getting the word out on the update process. Everyone needs to know that water is a precious resource and that everyone needs to pay their fair share for this resource. MWA has a job to do and needs to do it.

Pat Feary said she feels the Agency has done a good job with this process and has gotten the information out in various formats on various issues. She said it is the responsibility of the constituents to be involved, and that the Agency has done what they need to do to get the information out. Responsibility needs to lie with the constituents.

Norman Nichols stated that MWA was established to take are of water in this region, and that's what they are doing. The Plan is working. He believes that everyone needs to work within established parameters, or deal with Sacramento.

Jack Clarke stated that update of the regional plan is a step in that direction. It's not perfect, but with input the Plan update will be developed in the best way it can be done. It has to be dynamic and subject to change due to changing circumstances.

Mr. McPherson continued with his presentation. Some of the capital projects mentioned through meetings and through the questionnaire process are referred to on a map provided as a handout at the meeting, a copy of which is included as an attachment to these minutes. The Power Point presentation is also attached to these minutes. The following projects are identified by number below and correspond with the number identified on the map. These are proposed projects and may or may not come to fruition.

1. Oro Grande Recharge
2. Surface Water Treatment Plans for Victor Valley Water District, Baldy Mesa Water District, City of Adelanto and County of San Bernardino
3. Detention Basin Recharge
4. Antelope Wash Recharge
5. Upper Mojave River Wellfield and Distribution System
6. Mojave River Pipeline Extension - Transition Zone
7. Southern California Water Company Wellfield
8. Sheep Creek Recharge
9. Hi-Desert Water District Recharge Basin #3
10. Joshua Basin Water District Recharge and Pipeline
11. Ames Basin Recharge
12. Baja Storm Flow Retention (two locations)
13. Lucerne Valley Recharge
14. Land Purchase to Protection Riparian Habitat
15. Hesperia Lakes Recharge

Randy Hill noted that Victor Valley Water District injection wells are not noted on this map and should be included.

6. REGIONAL WATER MANAGEMENT PLAN UPDATE PROGRESS DISCUSSION

7. TENTATIVE SCHEDULE OF FUTURE ADVISORY COMMITTEE MEETINGS

Items #6 and #7 were addressed simultaneously. Mr. McPherson addressed the next steps in the update process. A list of critical issues to be addressed in the update Plan will be developed, as well as an expanded list of project and Plan alternatives. A finalized analysis on supply and demand and water management principles will be developed, culminating the process with a draft report, which should be completed by mid-December 2001. The next TAC meeting is targeted for December 19. The December 19 meeting will be to provide the draft document and to allow for review of it.

Mr. Brill once again encouraged suggestions on what has evolved to date on the update of the Plan. Input at this time is important so that suggestions can be considered and potentially incorporated into the draft update.

8. QUARTERLY REPORT ON BUILDING ACTIVITY: The report in the agenda packet was reviewed. Don Songer suggested a review of previous years, comparing projections and actuals on building report activity. Mr. Brill responded that this type of issue will be addressed in the update of the Regional Water Management Plan.

9. OTHER BUSINESS: None.

10. ADJOURNMENT: The meeting adjourned at 11:49 a.m.

Jack R. Clarke

Jack Clarke, Chairman

Mojave Water Agency Water Management Plan Update

Technical Advisory Committee Update

October 24, 2001

Saracino·Kirby·Snow

Discussion Topics for the Day

- Ongoing activities
- Overview of stakeholder issues assessment activities
- Projects mentioned by stakeholders
- Where we go from here

Ongoing Activities

- Data collection, review, and organization
- Updated assessments of current and projected demand and supply
- Stakeholder issues assessments
- Plan alternatives
- Report preparation

Summary of Stakeholder Issues Assessment Activities

- Interaction methods utilized
  - TAC meetings
  - Individual and group meetings
  - Written questionnaire

Individual and Group Meetings

1. Victor Valley Water Reclamation Authority
2. Baldy Mesa Water District
3. City of Barstow & Southern California Water Company
4. Joint Subarea Advisory Committee
5. City of Adelanto
6. City of Hesperia
7. Victor Valley Water District
8. Lahontan RWQCB
9. Improvement District "M"
   - Joshua Basin Water District
   - Hi-Desert Water District
   - Bighorn Desert View Water Agency
   - San Bernardino County Special Districts
10. California Department of Fish and Game
11. San Bernardino County Special Districts

Written Issues Questionnaire

- MWA mailed questionnaires to 26 entities
- Others received questionnaires from TAC members and at other meetings
- 19 completed questionnaires were submitted to MWA

Questionnaires Submitted

1. City of Adelanto
2. City of Barstow
3. Chuck Bell/Este Subcommittee
4. Bighorn-Desert View WD
5. Ca. Dept. of Fish & Game
6. Paul Davis
7. City of Hesperia
8. Hi-Desert WD
9. Jess Ranch
10. Joshua Basin WD
11. Lahontan RWQCB
12. Joe Monroe
13. Norman Nichols
14. County of San Bernardino Special Districts
15. So. Calif. Water Co.
16. City of Victorville
17. Victor Valley WD
18. Victor Valley WRA
19. Unknown

Number of Questionnaires Submitted by Each Region

- ID "M" -- 3
- Alto -- 7
- Este -- 2
- Oeste -- 1
- Centro -- 1
- Baja -- 0
- Regional/Multiple -- 5

Questionnaire Responses

- Responses were varied, but included some consistent themes

1. How important is to reverse the trend and recover from current groundwater overdraft?

- All indicated stopping the overdraft is very important to critical
  - Crucial to maintaining economic vitality of the region
  - Crucial to prevent degradation of water quality

1. continued

- Recovering from overdraft received varied response
  - Impossible to recover
  - Very important to critical
  - Define "recover" – What condition, in what year, at what water table level, in what area, do we recover too?

2. If the current WMP were fully implemented, how effectively would it meet your current and future needs? How would you improve the plan?

- General sense is the that the current plan is a good start
- A greater focus needs to be placed on the unique needs in the individual sub-areas
- Water quality is of prime concern and needs to continue to be monitored
- Water conservation has not been addressed
- Update events and additional goals

3. Do you think the current adjudication will solve the region's water supply problems in the short-term (1-5 years) and the long-term (6-20 years)? Why?

- Short-term, no. Long-term ranges from no, to maybe, to yes.
- No, to both, increasing the cost of water does not motivate users to conserve, need for a public outreach program.
- Adjudication does not match the physical solution, establishment of recharge basins is critical
- Yes, IF the adjudication is allowed to be fully implemented

4. How will you measure the success of this plan update process? (a) From your perspective? (b) From a basin-wide perspective? (c) For the short-term (1-5 years)? (d) For the long-term (6-20 years)?

- Sustainable and reliable water supply for entire agency
- Stakeholder consensus for major issues
- Recycled wastewater and conservation included in strategies
- Everyone shares the pain

4. How will you measure the success of this plan update process? (a) From your perspective? (b) From a basin-wide perspective? (c) For the short-term (1-5 years)? (d) For the long-term (6-20 years)?

- "...How realistically it guides the agency to the ultimate solution. A successful process only gets us a plan update, which will mostly consist of 'feel good' words on a lot of paper that might look better as trees back in the forest."

5. What is your confidence level that your expectations will be met in the short-term (1-5 years) and the long-term (6-20 years)? Why?

- Short term – mostly low confidence
- Long term – mostly high confidence
- Only if the parties work together for the good of the basin rather than focusing solely on their own interests

6. What potential barriers or key issues do you see that will need to be addressed in order for this plan update process to be a success?

- Diversity of opinions, politics, and lawyers
- Stakeholder commitment
- Adequate consideration of farming interests
- Allocation of SWP water and who will pay for it
- Lack of ability to update and improve the "physical solution"

7. If the update doesn't address your water supply needs, what do you think is the most likely way that you will be able to meet your water needs?

- Unacceptable scenario
- Seeking independence by seeking supply from multiple sources
- Recycled water programs
- Exploration and continued pumping
- Move to where more water is available

8. What do you think are the primary interests of the other stakeholders?

- Quantity – Quality – Cost
- Being treated equitably under the plan criteria
- New sources of affordable water
- Failure to recognize constraints of the arid region
- Political and financial benefits

9. What is your confidence level that the region's water resources can be managed to meet the region's anticipated water needs?

- Ranged from not very high to very high
- Concerns
  - Rapid growth and increased population every year
  - Inadequate distribution of supply
- Very High, if MWA gets the public to except responsibility for proper decisions

10. If you represent a water utility, what land use planning data do you use for your future water demand projections?

- County and city planning documents
- Land use and zoning maps, historic and projected growth rates, per capita consumption
- Figures provided by County of San Bernardino Planning Department
- Derived from general plans

11. If you represent a water utility, what are your current and projected (5-year increments through the Year 2020) water supply needs?

Projections in acre-feet

Region	Person or Agency	2000	2005	2010	2015	2020	% Growth
Alto	Randy Hill, Victor Valley Water	18000				28000	2.8
City of Hesperia	City of Hesperia	15635	17093	19815	22971	26630	3.5
	Joshua Basin Water District	1560	1639	1773	1905	2037	1.6
CSA 70 L (Pinon Hills Phelan A	County of San Bernardino		3632	4272	5026		3.8
CSA 70 J (Oak Hills)	County of San Bernardino		3710	4512			4.3
CSA 64 (Spring Valley)	County of San Bernardino		3468	3828	4191	4552	2.1
	Hi-Desert Water Agency		2835	3484	3753	4043	2.8
Centro (Barstow)	SCWC		10404	10720	11046	11381	0.6
Alto (Apple Valley)	SCWC		1029	1101	1176	1259	1.5
Este (Apple Valley)	SCWC		162	170	177	186	1.0

12. Do you gather and maintain groundwater level or groundwater quality data? What data do you have and what format (manual tabulation, electronic) is it in?

- Wide range of answers
- Sporadic and localized monitoring
- Some water quality, water quantity, or both
- Some records are manual, some are electronic

13. To what extent should the MWA be involved in regional use of recycled water?

- Should be considered as beneficial resource to the region in the plan update
- No role, jurisdiction belongs to sewer agencies and water retailers
- Should provide regional leadership and incentives for appropriate uses
- Provide guidance considering it is the entity responsible for the groundwater basin

14. To what extent should the MWA be involved in water conservation efforts?

- Extremely important the MWA takc a leadership role in regional effort
- MWA should actively promote to extend usefulness of SWP entitlements
- MWA should undertake a public education program
- Responsibility of water producers to individually and collectively enforce
- Higher costs will eventually be driving factor in conservation

15. Do you have any specific water quality concerns?

- Arsenic, nitrate, chromium, uranium, MTBE
- Concerns that water in spreading basins will degrade existing water quality by leaching contaminants
- Study the long-term impact of TDS from SWP water

16. Introduction of imported water into our groundwater basins may result in some changes to the native water quality. Assuming that changes will not exceed State or Federal health standards, should the maintenance of existing water quality take precedence over measures to reverse the existing overdraft and enhance long-term water supply reliability?

- Recharge and reversal of overdraft should take precedent, provided that health standards are met
- Continued overdraft will deteriorate WQ on its own
- Increasing TDS is acceptable if below drinking water standards
- Concerned about long-term impacts to quality
- This is not a black and white issue

17. What are your thoughts about MWA entering into groundwater storage agreements with outside agencies?

- Acceptable, provided that terms of the agreement do not adversely impact local solutions
- Fine, go for it
- Benefits must be equitably distributed
- Local entities must have priority for use of MWA facilities and groundwater storage
- Details must be carefully worked out

18. What are your thoughts about the MWA and/or the Mojave Basin Area Watermaster entering into groundwater storage agreements with water users within MWA?

- Essential part of the existing plan and the adjudication
- Benefit of storage locations should be fair to all users
- Any means of adding imported water should be a benefit to the region
- Details must be carefully worked out

19. Should the MWA consider purchasing new State Water Project entitlement whenever it might become available?

- Certainly
- #1 priority as long as it is affordable
- MWA should do everything possible to acquire additional SWP water if growth dictates and it is feasible
- First seek a high utilization of current entitlement
- Only at a level of affordability

20. Do you think there is potential for regional projects that would delay or offset proposed local projects?

- Should be considered on a case-by-case basis
- Interested in how regional projects may integrate with individual plans
- Do not understand the question

21. Are you willing to consider delaying local projects in order to develop the regional projects?

- Not for needed short-term goals but definitely for long-term goals
- All projects should be evaluated on their own merit
- No, unless approved in the Regional Plan with prior CEQA analysis
- Need more information, need to define regional and local

22. Are you willing to work with MWA to jointly finance regional capital facilities?

- Already discussed joint funding projects
- Want to continue joint applications with MWA to receive grant funding and matching funds
- Willing to work with MWA depending on the benefits of the project

23. How should the purchase of water and construction of facilities needed for the region to recover from the current groundwater overdraft be financed?

- Those that pay should receive benefits proportional to payment
- Municipal producers should pay for construction of facilities
- All alternatives should be considered, including: user fees, connection fees, assessments, grants, loans, etc.

24. How should the purchase of water and the construction of facilities needed for future water supply reliability be financed?

- End user should be charged a fair price
- By State and Federal grants
- Grants, assessment districts, low-interest loans, developer fees, etc.
- Good question
- Answers the same as question 23

25. Should the MWA offer "degrees of reliability" for wholesale imported water purchases with attendant cost differential (i.e. higher water supply reliability at a higher cost)?

- Should be considered
- If possible, would be able to make better water purchase decisions
- No, reliability must be fair and equitable to all water districts
- May favor particularly lucrative land-use over others
- Need a feasibility and cost-benefit study
- No, the priority should be (1) domestic, (2) agriculture, (3) industrial

26. Should the MWA commit entitlement to State Water Project water by specific region or area and how should it be done?

- Take every step ensure adequate water for everyone
- Allocate entitlement in proportion to payments
- Basins, subareas, locales with the worst overdraft, water quality problems, should be given priority
- Best accomplished by a free market setting
- MWA should annually allocate based on local needs

27. Should the Plan update consider a financing program where everyone pays for regional projects, but new development pays more than the established community?

- Yes, this method has been used effectively elsewhere
- On a case-by-case basis, considering grant availability, benefit of the project area, extent of local control, etc.
- Clarify anticipated regional projects
- No, will inhibit pro-growth philosophy

28. What should be the guiding principle(s) of the Mojave Water Agency?

- Maximize wet water put in the basin
- Procure State aqueduct water for the high desert
- Make sure that the Regional Groundwater Plan will meet the needs of the area
- Provide reliable, clean, cost-effective service to all constituents in an equitable manner
- Enabling legislation did a pretty good job
- Establish an unending water source

29. Do you believe there is input from individuals or groups that may be missed by this process? Please identify them.

- Major interests are represented
- When amendments are made they should be put before the public in the newspaper
- Minimal users should have input and pay their fare share
- Cities, community services districts, BIA
- Municipalities such as Apple Valley

30. Please provide any additional input you believe pertinent to the Plan update.

- Recharge the Transition Zone at the Lower Narrows
- MWA's role as Watermaster produces some inherent conflict of interest issues.
- Provide evidence that the plan is working
- The plan needs to be widely circulated
- It is time to stop studying, it is time to get water in the ground

30. Please provide any additional input you believe pertinent to the Plan update.

- Periodic schedule to assure that the plan objectives and guidelines are being followed in response to the changing economy and population
- Building consensus and gaining commitment among various parties in the basin will be the keys to successful implementation

30. Please provide any additional input you believe pertinent to the Plan update.

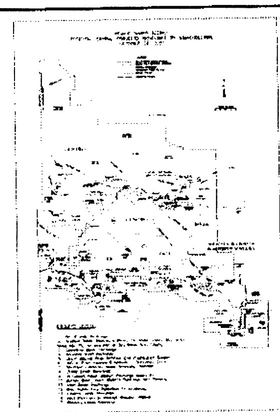
- Priority must be to put water back into the ground without putting farmers out of business while supporting municipal users
- Need for an urban water management plan, hydrographs with potential recharge locations highlighted, and a water systems map

Questionnaire Response Summary

- Questionnaire responses summarized in table format

Projects Mentioned by Stakeholders

- Several projects were mentioned
- Additional input is encouraged



Where We Go From Here

- Develop list of critical issues to be addressed in the updated plan
- Develop expanded list of project and plan alternatives
- Finalize supply and demand analysis
- Develop water management principles
- Prepare draft report

Schedule

- Draft report completed in mid-December
- Target date for next TAC meeting
  - December 19

SCANNED
11-2-01
TAC
mins.

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES

Mojave Water Agency
Board Room
22450 Headquarters Drive — **July 25, 2001**
Apple Valley, CA 92307 — **10:00 a.m.**

1. **CALL TO ORDER**: Chairman Clarke called the meeting to order at 10:03 a.m. MWA staff attending included General Manager Brill, Assistant General Manager Caouette, and Executive Secretary Thornell. Visitors attending included John Woodling, Senior Engineering Geologist and Mansour Hogabry, Civil Engineer, both representing the Department of Water Resources Integrated Storage Investigations Group, and Glenn McPherson representing the consulting team of Saracino-Kirby-Snow.

2. **INTRODUCTIONS**: Introductions were made.

3. **APPROVAL OF AGENDA**: The agenda was approved.

4. **OVERVIEW OF DWR INTEGRATED STORAGE INVESTIGATIONS PROGRAM**: Mr. Brill introduced DWR representatives John Woodling and Mansour Hogabry with the Integrated Storage Investigations (ISI) Program. Mr. Woodling provided a presentation and stated that he is with the DWR Conjunctive Water Management Branch. He is responsible for Proposition 13 groundwater programs, AB 303 (the Groundwater Management Assistance Act), and the groundwater storage element of Integrated Storage Investigations. He explained that the Integrated Storage Investigations is an initiative that came out of CalFed and is identified in the Record of Decision (ROD). The objectives of the ROD for groundwater storage is that the State achieve 0.5 million to 1 million acre-feet of new storage over the seven years of the Phase I implementation of CalFed.

In addressing the surface and groundwater conjunctive management element, Mr. Woodling stated that the objective here is to assist local agencies with improving water supply availability and reliability by increasing the coordinated use of surface and groundwater. In addition to that objective, there are a couple of fundamental beliefs that guide this program. First, conjunctive use projects with broad stakeholder support are more likely to be successful, which is why the ISI supports the TAC's involvement in this Agency's process. Also, if done locally and with local reliability, it makes the Statewide system better overall. CalFed adopted principals for conjunctive use projects which were then transferred to DWR's implementation of this program that deal with local control, locally driven planning, meeting in-basin needs, and if water is made available, there is water for out of basin type transfers and flexibility. Phase I of the ISI conjunctive management process begins with signing of an MOU, as well as stakeholder involvement, resource and needs assessment, programmatic feasibility, and basin management objectives. Phase II gets into project feasibility, environmental requirements, permits, pilot projects, institutional structure, and monitoring. Phase III involves full scale implementation.

DWR involvement includes planning assistance, technical work by DWR staff, contract services, State cost sharing, monies available through Proposition 13 grant funding in the amount of $200 million, and local groundwater assistance grant funds through AB 303. Mr. Brill added that MWA was successful in obtaining $250,000 in grant funds from AB 303.

Mr. Woodling next referred to an Overview of Groundwater Management and Conjunctive Use Programs, a copy of which is attached.

In summary, Mr. Woodling summarized that the ISI program is a local, voluntary, and flexible program to assist local agencies with improving water supply availability and reliability by increasing the use of surface and ground water.

A brief question and answer period followed.

5. **DISCUSSION OF STAKEHOLDER QUESTIONNAIRE**: Mr. Brill stated that the draft questionnaire, a copy of which is attached to these minutes, will be used in meetings with individual stakeholders to identify water supply needs and suggestions relating to the future of the Mojave Basin. By submitting the questionnaire to the stakeholders and individual meetings with stakeholders, MWA is trying to provide balance in order to capture issues and concerns as efficiently as possible.

Mr. McPherson stated that the list of questions in the questionnaire has been generated as a result of the consultant's history of working on stakeholder processes and putting together questions that will prompt thinking about where the update is going and the issues that need to be addressed. He next reviewed each question in the draft questionnaire. Discussion took place and suggestions for changes to questions were made.

Significant discussion took place as to the representation responding to the questionnaire. Mr. Brill reiterated that individual meetings with stakeholders and distribution of the questionnaire to the members of the TAC is felt to be the best manner in which to address concerns, the latter particularly because the TAC is widely represented by interests from throughout the Mojave basin. It was suggested that TAC members identify any individuals and entities they believe should be targeted with this questionnaire so that the Agency can include them in the process.

Following discussion, the Committee suggested changing the due date from August 10 to a date at the end of August so as to allow more time to gain responsible answers to the questions on the questionnaire. A suggestion was also made to consolidate some of the questions.

Mr. McPherson said that responses to the questionnaire will help to determine how many more meetings will be needed to finalize this process.

Mr. Brill thanked everyone for the comments made today and assured that changes addressed today will be made and the questionnaire will be distributed in the next day or so.

6. **TENTATIVE SCHEDULE OF FUTURE ADVISORY COMMITTEE MEETINGS**:

Mr. McPherson reviewed the project schedule, a copy of which is attached to these minutes. The next TAC meeting will review what was learned at the stakeholder meetings and as a result of responses to the questionnaires. Several other meetings will be held as the draft update is prepared and following the completion of Phase I to discuss the TAC's involvement in Phase II.

7. **OTHER BUSINESS**: None.

8. **ADJOURNMENT**: The meeting adjourned at 11:52 a.m.

Jack R. Clarke

Jack Clarke, Chairman

Mojave Water Agency
Regional Water Management Plan Update
Issues Questionnaire

July 26, 2001

Please return this questionnaire to the Mojave Water Agency no later than August 30, 2001. Your responses may be added directly to the space provided below each question, or you may receive an electronic version (MS Word) via e-mail by sending your request and e-mail address to Gloria Golike (gloriag@mojavewater.org). If you believe that specific questions do not apply to you, indicate "not applicable" or "n/a". Questions regarding the survey should be directed to Norm Caouette at (760) 240-9201.

1. How important is it to reverse the trend and recover from the current groundwater overdraft?

2. If the current Water Management Plan were fully implemented, how effectively would it meet your current and future needs? How would you improve the plan?

3. Do you think the current adjudication will solve the region's water supply problems in the short-term (1-5 years) and the long-term (6-20 years)? Why?

4. How will you measure the success of this plan update process?

    a. From your perspective?

    b. From a basin-wide perspective?

    c. For the short-term (1-5 years)?

    d. For the long-term (6-20 years)?

5. What is your confidence level that your expectations will be met in the short-term (1-5 years) and the long-term (6-20 years)? Why?

6. What potential barriers or key issues do you see that will need to be addressed in order for this plan update process to be a success?

7. If the update doesn't address your water supply needs, what do you think is the most likely way that you will be able to meet your water needs?

8. What do you think are the primary interests of the other stakeholders?

9. What is your confidence level that the region's water resources can be managed to meet the region's anticipated water needs?

10. If you represent a water utility, what land use planning data do you use for your future water demand projections?

11. If you represent a water utility, what are your current and projected (5-year increments through the Year 2020) water supply needs?

12. Do you gather and maintain groundwater level or groundwater quality data? What data do you have and what format (manual tabulation, electronic) is it in?

13. To what extent should the MWA be involved in regional use of recycled water?

14. To what extent should the MWA be involved in water conservation efforts?

15. Do you have any specific water quality concerns?

16. Introduction of imported water into our groundwater basins may result in some changes to the to the native water quality. Assuming that changes will not exceed State or Federal health standards, should the maintenance of existing water quality take precedence over measures to reverse the existing overdraft and enhance long-term water supply reliability?

17. What are your thoughts about MWA entering into groundwater storage agreements with outside agencies?

18. What are your thoughts about the MWA and/or the Mojave Basin Area Watermaster entering into groundwater storage agreements with water users within MWA?

19. Should the MWA consider purchasing new State Water Project entitlement whenever it might become available?

20. Do you think there is potential for regional projects that would delay or offset proposed local projects?

21. Are you willing to consider delaying local projects in order to develop the regional projects?

22. Are you willing to work with MWA to jointly finance regional capital facilities?

23. How should the purchase of water and construction of facilities needed for the region to recover from the current groundwater overdraft be financed?

24. How should the purchase of water and the construction of facilities needed for future water supply reliability be financed?

25. Should the MWA offer "degrees of reliability" for wholesale imported water purchases with attendant cost differential (i.e. higher water supply reliability at a higher cost)?

26. Should the MWA commit entitlement to State Water Project water by specific region or area and how should it be done?

27. Should the Plan update consider a financing program where everyone pays for regional projects, but new development pays more than the established community?

28. What should be the guiding principle(s) of the Mojave Water Agency?

29. Do you believe there is input from individuals or groups that may be missed by this process? Please identify them.

30. Please provide any additional input you believe pertinent to the Plan update.

Conjunctive Water Management

Since its inception in July 1999, the Conjunctive Water Management Program has emphasized the importance of forming partnerships with local agencies and stakeholders to assist in planning and developing conjunctive water management projects. Conjunctive water management is the planned, coordinated use of surface water and groundwater resources to provide local and regional water supply reliability and improved operational flexibility.

The primary programmatic principles are to: (1) establish local basin-wide planning partnerships, (2) facilitate local basin monitoring, (3) ensure the voluntary local implementation and control of projects, and (4) maintain priority for in-basin water needs and compensation for out-of-basin transfers.

Partnerships are established with local agencies through Memorandums of Understanding to coordinate studies for determining the appropriate role of conjunctive water management projects in the mix of available water management options. Through these partnerships, stakeholder advisory groups are convened to guide development of programmatic feasibility study reports that identify and increase understanding of environmental and third-party impacts, present and future in-basin water needs, and mitigation requirements for potential projects.

Cooperative investigations and project-specific feasibility studies, groundwater basin monitoring and modeling, and pilot and demonstration projects are being conducted by various partners to develop and implement conjunctive water management projects and programs. Other related groundwater basin planning, data collection, monitoring, and management programs are also being considered in the mix of project options.

Realizing the importance of conjunctive water management in the overall approach to resolving California's water supply needs, the State passed AB 303 and the Water Bond Act of 2000. AB 303 sets up a $5 million Local Groundwater Assistance Fund to provide grants to local public agencies for groundwater studies and management activities to increase their understanding of how to better manage their groundwater resources. Chapters 8 and 9 of the Bond Act provide $230 million to study, plan and construct groundwater storage and recharge facilities projects.

Activities to Date

Signed MOU's with local agencies to develop conjunctive management programs statewide.

Established partnerships local and regional agencies, and stakeholders to guide the programmatic feasibility evaluation process to discuss and resolve related groundwater management issues, and present opportunities to assess impacts before project implementation.

Assisted with modeling studies to determine feasibility of dry year transfers from north Sacramento area groundwater basin and entered into cost-sharing agreements with these partners to complete a groundwater data management system and develop a pilot scale groundwater banking and exchange program.

Assisting San Joaquin County partners with the development of a countywide water management plan.

Entered into cost-sharing agreement with Glenn County partners to complete basin management objectives and groundwater data management pilot program.

Assisted partners with technical evaluation of recharge areas in Westlands Water District.

Developed technical criteria and evaluated proposals for loans and grants to provide funding for conjunctive use feasibility and pilot studies, studies or monitoring leading to better groundwater management and project construction.

Fish Passage Improvement

Building partnerships to improve and enhance fish passage in Central Valley and Bay Area streams has been a main focus of the Fish Passage Improvement Program since it began in late 1999. Department of Water Resources staff has met with local, State, and federal agencies and stakeholder partners to plan and implement projects to remove barriers that impede migration and spawning of anadromous fish species.

Program principles encourage interagency and stakeholder participation by partnering with watershed and project-specific stakeholder groups to address fish passage issues. DWR's interdisciplinary team of fish biologists, hydrologists, engineers, and environmental specialists has joined with many partners to inventory potential barriers and begin feasibility evaluation of individual projects. These partnerships ensure that project impacts are properly addressed in an open and inclusive manner and have local support. CALFED agencies, water suppliers, and environmental advocates help review overall program direction.

To identify and evaluate projects to modify or remove instream structures that impede migration of anadramous species, the Fish Passage Improvement Program will use a Geographic Information System inventory of fish migration barriers. The inventory will help partners and stakeholders evaluate potential fish migration benefits, ecological and socioeconomic impacts, and project costs for each structure inventoried. Modification or removal of specific fish migration barriers can then be thoroughly investigated. The most feasible fish passage projects with accompanying water use and aquatic ecosystem benefits will be implemented.

Activities to Date

Consolidated a multi-disciplinary staff of fish biologists, engineers, and support staff to do general coordination and specific project development.

Sponsored meetings and workshops to organize collaborative efforts among stakeholder groups.

Reviewed existing agency information and communicated with local agencies and watershed groups to develop a computerized Geographic Information System inventory of fish migration barriers.

Developed criteria to evaluate projects and established a priority list.

Prepared a draft report on the Fish Passage Improvement Program.

Coordinated program activities with other organizations that have fish passage improvement programs, including The Resources Agency, Caltrans, California Department of Fish and Game, and others.

Coordinated preparation of environmental documentation and feasibility studies for specific projects.

Currently Identified Priority Projects

Alameda Creek *
San Francisquito Creek *
York Creek: York Dam *
Clear Creek: Saeltzer-McCormick Dam (completed)
Mill Creek: Clough Dam
Battle Creek
Red Bluff Diversion Dam
Yuba River: Daguerre Point Dam *
Butte Creek / Butte Sink / Sutter Bypass *
Fremont Weir *
Putah Creek
Dry Creek *
Cosumnes River *
Calaveras River *
Stanislaus River *
Merced River *

* Active, ongoing implementation and coordination

In-Delta Storage

A partnership of CALFED agencies are studying in-Delta water storage sites as part of the Integrated Storage Investigations Program. Three proposed water storage project alternatives are being evaluated for their potential to develop long–term approaches for operational flexibility to enhance water supply reliability to cities and farms and ecosystem benefits to fish and wildlife habitat in the Sacramento-San Joaquin River estuary.

The CALFED Record of Decision identified In-Delta storage as one of three surface storage projects to be pursued early in the Bay-Delta Program. The ROD committed CALFED agencies to explore the lease or purchase of the Delta Wetlands project, or, if that is not feasible, to initiate an alternative project. Delta Wetlands has already prepared an Environmental Impact Report for its proposed project.

Project Alternatives

1. Lease the Delta Wetlands Project, which includes the use of Webb Tract and Bacon Island for water storage and Holland Tract and Bouldin Island for wildlife habitat. Webb Tract and Bacon Island can store approximately 190,000 acre-feet of water, and can deliver approximately 100,000 acre-feet in average years.

2. Purchase the Delta Wetlands Project. This alternative also uses Webb Tract and Bacon Island for water storage and Holland Tract and Bouldin Island for wildlife habitat. Storage and delivery benefits are the same as Alternative 1.

3. Purchase the Delta Wetlands Project. Use Victoria and Bacon Islands for water storage and Webb Tract, Bouldin Island and Holland Tract for habitat development or partial agricultural use. Provide a connection between Victoria Island and Clifton Court Forebay. This alternative provides 232,000 acre-feet of reservoir storage, and provides approximately 120,000 acre-feet in average years.

The ROD lists specific actions for the In-Delta storage project including selecting a project alternative, initiating negotiations with landowners for acquisition or lease of necessary properties, developing a project plan that addresses local concerns about effects on neighboring lands, and completing final design, obtaining necessary authorizations and funding, and beginning construction.

The study is now focused on reconnaissance level investigations, including operations studies, preliminary engineering design and cost estimates, preliminary geologic and biological findings, potential water quality impacts, loss of agricultural land, seepage on adjacent islands, levee stability concerns, and water quality impacts to determine which water storage project alternatives are feasible and warrant further actions. An outreach program is being developed to share information and receive comments on the program from interested parties, local landowners, and other stakeholders within the Delta.

Study participants will then prepare a feasibility study report of In-Delta storage project alternatives. Subsequent to the feasibility study, agencies will complete permit documentation, and other regulatory compliance requirements, conduct a risk analysis, and evaluate other legal and policy issues.

Activities to Date

Completed reconnaissance level investigations of project alternatives to determine their ability to provide operational flexibility for storage and export, enhance flow regimes for fish in the Delta, and provide Environmental Water Account benefits.

Prepared an appraisal summary of USBR-DWR in-Delta storage investigations.

Developed a joint DWR-USBR workplan for feasibility study investigations of technical information on water quality effects, levee stability, seepage effects, seismic analyses, fishery impacts, operational flexibility, and cost estimates for the most feasible alternatives.

Los Vaqueros Reservoir Enlargement and Bay Area Blending/Exchange

CALFED agencies, including the Bureau of Reclamation and the Department of Water Resources, formed a partnership with Bay Area agencies and stakeholders to investigate the feasibility of enlarging Los Vaqueros Reservoir as a part of a water quality blending program for the Bay Area. The partnership is committed, consistent with the CALFED Record of Decision, to improve water quality and supply reliability, ecosystem restoration, and operational flexibility for Bay Area communities, while ensuring that the existing Contra Costa Water District mandates and agreements and local voter approval required for the expansion are respected.

The Bay Area Blending/Exchange Project is being developed concurrently to help local partners identify and evaluate actions to improve drinking water quality and supply reliability by interconnecting existing conveyance facilities and blending the water in the enlarged Los Vaqueros Reservoir.

Participating Agencies

Local Bay Area agencies:
Alameda County Water District
Bay Area Water Users Association
Public Utilities Commission of San Francisco
Contra Costa Water District
East Bay Municipal Utility District
Santa Clara Valley Water District
Zone 7 Water Agency

CALFED agencies:
Department of Water Resources
Department of Fish and Game
National Marine Fisheries Service
U.S. Bureau of Reclamation
U.S. Fish and Wildlife Service

Los Vaqueros Reservoir Enlargement

The ROD lists a number of actions related to the Los Vaqueros Reservoir Enlargement, beginning with initiation of a Memorandum of Understanding to identify participating partners and establish agreement concerning how the program will be carried out. Through contracts with DWR, CCWD and participating partners will conduct 100,000 acre-foot Los Vaqueros Reservoir by up to 400,000 acre feet. DWR will execute a contract with CCWD, which operates the existing reservoir, to develop Phase 1, Scope of Work, for the Los Vaqueros Reservoir enlargement; and initiate Phase II feasibility studies, which include securing authorization and funding for engineering and environmental studies, developing project alternatives, defining water rights needs, and completing a feasibility study report, environmental documentation and a preliminary design.

Partners will establish a water agency advisory group, and coordinate local agency partnership agreements for necessary studies to develop project alternatives and receive public input for preparation of environmental documentation. USBR, DWR, and stakeholders will work with CCWD to obtain voter approval of selected project, and construct approved project.

Bay Area Blending/Exchange

The ROD has also directed agencies to implement a project that enables Bay Area water districts to work cooperatively on water quality and water supply reliability. Bay Area water agencies will initiate a separate MOU to establish a partnership among Bay Area water agencies to cooperatively address program water quality and supply reliability concerns on a mutually beneficial and regionally-focused basis. DWR, in partnership with other project operators, will evaluate the feasibility of interconnecting Bay Area conveyance facilities, so water suppliers can take advantage of different sources when water quality is highest.

Activities to Date

DWR, in partnership with stakeholders, initiated an MOU to identify participants in the feasibility and environmental studies for the expansion of Los Vaqueros Reservoir.

DWR also initiated a partnership agreement with CCWD to outline Phase 1, Scope of Work, and to study enlargement of Los Vaqueros Reservoir as an element of Bay Area Blending/Exchange.

North of the Delta Offstream Storage

The Department of Water Resources is participating in a partnership with local, regional, State, and federal agencies, and stakeholders to further study north-of-the-Delta offstream storage opportunities. Storing water in offstream reservoirs during high flow periods provides opportunities to increase water storage in an environmentally sensitive manner. The stored water is then made available for beneficial uses at times when conflicts over available supplies are most pronounced – during droughts. The North of the Delta Offstream Storage Investigation has focused on four potential projects on the west side of the Sacramento Valley, including the Red Bank Project, Thomes-Newville Project, Colusa Reservoir, and Sites Reservoir.

CALFED's Record of Decision specifically identifies the proposed Sites Reservoir for further technical work, environmental review and development of cost-sharing arrangements during CALFED Stage 1 implementation, before a decision to implement the project as part of the CALFED Program is made. The ROD states that the Sites project could enhance water management flexibility in the Sacramento Valley, reduce diversions from the Sacramento River during critical fish migration and spawning periods, increase the reliability of water supplies for a significant portion of the Sacramento Valley, and provide storage and operational benefits for other programs, including Delta water quality and the Environmental Water Account.

This potential 1.9 million acre-foot reservoir site is located near the western edge of the Sacramento Valley in Glenn and Colusa counties. A reservoir would be formed by constructing two primary dams and nine saddle dams. The water supply to fill the reservoir would be diverted offstream for storage from the Sacramento River and local tributaries.

The ROD directed agencies to develop a Memorandum of Understanding to initiate a partnership with local, regional, State, and federal agencies, and stakeholders to develop an acceptable planning process, receive input from signatories and other interested parties, and address all aspects of project planning, including environmental review and cost-sharing.

Participating Partners

- CALFED agencies including DWR, Department of Fish and Game, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and Western Area Power Administration
- Colusa County
- Glenn-Colusa Irrigation District
- Maxwell Irrigation District
- Natomas Mutual Water Company
- Orland Unit Water Users' Association
- Princeton-Cordora-Glenn Irrigation District
- Provident Irrigation District
- Reclamation District No. 108
- Sutter Mutual Water Company
- Tehama-Colusa Canal Authority

The project partners will continue to work with a Technical Advisory Group to provide technical review and input into the planning process. Project planning will involve partnership members to evaluate engineering, economic, and environmental impacts. The investigation will continue to perform field surveys of environmental resources, and to prepare a feasibility study for the project.

Partnership members will jointly evaluate the most feasible project and various alternatives, as required by Section 404 of the Clean Water Act and the environmental documentation process. Partners will prepare planning and environmental documentation and necessary permits for the project determined most feasible.

Activities to Date

Signed an MOU to initiate a partnership with fifteen local, State, and federal agencies.

Partners jointly evaluated preliminary engineering, economic, and environmental studies, performed field surveys of environmental resources, and prepared feasibility study for the project.

Began development of planning agreements with partners.

San Joaquin River Watershed Storage

The Department of Water Resources and the U.S. Bureau of Reclamation are developing a partnership program to conduct feasibility studies to determine whether a viable alternative exists to improve the reliability of water supplies along the San Joaquin River and help meet the goals of the CALFED Bay-Delta Plan to improve the ecosystem of the San Joaquin River.

Several offstream storage projects have the potential to provide from 250,000 to 700,000 acre-feet of additional storage in the upper San Joaquin River watershed. These projects would be designed to contribute to improvement of water supply reliability and facilitate conjunctive water management and water exchanges that would improve the quality of water deliveries to urban communities and the Delta. These projects also have the potential to help meet riparian environmental needs downstream of Friant Dam and reduce the frequency of damaging floodflows and improve water quality in the river.

In a separate but related effort, the Friant Water Users Authority and a coalition of environmental and fishing organizations led by the Natural Resources Defense Council are developing a water supply plan for use in habitat restoration for the San Joaquin River. Their goal is to accomplish restoration, while not adversely impacting the overall sufficiency, reliability, and cost of water supplies to CVP Friant Division water users.

Participating Entities

- Department of Water Resources
- Natural Resources Defense Council
- The Friant Water Users Authority
- U.S. Bureau of Reclamation

The CALFED Record of Decision directs agencies to identify partners and develop and execute planning agreements with local, State and federal agencies, and other stakeholders and interested parties. In addition, partners will initiate discussions and coordinate investigations with the San Joaquin River Management Program and Comprehensive Flood Study. Agencies will also assess the potential water supply reliability improvement, engineering and economic feasibility, and the environmental impacts of the various project alternatives.

An investigation of the feasibility of potential project alternatives will include:

Friant Dam: raise the dam to enlarge the storage capacity of Millerton Lake for various purposes.

Fine Gold Reservoir: construct an offstream reservoir upstream of Millerton Lake on Fine Gold Creek to provide storage for water in the Fine Gold watershed and to hold water pumped from Millerton Lake.

Temperance Flat Dam and Reservoir: construct a new dam and reservoir on the San Joaquin River at the upstream end of Millerton Lake at Temperance Flat.

Upstream Reservoirs: modify operating procedures in reservoirs upstream of Millerton Lake to increase the average water yield in the watershed.

Montgomery Reservoir: construct Montgomery offstream reservoir near the Merced River.

Conjunctive Use: develop projects dowstream of Millerton Lake.

Partners will initiate a feasibility study on the selected project and complete environmental review and planning documentation.

Activities to Date

Completed initial evaluation of Montgomery Reservoir and completed a draft appraisal report for Montgomery Reservoir based on previous studies.

Began feasibility investigations for enlarging Friant Dam and other functionally equivalent surface storage projects.

Shasta Dam Enlargement

The U.S. Bureau of Reclamation, in partnership with the Department of Water Resources, other federal and local agencies, and stakeholders, will evaluate the feasibility of enlarging Shasta Lake by up to 300,000 acre-feet to meet the broad objectives of improved water supply reliability and ecosystem restoration. Enlarging the lake by raising Shasta Dam would increase the capaciiy to capture floodwaters, which would then be available to meet downstream beneficial uses. In addition, enlarging Shasta Lake could increase the pool of cold water available to maintain lower temperatures in the Sacramento River needed by certain fish species for survival and spawning.

State agencies could be limited from participating in studies of expansion of Shasta Lake if the project affects the wild and scenic reach of the McCloud River. The California Public Resources Code (Section 5093.542) states that "except for participation by the Department of Water Resources in studies involving the technical and economic feasibility of enlargement of Shasta Dam, no department or agency of the state shall assist or cooperate with, whether by loan, grant, license, or otherwise, any agency of the federal, state, or local government in the planning or construction of any dam, reservoir, diversion, or impoundment facility that could have an adverse effect on the free-flowing condition of the McCloud River, or on its wild trout fishery."

The CALFED Record of Decision identified expansion of Central Valley Project storage in Shasta Lake by approximately 300 thousand acre-feet as one of three surface storage projects to be pursued with project-specific study. Early actions will focus on feasibility study and environmental review necessary for decisions to proceed with or implement the project. A number of project actions are listed in the ROD including resolution of legal issues related to State agency participation in planning and implementation (described above), feasibility and preliminary design studies, environmental review and documentation, federal authorization and funding, and beginning construction.

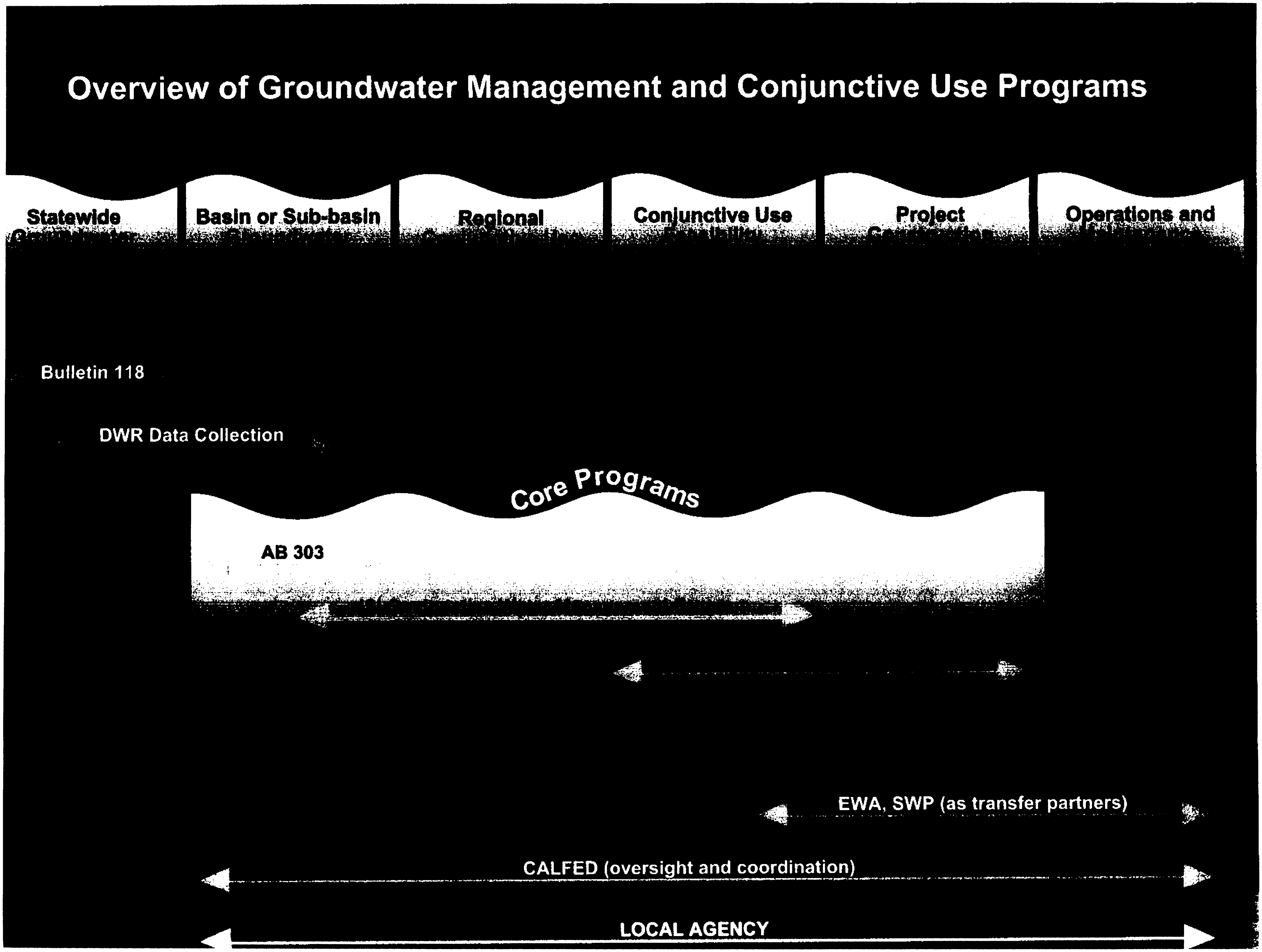
Activities to Date

The USBR completed an Appraisal Assessment on the potential for enlarging Shasta Dam and Reservoir. Three enlargement sizes were studied to illustrate the potential costs, technical issues, and impacts associated with raising the height of the dam to provide additional water storage.

Based on the results of this assessment, USBR concluded that a 6.5-foot raise costing about $122 million, including mitigation measures, has the least unit cost for storage - about $420 per acre-foot, minimizes both environmental and socio economic impacts, and warrants further study.

A detailed work plan is being developed by USBR and DWR for this program to outline the feasibility study activities for the Shasta Dam enlargement and its relationship with the Sites reservoir.

The impacts of relocating transportation routes, recreational facilities, and communities are being studied. Detailed topographic surveys are being conducted to assess the impacts on existing facilities.


Overview of Groundwater Management and Conjunctive Use Programs
Statewide
Basin or Sub-basin
Regional
Conjunctive Use
Project
Operations and
Bulletin 118
DWR Data Collection
Core Programs
AB 303
EWA, SWP (as transfer partners)
CALFED (oversight and coordination)
LOCAL AGENCY

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

11:30

AGENDA - SPECIAL MEETING

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

June 20, 2001
10:00 a.m.

1. CALL TO ORDER

2. INTRODUCTIONS

3. APPROVAL OF AGENDA

4. INTRODUCTION OF REPRESENTATIVES FROM SARACINO-KIRBY-SNOW, THE CONSULTANT TEAM SELECTED TO ASSIST MWA WITH UPDATE OF THE REGIONAL WATER MANAGEMENT PLAN (RWMP)

5. IDENTIFICATION OF THE BASIC REASONS TO UPDATE THE RWMP

6. ORGANIZATION OF THE TAC TO FUNCTION AS THE BASIN ADVISORY PANEL FOR THE RWMP UPDATE

7. IDENTIFICATION OF THE KEY STAKEHOLDERS NOT REPRESENTED BY THE TAC

8. IDENTIFICATION OF KEY ISSUES THE RWMP UPDATE SHOULD ADDRESS

9. COORDINATION OF FUTURE ACTIVITY OF THE TAC IN RELATION TO THE RWMP UPDATE

10. ADJOURNMENT

11-2-01
D TAC
F minutes

TECHNICAL ADVISORY COMMITTEE
TO THE
MOJAVE WATER AGENCY

MINUTES – SPECIAL MEETING

Mojave Water Agency
Board Room
22450 Headquarters Drive
Apple Valley, CA 92307

June 20, 2001
10:00 a.m.

1. **CALL TO ORDER:** The meeting was called to order at 10:00 a.m.

2. **INTRODUCTIONS:** Introductions were made. Thirty visitors attended the meeting.

3. **APPROVAL OF AGENDA:** The agenda was approved as submitted.

4. **INTRODUCTION OF REPRESENTATIVES FROM SARACINO-KIRBY-SNOW, THE CONSULTANT TEAM SELECTED TO ASSIST MWA WITH UPDATE OF THE REGIONAL WATER MANAGEMENT PLAN (RWMP):** Mr. Brill stated that MWA adopted the Regional Water Management Plan in 1994, which was a valuable planning tool for the Agency and stakeholders. The intent was for the plan to be updated every five years following adoption. The Agency is now in the process of doing this update, particularly in light of the many changes that have taken place regionally and State-wide since 1994.

Mr. Brill introduced Glenn McPherson, a representative from the consulting team of Saracino-Kirby-Snow, the firm the Agency has hired, along with the Department of Water Resources Integrated Storage Investigations (DWR ISI) group, to carry out the update. He added that DWR is a co-funder in this effort. DWR feels that by helping local management agencies such as MWA in proper management facilities and programs, it helps the overall State water supply situation.

Mr. McPherson provided an overview of the plan update (a copy of the presentation will be included as an attachment to these minutes), indicating that the plan will yield region benefits, including:

- Building consensus among MWA stakeholders
- Enhance management of MWA's water resources and heighten the Agency's ability to work with the stakeholders to manage the resources
- Increase availability and reliability of water supply
- Develop financing options to implement alternatives

Four primary components in this process include technical, institutional, political, legal and financial aspects.

The consulting team wants to be sure that they are asking the right questions throughout the update process to assure success of the update, including:

- How and when can the overdraft be mitigated?
- How will long-term water demands be met?

- How can water quality be protected?
- How will land use changes affect water resources and financial planning of MWA?
- How can outside interests (partners) be integrated into the Plan?
- How can MWA's assets be used to financial advantage?

Mr. McPherson noted that the project team of Saracino-Kirby-Snow does basin management. The update effort will include input from Psomas Engineering for civil and agricultural engineering; James Goodrich, who will be working with political and institutional issues; Peer Swan, who will provide input as to financial alternatives; and Susan Trager for input on legal issues. He referenced his firm's mission, which is to promote sound water resource management through effective use of technical information and scientific data in the development of water resources policy and programs. The firm is well known throughout the State for water resources planning, and the real impetus of the firm is to be sure they are utilizing technology and scientific data to its maximum extent in assisting in water policy development, which is their core purpose. The firm has been active in the CALFED process, the Conjunctive Use Program, and the Water Management Strategy Program, working on data handling and policy setting for the entire State as relates to the CALFED process. They are also involved with DWR on implementation of the CALFED process, as well as the DWR ISI program to enhance understanding of groundwater and surface water resources to integrate a program to maximize them.

Throughout the update process, his firm will be conducting stakeholder outreach, public workshops and education, data management, financial planning, and project engineering. He looks forward to working with everyone.

5. IDENTIFICATION OF THE BASIC REASONS TO UPDATE THE RWMP

Mr. Brill stated that a transition from agricultural to municipal and industrial use is being experienced currently, in large part due to growth coming into the region and the resulting need for increased water supply. There is also increased demand in some of the outlying areas away from the Mojave River, and potential regulatory pressures resulting from water quality standards that could have significant impacts. Many changes have also occurred as to California water supply, partly due to overall population growth. Since 1993-94, there is a heightened awareness relating to environmental issues relating to the Sacramento Delta, which is essentially competition for State Water Project water coming from the aqueduct, much of which flows through the Delta. There has been concern that there is not enough water supply for habitat, which directly impacts this region. In the last several years, and as a result of the State's reluctance to address challenges through additional surface storage, there has been a shift of focus from surface storage projects to groundwater storage projects. There have also been potential changes to the State Water Project (SWP) as to the Monterey agreement, which allowed the State Water Contractors (SWC) to make more efficient use of entitlement. This has been called into question as a result of a recent lawsuit. Also, there is potential legislation through the State as to approved development and adequate water supply for development. These are all drivers for the Agency to update the RWMP. Additionally, there is new census data which provides the tools needed to project future demand of water supply.

Mr. Brill noted that the update will be done in a three-phase approach. In Phase I, the current phase, the Agency will make a current assessment and preliminary scope to identify and select alternatives for consideration in the Plan update. The Agency plans to obtain ideas from the stakeholders to help the Agency assure a long-term water supply for the beneficial users. Data will be compiled for basic water supply and demand to assist in the scoping. Phase II will involve taking everything collected under Phase I and doing a more detailed evaluation, assessing pros and cons and costs and benefits, resulting in a short list of a combination of facilities and management responses the Agency might undertake. In Phase III, the Agency anticipates the potential of environmental documentation that will likely be necessary.

Mr. McPherson stated that the interaction with the stakeholders is a primary concern to MWA and to DWR. His firm hopes to build trust and confidence among the stakeholders that the management plan being developed does reflect input from throughout the entire region. They will need to develop principals of project implementation so that those projects being discussed and developed meet a common set of goals for the Agency and for the region. Information will be gathered and project alternatives will be formulated. Data management is key to putting this together. Many agencies have compiled information, and the key is to obtain that data and put it in a form that can be used now and in the future. This information will be assembled in an electronic database, which will be able to be used in the future to look for various types of information, and which will eventually be able to be shared among the stakeholders throughout the Mojave region.

The consulting team will be looking at water planning and demand forecasting, including demands for agriculture, municipal, and industry, and economically feasible conservation as different types of demands. In the past, demand forecasting has been done by looking at population and a historical mix of agricultural and urban demand, projecting it into the future by assuming population increases. With disaggregate forecasting methods, they can review each one of the components of land planning and project on an individual basis, which allows forecasting to be much more specific. To do this, they plan to use the IWR-MAIN model that provides a tool for demand forecasting for years to come.

The consulting team will develop alternatives concurrently while identifying key issues for the plan, which is assisted through stakeholder input. Preliminary results from the statewide economic optimization model (CALVIN) identify the Mojave area as a very economically viable area to do water banking as part of the overall State handling of water supply.

In summary, coming out of Phase I there will be an organized database, which should ultimately be available on the internet. A key component is the integrated process with the stakeholders, which will extend into Phases II and III. The scoping report, which should be out in late October 2001, will contain key issues for consideration as the plan update moves ahead, identifying promising plan alternatives that would provide benefits for the area and management principals and criteria.

6. ORGANIZATION OF THE TAC TO FUNCTION AS THE BASIN ADVISORY PANEL FOR THE RWMP UPDATE

7. IDENTIFICATION OF THE KEY STAKEHOLDERS NOT REPRESENTED BY THE TAC

Mr. Brill noted that TAC participation is very important in the first phase since more aggressive stakeholder outreach will be done in this phase. He also envisions meetings with individual stakeholders, particularly at the beginning of this process.

The Agency would like to have the TAC serve as a basin advisory panel due to its past value to the Agency and the historical relationship with MWA in relation to water supply issues. At a meeting of the TAC on April 4, the members agreed to participate in this capacity. It is important for MWA to have this support; DWR felt that it would be important for the Agency to have this commitment by the TAC that includes community interest as part of the criteria for DWR to supply funding. The TAC's purpose in this plan update is to provide a valuable tool for different types of stakeholders to communicate and work with MWA in developing this plan and promoting conjunctive use types of alternatives. Mr. Brill noted that the Agency wants to have representation from several key stakeholder groups, with a core group of approximately 20-25. He anticipates meetings about five times for the Phase I scoping process through the end of October. This panel would hopefully also assist in development of the scope for Phases II and III.

Mr. Clarke noted that this is a very important project, and a commitment that needs to be followed throughout the entire RWMP update process, which will be ongoing through 2002 to 2003.

A question and answer period took place. Don Songer asked if domestic well owners includes stipulating and non-stipulating well owners. Mr. Caouette responded that is the intent that both groups be represented.

Reg Adams, Pinon Hills, suggested that future power plants use the dry cooling process.

Tom Bilhorn, a consultant with the Department of Fish and Game, questioned how specific the Plan update will be compared to the current plan. He also believes it is important that it be clearly stated that this is an MWA plan, not a plan for the Watermaster and the stipulating parties. Mr. Brill stated that they are planning to be specific as to management responses and facilities. Phase II will be looking at specific facilities and conceptual cost benefit analyses. MWA wants this update to be a planning tool that launches directly into implementation of various management responses and facilities identified, allowing for a tool to have an accurate projection of the resources the Agency and stakeholders may need to implement what is identified in the Plan. Mr. Clarke added that he believes the Department of Fish and Game needs to be involved in environmental issues since the knowledge of the entire region would be very valuable.

Gary Ledford, Apple Valley resident, said he believes that somebody from the power plant community should be involved in this process. He also questions how the Agency's entitlement will be prioritized. Mr. Clarke responded that the update process will answer many of these types of questions. He also agrees that there needs to be interest from the power generation community.

Mr. Brill suggested that there be a determination today of parties interested in providing representation for the core group.

8. IDENTIFICATION OF KEY ISSUES THE RWMP UPDATE SHOULD ADDRESS

Mr. Brill addressed the first issues of priority as follows, indicating that this is the focus of the upcoming process, with the intent being to see where we are now and to build on or delete from the following list:

- Water supply reliability
- Groundwater storage programs and storage agreements
- SWP entitlement allocation
- Supplemental water pricing and policy (Ordinance No. 9)
- Consumptive use
- Riparian habitat
- Water quality
- Monitoring programs
- Regional aquifer recharge
- New water supply facility needs (recharge, injection, direct use)
- Use of existing facility capacity by others
- Wastewater return flows and reclaimed water use
- Flood water storage
- Relationship of Mojave Basin Area Judgment to RWMP
- Changes to State law
- Other key issues to be identified through the stakeholder process

The next step in the process is as follows:

- Collect, review and organize current data
- Develop current and projected water demand estimates
- One on one meetings with key stakeholders
- Identify key issues for the plan
- Identify water management principals
- Develop preliminary plan alternatives
- Prepare draft scoping report
- Prepare final scoping report

TAC meetings will be held so that there is a purpose to meet. The second meeting will occur after data is collected and compiled so that there will be an opportunity to look at the data. Individual stakeholder outreach will take place in August. The plan is to compile input presented into a general format, with results brought back to the TAC for review. There will also be an opportunity for the TAC to meet after the draft scoping report has been prepared, which will provide an opportunity for review, comment, and input.

Guy Patterson, representative from the City of Victorville, said he is pleased to see the update process beginning. He is also pleased to see the issue of wastewater treatment being addressed, since in the 1994 plan discharge was listed at 4.8 million gallons daily; currently, the rate is 8.5 million gallons daily, and in 2020 it is projected to be about 21 million gallons daily. He believes it will be critical to determine if we can continue to keep pumping that much water out of the ground, and to address alternatives. Additionally, he believes the issue of water conservation needs to be addressed, particularly in the developing cities. Developers are coming into the cities with plans for mini-parks, landscape maintenance districts, and greenbelts. A plan prepared by MWA with TAC support with justifications for efficient and sensible water use will help to enforce conservation efforts.

Paul Davis, member of the Oeste Subarea Advisory Committee, believes that water quality is a top issue. Mr. Clarke stated that Harold Singer, the Executive Officer for Lahontan, has committed that his agency will be involved in the stakeholder process. Hisam Baqai added that his agency looks forward to providing input to this process. They have many concerns with issues relating to chromium and arsenic, and that activities involving recharge, injection, and direct recharge are protective of water quality and conducive to the basin's needs.

Randy Hill, Victor Valley Water District General Manager, stated that as to water supply reliability and entitlement allocation, he would like to see emphasis on securing additional entitlement in addition to management of what MWA currently has. As to groundwater storage programs and storage agreements, there are two separate categories, including those done internally by entities within this area, and storage issues relating to parties outside this area storing water here. He believes these issues are separate and should be treated as such. He also believes that nitrate is a growing problem, which in his opinion is largely from failing septic systems, and which could threaten the groundwater supply. Another issue is that between water quality and water quantity, since as we bring in more water there is a higher salt content than what is in the basin. Salt loading issues are key and critical and need to be stressed under water quality. Another issue is the area of conservation, especially related to landscaping, as well as fixtures for existing water use. Another key area to be addressed is concern by many of the municipal and industrial producers in looking at the Judgment and insecurity about water rights with respect to future nonstipulating overlying users that may come into the basin and begin using water, who may have a higher water rate than the municipal users. Since this uncertainty makes it difficult to do long range planning, he would like to see this addressed.

Lee Pearl, General Manager for Hi-Desert Water District, said he believes that financial strategy and policy is key, and he hopes this update effort will invest time related to this issue. Mr. Brill confirmed that this has been identified as a critical element of the plan.

Mr. Brill thanked everyone for coming to today's meeting and for the input received, adding that the update process will work only with interaction and dialogue.

10. ADJOURNMENT

The meeting adjourned at 11:30 a.m.

Jack R. Clarke

Jack Clarke, Chairman

9. COORDINATION OF FUTURE ACTIVITY OF THE TAC IN RELATION TO THE RWMP UPDATE

Mr. Clarke called for volunteers to participate in the TAC advisory panel, listed as follows with indication of their representation.

Tom Bilhorn, Department of Fish and Game (he will verify his participation on this group with the Department)

Harold Singer and Hisam Baqai, Lahontan Regional Water Quality Control Board

Gary Ledford, development interests

Guy Patterson, City of Victorville

Jack Stonesifer, City of Adelanto

Don Bartz, Baldy Mesa Water District

Dan Gallagher and Linda Ellsworth, Victor Valley Water Reclamation Authority

Karen Gray, representing well owners in the Baja Subarea

Mike Podegracz, City of Hesperia

Paul Davis, El Mirage community

Chuck Bell, agricultural representative

Lee Pearl, Hi-Desert Water District

Guy Patterson suggested that a representative from San Bernardino County be involved.

Hisam Baqai suggested that a representative from the State health department also be involved. Mr. Clarke said he would address this. Mr. Songer suggested it be coordinated through the local Lahontan office.

Tom Bilhorn suggested that a military representative also serve on this group, perhaps the Yermo Marine Captain.

Perry Dahlstrom, representing interests at Nebo and the City of Barstow

Gary Thrasher, agriculture (Mr. Clarke will contact him)

Mr. Clarke suggested that MWA be contacted if anyone has ideas about anyone who might be a positive influence on this committee. He believes that this is an excellent start for looking at the future of water supply for this region.

Technical Advisory Committee to the Mojave Water Agency

Mojave Water Agency

Regional Water Management Plan Update

Phase I

Thoughtful Crafting of the Plan Update Will Yield Benefits

- Build consensus among MWA stakeholders
- Enhance management of MWA's water resources

A Successful Plan Must Address Four Primary Components

Stakeholder Outreach

- Technical
  - Science and engineering
  - Data management [illegible]
- Institutional [illegible]
  - NWL [illegible]
- [illegible]

Answering the Right Questions Will Help Assure Success

- How & when can overdraft be mitigated?
- How will long-term water demands be met?
- How can water quality be protected?
- How will land use [illegible] water resources [illegible]

The Project Team Will Address all of the Necessary Components

- Saracino-Kirby-Snow: Basin Management
- Psomas Engineering: Civil & Ag Engineering
- [illegible]

Saracino-Kirby-Snow
Company Mission

To promote sound water resource management [illegible] effective use of [illegible] and [illegible]

- Our firm specializes in using technical information to influence policy formation.
- We believe a significant gap often exists [illegible] and [illegible]

Converting Information to Policy

- We have the experience and training to:
  - Convert data to [illegible]
  - Use [illegible] effective [illegible]

Wide Range of Services

- Technical assistance
  - Water supply yield and reliability
  - Reservoir [illegible]
  - Water quality
  - Conjunctive [illegible]
- [illegible]
- [illegible]

Our Experience Will Enable Us to Meet Plan Objectives

- CALFED Conjunctive Use Program and Water Management Strategy
- DWR Integrated Storage Investigations/MOU Development
- [illegible]

The Team has the Strengths to Complete the Needed Tasks

- Stakeholder outreach
- Public workshops and education
- Data management [illegible]
- Conjunctive [illegible] planning
- [illegible]
- [illegible]

We look forward to working with you!

Reasons to Update the RWMP

- Plan Adopted in 1994
- Changes in local water demands
  - Transition from [illegible]
  - Increased demand [illegible]
  - Potential changes [illegible] standards
- [illegible] supply [illegible]

Reasons to Update the RWMP

- Emphasis on groundwater storage (Conjunctive Use)
- Operational changes to State Water Project (Monterey Agreement)
- Increased [illegible]
- [illegible]

RWMP Update Process

- Three Phased Approach
  - Phase I
    - Current assessment and preliminary scope to identify, refine and select alternatives for RWMP Update

RWMP Update Process

- Phase II
  - Prepare Draft Update assessing the alternatives identified in Phase I
- Phase III

Approach Promotes Understanding for Stakeholders

- Build trust and confidence among the stakeholders
- Develop principles for project implementation

Proper Data Management Facilitates Understanding

- Data will be assembled in a normalized electronic database
- We have developed database systems to manage [illegible] related information [illegible]

Rigorous Methods are Available to Estimate Future Demand

- Disaggregate demand forecasts based on
  - Agricultural
  - Municipal and industrial
  - [illegible]
- [illegible]

Casting a Wide Net Can Produce Innovative Alternatives

- Developing alternatives will be done concurrently with identifying key issues for the plan
- We have extensive knowledge of activities and plans [illegible] levels
- [illegible]

Products from Phase I

- Organized data needed for future analysis in electronic form designed to facilitate distributed use
- Demand [illegible] that can be used [illegible]
- [illegible]

Products from Phase I

- The Scoping Report will contain:
  - Key issues to consider
  - Promising plan [illegible] that provide water supply [illegible]
  - [illegible]

RWMP Update Process

- Focused now on Phase I
- TAC participation in all three phases
- Meetings with individual [illegible] stakeholders [illegible] needed

TAC as Basin Advisory Panel

- Utilize the historical relationship between TAC and MWA and the knowledge of water supply issues [illegible] by TAC
- TAC agreed to [illegible] capacity by vote on April [illegible]
- [illegible]

TAC as Basin Advisory Panel

- Core group of 20 to 25 to represent:
  - MWA geographic areas
  - Agriculture
  - Domestic well owners
  - Municipal and Industrial producers
  - Parties to the Mojave Basin [illegible]
  - [illegible]

TAC as Basin Advisory Panel

- Meet about 5 times for Phase I scoping process (through end of October)
- Assist with development of Scope for [illegible]
- [illegible]

Our First Cut at Key Issues

- Water supply reliability
- Groundwater storage programs and storage agreements
- SWP Entitlement allocation
- [illegible]

Our First Cut at Key Issues

- Water quality
- Monitoring programs
- Regional aquifer recharge
- [illegible]
- [illegible]

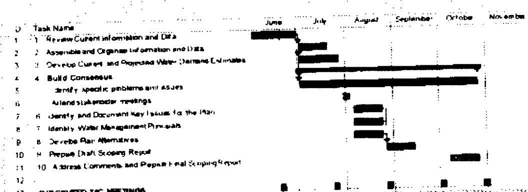
Our First Cut at Key Issues

- Wastewater return flows and reclaimed water use
- Flood water storage
- Relationship of Mojave Basin Area Judgment to [illegible]
- [illegible]

What's Next?

- Collect, review, and organize current data
- Develop current and projected water demand estimates
- One on one meetings with key stakeholders
- Identify key issues for the [illegible]
- [illegible]
- [illegible]
- [illegible]

Anticipated TAC Meetings



Questions

APPENDIX F

The Panorama

A newsletter published by the Mojave Water Agency

Mojave Water Agency

The Panorama

A newsletter published by the Mojave Water Agency to provide the community a regional perspective on water issues affecting the High Desert

Volume 3, Issue 1

Winter 2003

Mojave Water Agency Mission:

To manage the region's water resources for the common benefit to assure stability in the sustained use by the citizens we serve.

Inside this issue:

MWA Works with New State Laws to Ensure Water Supplies

The critical link between water supply and responsible development has found its way into two new pieces of State law that will significantly affect how the High Desert grows.

Created by Senate Bills 221 and 610, the two laws require an assurance of adequate water supply before development can take place in a given area. They were passed in response to growing concern about the continued availability of water to accommodate population growth in California over the next 20 years and beyond.

As the caretaker and monitor of the High Desert's water supply, Mojave Water Agency will play a key role in the implementation of the two laws. The Agency will be called upon to provide an accounting of water resources in the High Desert - information that builders must provide under the two new laws.

General Manager Kirby Brill said SB 221 and SB 610 will be important in the Agency's ongoing goal of securing a long-term, balanced supply of water for the High Desert.

"Population growth is outstretching native water supply," Brill said. "Reversing that trend by importing more water is the key to ensuring the highest quality of life for future generations in the High Desert."

It was this same urgency on a Statewide level that spurred State lawmakers Sheila Kuehl and Jim Costa to draft SB 221 and SB 610, respectively.

SB 221 is expected to have the greatest initial impact on Southern California. It requires developers constructing subdivisions of 500 units or more to submit proof through written verification that a sufficient water supply will be available to serve the subdivisions before they can receive approvals to begin construction.

Previous laws required developers to disclose whether they had enough water, but allowed them to build regardless of whether they could document an adequate supply.

SB 221 would force California builders to prove water supply before building the first house.

SB 610 approaches the relationship between water supply and development from more of a macro perspective by requiring that water supply assurances are provided during the State's environmental review of a development project.

The law increases the consequences for urban water suppliers that do not submit and update their urban water management plan and demand water supply assessments for all projects under the California Environmental Quality Act (CEQA).

This law also requires planning agencies to contemplate water availability when projecting potential development in their General Plan. This includes a thorough description of water amount, location and projected pumping rights of water suppliers in the future.

SB 610 applies to residential developments of more than 500 dwelling units, proposed shopping centers or business establishments employing more than 1,000 people or more than 500,000 square feet of floor space, and proposed hotels or motels having more than 500 rooms. It also applies to a project that would demand an amount of water equal to or greater than the amount of water required to serve the project.

"These laws are proof positive that we cannot grow and prosper responsibly until we have addressed the issue of ensuring a safe and secure water supply for this region," says High Desert economic development and commercial real estate professional Joe Brady.

Fortunately, MWA has anticipated these pressures by supporting the Mojave River Basin Adjudication and other management strategies within its service area. According to Brill, "We have an assortment of assets that we are building into a water management portfolio to address these challenges. The Regional Water Management Plan will go a long way toward pulling it all together."

Message from the Manager

Kirby Brill
General Manager

As many parts of our region experience growth, there is a growing concern about whether there will be enough water to support the needs of future generations. The issues we face here locally are not unique. The State looks at water resources all across California and expresses similar concerns. In response to a greater awareness of water issues, the State legislature is beginning to engage. SB 221 and SB 610 are just the start. Those and other pieces of new legislation indicate a growing interest by the legislature to ensure that growth throughout the State is supported by solid water resource management that balances supplies with long-term demands.

Fortunately, our region is blessed with several assets that put us in an excellent position to meet the challenges ahead. However, it will not be easy or painless. It will take a community working together to build a portfolio of actions and policies that, when combined together, will form a solid platform from which growth can prosper.

In the Mojave River Basin, our assets start with the Mojave Basin Area Judgment. Although controversial in its inception and implementation, it represents exactly the kind of structure the new State laws are now requiring. The underpinnings of the Judgment leverage our other key asset—our ability to access water from the California Aqueduct. As rampdown progresses, we will begin to realize a revenue source to buy water from the State Water Project in significant quantities in an attempt to arrest the overdraft and achieve that long-term balance between water supply and demand. Without rampdown, we will continue to watch available water run by us while we continue to mine our aquifers. It will be difficult, if not impossible, to provide those sought after assurances.

Our region is also blessed with a unique ability to store large amounts of water underground so that we can accumulate imported water in times of surplus to withstand the inevitable shortages that come in times of drought.

Combine these and other assets into a diverse portfolio and I have significant reason to be optimistic. But again, it won't come easy. We can meet these challenges through prudent planning, aggressive action, communication and cooperation.

Regional Water Management Plan Moves through Phase II

The second phase of a comprehensive planning effort to map out the desert's future water needs and how to meet them is now well under way. Under Phase II of the Regional Water Management Plan update, MWA is now evaluating and screening potential water delivery projects. Phase II will also involve prioritizing which potential projects will be pursued.

Jointly developed by MWA, Federal and State regulators, and High Desert stakeholders, the Plan will help address the future growth of our region by focusing on increasing the availability and reliability of ground and surface water resources.

As with Phase II of the Regional Water Management Plan update, the Agency will be assisted in Phase II by input from its constituents. The MWA Technical Advisory Committee, made up of various community representatives, has been key to the Agency's efforts to reach out to High Desert stakeholders in developing the Plan update.

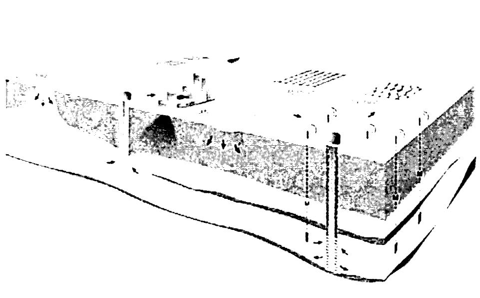
"The collective input we receive has and will continue to provide an important insight into the direction of our projects and the demand that we can expect to see in the near future," said Agency General Manager Kirby Brill. "It is crucial that we continue working together to ensure future success."

If members of the community would like to engage in the process, it's not too late. The Technical Advisory Committee will continue to meet regularly approximately every month through the completion of Phase II, which is expected to conclude in May. The Agency is also planning on several public meetings in different communities to solicit input on the preliminary conclusion of Phase II. The meetings are expected to occur in April.

MWA Moves to Secure Future Water Supplies Through Banking

On February 13, the Board of Directors made another significant step toward securing adequate water supplies for the region by approving the purchase of 7,700 acre-feet of imported water for "banking" and adopting guidelines for groundwater banking. The imported water will be stored in underground aquifers throughout the region to meet future demands.

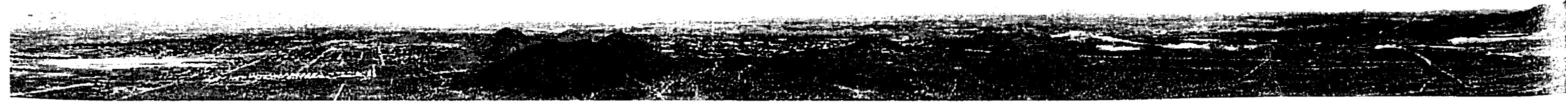
The purpose of the actions is to guide the Agency in determining where water will be "banked". The Agency defines "water banking" as the purchase of imported State Water Project water for storage in the various groundwater basins within Agency boundaries for future use. This water is in excess to the annual water demand that the Agency is/will be required to meet under the various current and future water supply obligations of the Agency .



In preparation of implementing the banking program, the MWA established a fund to purchase water for storage in the groundwater basins within the Agency. The funds will be used to purchase water when the Agency determines that water is readily available from the State Water Project, there is sufficient capacity in the MWA system to deliver the water, and the cost of the water is reasonable.

MWA staff will seek approval from the Board of Directors prior to making purchases under these interim guidelines.

Groundwater banking will become one of the most important tools MWA will use to ensure that there is enough water for future generations. The Agency's Regional Water Management Plan update will identify other specific actions to complement the banking program and add to the portfolio.



Judge Kaiser Approves Rampdown for Alto Basin

After more than four years of delays and numerous requests by the Mojave Basin Area Watermaster, Superior Court Judge E. Michael Kaiser has ruled to proceed with additional rampdown in the Alto sub-basin (Victor Valley area).

Rampdown is the primary mechanism under the Mojave River Basin Adjudication that allows groundwater production rights to be brought into balance with the natural water supply from our local mountains. Without rampdown, many of the groundwater basins will continue to be in overdraft, threatening the long-term stability of our precious water resources.

When the Judgment was first implemented, groundwater pumpers were initially allowed to continue pumping at levels prior to the Judgment. Although pumping at these high levels continued to withdraw groundwater at rates exceeding the natural local supply, it was understood and agreed upon through a series of five percent rampdowns that those production rights would eventually be reduced to equal the natural supply. Those wishing to produce more than their rights could either transfer rights from other production right holders or pay a replacement assessment that would fund the purchase of imported water from the aqueduct. In this way imported water will be purchased to eliminate the overdraft and balance supply with demands, thus securing future supplies for all water users.

The terms of the Judgment clearly state that the Watermaster must recommend a five percent rampdown if the available production rights exceed the average natural supply by more than five percent. The Judgment contains provisions for four such rampdowns, which were concluded in 1998. Those actions brought about a reduction of pumping rights in all basins from 100 percent to eighty percent.

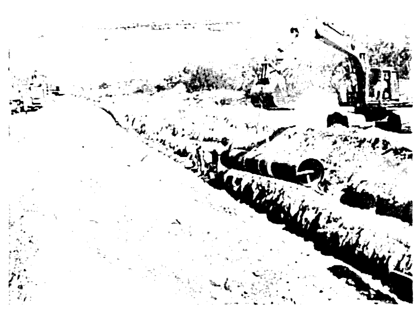
Then, after eliminating several significant legal threats to the Judgment (see last issue), the Watermaster submitted its third additional recommendation for rampdown. This time the request was limited to the Alto and Baja (Daggett and Newberry Springs area) subareas. Other sub-areas were considered close enough to being in balance that rampdown was not warranted. Both the Alto and Baja groundwater basins remain in severe overdraft even after rampdowns are to eighty percent.

In a show of united support, the majority of groundwater pumpers and many municipal interests in the Alto subarea wrote letters to Judge Kaiser expressing the importance of a balanced water supply to the local community. Judge Kaiser clearly acknowledged these voices from the community.

Alternately, significant opposition was expressed against the rampdown motion for Baja. As a result, Judge Kaiser ruled for rampdown in Alto and deferred action in Baja. Clearly, the Judge's action will pave the way for importation of water and a balanced long-term water supply in the Alto subarea. The fate of water supplies in the Baja area remains uncertain.

Mojave River Pipeline Completed to Daggett

Construction of Reach 3D/E of the Mojave River Pipeline has been completed to the Daggett / Yermo Recharge Facility located on the south side of the Mojave River, approximately one mile west of Daggett Road. Reach 3D/E is the latest in a series of segments of the Mojave River Pipeline Project to be completed, and it will enable the Agency to deliver up to 56 acre-feet per day of imported State Water Project water to the upper Baja sub-basin. Baldi Brothers Construction of Beaumont, California is the prime contractor for the project.

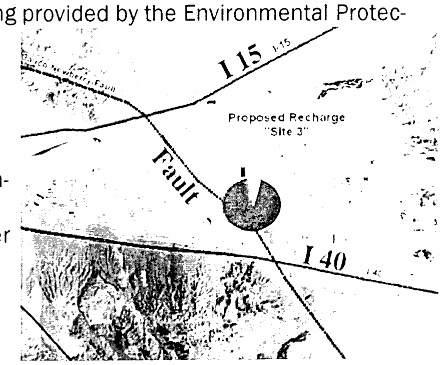


Construction began in September, 2002 on the northeast side of the I-15 undercrossing at Soap Mine Road and included installation of 34,000 feet of 36-inch diameter, cement mortar-lined and coated steel pipe manufactured by Northwest Pipe Company at their Adelanto plant. The project also included construction of the Daggett / Yermo Recharge Facility, which provides flow control to the Mojave River outlet. A portion of the historic Daggett Ditch is utilized to convey water from the flow control building to the river outlet. The pipeline crosses the Mojave River just west of the Nebo Marine Base and travels east along the BNSF railroad to the Daggett / Yermo recharge site.

Mojave River Pipeline Project Looks for Recharge Site in Newberry Springs

The Mojave River Pipeline Project which began construction in 1994 is nearing the end of its journey. It's taken nine years, millions of dollars spent, and countless construction hours, but by 2006 this life-giving water line will be able to serve the Baja Lower Mojave River area. Mojave Water Agency will complete the first of the two part construction phases for the fourth and final segment of the pipeline. The first pipeline segment is approximately seven miles in length and travels between Daggett Road and the Daggett/ Yermo Airport. The construction of this segment will be completed by the end of 2003.

The second pipeline segment will be approximately 12 miles in length, ending in the Lower Mojave River Basin near the Newberry Springs area. The exact location for the groundwater recharge site is presently being studied by the agency's hydrogeology staff and will involve input from local stakeholders, subsurface investigations, and environmental assessments prior to the final selection of the site. The basin will be located downstream of the Calico-Newberry seismic fault and will be able to annually deliver up to 6,000 acre-feet of State Water Project water to the area for groundwater recharge. The total cost of the remaining work is $8 million, with funds being provided by the Environmental Protection Agency, State of California, and MWA. When completed, the Mojave River Pipeline Project will serve the people and the environment along the river, bringing imported water to areas where overdraft conditions exist.



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WE'RE ON THE WEB
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Mojave Water Agency's "Panorama"

A newsletter published by the Mojave Water Agency to provide the community a regional perspective on water issues affecting the High Desert

Common Questions and Answers Relating to MWA

Q: What does the MWA do for us?

A: Since 1991 the MWA has been regularly importing water from the California Aqueduct to recharge the groundwater basins, from which local water companies and other well owners derive water for all uses: domestic, agricultural, industrial and recreational. By importing state water, and managing the native supply, MWA ensures a stable and secure water supply—the key to economic growth in our region and the highest quality of life for residents of the desert region.

Q: Where do we get our water from?

A: The area has traditionally been dependent on groundwater retrieved by wells for all its water supply. Water demands are met by pumping water from groundwater basins, or aquifers. The water originates in the San Bernardino and San Gabriel Mountains, where rain and snow run off into the underlying groundwater basins. As a State Water Contractor, the MWA can also import supplemental water from the California Aqueduct.

Q: How do I go about drilling a well?

A: Obtain or contact a C-57 licensed well driller. A list of C-57 licensed well drillers can be obtained from the San Bernardino County Department of Environmental Health Services (SB EHS) at (909) 387-4666, or in the yellow pages under "Water Well Drilling".

Q: Do I need a permit in order to drill a well?

A: Yes, the well driller is responsible for pulling the well permit with the SB EHS. Upon obtaining a well permit, the Mojave Water Agency receives a copy of the permit via facsimile from the SB EHS.

Q: Will I have to install a meter on my well?

A: As of yet, no.

APPENDIX G

A Resolution of the Board of Directors of the Mojave Water Agency Approving the Mojave Water Agency Regional Water Management Plan

RESOLUTION NO.
A RESOLUTION OF THE BOARD OF DIRECTORS OF THE MOJAVE WATER AGENCY APPROVING THE MOJAVE WATER AGENCY 2004 REGIONAL WATER MANAGEMENT PLAN

WHEREAS, Chapter 97 of Appendices to the Water Code ("MWA Law") enabled formation of the Mojave Water Agency, and prescribes the powers and duties of the MWA; and,

WHEREAS, Section 15 (a) of said Chapter 97 declares that "The Agency may do any and every act necessary so that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants of the agency, including without limiting the generality of the foregoing, irrigation, domestic, fire protection, municipal, commercial, industrial, and recreational uses."; and,

WHEREAS, Subsection (1) of Section 15 (b) of said Chapter 97 empowers the Agency "To make surveys and investigation of the water supply and resources of the agency, to gather data on water use, to plan water projects and to publish and distribute reports thereof."; and,

WHEREAS, Subsection (11) of Section 15 (b) of said Chapter 97 empowers the Agency "To gather data for, and to develop and implement, after consultation and coordination with all public and private water entities who are in any way affected, management and master plans to mitigate the cumulative overdraft of groundwater basins, to monitor the condition of the groundwater basins, to pursue all necessary water conservation measures, and to negotiate for additional water supplies from all federal, state and other sources."; and,

WHEREAS, in December of 1991, the Agency began preparation of a Regional Water Management Plan (RWMP); and,

WHEREAS, a number of "Alternative Management Strategies" were developed as a step in the RWMP process to address the water supply and water demand issues identified within the Agency, and said Alternatives were presented for review and discussion to the Technical Advisory Committee to the Mojave Water Agency and the general public at several public meetings throughout the Agency; and,

WHEREAS, said Alternative Management Strategies and the public comments received were considered during development of a Draft RWMP, and during 2003 and 2004 the Draft RWMP was again presented to the Technical Advisory Committee to the Mojave Water Agency and to the general public at several public meetings throughout the Agency for review and comment as to both the recommendations in the RWMP which should be reviewed in association with the recommendations in the RWMP; and, WHEREAS, the Draft RWMP was further reviewed in the context of the comments received and was redrafted and formally released for review and comment by the Agency in 2004; and,

WHEREAS, written responses to comments received by the Agency on the Draft RWMP were prepared and provided to the Board of Directors and duly considered; and,

WHEREAS, the Programmatic Environmental Impact Report for the RWMP was circulated for public review and certified by the Mojave Water Agency Board of Directors on XXX, 2004.

NOW, THEREFORE, BE IT RESOLVED by the Mojave Water Agency Board of Directors that the Regional Water Management Plan prepared by Schlumberger Water Services dated XXX 2004, the staff report and recommendations to the Board of Directors dated XXX, 2004, are hereby adopted by the Agency to describe management programs which the Agency can perform as authorized by Chapter 97 of Appendices to the Water Code.

ADOPTED:______________________

____
Richard Hall
President

ATTEST:

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Secretary

APPENDIX H

EXISTING MONITORING PROTOCOLS

EXISTING MONITORING PROTOCOLS

Introduction

This appendix discusses existing monitoring protocols that have been adopted by the Mojave Water Agency (MWA) for general monitoring activity and to monitor compliance with the Mojave Basin Area Judgment and the Warren Valley Judgment. This information supplements the information on existing and proposed monitoring activities presented in Chapter 10. Senate Bill 1938 (S.B. 1938) states, "the local agency shall adopt monitoring protocols that are designed to detect changes" in:

- Groundwater levels
- Groundwater quality
- Inelastic land surface subsidence
- The flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin.

These protocols "shall be designed to generate information that promotes efficient and effective groundwater management." The following sections describe current monitoring activities in the Mojave Basin Area and in the Morongo Basin/Johnson Valley Area.

Mojave Basin Area

In the Mojave Basin Area, much of the monitoring required by S.B. 1938 is conducted by Agency and Watermaster staff. The MWA Board acts as Watermaster for administration of the Mojave Basin Area Judgment. In addition, the Agency has engaged the U.S. Geological Survey (USGS) in a cooperative water resources program by which the USGS performs monitoring activities in the MWA service area.

Mojave Basin Area Watermaster

By order of the Mojave Basin Area Judgment, the Mojave Basin Area Watermaster performs monitoring to ensure that the mandates of the Judgment are enforced. Monitoring requirements are described in the Judgment After Trial (1996) and in the Mojave Basin Area Watermaster Annual Reports. The following is a summary of monitoring currently performed by the Watermaster.

1. Water Production and Verification

The Judgment requires that annual water production records be collected and verified by producers exceeding 10 acre-feet per year of production within each of the five subareas. These records are used to document water usage and to determine Replacement Water and Makeup Water Obligations.

In addition, MWA catalogues wells as part of the Minimal Producer Program. Minimal Producers are defined as those producers who have an annual production of less than 10 acre-feet and are not subject to the Judgment. MWA estimates total production by Minimal Producers in each subarea.

2. Replacement Water Tracking

If a producer's water production exceeds their Free Production Allowance (FPA) in any year the producer must either transfer unused FPA from a willing party or pay the Watermaster a Replacement Water Assessment. The Watermaster then has the responsibility to acquire Replacement Water to replace the overpumped amount. Typically, the Watermaster will pay the funds to the MWA to import State Water Project water to meet this Replacement Water obligation.

3. Mojave River Flow Data

The Watermaster uses Mojave river flow data provided by USGS as part of the cooperative water resources program (see below). Mojave River flows are estimated at the following locations:

Forks: Total flow at the Forks is measured by combining discharges measured for the West Fork of the Mojave River and for Deep Creek.

Lower Narrows: Lower Narrows flow is estimated from the Lower Narrows gage, at which flow measurements are taken on a weekly basis. The Watermaster makes a determination of how much of this flow is base flow and how much is storm flow. The method used to make this determination is described on page C-2 of the Judgment.

Alto/Centro Boundary: Because there is no gage at the Alto to Centro boundary, the Judgment requires that the "Transition Zone" water levels be maintained sufficient to transport water from the gage to the Centro Subarea.

Barstow: Flow records are taken from the Barstow gage.

Afton: Flow records are taken from the Afton Canyon gage.

4. Precipitation

The Watermaster utilizes precipitation data complied from records obtained by the National Oceanographic and Atmospheric Administration (NOAA) at Lake Arrowhead, Victorville, and Barstow.

The Watermaster's hydrological inventory includes estimates for deep percolation of percolation for Alto and Baja. These values do not change from year to year and are equal to the following values, which are the same as contained in the sample table in the Judgment:

Alto:	3,500 acre-feet/year
Baja:	100 acre-feet/year

5. Victor Valley Wastewater Reclamation Authority (VVWRA) discharges

VVWRA provides the Watermaster with records of discharge of reclaimed water into the Mojave River in the Transition Zone.

6. Subsurface Flow

The Watermaster's hydrogeologic inventory includes estimates for subsurface flow between subareas. These values do not change from year to year and are equal to the following values, which are the same as contained in the sample table in the Judgment:

Este to Alto:	200 acre-feet/year
Oeste to Alto:	800 acre-feet/year
Alto to Centro:	2,000 acre-feet/year*
Centro to Baja:	1,200 acre-feet/year
Baja to Afton:	400 acre-feeet/year

*The Alto to Centro obligation is for the sum of surface and subsurface flows and VVVWRA wastewater discharge to the Mojave River.

7. Makeup Water

Both average and minimum annual surface and subsurface flows must be maintained between Alto and Centro. Each year, the Watermaster estimates the total flow between these subareas. If the amount is less than the minimum amount required by the Judgment, the producers in the upstream Alto Subarea must pay the Watermaster for makeup water to be delivered to the downstream subarea. Either, the Watermaster will pay the MWA to import State Water Project water to meet this Makeup Water obligation or the parties in the Alto Subarea can purchase available FPA in the Centro Subarea to meet the obligation.

The flow measured between subareas includes both surface water and groundwater flows. For the flow from Alto to Centro, the flow equals the subsurface flow plus the Mojave River base flow plus the VVWRA wastewater discharge into the Mojave River.

8. Wastewater Imports

The Watermaster records the amount of reclaimed wastewater imported into MWA from Lake Arrowhead Community Services District and Big Bear Area Regional Wastewater Agency.

9. State Water Project Imports

The Watermaster records the amount of State Water Project imported by month. This water is categorized by subarea and also by whether it is makeup water, replacement water, or water delivered to other MWA customers.

10. Groundwater Levels

Groundwater levels were established in Exhibit H of the Judgment for key wells to monitor water levels for riparian habitat in the Mojave River floodplain. These wells, and their associated groundwater levels as measured from the ground surface to standing water are:

- wells H1-1 and H1-2 in the Victorville/Alto Zone (upper Narrows area) are to be maintained at 7 feet
- well H2-1 in the Lower Narrows/Transition zone is to be maintained at 10 feet
- well H3-1 in the Harvard/Eastern Baja Riparian Forest Habitat (Camp Cady area) is to be maintained at 7 feet. Well H3-2, also in the Camp Cady area, is to be maintained at 1 foot above ground surface to ensure adequate surface water habitat.

Of these wells, only H3-1 has been installed; other monitoring is accomplished using surrogate wells or gauging stations.[1] MWA is continuing to work with Department of Fish and Game to select the well sites.

The Judgment also requires the MWA to establish appropriate well levels in the "Transition Zone." A hydrogeologic study has been completed for the area. Some existing key wells were identified for this purpose. Areas where new key wells need to be established were also identified.

11. Ungaged Surface Water Inflows

The Watermaster's hydrogeologic inventory includes estimates of ungaged inflow into each subarea. These values do not change from year to year and are equal to the following values, which are the same as contained in the sample table in the Judgment:

Este:	1,700 acre-feet/year
Oeste:	1,500 acre-feet/year
Alto:	3,600 acre-feet/year
Baja:	400 acre-feet/year

12. Consumptive Use

The Watermaster estimates agricultural, urban, and phreatophyte consumptive use for each subarea. Phreatophyte consumptive use is estimated from annual aerial photography and a 1995 study completed by the USGS and California Department of Fish and Game. Agricultural and urban consumptive use is estimated using the records of annual verified production and minimal producer production and the following consumptive use rates, which are specified on page F-1 of the Judgment:

Municipal:	50%
Agriculture:	50%
Industrial:	case by case
Lakes or Aquaculture:	surface acres x 7 feet

U.S. Geological Survey

[1] Personal communication with L. Eckhart, November 26, 2003

As part of a cooperative water services program between MWA and USGS, the USGS performs monitoring of groundwater levels, groundwater quality, surface water flows, and regional water level changes and subsidence. Each of these is described below.

Groundwater Levels and Water Quality

The USGS has 121 monitoring wells within the Mojave Basin Area from which it takes water level and water quality samples. These are categorized as follows:

- 53 annual water level wells
- 46 semi-annual water level wells
- 2 recorder wells
- 65 water quality wells

Water quality samples are collected once a year from the 23 water quality wells located in the Floodplain Aquifer and once every two years in the 42 water quality wells located in the Regional Aquifer.

Surface Water Monitoring

The USGS operates and maintains the following gaging stations on the Mojave River:

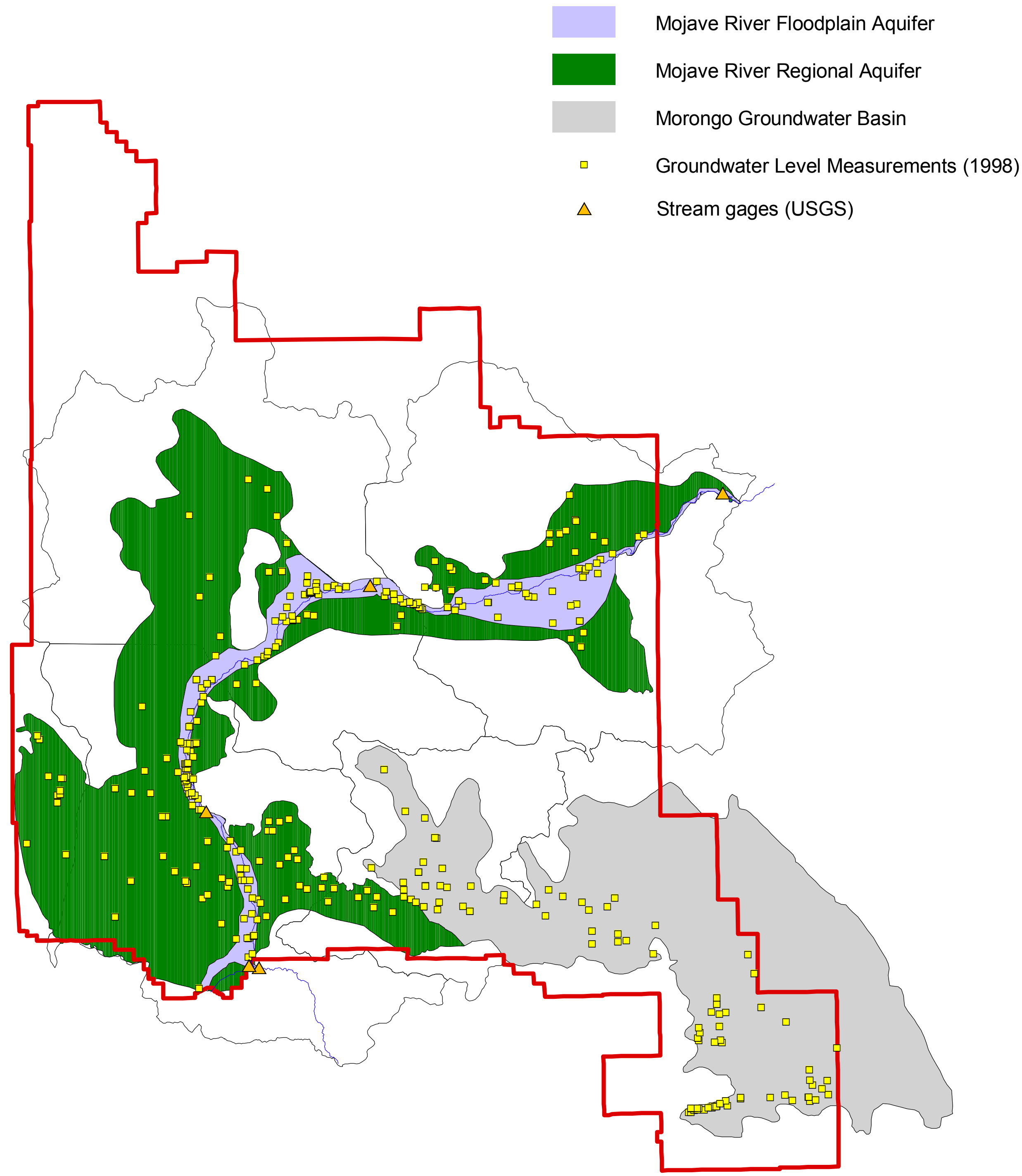
- Deep Creek near Hesperia
- West Fork near Hesperia
- Mojave River at Lower Narrows near Victorville
- Mojave River near Barstow
- Mojave River at Afton

Flows from these gaging stations are used by the Mojave Basin Area Watermaster to determine annual water balances within each subarea (see above).

Regional Water Level Changes and Land Subsidence

The U.S. Geological Survey (USGS) performed a study of land subsidence in the following four study areas using Interferometric Synthetic Aperture Radar (InSAR) methods (Sneed et al. 2003):

- El Mirage area (Oeste)
- Lockhart-Harper Lake area (Centro)
- Newberry Springs area (Baja)
- Lucerne Valley area (Este)



Schlumberger Water Services

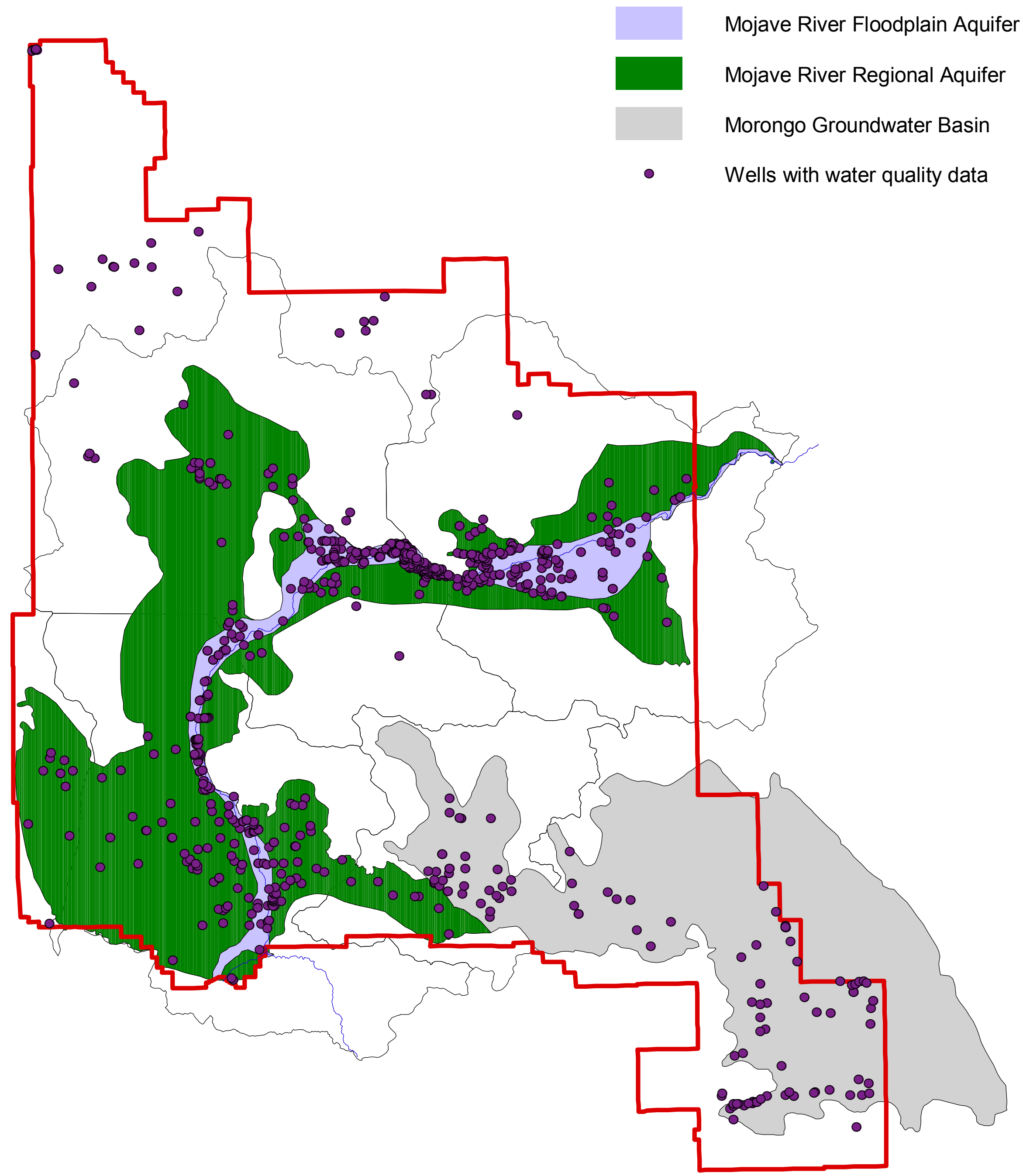
Groundwater/ Surface Water Monitoring Sites

Mojave Water Agency
2004 Regional Water Management Plan

Figure H-1

Date: February 2004

Prepared By: KTW



Schlumberger Water Services

Groundwater Quality Monitoring Sites

Mojave Water Agency
2004 Regional Water Management Plan

Figure H-2

Date: February 2004

Prepared By: KTW

CIMIS Weather Stations

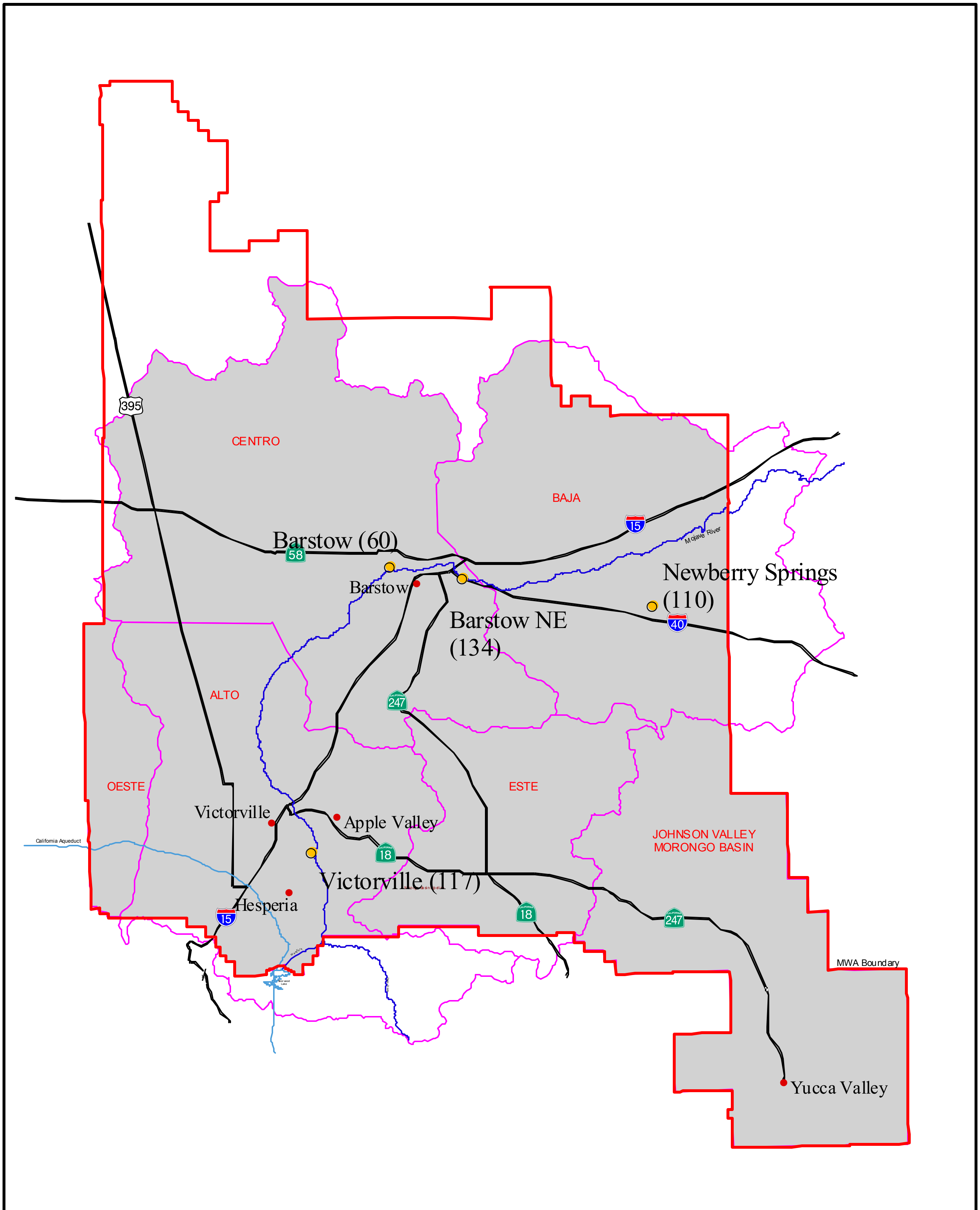
The California Irrigation Management Information System (CIMIS) is a repository of meteorological data collected throughout the State of California. CIMIS is an integrated network of over 100 computerized weather stations located at key agricultural and municipal sites within the state. Comprehensive and timely weather data are collected daily from each weather station. The data are automatically transmitted each night to a computer in Sacramento. Weather data are analyzed for accuracy and stored in the CIMIS database to provide on-demand, localized weather information.

Based on weather data, CIMIS can calculate estimates of the amount of water evaporated from the soil and the amount actually transpired by irrigated grass at the weather station site. Growers can then calculate the appropriate amounts of water to apply to their fields. The ultimate purpose of CIMIS is to encourage growers and turf managers to adopt and use water budget irrigation scheduling so that water is used as efficiently as possible.

CIMIS has operated four stations within the Mojave Water Agency boundaries; station 117 near the City of Victorville and station 134 near the City of Barstow are currently active. Two other stations have been active in the past in Barstow and at Newberry Springs. Locations of these CIMIS stations are shown in Figure H – 3. Data available on CIMIS stations is shown below in Table H – 1.

Table H - 1 CIMIS Stations

Station #, name	County	Start	End
60 - Barstow	San Bernardino	20-Nov-86	20-Feb-92
110 - Newberry Springs	San Bernardino	21-Feb-92	27-Dec-96
117 - Victorville	San Bernardino	1-Feb-94	ACTIVE
134 - Barstow NE	San Bernardino	8-Jan-97	ACTIVE



Schlumberger Water Services

CIMIS Weather Station Locations

Mojave Water Agency
2004 Regional Water Management Plan

Figure H-3

Date: February 2004

Prepared By: KTW

Satellite images

SEBAL (Surface Energy Balance Algorithm for Land) is a new technology that uses data gathered by satellite-based sensors to compute the energy balance at the earth's surface. Evapotranspiration (ET) is predicted as a residual of the energy balance, without having to know crop or vegetation type, or other ground-based information, except routine weather data. ET is computed at the instant of the satellite image, and can be extrapolated to daily and monthly values for use in hydrologic investigations. The spatially discrete information generated by SEBAL supports water management innovation at the farm, district, river basin, national and international scales.

SEBAL is an image-processing model comprised of twenty-five computational steps that calculate ET flux and other energy exchanges at the earth's surface using digital image data collected by Landsat, MODIS, or other remote-sensing satellites measuring visible, near-infrared and thermal infrared radiation. Basically, ET is computed from an energy balance equation for each image pixel.

SEBAL is most applicable in situations where the magnitude and/or spatial distribution of consumptive depletion must be accurately estimated. From a water management perspective, these needs tend to emerge as river basins or groundwater basins approach closure, the condition where little or no potential remains to develop additional supplies, and attention focuses on managing consumptive depletion. MWA plans to use SEBAL as part of comprehensive basin modeling efforts.

Additional monitoring protocols developed as part of this Plan are presented in Chapter 10.

Monitoring and Management Component Historical Background Data

This section provides a brief description of issues that pertain to particular aspects of the groundwater basins underlying the Mojave Water Agency. These aspects are described here or a reference to locate a more thorough discussion in another chapter is provided to avoid redundancy.

Identification, Management, and Protection of Wellhead and Recharge Areas

The Mojave Water Agency does not currently have a plan for protection of wellhead and recharge areas. The Agency is developing a geographic information system and associated data that will suggest these activities.

Well Abandonment and Destruction Program

The Mojave Water Agency does not have a specific well abandonment and destruction program that they administer. Rather, the Agency relies on the County of San Bernardino to provide policy guidance and regulation of well abandonment and destruction. The County has adopted standards contained in the California Water Well Book. The MWA provides information to the County regarding the location and status of abandoned wells identified in the field.

The destruction of abandoned groundwater wells should be performed in accordance with state standards. California Water Code Section 13750.5 requires that those responsible for the destruction of water wells possess a C-57 Water Well Contractor's License. Whenever a water well is destroyed, a report of completion must be filed with the California Department of Water Resources within 60 days of the completion of the work.

Replenishment of Extracted Water

Water is extracted from the groundwater basins within the Mojave Water Agency's boundaries as the primary source of agricultural, municipal, and industrial water. These basins have been adjudicated in the Mojave Basin Area Judgment (previously described) and the Warren Valley Basin Judgment (also previously described). The management actions called for in the physical solutions to the adjudications are designed to reverse the declining groundwater basins and are described in Chapter 9, Basin Management Objectives and Alternatives.

Monitoring Levels and Storage

The Mojave Water Agency, as well as many water purveyors and agencies with overlapping boundaries, monitor groundwater levels and estimate storage. A full discussion of past and present monitoring is provided in Chapter 3. A discussion of expected future monitoring is provided under the Monitoring Section in Chapter 10, Management Action Plan.

Facilitating Conjunctive Use Operations

The Regional Water Management Plan published in 1994 was designed to provide facilities that would assist in accepting as much SWP entitlement as possible for percolation into the groundwater basin for storage and use. This Regional Water Management Plan Update continues to describe ways to maximize surface water use with groundwater replenishment to stabilize the Mojave Regional and Floodplain Aquifers. The projects and management actions that are described in Chapter 9, Basin Management Objectives, are designed to facilitate conjunctive use operations to the fullest. Please refer to Chapter 9 for a fuller discussion of these facilities.

Well Construction Policies

The Mojave Water Agency does not have specific well construction policies that they administer. Rather, the Agency relies on the County of San Bernardino to provide policy guidance and regulation of well construction. The County has adopted standards contained in the California Water Well Book.

The construction of groundwater wells should be performed in accordance with state standards. California Water Code Section 13750.5 requires that those responsible for the construction of water wells possess a C-57 Water Well Contractor's License. Whenever a water well is constructed, the driller must file a report of completion, called the *Well Completion Report*, DWR 188, with the California Department of Water Resources (DWR) within 60 days after completion of the work. The MWA and the County have entered into an MOU providing that the County will inform the MWA of well construction or destruction permits issued within the MWA. The MWA is also the local entity responsible to provide and maintain state well numbers in cooperation with the DWR.

Groundwater Cleanup

The Mojave Water Agency does not have groundwater cleanup programs, nor does it track contaminated sites. MWA currently relies on the County of San Bernardino Department of Health Services, and its programs to deal with any of these issues. The Department of Health Services in turn relies on the State programs to track identification and remediation of known groundwater contamination.

The Department of Toxic Substances Control (DTSC) is a part of the California Environmental Protection Agency (Cal EPA) and is responsible, among other programs, for dealing with improper hazardous waste management by overseeing site cleanups. As part of their cleanup program, DTSC has prepared guidelines for the investigation, monitoring and remediation of groundwater at hazardous substance release sites. The California Integrated Waste Management Board enforces the minimum environmental standards imposed by the State Water Resources Control Board upon closed, illegal or abandoned disposal sites.

The Regional Water Quality Control Board maintains a *Site Cleanup List*. It incorporates data from the DTSC as well as the San Bernardino County Environmental Management Department's site inventory of hazardous material storage sites and underground storage tanks. The Regional Board's cleanup list shows sites that have degraded or threaten to degrade groundwater quality, including spill sites, above ground tank sites, and Department of Defense sites. The list is available to the public on the Internet. It is normally updated on a quarterly basis but has not been updated recently due to understaffing.

Groundwater Protection

Groundwater is a vital resource for the Mojave area and must be diligently protected – both to maintain or improve quality and to ensure quantities are available to meet current and planned uses.

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer in order to maintain a high quality supply available for use. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other departments and agencies that have local or regional authority or programs.

Efforts to protect groundwater quality can range in scale from protecting the entire watershed to protecting an individual well site. On the largest scale, an entire watershed can be managed in a way that protects the quality of groundwater and other natural resources within the watershed boundaries. In some cases, natural barriers may isolate aquifers from other regions in the watershed and groundwater protection efforts can be focused on the aquifers used for drinking water supplies. Wellhead protection and source water protection efforts involve protecting portions of the aquifer by protecting the land directly overlying well capture zones and areas of an aquifer that serve to recharge groundwater.

In the Mojave area, there are a number of efforts underway by a variety of entities that focus on groundwater and other resource management.

Groundwater Monitoring

Current groundwater monitoring efforts are discussed in Chapter 10.

Well Site Management Activities

Well site management activities include a wide array of functions directed at creating consistency and quality in the drilling, construction, inspection and operation of municipal drinking water production wells. Diligent well site management provides multiple benefits ranging from reducing the opportunity for a well to become a direct conduit for contamination to providing early detection of potential compromises in groundwater quality at production wells. Activities include:

- Well Site Control – the Well Site Control Zone encompasses the area immediately surrounding the well. The purpose of this zone is to provide protection from vandalism, tampering, or other threats at the well site.
- Regular Well Inspection, Testing and Maintenance – Electrical systems that operate the pumps are inspected annually. A visual inspection of the well and the chlorination unit is performed at this time.
- Well Construction Standards – The municipal purveyors follow state standards developed by DWR that address a number of aspects of well construction intended to help prevent contamination of groundwater via the well.

Wellhead Protection

In 1996, the federal Safe Drinking Water Act (SDWA) was reauthorized. One of the amendments to the act required states to develop and implement a program to assess sources of drinking water and encouraged states to establish source water protection programs. The U.S. Environmental Protection Agency (EPA) envisions a state Source Water Assessment Program (SWAP) to be a partnership among local, state, and federal agencies to maintain safe, good quality drinking water.

Ten years prior to the 1996 Safe Drinking Water Act amendments, the SDWA established the Wellhead Protection Program (WHPP). Section 1428 of the SDWA (State Programs to Establish Wellhead Protection Areas) was intended to establish state programs that adequately protect the wellhead areas of all public water systems from contaminants that may adversely affect human health. Each state was to prepare a WHPP and submit it to EPA by June 19, 1989. Although there were many wellhead and groundwater protection efforts in California, the State did not develop a WHPP by the 1989 deadline. However, central elements of a WHPP—protection area and zone delineation, inventory of possible contaminating activities (PCAs), and vulnerability analysis—are also elements of a SWAP.

In California, the Department of Health Services (DHS) Division of Drinking Water and Environmental Management is the lead agency for implementing California's SWAP program, called the Drinking Water Source Assessment and Protection (DWSAP) Program. In addition to the federal SDWA, there are California statutes that require development and implementation of programs to protect sources of drinking water. Section 116762.60 of the California Health and Safety Code requires DHS to develop such a program, and the program is to include a source water assessment program and a wellhead protection program. The DWSAP satisfies the mandates of Section 116762.60 of the California Health and Safety Code and the federal SWAP and WHPP.

Drinking Water Source Assessment and Protection

Water purveyors within the MWA that have completed assessments for their wells are summarized below in Table H-2. Assessments for private wells that supply groundwater for drinking water to restaurants, resorts and other commercial establishments have been conducted by DHS.

Table H-2: Completed Assessment of Wells

Purveyor	DWSAP # of Sources
Adelanto	13
Apple Valley WC	22
Barstow	17
Hesperia	NA*
Hi Desert WD	16
Victorville	25
Yucca Valley	NA*

*Data on Hesperia and Yucca Valley were not available at time of publication.

Identification and Destruction of Abandoned Wells

The presence of abandoned groundwater wells represents a potential hazard to the quality of the groundwater basin. It is vital for the long-term health of the basin that abandoned wells be located and destroyed.

While it is the landowner's responsibility to destroy an abandoned well, local water agencies should be proactive about making sure that abandoned wells are in fact destroyed. Coordinated efforts to locate and destroy abandoned wells are currently limited to efforts by the MWA to identify and categorize abandoned wells found in the field and relay that information to the County. The County has contacted property owners grading their responsibility to properly destroy abandoned wells on their property.

Hazardous Materials Response

The use, storage and transportation of hazardous materials and the generation and transportation of hazardous wastes are issues of increasing importance in the protection of life, the environment and property in the Mojave basin – and a concern for groundwater quality protection. Hazardous material emergencies may be the result of threatened releases, highway accidents, clandestine drug laboratories, train derailments, pipeline transportation accidents, and fire and/or spills at fixed facilities.

Hazardous material emergencies are not currently coordinated with MWA.

Map and monitor contaminant sites

Through its groundwater quality analysis system currently being developed, the MWA will be able to identify and monitor groundwater quality in the basin to meet the Agency's long-term objectives. More information on water quality efforts is provided earlier in this chapter.

Watershed management

MWA coordinates with watershed related entities including the Mojave Desert Resource Conservation District , U.S. Forest Service and the U. S. Bureau of Land Management.

Well standards

Well standards are administered via the San Bernardino County Department of Public Health. The County's Safe Drinking Water Program protects drinking water resources by maintaining a permitting system for water well construction and destruction, serving as the Local Primary Agency for small water systems, providing input into the land use process for the County, and by review of on-site sewage disposal conditions.

Water Conservation

There are numerous water conservation efforts in the Mojave basin. In addition to conservation efforts of cities, water districts, and water agencies, a coordinated effort is being conducted by the Alliance for Water Awareness and Conservation, a group of 23 entities. A full description of water conservation measures and the Alliance is provided in Chapter 7.

Land Use Planning

Land uses in the MWA have been primarily agricultural, urban and open space. Population growth is resulting in urbanization of some of the agricultural lands. MWA coordinates with several County and city planning departments in the review of land use plans to facilitate groundwater protection and to monitor potential new water demand.

APPENDIX I

WELL CONSTRUCTION DATA
FROM MWA WELL DATABASE

Well Construction Data From MWA Well Database

State Well Number	Boring Depth [feet]	Perforated Intervals [feet]	WellType
04N03W30C01	200	85-200	Aqua/Agriculture[1]
07N04W06N01	452	74-452	Recreational/Lakes[1]
09N03W22J04	205	70-205	Aqua/Agriculture[1]
07N05W25R04	85	65-85	Aqua/Agriculture[1]
06N04W34M08	185	130-180	Recreational/Lakes[1]
05N04W35J02	415	100-400	Aqua/Agriculture[1]
09N03W22F01	200	70-190	Aqua/Agriculture[2]
10N01W32F12	190	68.6	Aqua/Agriculture[2]
10N03E15Q02	260	60-260	Aqua/Agriculture[2]
05N04W15K01	600	200-600	Domestic[2]
08N04W20Q12	140	99.5-139.5	Monitoring
09N02W06H06	99	95-99	Monitoring
09N02W06L07	212	94.7	Monitoring
06N05W12G02	103	93-103	Monitoring
08N04W12C01	150	90-150	Monitoring
09N03E22R07	110	90-110	Monitoring
07N05W13H01	100	90-100	Monitoring
07N04W06F05	99	88-99	Monitoring
04N03W30B01	200	80-200	Monitoring
10N03W27F01	130	80-130	Monitoring
04N03W30K03	80	80-120	Monitoring
05N04W14D03	100	80-100	Monitoring
09N01W10J15	100	80-100	Monitoring
09N02W06M07	97	77-97	Monitoring
04N04W03A02	790	770-790	Monitoring
09N02W06L13	95	75-95	Monitoring
09N02W06P01	95	75-95	Monitoring
10N03W28M01	217	75-217	Monitoring
09N02W06P02	94	74-94	Monitoring
05N06W22E01	750	730-750	Monitoring
09N01W11K15	90	70-90	Monitoring
10N03E27J04	90	70-90	Monitoring
07N05W23R01	740	700-740	Monitoring
06N05W12F01	88	68-78	Monitoring
04N01E23K01	660	640-660	Monitoring
09N02E03K05	650	630-650	Monitoring
09N01W12N04	640	620-640	Monitoring
09N01W09D08	80	60-80	Monitoring
09N01W12L05	80	60-80	Monitoring
09N01W12N07	80	60-80	Monitoring
04N04W01C05	80	60-80	Monitoring
09N03W23D01	70	60-70	Monitoring
09N02E05H01	N/A	60-200	Monitoring
09N02E11H03	160	60-160	Monitoring
09N02W01A02	110	60-110	Monitoring
04N04W01C02	620	600-620	Monitoring

[1]active
[2]inactive
N/A- not available

Well Construction Data From MWA Well Database

State Well Number	Boring Depth [feet]	Perforated Intervals [feet]	WellType
09N01W10J12	610	590-610	Monitoring
09N03E22R04	610	590-610	Monitoring
04N03W12A01	600	580-600	Monitoring
04N03W19G02	600	580-600	Monitoring
09N02E03G06	600	580-600	Monitoring
09N01W11K12	590	570-590	Monitoring
10N03E27J01	570	550-570	Monitoring
05N06W22E02	565	545-565	Monitoring
07N04W19Q05	574	534-574	Monitoring
04N03W31L06	550	530-550	Monitoring
09N01E10Q02	550	530-550	Monitoring
07N05W24R05	550	510-550	Monitoring
06N05W01B05	10	5-10	Monitoring
01N05E36G01	510	510	Monitoring
09N02E11C03	190	50-190	Monitoring
03N03W07E01	150	50-150	Monitoring
10N01W33L03	120	50-120	Monitoring
04N04W03A03	510	490-510	Monitoring
07N05W23R02	510	490-510	Monitoring
09N02E03K06	510	490-510	Monitoring
09N03E22R05	510	490-510	Monitoring
09N01W09D05	500	480-500	Monitoring
09N02E03G07	490	470-490	Monitoring
04N01W13R01	480	470-480	Monitoring
09N02E03K09	65	45-65	Monitoring
09N01E04K01	470	450-470	Monitoring
08N04W20Q07	460	440-460	Monitoring
09N01W12L02	450	430-450	Monitoring
09N01W04M07	80	40-80	Monitoring
09N02W06L14	50	40-50	Monitoring
09N02W05N08	195	40-195	Monitoring
10N01W32Q04	139	40-139	Monitoring
01N05E36G02	400	400	Monitoring
08N04W21M04	60	40	Monitoring
09N01E16F01	410	390-410	Monitoring
05N06W22E03	400	380-400	Monitoring
10N03E27J02	350	370-350	Monitoring
04N01E23K02	380	360-380	Monitoring
04N01W13R02	380	360-380	Monitoring
04N03W31L07	380	360-380	Monitoring
01N07E23A01	370	360-370	Monitoring
09N02W03A02	55	35-55	Monitoring
04N03W19G03	375	355-375	Monitoring
10N03E27J05	45	35-45	Monitoring
08N04W21M01	370	350-370	Monitoring
09N01W10J13	370	350-370	Monitoring
04N04W03A04	360	340-360	Monitoring

[1]active
[2]inactive
N/A- not available

Well Construction Data From MWA Well Database

State Well Number	Boring Depth [feet]	Perforated Intervals [feet]	WellType
10N01E20M01	350	340-350	Monitoring
08N04W20Q08	350	330-350	Monitoring
09N01E10Q03	350	330-350	Monitoring
04N03W12A02	345	325-345	Monitoring
05N04W14D01	340	320-340	Monitoring
09N01E04K02	340	320-340	Monitoring
09N01E16F02	340	320-340	Monitoring
09N02E03K07	340	320-340	Monitoring
04N04W01C03	330	310-330	Monitoring
09N03W01R05	330	310-330	Monitoring
08N04W20Q11	50	30-50	Monitoring
05N04W14D04	50	30-50	Monitoring
08N04W29E06	40	30-40	Monitoring
06N05W12H01	150	30-150	Monitoring
09N01W12L03	320	300-320	Monitoring
08N04W19G01	315	295-315	Monitoring
07N05W23R03	315	295-315	Monitoring
09N01W11K13	315	295-315	Monitoring
09N01W12N05	310	290-310	Monitoring
08N04W29E03	309	289-309	Monitoring
09N01W09D06	300	280-300	Monitoring
09N02E03G08	300	280-300	Monitoring
09N03E22R06	290	270-290	Monitoring
07N05W24R06	285	265-285	Monitoring
10N01E20M02	285	265-285	Monitoring
09N01W04R02	280	260-280	Monitoring
07N04W19Q06	276	256-276	Monitoring
06N04W30D10	145	25-145	Monitoring
08N04W20Q09	270	250-270	Monitoring
06N04W30J05	40	24-40	Monitoring
04N01W13R03	260	240-260	Monitoring
04N03W31L08	140	240-260	Monitoring
10N03E27J03	255	235-255	Monitoring
09N01E16F03	250	230-250	Monitoring
09N01W04M05	250	230-250	Monitoring
06N05W12G04	27	22-27	Monitoring
08N04W19G02	250	220-240	Monitoring
04N04W03A05	235	215-235	Monitoring
08N04W21M02	230	210-230	Monitoring
09N02W03E01	230	210-230	Monitoring
09N01W04R04	40	20-40	Monitoring
04N03E35J01	500	200-500	Monitoring
08N04W29E04	210	190-210	Monitoring
09N02E03K08	210	190-210	Monitoring
09N03W01R06	210	190-210	Monitoring
09N02W06L11	200	190-200	Monitoring
02N06E18B01	310	187-305	Monitoring

[1]active
[2]inactive
N/A- not available

Well Construction Data From MWA Well Database

State Well Number	Boring Depth [feet]	Perforated Intervals [feet]	WellType
05N04W14D02	200	180-200	Monitoring
09N01E10Q04	200	180-200	Monitoring
09N01W10J14	200	180-200	Monitoring
04N03W19G04	195	175-195	Monitoring
09N01E04K03	195	175-195	Monitoring
04N04W01C04	190	170-190	Monitoring
09N01W09D07	190	170-190	Monitoring
09N01W12L04	180	165-185	Monitoring
09N02W03E02	185	165-185	Monitoring
06N07W21A02	200	162-194	Monitoring
09N03W24J04	300	160-300	Monitoring
04N03W19J06	255	160-250	Monitoring
09N01W11K14	180	160-180	Monitoring
04N03W19M01	175	153-173	Monitoring
06N05W12G03	25	15-25	Monitoring
07N04W06F06	25	15-25	Monitoring
07N05W13H02	25	15-25	Monitoring
07N05W13H03	25	15-25	Monitoring
06N05W01B04	20	15-20	Monitoring
08N04W19G03	170	150-170	Monitoring
09N01W12N06	170	150-170	Monitoring
08N04W10Q01	61	14-59	Monitoring
08N04W20Q10	160	140-160	Monitoring
09N01W04M06	160	140-160	Monitoring
09N02W02E01	160	140-160	Monitoring
09N02W06L12	155	135-155	Monitoring
07N04W19Q07	150	130-150	Monitoring
07N05W24R07	150	130-150	Monitoring
09N01E16F04	150	130-150	Monitoring
08N04W21M03	140	120-140	Monitoring
09N01W04R03	140	120-140	Monitoring
09N02E03G09	140	120-140	Monitoring
04N03W31L09	140	120-140	Monitoring
07N04W31L01	230	112-212	Monitoring
06N04W18N03	12	11-12	Monitoring
06N06W21J02	200	110-200	Monitoring
08N04W29E05	130	110-130	Monitoring
09N03W01R07	130	110-130	Monitoring
05N04W23B01	45	10-45	Monitoring
07N04W06F04	20	10-20	Monitoring
06N05W01B06	15	10-15	Monitoring
06N04W18N02	15	10-14	Monitoring
10N02E35A01	207	100-200	Monitoring
09N01E03H05	200	100-200	Monitoring
09N02W03A01	120	100-120	Monitoring
09N02W03E03	120	100-120	Monitoring

[1]active
[2]inactive
N/A- not available

APPENDIX J

Groundwater Management Planning
(AB 3030)

Groundwater Management and State Funding
(SB 1938)

California Urban Water Management Planning Act

Water Security, Clean Drinking Water,
Coastal and Beach Protection Act of 2002
(Proposition 50)

Groundwater Management Planning

California Water Code
Section 10750 - 10750.10 and 10753 - 10753.10

10750. (a) The Legislature finds and declares that groundwater is a valuable natural resource in California, and should be managed to ensure both its safe production and its quality. It is the intent of the Legislature to encourage local agencies to work cooperatively to manage groundwater resources within their jurisdictions.
(b) The Legislature also finds and declares that additional study of groundwater resources is necessary to better understand how to manage groundwater effectively to ensure the safe production, quality, and proper storage of groundwater in this state.

10750.2. (a) Subject to subdivision (b), this part applies to all groundwater basins in the state.
(b) This part does not apply to any portion of a groundwater basin that is subject to groundwater management by a local agency or a watermaster pursuant to other provisions of law or a court order, judgment, or decree, unless the local agency or watermaster agrees to the application of this part.

10750.4. Nothing in this part requires a local agency overlying a groundwater basin to adopt or implement a groundwater management plan or groundwater management program pursuant to this part.

10750.6. Nothing in this part affects the authority of a local agency or a watermaster to manage groundwater pursuant to other provisions of law or a court order, judgment, or decree.

10750.7. (a) A local agency may not manage groundwater pursuant to this part within the service area of another local agency, a water corporation regulated by the Public Utilities Commission, or a mutual water company without the agreement of that other entity.
(b) This section applies only to groundwater basins that are not critically overdrafted.

10750.8. (a) A local agency may not manage groundwater pursuant to this part within the service area of another local agency without the agreement of that other entity.
(b) This section applies only to groundwater basins that are critically overdrafted.

10750.9. (a) A local agency that commences procedures, prior to January 1, 1993, to adopt an ordinance or resolution to establish a program for the management of groundwater pursuant to Part 2.75 (commencing with Section 10750), as added by Chapter 903 of the Statutes of 1991, may proceed to adopt the ordinance or resolution pursuant to Part 2.75, and the completion of those procedures is deemed to meet the requirements of this part.

(b) A local agency that has adopted an ordinance or resolution pursuant to Part 2.75 (commencing with Section 10750), as added by chapter 903 of the Statutes of 1991, may amend its groundwater management program by ordinance or resolution of the governing body of the local agency to include any of the plan components set forth in Section 10753.7.

10750.10. This part is in addition to, and not a limitation on, the authority granted to a local agency pursuant to other provisions of law.

10753. (a) Any local agency, whose service area includes a groundwater basin, or a portion of a groundwater basin, that is not subject to groundwater management pursuant to other provisions of law or a court order, judgment, or decree, may, by ordinance, or by resolution if the local agency is not authorized to act by ordinance, adopt and implement a groundwater management plan pursuant to this part within all or a portion of its service area.

(b) Notwithstanding subdivision (a), a local public agency, other than an agency defined in subdivision (g) of Section 10752, that provides flood control, groundwater management, or groundwater replenishment, or a local agency formed pursuant to this code for the principal purpose of providing water service that has not yet provided that service, may exercise the authority of this part within a groundwater basin that is located within its boundaries within areas that are either of the following:

(1) Not served by a local agency.

(2) Served by a local agency whose governing body, by a majority vote, declines to exercise the authority of this part and enters into an agreement with the local public agency pursuant to Section 10750.7 or 10750.8.

10753.1. Nothing in this part, or in any groundwater management plan adopted pursuant to this part, affects surface water rights or the procedures under common law or local groundwater authority, or any provision of law other than this part that determines or grants surface water rights.

10753.2. (a) Prior to adopting a resolution of intention to draft a groundwater management plan, a local agency shall hold a hearing, after publication of notice pursuant to Section 6066 of the Government Code, on whether or not to adopt a resolution of intention to draft a groundwater management plan pursuant to this part for the purposes of implementing the plan and establishing a groundwater management program.

(b) At the conclusion of the hearing, the local agency may draft a resolution of intention to adopt a groundwater management plan pursuant to this part for the purposes of implementing the plan and establishing a groundwater management program.

10753.3. (a) After the conclusion of the hearing, and if the local agency adopts a resolution of intention, the local agency shall publish the resolution of intention in the same manner that notice for the hearing held under Section 10753.2 was published. (b) Upon written request, the local agency shall provide any interested person with a copy of the resolution of intention.

10753.4. (a) The local agency shall prepare a groundwater management plan within two years of the date of the adoption of the resolution of intention. If the plan is not adopted within two years, the resolution of intention expires, and no plan may be adopted except pursuant to a new resolution of intention adopted in accordance with this chapter.

(b) For the purposes of carrying out this part, the local agency shall make available to the public a written statement describing the manner in which interested parties may participate in developing the groundwater management plan. The local agency may appoint, and consult with, a technical advisory committee consisting of interested parties for the purposes of carrying out this part.

10753.5. (a) After a groundwater management plan is prepared, the local agency shall hold a second hearing to determine whether to adopt the plan. Notice of the hearing shall be given pursuant to Section 6066 of the Government Code. The notice shall include a summary of the plan and shall state that copies of the plan may be obtained for the cost of reproduction at the office of the local agency.

(b) At the second hearing, the local agency shall consider protests to the adoption of the plan. At any time prior to the conclusion of the second hearing, any landowner within the local agency may file a written protest or withdraw a protest previously filed.

10753.6. (a) A written protest filed by a landowner shall include the landowner's signature and a description of the land owned sufficient to identify the land. A public agency owning land is deemed to be a landowner for the purpose of making a written protest.

(b) The secretary of the local agency shall compare the names and property descriptions on the protest against the property ownership records of the county assessors.

(c) (1) A majority protest shall be determined to exist if the governing board of the local agency finds that the protests filed and not withdrawn prior to the conclusion of the second hearing represent more than 50 percent of the assessed value of the land within the local agency subject to groundwater management pursuant to this part.

(2) If the local agency determines that a majority protest exists, the groundwater plan may not be adopted and the local agency shall not consider adopting a plan for the area proposed to be included within the program for a period of one year after the date of the second hearing.

(3) If a majority protest has not been filed, the local agency, within 35 days after the conclusion of the second hearing, may adopt the groundwater management plan.

10753.7. (a) For the purposes of qualifying as a groundwater management plan under this part, a plan shall contain the components that are set forth in this section. In addition to the requirements of a specific funding program, any local agency seeking state funds administered by the department for the construction of groundwater projects or groundwater quality projects, excluding programs that are funded under Part 2.78 (commencing with Section 10795), shall do all of the following:

(1) Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin.

(2) For the purposes of carrying out paragraph (1), the local agency shall prepare a plan to involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin.

(3) For the purposes of carrying out paragraph (1), the local agency shall prepare a map that details the area of the groundwater basin, as defined in the department's Bulletin No. 118, and the area of the local agency, that will be subject to the plan, as well as the boundaries of other local agencies that overlie the basin in which the agency is developing a groundwater management plan.

(4) The local agency shall adopt monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for

basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management.

(5) Local agencies that are located in areas outside the groundwater basins delineated on the latest edition of the department' s groundwater basin and subbasin map shall prepare groundwater management plans incorporating the components in this subdivision, and shall use geologic and hydrologic principles appropriate to those areas.

(b) (1) (A) A local agency may receive state funds administered by the department for the construction of groundwater projects or for other projects that directly affect groundwater levels or quality if it prepares and implements, participates in, or consents to be subject to, a groundwater management plan, a basinwide management plan, or other integrated regional water management program or plan that meets, or is in the process of meeting, the requirements of subdivision (a). A local agency with an existing groundwater management plan that meets the requirements of subdivision (a), or a local agency that completes an upgrade of its plan to meet the requirements of subdivision (a) within one year of applying for funds, shall be given priority consideration for state funds administered by the department over local agencies that are in the process of developing a groundwater management plan. The department shall withhold funds from the project until the upgrade of the groundwater management plan is complete.

(B) Notwithstanding subparagraph (A), a local agency that manages groundwater under any other provision of existing law that meets the requirements of subdivision (a), or that completes an upgrade of its plan to meet the requirements of subdivision (a) within one year of applying for funding, shall be eligible for funding administered by the department. The department shall withhold funds from a project until the upgrade of the groundwater management plan is complete.

(C) Notwithstanding subparagraph (A), a local agency that conforms to the requirements of an adjudication of water rights in the groundwater basin is in compliance with subdivision (a). For purposes of this section, an "adjudication" includes an adjudication under Section 2101, an administrative adjudication, and an adjudication in state or federal court.

(D) Subparagraphs (A) and (B) do not apply to proposals for funding under Part 2.78 (commencing with Section 10795), or to funds authorized or appropriated prior to September 1, 2002.

(2) Upon the adoption of a groundwater management plan in accordance with this part, the local agency shall submit a copy of the plan to the department, in an electronic

format, if practicable, approved by the department. The department shall make available to the public copies of the plan received pursuant to this part.

10753.8. A groundwater management plan may include components relating to all of the following:

(a) The control of saline water intrusion.

(b) Identification and management of wellhead protection areas and recharge areas.

(c) Regulation of the migration of contaminated groundwater.

(d) The administration of a well abandonment and well destruction program.

(e) Mitigation of conditions of overdraft.

(f) Replenishment of groundwater extracted by water producers.

(g) Monitoring of groundwater levels and storage.

(h) Facilitating conjunctive use operations.

(i) Identification of well construction policies.

(j) The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.

(k) The development of relationships with state and federal regulatory agencies.

(l) The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

10753.9. (a) A local agency shall adopt rules and regulations to implement and enforce a groundwater management plan adopted pursuant to this part.

(b) Nothing in this part shall be construed as authorizing the local agency to make a binding determination of the water rights of any person or entity.

(c) Nothing in this part shall be construed as authorizing the local agency to limit or suspend extractions unless the local agency has determined through study and investigation that groundwater replenishment programs or other alternative sources of water supply have proved insufficient or infeasible to lessen the demand for groundwater.

10753.10. In adopting rules and regulations pursuant to Section 10753.9, the local agency shall consider the potential impact of those rules and regulations on business activities, including agricultural operations, and to the extent practicable and consistent with the protection of the groundwater resources, minimize any adverse impacts on those business activities.

Groundwater Management and State Funding

Senate Bill: 1938
Introduced: Senator Machado February 22, 2002
Chaptered: September 19, 2002

An act to amend Sections 10753.4 and 10795.4 of, to amend and renumber Sections 10753.7, 10753.8, and 10753.9 of, and to add Sections 10753.1 and 10753.7 to, the Water Code, relating to water.

Existing law authorizes a local agency to prepare and implement a groundwater management plan. Existing law establishes the Local Groundwater Assistance Fund and provides that, upon appropriation by the Legislature, money in the fund may be used by the Department of Water Resources to assist local public agencies by awarding grants to those agencies to conduct groundwater studies or to carry out groundwater monitoring and management activities.

This bill would require a local agency that elects to develop a groundwater management plan to make available to the public a written statement describing the manner in which interested parties would be allowed to participate in the development of that plan. The bill would require a local agency, for the purposes of qualifying as a groundwater management plan under certain provisions of law, or, with certain exceptions, for the purposes of receiving state funds administered by the department for the construction of groundwater projects or groundwater quality projects, to prepare and implement a plan that includes certain basin management objectives and components, and to adopt certain monitoring protocols. The bill would require the local agency to submit a copy of the plan to the department, in an electronic format, if practicable, approved by the department, and the department would be required to make copies available to the public. The bill would provide, that upon appropriation by the Legislature, money in the Local Groundwater Assistance Fund may be used by the department to assist local public agencies in the development of groundwater management plans.

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. The Legislature finds and declares the following:
(a) Groundwater constitutes a major source of water for use by the state's citizens in many urban and rural areas. It is in the interest of those citizens, and of benefit to

California's economy, that groundwater resources be protected and managed to optimize the available water supply.

(b) Protection and management include, but are not limited to, protection of recharge areas and source areas from contamination, protection of groundwater quality, artificial recharge, planned variation of pumping, and conjunctive management of both surface water and groundwater to optimize supplies.

(c) Groundwater is a crucial component of California's water supply and provides about 30 percent of California's agricultural and urban demand in an average year, and 40 percent or more in dry years.

(d) California has 515 groundwater basins and subbasins, many of which are the sole source of water supply for irrigation and drinking water and significant number of groundwater basins have been impaired by pollution or are threatened with impairment.

(e) A significant number of the state's groundwater basins are poorly understood, making proper management difficult.

(f) The preparation of groundwater management plans enables local agencies to address issues related to groundwater recharge and storage, which are crucial components for effective management of California's water supply.

(g) It is the intent of the Legislature to encourage local agencies to work cooperatively to manage groundwater resources within their jurisdictions. The preparation of certain basin management objectives will assist local agencies in optimizing local resources while protecting groundwater and surface water resources. The preparation of basin management objectives also will facilitate an understanding of the basin or subbasin, thereby allowing local agencies, individually and cooperatively, to meet local, regional, and state water needs through conjunctive management, while ensuring that no particular water supply is jeopardized.

SEC. 2. Section 10753.1 is added to the Water Code, to read: 10753.1. Nothing in this part, or in any groundwater management plan adopted pursuant to this part, affects surface water rights or the procedures under common law or local groundwater authority, or any provision of law other than this part that determines or grants surface water rights.

SEC. 3. Section 10753.4 of the Water Code is amended to read: 10753.4. (a) The local agency shall prepare a groundwater management plan within two years of the date of the adoption of the resolution of intention. If the plan is not adopted within two years, the resolution of intention expires, and no plan may be adopted except pursuant to a new resolution of intention adopted in accordance with this chapter.

The study was performed as part of a cooperative program with the USGS. This program will continue in the future, and will be expanded to determine the relationship between groundwater levels and land surface elevation changes.

Morongo Basin/Johnson Valley Area

Warren Valley Basin Watermaster

The Warren Valley Basin Watermaster performs monitoring in accordance with the Rules and Regulations of the Warren Valley Watermaster (1995). The Hi-Desert Water District acts as Watermaster. The following is a summary of monitoring currently performed by the Watermaster.

1. **Water Production and Verification**

   The Judgment requires that annual water production records be collected and verified by producers exceeding one acre-foot per year of production. The Watermaster is required to charge a production levy against any producer that exceeds their production right.

2. **Water Level Measurement**

   The Watermaster takes water level measurements each year on a quarterly basis.

3. **Water Quality**

   Each producing well must be tested by the well owner for nitrates and total dissolved solids every six months.

Locations of surface water monitoring stations (stream gauges) and wells that are monitored for groundwater elevations are shown in Figure H - 1. Locations of wells that are sampled for groundwater quality are shown in Figure H - 2.

(b) For the purposes of carrying out this part, the local agency shall make available to the public a written statement describing the manner in which interested parties may participate in developing the groundwater management plan. The local agency may appoint, and consult with, a technical advisory committee consisting of interested parties for the purposes of carrying out this part.

SEC. 4. Section 10753.7 of the Water Code is amended and renumbered to read: 10753.8. A groundwater management plan may include components relating to all of the following:

(a) The control of saline water intrusion.

(b) Identification and management of wellhead protection areas and recharge areas.

(c) Regulation of the migration of contaminated groundwater.

(d) The administration of a well abandonment and well destruction program.

(e) Mitigation of conditions of overdraft.

(f) Replenishment of groundwater extracted by water producers.

(g) Monitoring of groundwater levels and storage.

(h) Facilitating conjunctive use operations.

(i) Identification of well construction policies.

(j) The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.

(k) The development of relationships with state and federal regulatory agencies.

(l) The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

SEC. 5. Section 10753.7 is added to the Water Code, to read: 10753.7. (a) For the purposes of qualifying as a groundwater management plan under this part, a plan shall contain the components that are set forth in this section. In addition to the requirements of a specific funding program, any local agency seeking state funds administered by the department for the construction of groundwater projects or groundwater quality projects, excluding programs that are funded under Part 2.78 (commencing with Section 10795), shall do all of the following:

(1) Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin.

(2) For the purposes of carrying out paragraph (1), the local agency shall prepare a plan to involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin.

(3) For the purposes of carrying out paragraph (1), the local agency shall prepare a map that details the area of the groundwater basin, as defined in the department's Bulletin No. 118, and the area of the local agency, that will be subject to the plan, as well as the boundaries of other local agencies that overlie the basin in which the agency is developing a groundwater management plan.

(4) The local agency shall adopt monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management.

(5) Local agencies that are located in areas outside the groundwater basins delineated on the latest edition of the department' s groundwater basin and subbasin map shall prepare groundwater management plans incorporating the components in this subdivision, and shall use geologic and hydrologic principles appropriate to those areas.

(b) (1) (A) A local agency may receive state funds administered by the department for the construction of groundwater projects or for other projects that directly affect groundwater levels or quality if it prepares and implements, participates in, or consents to be subject to, a groundwater management plan, a basinwide management plan, or other integrated regional water management program or plan that meets, or is in the process of meeting, the requirements of subdivision (a). A local agency with an existing groundwater management plan that meets the requirements of subdivision (a), or a local agency that completes an upgrade of its plan to meet the requirements of subdivision (a) within one year of applying for funds, shall be given priority consideration for state funds administered by the department over local agencies that are in the process of developing a groundwater management plan. The department shall withhold funds from the project until the upgrade of the groundwater management plan is complete.

(B) Notwithstanding subparagraph (A), a local agency that manages groundwater under any other provision of existing law that meets the requirements of subdivision (a), or that completes an upgrade of its plan to meet the requirements of subdivision (a) within one year of applying for funding, shall be eligible for funding administered by the department. The department shall withhold funds from a project until the upgrade of the groundwater management plan is complete.

(C) Notwithstanding subparagraph (A), a local agency that conforms to the requirements of an adjudication of water rights in the groundwater basin is in compliance with subdivision (a). For purposes of this section, an "adjudication" includes an adjudication under Section 2101, an administrative adjudication, and an adjudication in state or federal court.

(D) Subparagraphs (A) and (B) do not apply to proposals for funding under Part 2.78 (commencing with Section 10795), or to funds authorized or appropriated prior to September 1, 2002.

(2) Upon the adoption of a groundwater management plan in accordance with this part, the local agency shall submit a copy of the plan to the department, in an electronic format, if practicable, approved by the department. The department shall make available to the public copies of the plan received pursuant to this part.

SEC. 6. Section 10753.8 of the Water Code is amended and renumbered to read:
10753.9. (a) A local agency shall adopt rules and regulations to implement and enforce a groundwater management plan adopted pursuant to this part.

(b) Nothing in this part shall be construed as authorizing the local agency to make a binding determination of the water rights of any person or entity.

(c) Nothing in this part shall be construed as authorizing the local agency to limit or suspend extractions unless the local agency has determined through study and investigation that groundwater replenishment programs or other alternative sources of water supply have proved insufficient or infeasible to lessen the demand for groundwater.

SEC. 7. Section 10753.9 of the Water Code is amended and renumbered to read:
10753.10. In adopting rules and regulations pursuant to Section 10753.9, the local agency shall consider the potential impact of those rules and regulations on business activities, including agricultural operations, and to the extent practicable and consistent with the protection of the groundwater resources, minimize any adverse impacts on those business activities.

SEC. 8. Section 10795.4 of the Water Code is amended to read: 10795.4. Upon appropriation by the Legislature, the money in the fund may be used by the department to assist local public agencies by awarding grants to those agencies to conduct groundwater studies or to carry out groundwater monitoring and management activities in accordance with Part 2.75 (commencing with Section 10750) or other authority pursuant to which local public agencies manage groundwater resources, or both, including the development of groundwater management plans, as provided for in subdivision (a) of Section 10753.7.

California Urban Water Management Planning Act

California Water Code
Section 10610 - 10657

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. (a) The Legislature finds and declares all of the following:
(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.
(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.
(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.
(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.
(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.
(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.
(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.
(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.
(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.
(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:
(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.
(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.
(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

CHAPTER 3. URBAN WATER MANAGEMENT PLANS

Article 1. General Provisions

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d)(1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621. (a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the

board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(1) An average water year

(2) A single dry water year

(3) Multiple dry water years

For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e)(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential

(B) Multifamily

(C) Commercial

(D) Industrial

(E) Institutional and governmental

(F) Landscape

(G) Sales to other agencies

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.

(K) Conservation pricing.

(L) Water conservation coordinator.

(M) Water waste prohibition.

(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).

(j) Urban water suppliers that rely upon a wholesale agency for a source of water, shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).

10631.5. The department shall take into consideration whether the urban water supplier is implementing or scheduled for implementation, the water demand management activities that the urban water supplier identified in its urban water management plan, pursuant to Section 10631, in evaluating applications for grants and loans made available pursuant to Section 79163. The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities.

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
(a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.
(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.
(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.
(d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.
(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.
(f) Penalties or charges for excessive use, where applicable.
(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.
(h) A draft water shortage contingency resolution or ordinance.
(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:
(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.
(b) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.
(c) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.
(d) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.
(e) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.
(f) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Article 2.5 Water Service Reliability

10635. (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water

service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.
(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.
(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.
(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

Article 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630). The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing hereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. (a) An urban water supplier shall file with the department and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department and any city or county within which the supplier provides water supplies within 30 days after adoption.
(b) The department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall identify the outstanding elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:
(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.
(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

10657. (a) The department shall take into consideration whether the urban water supplier has submitted an updated urban water management plan that is consistent with Section

10631, as amended by the act that adds this section, in determining whether the urban water supplier is eligible for funds made available pursuant to any program administered by the department.

(b) This section shall remain in effect only until January 1, 2006, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2006, deletes or extends that date.

Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002.

California Water Code
Section 79500 - 79590

79500. This division shall be known and may be cited as the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002.

79501. The people of California find and declare that it is necessary and in the public interest to do all of the following:
(a) Secure and safeguard the integrity of the state's water supply from catastrophic damage or failure from terrorist acts or other deliberate acts of destruction.
(b) Provide a safe, clean, affordable, and sufficient water supply to meet the needs of California residents, farms, and businesses.
(c) Provide adequate financing for balanced implementation of the CALFED Bay-Delta Program to:
(1) Provide good water quality for all beneficial uses.
(2) Improve and increase aquatic and terrestrial habitats and improve ecological functions in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary to support sustainable populations of diverse plant and animal species.
(3) Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system.
(4) Reduce the risk to land uses and associated economic activities, water supply, infrastructure, and ecosystems from catastrophic breaching of Delta levees.
(d) Establish and facilitate integrated regional water management systems and procedures to meet increasing water demands due to significant population growth that is straining local infrastructure and water supplies.
(e) Improve practices within watersheds to improve water quality, reduce pollution, capture additional storm water runoff, protect and manage groundwater better, and increase water use efficiency.
(f) Protect urban communities from drought, increase supplies of clean drinking water, reduce dependence on imported water, reduce pollution of rivers, lakes, streams, and coastal waters, and provide habitat for fish and wildlife.
(g) Invest in projects that further the ability of all Californians to live within California's basic apportionment of 4.4 million acre-feet per year of Colorado River water pursuant to the Colorado River Water Use Plan.
(h) Protect, restore, and acquire beaches and coastal uplands, wetlands, and watershed lands along the coast and in San Francisco Bay to protect the quality of drinking water, to keep beaches and coastal waters safe from water pollution, and to provide the wildlife and plant habitat and riparian and wetlands areas needed to support functioning coastal and San Francisco Bay ecosystems for the benefit of the people of California.

79502. It is the intent of the people in enacting this division that it be administered and executed in the most expeditious manner possible, and that all state, regional and local officials implement this division to the fullest extent of their authority.

79503. It is the intent of the people that water facility projects financed pursuant to this division shall be designed and constructed so as to improve the security and safety of the state's drinking water system.

79504. It is the intent of the people that investment of public funds pursuant to this division should result in public benefits.

79505. As used in this division, the following terms shall have the following meanings:
(a) "Acquisition" means the acquisition of a fee interest or any other interest, including easements, leases, and development rights.
(b) "Board" means the State Water Resources Control Board.
(c) "CALFED" means the consortium of state and federal agencies with management and regulatory responsibilities in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.
(d) "CALFED Bay-Delta Program" means the undertaking by CALFED to develop and implement, by means of the final programmatic environmental impact statement/environmental impact report, the preferred programs, actions, projects, and related activities that will provide solutions to identified problem areas related to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary ecosystem, including but not limited to the Bay-Delta and its tributary watersheds.
(e) "Department" means the Department of Water Resources.
(f) "Fund" means the Water Security, Clean Drinking Water, Coastal and Beach Protection Fund of 2002 created pursuant to Section 79510.
(g) "Nonprofit organization" means any nonprofit corporation formed pursuant to the Nonprofit Public Benefit Corporation Law (Division 2 (commencing with Section 5000) of Title 1 of the Corporations Code) and qualified under Section 501(c)(3) of the United States Internal Revenue Code.
(h) "Secretary" means the Secretary of the Resources Agency.
(i) "Wetlands" means lands that may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, fens, and vernal pools.

79505.5. As used in this division, the following terms shall have the following meanings:
(a) "Disadvantaged community" means a community with an annual median household income that is less than 80 percent of the statewide annual median household income.
(b) "Matching funds" means funds made available by nonstate sources, which may include, but are not limited to, donated services from nonstate sources.
(c) Notwithstanding subdivision (b), matching funds for a state agency may include state funds and services.

79505.6. (a) (1) By March 15, 2004, each state agency disbursing grants or loans ursuant to this division shall develop project solicitation and evaluation guidelines. The guidelines may include a limitation on the size of grants or loans to be awarded.
(2) Prior to disbursing grants, each state agency shall conduct two public meetings to consider public comments prior to finalizing the guidelines. Each state agency shall publish the draft solicitation and evaluation guidelines on its Internet Web site at

least 30 days before the public meetings. One meeting shall be conducted at a location in northern California and one meeting shall be conducted at a location in southern California. Upon adoption, each state agency shall transmit copies of the guidelines to the fiscal committees and the appropriate policy committees of the Legislature. To the extent feasible, each state agency shall provide outreach to disadvantaged communities to promote access and participation in those meetings.

(3) (A) Subject to subparagraph (B), the guidelines may include a requirement for matching funds.

(B) A state agency may not require matching funds for the purposes of awarding a grant financed by this division to assist a disadvantaged community, except as follows:

(i) For the purposes of awarding a grant pursuant to subdivision (a) of Section 79545, the department shall impose matching fund requirements in accordance with subdivision (a) of Section 79545.

(ii) For the purposes of awarding a grant subject to Section 79564, the board shall impose matching fund requirements in accordance with subdivision (b) of Section 79564.

(b) Notwithstanding subdivision (a), a state agency, in lieu of adopting guidelines pursuant to subdivision (a), may use guidelines existing on January 1, 2004, to the extent those guidelines conform to the applicable requirements of this division.

79506. Every proposed activity to be financed pursuant to this division shall be in compliance with the California Environmental Quality Act (Division 13 (commencing with Section 21000)) of the Public Resources Code.

79506.7. State agencies that are authorized to award loans or grants financed by this division shall provide technical assistance with regard to the preparation of the applications for those loans or grants in a manner that, among other things, addresses the needs of economically disadvantaged communities.

79507. Watershed protection activities financed pursuant to this division shall be consistent with the applicable adopted local watershed management plan and the applicable regional water quality control plan adopted by the regional water quality control board.

79508. Watershed protection activities in the San Gabriel and Los Angeles River watersheds shall be consistent with the San Gabriel and Los Angeles River Watershed and Open Space Plan as adopted by the San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy and the Santa Monica Mountains Conservancy. Notwithstanding any other provision of law, this plan shall be implemented pursuant to Division 23 (commencing with Section 33000) of the Public Resources Code in the watershed of the Los Angeles River upstream of the northernmost boundary of the City of Vernon and pursuant to Division 22.8 (commencing with Section 32600) of the Public Resources Code in the San Gabriel River and in the lower Los Angeles River watershed.

79509. Except for projects financed pursuant to Chapter 6 (commencing with Section 79545) or Chapter 10 (commencing with Section 79570), to be eligible to be financed pursuant to this division, any project that will wholly or partially assist in the fulfillment of one or more of the goals of the CALFED Bay-Delta Program shall be consistent with the CALFED Programmatic Record of Decision, and shall be implemented, to the maximum extent possible, through local and regional programs.

79510. The Water Security, Clean Drinking Water, Coastal and Beach Protection Fund of 2002 is hereby created.

79511. All money deposited in the fund shall be used only for the purposes and in the amounts set forth in this division and for no other purpose.

79512. Except as otherwise expressly provided in this division, upon a finding by the agency authorized to administer or expend money appropriated from the fund that a particular project or program for which money has been allocated or granted cannot be completed, or that the amount that was appropriated, allocated, or granted is in excess of the total amount needed, the Legislature may reappropriate the money for other high priority needs consistent with this division.

79520. The sum of fifty million dollars ($50,000,000) shall be available for appropriation by the Legislature from the fund for the purpose of protecting state, local, and regional drinking water systems from terrorist attack or deliberate acts of destruction or degradation. This money may be expended or granted for monitoring and early warning systems, fencing, protective structures, contamination treatment facilities, emergency interconnections, communications systems, and other projects designed to prevent damage to water treatment, distribution, and supply facilities, to prevent disruption of drinking water deliveries, and to protect drinking water supplies from intentional contamination.

79521. The Legislature may enact such legislation as is necessary to implement this chapter.

79522. (a) Funds made available pursuant to Section 79520 shall be appropriated to the State Department of Health Services to carry out this chapter consistent with the requirements and for the purposes specified in Section 79520.

(b) In the development of priorities for expenditure of the funds appropriated for the purposes of this section, the State Department of Health Services shall consult with the Office of Emergency Services, the state Office of Homeland Security and local water agencies to develop criteria for the department's programs.

(c) Funds allocated pursuant to this section shall not be available for grants that reimburse project costs incurred prior to the adoption of criteria for the grants provided in this section.

(d) No grant funds may be awarded to supplant funding for the routine responsibilities or obligations of any state, local, or regional drinking water system.

79530. (a) The sum of four hundred thirty-five million dollars ($435,000,000) shall be available for appropriation by the Legislature from the fund to the State Department of

Health Services for grants and loans for infrastructure improvements and related actions to meet safe drinking water standards including, but not limited to, the following types of projects:

(1) Grants to small community drinking water systems to upgrade monitoring, treatment, or distribution infrastructure.

(2) Grants to finance development and demonstration of new technologies and related facilities for water contaminant removal and treatment.

(3) Grants for community water quality monitoring facilities and equipment.

(4) Grants for drinking water source protection.

(5) Grants for treatment facilities necessary to meet disinfectant by-product safe drinking water standards.

(6) Loans pursuant to the Safe Drinking Water State Revolving Fund Law of 1997 (Chapter 4.5 (commencing with Section 116760) of Part 12 of Division 104 of the Health and Safety Code).

(b) Not less than 60 percent of the money appropriated pursuant to this section shall be available for grants to Southern California water agencies to assist in meeting the state's commitment to reduce Colorado River water use to 4.4 million acre feet per year.

79531. The Legislature may enact such legislation as is necessary to implement this chapter.

79532. (a) Funds made available pursuant to subdivision (b) of Section 79530 shall be administered in accordance with this section.

(b) (1) Grant funds appropriated for the purposes of subdivision (b) of Section 79530 shall be awarded on a competitive basis.

(2) The department shall consolidate the application process required to implement the grant program described in this section.

(c) For the purposes of this chapter, "Southern California water agencies" means water agencies whose service area is entirely or partly in one or more of the following counties: San Diego, Imperial, Riverside, Orange, Los Angeles, San Bernardino, Santa Barbara, or Ventura.

(d) Grants may be awarded to Southern California water agencies for eligible projects undertaken by one or more Southern California water agencies and other entities.

(e) A project funded by a grant made pursuant to subdivision (b) of Section 79530 shall meet both of the following requirements:

(1) The project will assist the grantee to meet safe drinking water standards.

(2) The project will assist in meeting the state's commitment to reduce Colorado River water use to 4.4 million acre-feet per year.

(f) In the development of criteria for the grants awarded pursuant to this section, the State Department of Health Services shall consult with the Office of Environmental Health Hazard Assessment for the purposes of developing a program that gives priority to projects that reduce public and environmental exposure to contaminants that pose the most significant health risks, and that will bring water systems into compliance with safe drinking water standards. These include, but are not limited to, projects that address public exposure to contaminants for which safe drinking water standards have been established, including arsenic, disinfection byproducts and uranium. Projects to address emerging contaminants, including perchlorate, chromium 6, and endocrine disrupters shall also be given priority.

79534. (a) Funds made available pursuant to paragraph (1), (2), 3), (4), or (5) of subdivision (a) of Section 79530, and not for the purposes of subdivision (b) of that section, shall be administered in accordance with this section.
   (b) (1) Grants shall be awarded in accordance with subdivision (a) of Section 79530 on a statewide competitive basis.
   (2) A project that is eligible for funding for the purposes of subdivision (b) of Section 79530 is not eligible for a grant subject to this section.
   (c) For the purposes of this chapter, "small community" means a municipality with a population of 3,300 persons or fewer, or 1,000 connections or fewer.
   (d) The State Department of Health Services shall consolidate the application process required to implement the grant program described in this section.
   (e) In the development of criteria for the grants awarded under this section, the State Department of Health Services shall consult with the Office of Environmental Health Hazard Assessment for the purpose of developing a program that gives priority to projects that pose the most significant health risks, and that will bring water systems into compliance with safe drinking water standards. These include, but are not limited to, projects that address public eposure to contaminants for which safe drinking water standards have been established, including arsenic, disinfection byproducts and uranium. Projects to address emerging contaminants, including perchlorate, chromium 6, and endocrine disrupters shall also be given priority.
   (f) Grants awarded pursuant to this section may not exceed ten million dollars ($10,000,000) for any one project.

79540. (a) The sum of one hundred million dollars ($100,000,000) shall be available for appropriation by the Legislature from the fund to the board for competitive grants for the following purposes:
   (1) Water pollution prevention.
   (2) Water reclamation.
   (3) Water quality improvement.
   (4) Water quality blending and exchange projects.
   (5) Drinking water source protection projects.
   (6) Projects to mitigate pathogen risk from recreational uses at drinking water storage facilities.
   (b) Priority shall be given to projects that assist in meeting water quality standards established by the board.
   (c) The Legislature may enact such legislation as is necessary to implement this section.

79540.1. (a) Grants shall be awarded in accordance with Section 79540 on a statewide competitive basis.
   (b) To the extent funds appropriated pursuant to Section 79540 are expended for the purposes of programs established under Division 20.4 (commencing with Section 30901)

of the Public Resources Code, those funds shall comply with the requirements of that division.

79541. The sum of one hundred million dollars ($100,000,000) shall be available for appropriation by the Legislature from the fund to the secretary for the acquisition from willing sellers, restoration, protection, and development of river parkways. The secretary shall allocate this money in accordance with Article 6 (commencing with Section 78682) of Chapter 6 of Division 24 or pursuant to any other statute that provides for the acquisition, restoration, protection, and development of river parkways. Priority shall be given to projects that are implemented pursuant to approved watershed plans and include water quality and watershed protection benefits. This money may also be used to acquire facilities necessary to provide flows to improve water quality downstream.

79542. The sum of forty million dollars ($40,000,000) shall be available for appropriation by the Legislature from the fund to the California Tahoe Conservancy for acquisition from willing sellers, restoration, and protection of land and water resources to improve water quality in Lake Tahoe.

79543. (a) The sum of one hundred million dollars ($100,000,000) shall be available for appropriation by the Legislature from the fund to the board for the purpose of financing projects that restore and protect the water quality and environment of coastal waters, estuaries, bays and nearshore waters, and groundwater.

(b) All expenditures, grants, and loans made pursuant to this section shall be consistent with the requirements of Article 5 (commencing with Section 79148) of Chapter 7 of Division 26.

(c) Of the money made available pursuant to this section, not less than twenty million dollars ($20,000,000) shall be expended to implement priority actions specified in the Santa Monica Bay Restoration Plan. Money appropriated pursuant to this subdivision shall be allocated as recommended by the Santa Monica Bay Restoration Commission.

(d) Money made available pursuant to this section shall supplement, not supplant, money appropriated or available pursuant to that Article 5 (commencing with Section 79148), and no money appropriated pursuant to this section shall be used for a project for which an appropriation was made pursuant to that Article 5 (commencing with Section 79148).

79544. The sum of thirty million dollars ($30,000,000) shall be available for appropriation by the Legislature from the fund to the secretary for the purpose of grants to local public agencies, local water districts, and nonprofit organizations for acquisition from willing sellers of land and water resources to protect water quality in lakes, reservoirs, rivers, streams and wetlands in the Sierra Nevada-Cascade Mountain Region as defined in Section 5096.347 of the Public Resources Code.

79545. The sum of one hundred million dollars ($100,000,000) shall be available for appropriation by the Legislature from the fund to the department for grants for the following projects:

(a) Desalination of ocean or brackish waters. Not less than fifty million dollars ($50,000,000) of the money appropriated by this chapter shall be available for desalination projects. To be eligible to receive a grant, at least 50 percent of the total cost of the project shall be met by matching funds or donated services from non-state sources.
(b) Pilot and demonstration projects for treatment or removal of the following contaminants:
(1) Petroleum products, such as MTBE and BTEX.
(2) N-Nitrosodimethylamine (NDMA).
(3) Perchlorate.
(4) Radionuclides, such as radon, uranium, and radium.
(5) Pesticides and herbicides.
(6) Heavy metals, such as arsenic, mercury, and chromium.
(7) Pharmaceuticals and endocrine disrupters.
(c) Drinking water disinfecting projects using ultraviolet technology and ozone treatment.

79546. The Legislature may enact such legislation as is necessary to implement this chapter.

79547. (a) Funds made available pursuant to Section 79545 shall be administered in accordance with this section. (b) Grants shall be awarded in accordance with Section 79545 on a statewide competitive basis.

79547.2. (a) For the purposes of implementing subdivision (a) of Section 79545, eligible projects shall be selected based on demonstrated need for new or alternative water supplies, project readiness, and the degree to which the project avoids or mitigates adverse environmental impacts. Preference shall be given to eligible projects that incorporate ecosystem restoration and water quality benefits.
(b) A grant made pursuant to subdivision (a) of Section 79545 may not exceed five million dollars ($5,000,000).
(c) For the purposes of this section, "desalination project" includes construction, planning, engineering, design, environmental assessments, or related work necessary for the construction of a desalination facility, or the construction of a pilot or demonstration facility.

79550. The sum of eight hundred twenty-five million dollars ($825,000,000) shall be available for appropriation by the Legislature from the fund for the balanced implementation of the CALFED Bay-Delta Program. Expenditures and grants pursuant to this chapter shall be limited to the following:
(a) Fifty million dollars ($50,000,000) for surface water storage planning and feasibility studies.
(b) Seventy-five million dollars ($75,000,000) for the water conveyance facilities described in subparagraph (B) of paragraph (2) of subdivision (d) of Section 79190.
(c) Seventy million dollars ($70,000,000) for Delta levee restoration. Money expended pursuant to this subdivision shall be subject to Section 79050.

(d) One hundred eighty million dollars ($180,000,000) for water supply reliability projects that can be implemented expeditiously and thereby provide near-term benefits, including, but not limited to, projects that facilitate groundwater management and storage, water transfers, and acquisition of water for the CALFED environmental water account. In acquiring water, preference shall be given to long-term water purchase contracts and water rights. Money allocated pursuant to this subdivision shall be subject to Article 4 (commencing with Section 79205.2) of Chapter 9 of Division 26.

(e) One hundred eighty million dollars ($180,000,000) for ecosystem restoration program implementation of which not less than twenty million dollars ($20,000,000) shall be allocated for projects that assist farmers in integrating agricultural activities with ecosystem restoration.

(f) Ninety million dollars ($90,000,000) for watershed program implementation.

(g) One hundred eighty million dollars ($180,000,000) for urban and agricultural water conservation, recycling, and other water use efficiency projects.

79551. All appropriations pursuant to this chapter shall include money for independent scientific review, monitoring, and assessment of the results or effectiveness of the project or program expenditure.

79552. All projects financed pursuant to this chapter shall be consistent with the CALFED Programmatic Record of Decision including its provisions regarding finance and balanced implementation.

79553. Consistent with the CALFED Programmatic Record of Decision, priority shall be given to projects that achieve multiple benefits across CALFED program elements. Not more than 5 percent of the money available pursuant to this chapter may be used for administrative costs.

79554. All real property acquired with money appropriated or granted pursuant to subdivision (e) or (f) of Section 79550 shall be acquired from willing sellers.

79555. (a) For the 2004-05 fiscal year, and each fiscal year thereafter, not less than 50 percent of the funds made available pursuant to subdivision (d) of Section 79550 for acquisition of water for the CALFED environmental water account shall be expended for long-term water purchase contracts, permanent water rights, and associated costs.

(b) The California Bay-Delta Authority shall report annually to the Legislature on the state's efforts in acquiring long-term purchase contracts and permanent water rights in accordance with this section.

79560. The sum of five hundred million dollars ($500,000,000) shall be available for appropriation by the Legislature from the fund for competitive grants for projects set forth in this section to protect communities from drought, protect and improve water quality, and improve local water security by reducing dependence on imported water. No project financed pursuant to this section shall include an on-stream surface water storage facility or an off-stream surface water storage facility other than percolation ponds for groundwater recharge in urban areas. No river or stream channel modification project whose construction or operation causes any negative environmental impacts may be financed pursuant to this chapter unless those impacts are fully mitigated.

79560.1. (a) The department shall administer 50 percent of the funds, and the board shall administer the remaining 50 percent of the funds, made available to the program described in Sections 79560 and 79561.

(b) For projects proposed to be funded pursuant to Section 79560 that include any modification of a river or stream channel, the state agency making the grant, prior to the award of the grant, shall determine whether the environmental impacts resulting from that modification will be fully mitigated by considering all of the impacts of that modification and any mitigation, environmental enhancement, and environmental benefit resulting from the project, and determining whether, on balance, any environmental enhancement or benefit equals or exceeds any negative environmental impacts of the project. The costs of mitigation or enhancement may be included in the project costs eligible for funding pursuant to Section 79560.

(c) This section shall become operative only if the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 is approved by the voters at the November 5, 2002, statewide general election.

79560.5. For the purposes of carrying out this chapter, the department and the board shall jointly develop project solicitation and evaluation guidelines. Before developing the solicitation and evaluation guidelines, the department and the board shall jointly conduct a public meeting to receive public comments on the scope, procedures, and content of the guidelines. Considering the public comments, the department and the board shall jointly develop solicitation and evaluation guidelines that are consistent with law and state programs and policies. The department and the board shall post the solicitation and evaluation guidelines on their respective Internet Web sites.

79561. Money appropriated in Section 79560 shall be available for grants for water management projects that include one or more of the following elements:

(a) Programs for water supply reliability, water conservation, and water use efficiency.

(b) Storm water capture, storage, treatment, and management.

(c) Removal of invasive non-native plants, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands.

(d) Non-point source pollution reduction, management, and monitoring.

(e) Groundwater recharge and management projects.

(f) Contaminant and salt removal through reclamation, desalting, and other treatment technologies.

(g) Water banking, exchange, reclamation, and improvement of water quality.

(h) Planning and implementation of multipurpose flood control programs that protect property; and improve water quality, storm water capture and percolation; and protect or improve wildlife habitat.

(i) Watershed management planning and implementation.

(j) Demonstration projects to develop new drinking water treatment and distribution methods.

79561.5. (a) Notwithstanding any other provision of law, of the funds appropriated to the department for the purposes of Section 79560 and 79560.1, the department shall allocate the sum of not less than twenty million dollars ($20,000,000) to competitive grants for groundwater management and recharge projects. The department shall not allocate funds pursuant to this section unless it determines that the allocation is consistent with this division, as approved by the voters at the November 5, 2002, statewide general election.

(b) It is the intent of the Legislature that these funds be used to enhance water supply in rapidly growing areas of this state with limited access to imported water supplies.

(c) Not more than 50 percent of the grants pursuant to this section shall be for projects in northern California. For projects in southern California, the department shall give preference to projects outside the service area of the Metropolitan Water District of Southern California that are infill projects within one mile of established residential and commercial development.

(d) As used in this section, the term "rapidly growing areas" means counties located in southern California where the county population increased by 2.4 percent or more between January 1, 2002, and January 1, 2003.

79562. An amount, not to exceed 10 percent of the money available for appropriation in Section 79560, may be appropriated by the Legislature for facilities, equipment, and other expenses associated with the establishment of comprehensive statewide groundwater monitoring pursuant to Part 2.76 (commencing with Section 10780) of Division 6.

79562.5. (a) For the purposes of carrying out Section 79560, the department shall award grants to eligible projects consistent with an adopted integrated regional water management plan.

(b) For purposes of subdivision (a), the department shall establish standards for integrated regional water management plans. At a minimum, these plans shall address the major water related objectives and conflicts of the watersheds in the region covered by the plan, including water supply, groundwater management, ecosystem restoration, and water quality elements, and may include other elements consistent with this chapter.

(c) The department may waive the requirement for consistency with an adopted integrated regional water management plan until January 1, 2007, if the applicant is engaged in the development of an integrated regional water management plan and indicates, within its grant application, how the project fits into achieving the integrated regional water management plan objectives.

(d) The department may waive the matching fund requirement for disadvantaged communities.

(e) For groundwater management and recharge projects and for projects with potential groundwater impacts, the board and the department shall give preference to eligible projects in areas subject to a groundwater management plan that meets the requirements of Section 10753.7, or that includes the development of a groundwater management plan as a project component.

(f) The maximum award for any single grant pursuant to this section may not exceed fifty million dollars ($50,000,000).

(g) The department shall require that eligible projects include a nonstate contribution.

(h) For the purposes of implementing Section 79563, and to the extent funds are expended for the purposes of Section 30947 of the Public Resources Code, those funds shall comply with the requirements of that section.

79563. At least 50 percent of the amount available for appropriation in Section 79560 shall be appropriated to the board. The board shall establish procedures for selecting among eligible projects specified in Section 79561 that use the procedures developed by the board for stakeholder-based accelerated selection and contracting pursuant to Section 79104.32.

79563.5. (a) The board, to the extent that funds are appropriated pursuant to Section 79563 of the Water Code for purposes that are consistent with this section, shall fund the development of one or more integrated coastal watershed management plans.

(b) The plans shall be designed to allow for the integration of projects funded by the State Coastal Conservancy pursuant to Chapter 5.5 (commencing with Section 31220) of Division 21 of the Public Resources Code, and projects funded by the board pursuant to Chapter 3 (commencing with Section 30915) and Article 5 (commencing with Section 30945) of Chapter 4, of Division 20.4 of the Public Resources Code, within one or more coastal regions.

(c) The planning areas shall be selected by the board in consultation with the State Coastal Conservancy and the Department of Fish and Game and shall include coastal watersheds that influence water quality in areas of special biological significance.

(d) The board may only expend funds for the purposes of this section to the extent the board determines that the expenditures are consistent with the requirements of this chapter.

79564. To be eligible for financing pursuant to Section 79563, a project shall meet both of the following criteria:

(a) The project is consistent with an adopted integrated water management plan designed to improve regional water supply reliability, water recycling, water conservation, water quality improvement, storm water capture and management, flood management, recreation and access, wetlands enhancement and creation, and environmental and habitat protection and improvement.

(b) The project includes matching funds or donated services from non-state sources.

79564.1. (a) Of the funds made available by Section 79560, not less than 40 percent shall be available for eligible projects in northern California and not less than 40 percent be available for eligible projects in southern California, subject to a determination by the administering agency that each project meets all of the requirements of this chapter.

(b) For the purposes of this section, "southern California" means the Counties of San Diego, Imperial, Riverside, Orange, Los Angeles, Santa Barbara, San Bernardino, and Ventura.

(c) For the purposes of this section, "northern California" means all California counties except those identified in subdivision (b).

79565. Notwithstanding Section 13340 of the Government Code, the sum of one hundred forty million dollars ($140,000,000) is hereby continuously appropriated from the fund to the Wildlife Conservation Board, without regard to fiscal years, for expenditure by the board and for grants, for the acquisition from willing sellers of land and water resources, including the acquisition of conservation easements, to protect regional water quality, protect and enhance fish and wildlife habitat, and to assist local public agencies in improving regional water supply reliability.

79567. The sum of twenty million dollars ($20,000,000) shall be available for appropriation by the Legislature from the fund to the department for grants for canal lining and related projects necessary to reduce Colorado River water use pursuant to the California Colorado River Water Use Plan adopted by the Colorado River Board of California.

79568. (a) The sum of fifty million dollars ($50,000,000) shall be available for appropriation by the Legislature from the fund to the Wildlife Conservation Board for the acquisition, protection, and restoration of land and water resources necessary to meet state obligations for regulatory requirements related to California's allocation of water supplies from the Colorado River. No money allocated pursuant to this section may be used to supplant or pay for the regulatory mitigation obligations of private parties under state or federal law.

(b) All real property acquired pursuant to this section shall be acquired from willing sellers.

79570. The sum of two hundred million dollars ($200,000,000) shall be available for appropriation by the Legislature from the fund for expenditures and grants for the purpose of protecting coastal watersheds, including, but not limited to, acquisition, protection, and restoration of land and water resources and associated planning, permitting, and administrative costs, in accordance with the following schedule:

(a) The sum of one hundred twenty million dollars ($120,000,000) to the State Coastal Conservancy for coastal watershed protection pursuant to Division 21 (commencing with Section 31000) of the Public Resources Code.

(b) The sum of twenty million dollars ($20,000,000) to the State Coastal Conservancy for expenditure for the San Francisco Bay Conservancy Program for coastal watershed protection pursuant to Chapter 4.5 (commencing with Section 31160) of Division 21 of the Public Resources Code.

(c) The sum of forty million dollars ($40,000,000) to the Santa Monica Mountains Conservancy. Twenty million dollars ($20,000,000) of this sum shall be expended for protection of the Los Angeles River watershed upstream of the northernmost boundary of the City of Vernon, and twenty million dollars ($20,000,000) shall be expended for protection of the Santa Monica Bay and Ventura County coastal watersheds, pursuant to Division 23 (commencing with Section 33000) of the Public Resources Code.

(d) The sum of twenty million dollars ($20,000,000) to the San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy for protection of the San Gabriel and lower

Los Angeles River watersheds pursuant to Division 22.8 (commencing with Section 32600) of the Public Resources Code.

79571. Ten percent of the money allocated in each of the categories in Section 79570 shall be used for grants for the acquisition and development of facilities to promote public access to and participation in the conservation of land, water, and wildlife resources. Eligible projects include, but are not limited to, the following:

(a) Training and research facilities for watershed protection and water conservation activities conducted by nonprofit organizations. Priority shall be given to projects operated by nonprofit organizations in collaboration with the University of California and public water agencies.

(b) Nature centers that are in or adjacent to watersheds and wetlands identified for protection pursuant to this chapter, that provide wildlife viewing, outdoor experiences, and conservation education programs to the public and to students. Priority shall be given to projects that are operated by or in cooperation with nonprofit organizations and are designed to serve children from urban areas that lack access to natural areas and outdoor education programs.

79572. (a) Notwithstanding Section 13340 of the Government Code, the sum of seven hundred fifty million dollars ($750,000,000) is hereby continuously appropriated from the fund to the Wildlife Conservation Board, without regard to fiscal years, for the acquisition, protection, and restoration of coastal wetlands, upland areas adjacent to coastal wetlands, and coastal watershed lands. Money appropriated pursuant to this section shall be for the acquisition, protection, and restoration of lands in or adjacent to urban areas. Eligible projects shall be limited to the following:

(1) Acquisition, protection, and restoration of coastal wetlands identified in the Southern California Coastal Wetlands Inventory as of January 1, 2001, published by the State Coastal Conservancy, located within the coastal zone, and other wetlands connected and proximate to such coastal wetlands, and upland areas adjacent and proximate to such coastal wetlands, or coastal wetlands identified for acquisition, protection, and restoration in the San Francisco Baylands Ecosystem Habitat Goals Report, and upland areas adjacent to the identified wetlands.

(2) Acquisition, protection, and restoration of coastal watershed and adjacent lands located in Los Angeles, Ventura, and Santa Barbara Counties. Any project financed pursuant to this paragraph within the Santa Monica Mountains Zone, as defined in Section 33105 of the Public Resources Code, shall be by grant from the Wildlife Conservation Board to the Santa Monica Mountains Conservancy. Any project financed pursuant to this paragraph within the Baldwin Hills area, as defined in Section 32553 of the Public Resources Code, shall be by grant from the Wildlife Conservation Board to the Baldwin Hills Conservancy.

(b) Not less than three hundred million dollars ($300,000,000) of the amount appropriated in this section shall be expended or granted for projects within Los Angeles and Ventura Counties. Of the remaining funds available pursuant to this section the Wildlife Conservation Board shall give priority to the acquisition of not less than 100 acres consisting of upland mesa areas, including wetlands therein, adjacent to the state ecological reserve in the Bolsa Chica wetlands in Orange County.

(c) Not more than two hundred million dollars ($200,000,000) of the amount appropriated in this section may be expended or granted for projects in the San Francisco Bay area, as described in Section 31162 of the Public Resources Code. Any project within the San Francisco Bay area may be by grant from the Wildlife Conservation Board to the State Coastal Conservancy.

79573. (a) The purchase price for each acquisition made pursuant to Section 79572 shall not exceed the fair market value of the property as defined in Section 1263.320 of the Code of Civil Procedure. Fair market value shall be determined by an appraisal that is prepared by a licensed real estate appraiser and approved by the Wildlife Conservation Board and the Department of General Services.

(b) All real property acquired pursuant to this chapter shall be acquired from willing sellers.

79575. Not later than January 1, 2005, and on or before January 1 of each year thereafter, each state agency expending funds pursuant to this division for projects, grants, or loans shall report to the Legislature on the recipient and amount of each project, grant, or loan awarded under this division during the previous fiscal year. The information shall include the total amount awarded, categorized by project, grant, or loan, the geographic distribution of projects, grants, or loans awarded under this division, and the intended public and environmental benefit that the awards provide. The information shall also include data on the balances of funds available under this division for expenditures and grants in that fiscal year and future fiscal years.

79580. Bonds in the total amount of three billion four hundred forty million dollars ($3,440,000,000), not including the amount of any refunding bonds issued in accordance with Section 79588, or so much thereof as is necessary, may be issued and sold to be used for carrying out the purposes set forth in this division and to be used to reimburse the General Obligation Bond Expense Revolving Fund pursuant to Section 16724.5 of the Government Code. The bond proceeds shall be deposited in the Water Security, Clean Drinking Water, Coastal and Beach Protection Fund of 2002 created by Section 79510. The bonds shall, when sold, be and constitute a valid and binding obligation of the State of California, and the full faith and credit of the State of California is hereby pledged for the punctual payment of both principal of and interest on the bonds as they become due and payable.

79581. The bonds authorized by this division shall be prepared, executed, issued, sold, paid, and redeemed as provided in the State General Obligation Bond Law (Chapter 4 (commencing with Section 16720) of Part 3 of Division 4 of Title 2 of the Government Code), and all provisions of that law shall apply to the bonds and to this division and are hereby incorporated in this division by this reference as though fully set forth in this division.

79582. (a) Solely for the purpose of authorizing the issuance and sale, pursuant to the State General Obligation Bond Law, of the bonds authorized by this division, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 Finance

Committee is hereby created. For purposes of this division, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 Finance Committee is "the committee" as that term is used by the State General Obligation Bond Law. The committee shall consist of the Controller, the Director of Finance, and the Treasurer, or their designated representatives. The Treasurer shall serve as chairperson of the committee. A majority of the committee may act for the committee.
(b) For purposes of this chapter and the State General Obligation Bond Law, the secretary is designated as "the board."

79583. The committee shall determine whether or not it is necessary or desirable to issue bonds authorized pursuant to this division in order to carry out the actions specified in this division and, if so, the amount of bonds to be issued and sold. Successive issues of bonds may be authorized and sold to carry out those actions progressively, and it is not necessary that all of the bonds authorized to be issued be sold at any one time.

79584. There shall be collected annually in the same manner and at the same time as other state revenue is collected, in addition to the ordinary revenues of the state, a sum in an amount required to pay the principal of, and interest on, the bonds maturing each year, and it is the duty of all officers charged by law with any duty in regard to the collection of the revenue to do so and perform each and every act that is necessary to collect that additional sum.

79585. Notwithstanding Section 13340 of the Government Code, there is hereby appropriated from the General Fund, for purposes of this division, an amount that will equal the total of the following:
(a) The sum annually necessary to pay the principal of, and interest on, bonds issued and sold pursuant to this division, as the principal and interest become due and payable.
(b) The sum which is necessary to carry out the provisions of Section 79586, appropriated without regard to fiscal years.

79586. For the purposes of carrying out this division, the Director of Finance may authorize the withdrawal from the General Fund of an amount or amounts not to exceed the amount of the unsold bonds that have been authorized to be sold for the purpose of carrying out this division. Any amounts withdrawn shall be deposited in the fund. Any money made available under this section shall be returned to the General Fund, plus the interest that the amounts would have earned in the Pooled Money Investment Account, from money received from the sale of bonds that would otherwise be deposited in that fund.

79587. All money derived from premium and accrued interest on bonds sold shall be reserved and shall be available for transfer to the General Fund as a credit to expenditures for bond interest.

79588. Any bonds issued or sold pursuant to this division may be refunded by the issuance of refunding bonds in accordance with Article 6 (commencing with Section 16780) of Chapter 4 of Part 3 of Division 4 of Title 2 of the Government Code. Approval by the electors of the state for the issuance of the bonds shall include approval of the issuance of any bonds issued to refund any bonds originally issued or any previously issued refunding bonds.

79589. The people of California hereby find and declare that inasmuch as the proceeds from the sale of bonds authorized by this division are not "proceeds of taxes" as that term is used in Article XIIIB of the California Constitution, the disbursement of these proceeds is not subject to the limitation imposed by that article.

79590. Pursuant to Chapter 4 (commencing with Section 16720) of Part 3 of Division 4 of Title 2 of the Government Code, the cost of bond issuance shall be paid out of the bond proceeds. These costs shall be shared proportionally by each program funded under this division. Actual costs incurred in connection with administering programs authorized under the categories specified in this division shall be paid by the funds authorized for those purposes by this division.

Appendix H

Documentation of submittal to Library, Cities and Counties

Golden State
Water Company
A Subsidiary of American States Water Company

July 25, 2011

Peter Brostrom, Department of Water Resources
Statewide Integrated Water Management
Water Use and Efficiency Branch
901 P Street
Sacramento, CA 95814

Subject: Submittal of the Golden State Water Company (GSWC) 2010 Urban Water Management Plan (UWMP) – Barstow, Bay Point, Cordova and Southwest Systems

Dear Mr. Brostrom:

This transmittal letter submits the GSWC 2010 UWMPs for the Barstow, Bay Point, Cordova and Southwest Systems. GSWC prepared these UWMPs consistent with the Water Conservation Act of 2009 (Water Code sections 10608.12 to 10608.64) and the Urban Water Management Planning Act (Water Code sections 10610 to 10656).

GSWC adopted the UWMPs on July 1, 2011. Pursuant to California Water Code Sections 10620(d) and 10644, enclosed are one hard copy and one PDF version of the GSWC 2010 UWMPs for the Barstow, Bay Point, Cordova and Southwest Systems.

Please contact me at (916) 853-3612 or at eagisler@gswater.com with any questions on the 2010 GSWC Urban Water Management Plans.

Very truly yours,
GOLDEN STATE WATER COMPANY

Ernest A. Gisler
Planning Manager

Golden State
Water Company
A Subsidiary of American States Water Company

July 25, 2011

California State Library
Government Publications Section
900 N Street
Sacramento, CA 95814

Subject: Submittal of the Golden State Water Company (GSWC) 2010 Urban Water Management Plan (UWMP) – Barstow, Bay Point, Cordova and Southwest Systems

To Whom It May Concern:

This transmittal letter submits the GSWC 2010 UWMPs for the Barstow, Bay Point, Cordova and Southwest Systems. GSWC prepared these UWMPs consistent with the Water Conservation Act of 2009 (Water Code sections 10608.12 to 10608.64) and the Urban Water Management Planning Act (Water Code sections 10610 to 10656).

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Please contact me at (916) 853-3612 or at eagisler@gswater.com with any questions on the 2010 GSWC Urban Water Management Plans.

Very truly yours,
GOLDEN STATE WATER COMPANY

Ernest A. Gisler
Planning Manager

3035 Prospect Park Drive, Ste. 60, Rancho Cordova, CA 95670
Tel: (800) 999-4033 • Fax: (916) 852-0171 • www.gswater.com

Golden State Water Company
A Subsidiary of American States Water Company

July 28, 2011

City of Barstow
Assistant City Planner
Mike Massimini
222 E. Mountain View St., Suite A
Barstow, CA 92311

RE: Golden State Water Company- 2010 Urban Water Management Plan

Golden State Water Company (GSWC) adopted the 2010 Urban Water Management Plan (UWMP) following a public hearing on June 9, 2011. The 2010 UWMP was adopted, July 1, 2011, in accordance with the Urban Water Management Planning Act and filed with DWR and the California Sate Library.

Pursuant to Section 10644(a) of the California Water Code, GSWC is required to file a copy of the adopted 2010 UWMP with any city or county within which GSWC provided water. Enclosed for your files is one copy of GSWC's adopted 2010 UWMP. It is also on our website at www.gswater.com.

If you have any questions you can contact me at (916) 853-3612.

Sincerely,

Ernest A. Gisler
Planning Manger

Enclosure

Golden State
Water Company
A Subsidiary of American States Water Company

July 28, 2011

County of San Bernardino
Michael Hayes
Director Land Use Services Department
385 N. Arrowhead Avenue
San Bernardino, CA 92415

RE: Golden State Water Company- 2010 Urban Water Management Plan

Golden State Water Company (GSWC) adopted the 2010 Urban Water Management Plan (UWMP) following a public hearing on June 9, 2011. The 2010 UWMP was adopted, July 1, 2011, in accordance with the Urban Water Management Planning Act and filed with DWR and the California Sate Library.

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If you have any questions you can contact me at (916) 853-3612.

Sincerely,

Ernest A. Gisler
Planning Manger

Enclosure

Appendix I

Documentation of Water Use Projections Submittal

Golden State
Water Company
A Subsidiary of American States Water Company

11 February 2011

Mr. Gary Martin
Director of Engineering
Mojave Water Agency
22450 Headquarters Drive
Apple Valley, CA 92307

Subject: Golden State Water Company - Barstow System
2010 Urban Water Management Plan Preparation Notification and Supply Reliability Information Request

Dear Mr. Martin:

Golden State Water Company (GSWC) is currently preparing its 2010 Urban Water Management Plan (UWMP) for the Barstow System as required by the Urban Water Management Planning Act (Act). Since Mojave Water Agency is a wholesale water supplier to GSWC, water use projections through 2035 are enclosed (Table 1) pursuant to §10631(k) of the Act. We would like to request confirmation of the anticipated water supply reliability, water supply sources, and other information as described below. This information may be provided by either (a) providing a copy of your Draft UWMP if all requested information is included or, (b) completing the enclosed tables and providing any additional documents as required.

1. Supply projections to 2035 (Table 2)
2. Single Dry Year Reliability to 2035 (Table 3)
3. Normal, single dry, and multiple dry year reliability (Table 4)
4. Basis of water year data (Table 5)
5. Factors resulting in inconsistency of supply (Table 6)
6. Assumptions used to determine retail agency supply projections, including conservation.
7. Recycled water projections to the Barstow service area (if applicable) (Table 7)
8. Describe any regional desalination opportunities, if any for the Barstow system (if applicable)

We appreciate your timely attention to the information requested above and ask you provide a response no later than **18 February 2011**. Kennedy/Jenks Consultants is assisting GSWC with preparation of the 2010 UWMP and will be contacting you directly within the next week to follow up on this request. In the meantime, should you have any questions or concerns please feel free to contact me at (916) 853-3612.

Very truly yours,

GOLDEN STATE WATER COMPANY

Ernest Gisler
Planning Manager

Enclosures

cc: Sean Maguire, Kennedy/Jenks Consultants

Appendix J

Urban Water Management Plan Checklist

Table I-2 Urban Water Management Plan checklist, organized by subject

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
PLAN PREPARATION					
4	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	10620(d)(2)		1.6	1-6
6	Notify, at least 60 days prior to the public hearing on the plan required by Section 10642, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Any city or county receiving the notice may be consulted and provide comments.	10621(b)		1.6	1-6
7	Provide supporting documentation that the UWMP or any amendments to, or changes in, have been adopted as described in Section 10640 et seq.	10621(c)		1.6	1-6
54	Provide supporting documentation that the urban water management plan has been or will be provided to any city or county within which it provides water, no later than 60 days after the submission of this urban water management plan.	10635(b)		Appendix H	
55	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	10642		1.6	1-6
56	Provide supporting documentation that the urban water supplier made the plan available for public inspection and held a public hearing about the plan. For public agencies, the hearing notice is to be provided pursuant to Section 6066 of the Government Code. The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water. Privately-owned water suppliers shall provide an equivalent notice within its service area.	10642		Page vii	Vii
57	Provide supporting documentation that the plan has been adopted as prepared or modified.	10642		1.6	1-6
58	Provide supporting documentation as to how the water supplier plans to implement its plan.	10643		1.8	1-8

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
59	Provide supporting documentation that, in addition to submittal to DWR, the urban water supplier has submitted this UWMP to the California State Library and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. This also includes amendments or changes.	10644(a)		1.7 Appendix H	1-7
60	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the urban water supplier has or will make the plan available for public review during normal business hours	10645		1.7	1-7
SYSTEM DESCRIPTION					
8	Describe the water supplier service area.	10631(a)		2.1	2-1
9	Describe the climate and other demographic factors of the service area of the supplier	10631(a)		2.2 & 2.4	2-1 & 2-8
10	Indicate the current population of the service area	10631(a)	Provide the most recent population data possible. Use the method described in "Baseline Daily Per Capita Water Use." See Section M.	2.3	2-5
11	Provide population projections for 2015, 2020, 2025, and 2030, based on data from State, regional, or local service area population projections.	10631(a)	2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	2.3	2-5
12	Describe other demographic factors affecting the supplier's water management planning.	10631(a)		2.2 & 2.4	2-1 & 2-8
SYSTEM DEMANDS					
1	Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	10608.20(e)		3.2	3-3

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
2	*Wholesalers:* Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions. *Retailers:* Conduct at least one public hearing that includes general discussion of the urban retail water supplier's implementation plan for complying with the Water Conservation Bill of 2009.	10608.36 10608.26(a)	Retailers and wholesalers have slightly different requirements	4.5	4-9
3	Report progress in meeting urban water use targets using the standardized form.	10608.40		Not Applicable	
25	Quantify past, current, and projected water use, identifying the uses among water use sectors, for the following: (A) single-family residential, (B) multifamily, (C) commercial, (D) industrial, (E) institutional and governmental, (F) landscape, (G) sales to other agencies, (H) saline water intrusion barriers, groundwater recharge, conjunctive use, and (I) agriculture.	10631(e)(1)	Consider 'past' to be 2005, present to be 2010, and projected to be 2015, 2020, 2025, and 2030. Provide numbers for each category for each of these years.	3.3	3-9
33	Provide documentation that either the retail agency provided the wholesale agency with water use projections for at least 20 years, if the UWMP agency is a retail agency, OR, if a wholesale agency, it provided its urban retail customers with future planned and existing water source available to it from the wholesale agency during the required water-year types	10631(k)	Average year, single dry year, multiple dry years for 2015, 2020, 2025, and 2030.	3.7 Appendix I	3-15
34	Include projected water use for single-family and multifamily residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.	10631.1(a)		3.8	3-16
SYSTEM SUPPLIES					
13	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, and 2030.	10631(b)	The 'existing' water sources should be for the same year as the "current population" in line 10. 2035 and 2040 can also be provided.	4.1	4-2

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
14	Indicate whether groundwater is an existing or planned source of water available to the supplier. If yes, then complete 15 through 21 of the UWMP Checklist. If no, then indicate "not applicable" in lines 15 through 21 under the UWMP location column.	10631(b)	Source classifications are: surface water, groundwater, recycled water, storm water, desalinated sea water, desalinated brackish groundwater, and other.	4.2	4-3
15	Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	10631(b)(1)		4.2	4-3
16	Describe the groundwater basin.	10631(b)(2)		4.2	4-3
17	Indicate whether the groundwater basin is adjudicated? Include a copy of the court order or decree.	10631(b)(2)		4.2 & Appendix F	4-3
18	Describe the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. If the basin is not adjudicated, indicate "not applicable" in the UWMP location column.	10631(b)(2)		4.2	4-3
19	For groundwater basins that are not adjudicated, provide information as to whether DWR has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. If the basin is adjudicated, indicate "not applicable" in the UWMP location column.	10631(b)(2)		Not Applicable	
20	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	10631(b)(3)		4.2	4-3
21	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	10631(b)(4)	Provide projections for 2015, 2020, 2025, and 2030.	4.2	4-3
24	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	10631(d)		4.3	4-8

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
30	Include a detailed description of all water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years, excluding demand management programs addressed in (f)(1). Include specific projects, describe water supply impacts, and provide a timeline for each project.	10631(h)		4.4	4-8
31	Describe desalinated water project opportunities for long-term supply, including, but not limited to, ocean water, brackish water, and groundwater.	10631(i)		4.6	4-10
44	Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier. Coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	10633		4.7	4-11
45	Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	10633(a)		4.7.2	4-12
46	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	10633(b)		4.7.2	4-13
47	Describe the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.	10633(c)		4.7.2	4-12
48	Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.	10633(d)		4.7.3	4-15
49	The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	10633(e)		4.7	4-11
50	Describe the actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.	10633(f)		4.7.4	4-16

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
51	Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.	10633(g)		4.7.4	4-16
WATER SHORTAGE RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING [b]					
5	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	10620(f)		1.10	1-9
22	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage and provide data for (A) an average water year, (B) a single dry water year, and (C) multiple dry water years.	10631(c)(1)		6.1	6-1
23	For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.	10631(c)(2)		6.1.3	6-5
35	Provide an urban water shortage contingency analysis that specifies stages of action, including up to a 50-percent water supply reduction, and an outline of specific water supply conditions at each stage	10632(a)		8.1	8-1
36	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.	10632(b)		8.2	8-3
37	Identify actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.	10632(c)		8.3	8-4
38	Identify additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.	10632(d)		8.4	8-5
39	Specify consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.	10632(e)		8.4	8-5
40	Indicated penalties or charges for excessive use, where applicable.	10632(f)		8.4	8-5

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
41	Provide an analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.	10632(g)		8.5	8-7
42	Provide a draft water shortage contingency resolution or ordinance.	10632(h)		8.4 & Appendix D	8-5
43	Indicate a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.	10632(i)		8.6	8-9
52	Provide information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments, and the manner in which water quality affects water management strategies and supply reliability	10634	For years 2010, 2015, 2020, 2025, and 2030	5	5-1
53	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. Base the assessment on the information compiled under Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.	10635(a)		6.2 – 6.4	6-6
DEMAND MANAGEMENT MEASURES					
26	Describe how each water demand management measures is being implemented or scheduled for implementation. Use the list provided.	10631(f)(1)	Discuss each DMM, even if it is not currently or planned for implementation. Provide any appropriate schedules.	7.1	7-2
27	Describe the methods the supplier uses to evaluate the effectiveness of DMMs implemented or described in the UWMP.	10631(f)(3)		7.1	7-2
28	Provide an estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the ability to further reduce demand.	10631(f)(4)		7.2	7-4

No.	UWMP requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location	Page Number
29	Evaluate each water demand management measure that is not currently being implemented or scheduled for implementation. The evaluation should include economic and non-economic factors, cost-benefit analysis, available funding, and the water suppliers' legal authority to implement the work.	10631(g)	See 10631(g) for additional wording.	7.2	7-4
32	Include the annual reports submitted to meet the Section 6.2 requirements, if a member of the CUWCC and signer of the December 10, 2008 MOU.	10631(j)	Signers of the MOU that submit the annual reports are deemed compliant with Items 28 and 29.	N/A	

a The UWMP Requirement descriptions are general summaries of what is provided in the legislation. Urban water suppliers should review the exact legislative wording prior to submitting its UWMP.

b The Subject classification is provided for clarification only. It is aligned with the organization presented in Part I of this guidebook. A water supplier is free to address the UWMP Requirement anywhere with its UWMP, but is urged to provide clarification to DWR to facilitate review.