



City of Adelanto

Urban Water Management Plan

Prepared for:
Adelanto Water Authority

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May 1997



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I. Introduction

I. INTRODUCTION

A. Purpose

The *City of Adelanto Urban Water Management Plan* (Plan) has been prepared to fulfill the requirements as set forth in the Urban Water Management Planning Act (Water Code Sections 10610 through 10656) for state "urban water suppliers". An "urban water supplier" is defined by the Act to be "...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."

Sections 10610 through 10656 of the California Water Code, Urban Water Management Planning Act, were enacted in 1983. The Act, which is included in Appendix A, was originally known as Assembly Bill 797 (AB 797). At that time it required every urban water supplier serving water directly to customers to, not later than December 1, 1985, prepare and adopt an urban water management plan or participate in urban water management planning. AB 797 requires the urban water suppliers to periodically review its Plan once every five years with changes to the plan being made as needed.

Assembly Bill II (AB II), which was signed by the Governor on October 13, 1991, requires all urban water suppliers who provide municipal water directly or indirectly to more than 3,000 customers, or supplies more than 3,000 acre-feet annually, to prepare, adopt and submit an Urban Water Management Plan that includes a water shortage contingency plan and water conservation programs. The purpose of the water shortage contingency plan is to focus more attention on the potential for continued water shortage conditions and require that urban water suppliers provide detailed planning for future water shortages in their Plan.

The Urban Water Management Planning Act has been amended several times since AB 11 through AB 1869 (1991), AB 892 (1993), SB 1017 (1994), and AB 2853 (1996).

The Urban Water Management Planning Act states the Legislature finds and declares as follows:

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

- 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.
- The conservation and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.
- The conservation and efficient use of urban water supplies shall be a guiding criterion in public decisions.
- Urban water suppliers shall be required to develop water management plans to achieve conservation and efficient use.

Prior to adopting the Plan, the Plan is made available for public review and hearing. Notification of the hearing is made pursuant to Section 6066 of the Government Code. Upon completion of the hearing, the Authority shall adopt the plan as prepared or as modified after the hearing. Within 30 days of adoption of the Plan by the Authority, a copy of the Plan is to be filed with the State of California, Department of Water Resources.

1. Plan Adoption

The Adelanto Water Authority (AWA) prepared this Urban Water Management Plan from December 1996 through April 1997. This plan will be considered by the Board of Directors in May 1997 and will be submitted to the California Department of Water Resources within 30 days of Board approval. The Plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning).

B. Service Area Description

The City of Adelanto is located in the high desert area of California approximately 95 miles northeast of the City of Los Angeles. The City's location is depicted in Exhibit I-1, Regional Location Map and Exhibit I-2, Vicinity Map.

From the date of its incorporation in 1972 when it merged with the former Adelanto Community Services District, the City of Adelanto has been responsible for water supply to its own residents as well as the adjacent, but presently deactivated, George Air Force Base (GAFB). In mid 1996, the water system was sold by the City to the Adelanto Water Authority.

Historically, Adelanto has obtained nearly all of its water from wells which tap the Mojave River under flow and groundwater from local underground aquifers. Water

is produced from seven AWA-owned and operated wells (Wells 2, 4, 5, 6, 7, 8a, and 14). Well No. 3, an eighth well, is inactive due to low production rates. In addition, the U.S. Government operates certain wells located adjacent to the Mojave River along Shay Road. These wells are located on land owned by the City of Adelanto.

Exhibit I-3, AWA Service Area, shows the AWA's present service boundaries, which correspond to the Adelanto City limits, and the ultimate service planning area, which corresponds to the City's Planning Area as defined in the 1994 General Plan. While the City will achieve its ultimate boundaries only in the distant future, it serves as a best estimate of the area which the AWA must ultimately be prepared to serve. The ultimate service area is approximately defined on the north by Shadow Mountain Road, on the west by Leasing Avenue, on the south by Palmdale Road, and on the east by George Air Force Base, the City of Victorville and the Mojave River. The present service area encompasses the approximately 53 square mile incorporated area, the City's existing Sphere of Influence as defined by LAFCO encompasses about 73 square miles while the ultimate AWA service planning area encompasses approximately 123 square miles.

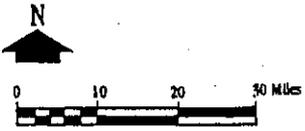
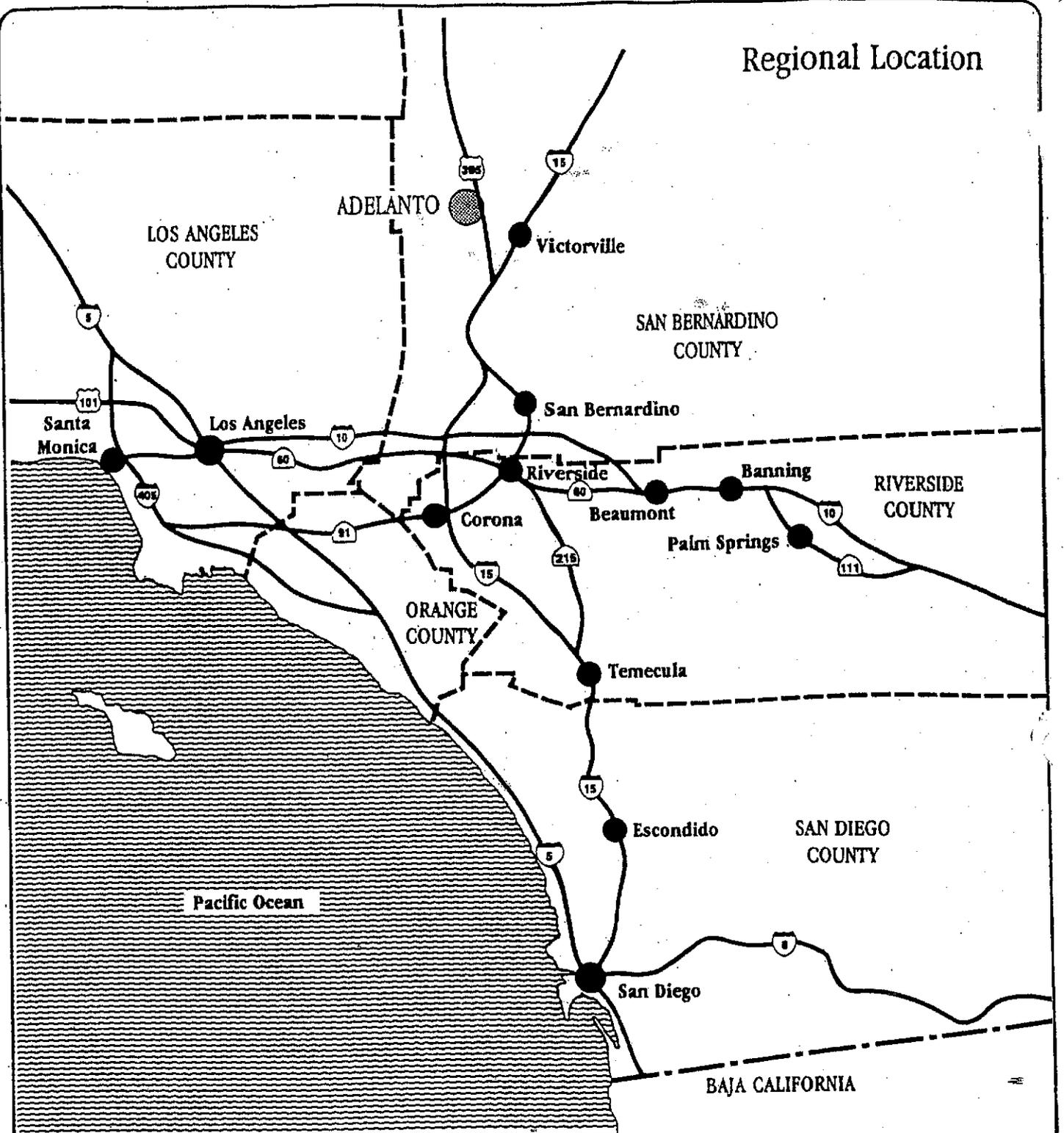
The AWA's present service area includes approximately 3,847 services or connections. According to statistics provided by the State of California Department of Finance, the 1995 population of the City of Adelanto was approximately 13,300 persons with very few residences occurring in the Sphere of Influence. The ultimate service area ranges in elevation from 3,250 feet above mean sea level (MSL) at the southern boundary to 2,700 feet MSL at the northeastern corner of the Adelanto City boundary and 2,520 feet MSL at the northeastern corner of the Adelanto Sphere of Influence.

Summer temperatures in Adelanto average 91° F, with a rapid cool down at night and relative humidity below 20 percent. Annual precipitation in Adelanto averages approximately five inches, and occurs principally between the months of December and March in the form of rain.

Historically, the principal industries in Adelanto have been in the areas of service, wholesale and retail trade, and government. Specific employers include various manufacturers, trucking companies, the Adelanto School District, the Adelanto Converter Switching Utility, the High Desert Casino, and the Adelanto Community Correctional Facility. Current trends are seeing the creation of new housing tracts in the area as new buyers are seeking affordable homes where land costs are still relatively low. As of January 1997, there were currently active tentative tract map approvals for nearly 5,500 single-family home sites throughout the City. New homes are currently available in the \$60,000 to \$110,000 price range. These projects and others will have a major impact on the AWA's water supply system and the water resources in the Adelanto Area in the near term.

Exhibit I-1, Regional Location Map

Regional Location



City of Adelanto
Urban Water Management Plan

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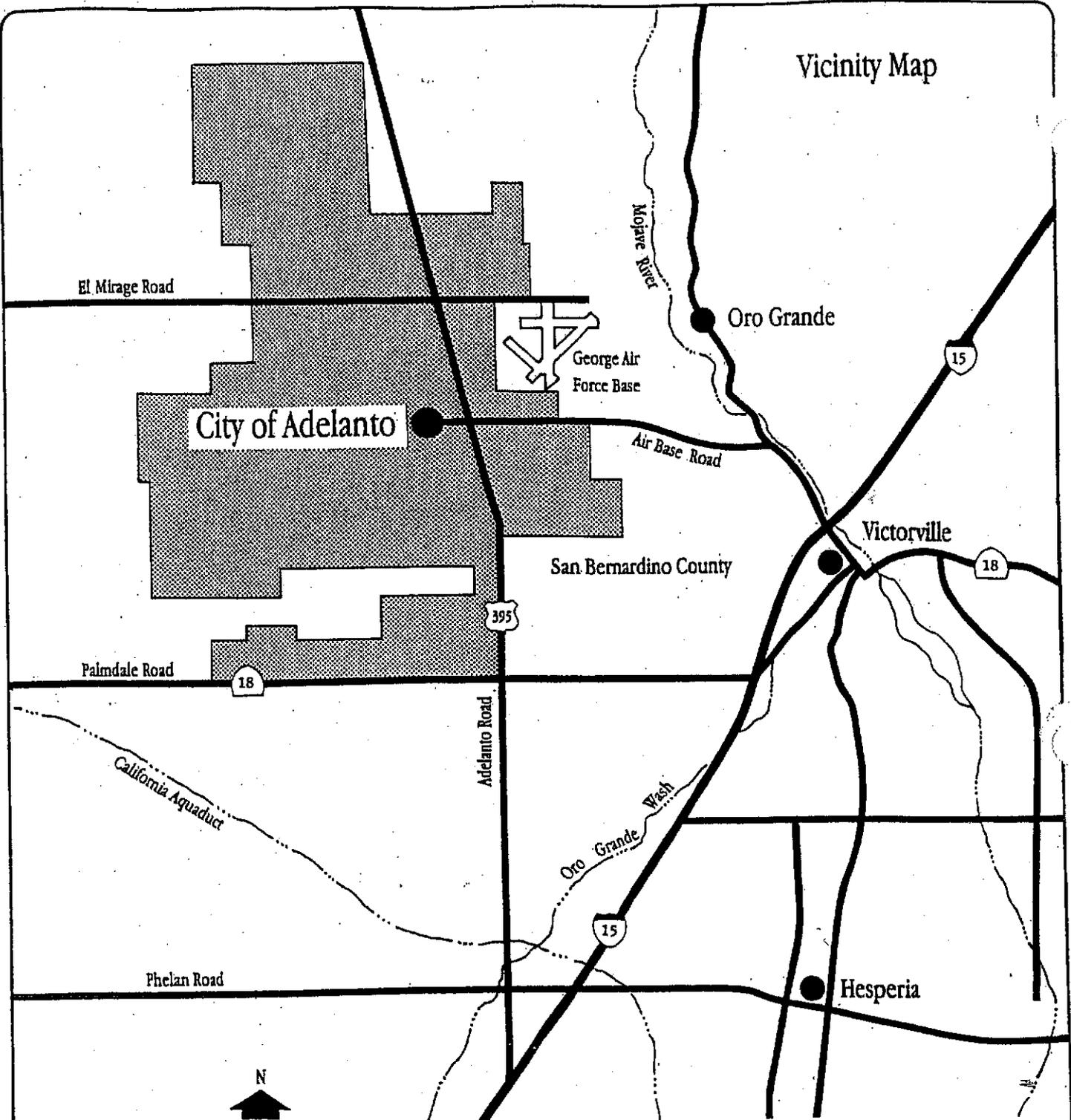
Planning, Municipal Services,
Environmental Management

Exhibit No.: I-1

Graphics Prepared by Tandy Graphic

Exhibit I-2, Vicinity Map.

Vicinity Map



Scale: 1" = 2.5 Miles



**City of Adelanto
Urban Water Management Plan**

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Planning, Municipal Services,
Environmental Management

Exhibit No: I-2

Graphics Prepared by Tandy Graphic

Exhibit I-3, AWA Service Area

Shadow Mountain Road

AWA Service Area

El Mirage Road

City of Adelanto

George Air Force Base

Oro Grande

Air Base Road

San Bernardino County

Victorville

Palmdale Road

California Aquaduct

Adelanto Road

Oro Grande Wash

Phelan Road

Hesperia

N

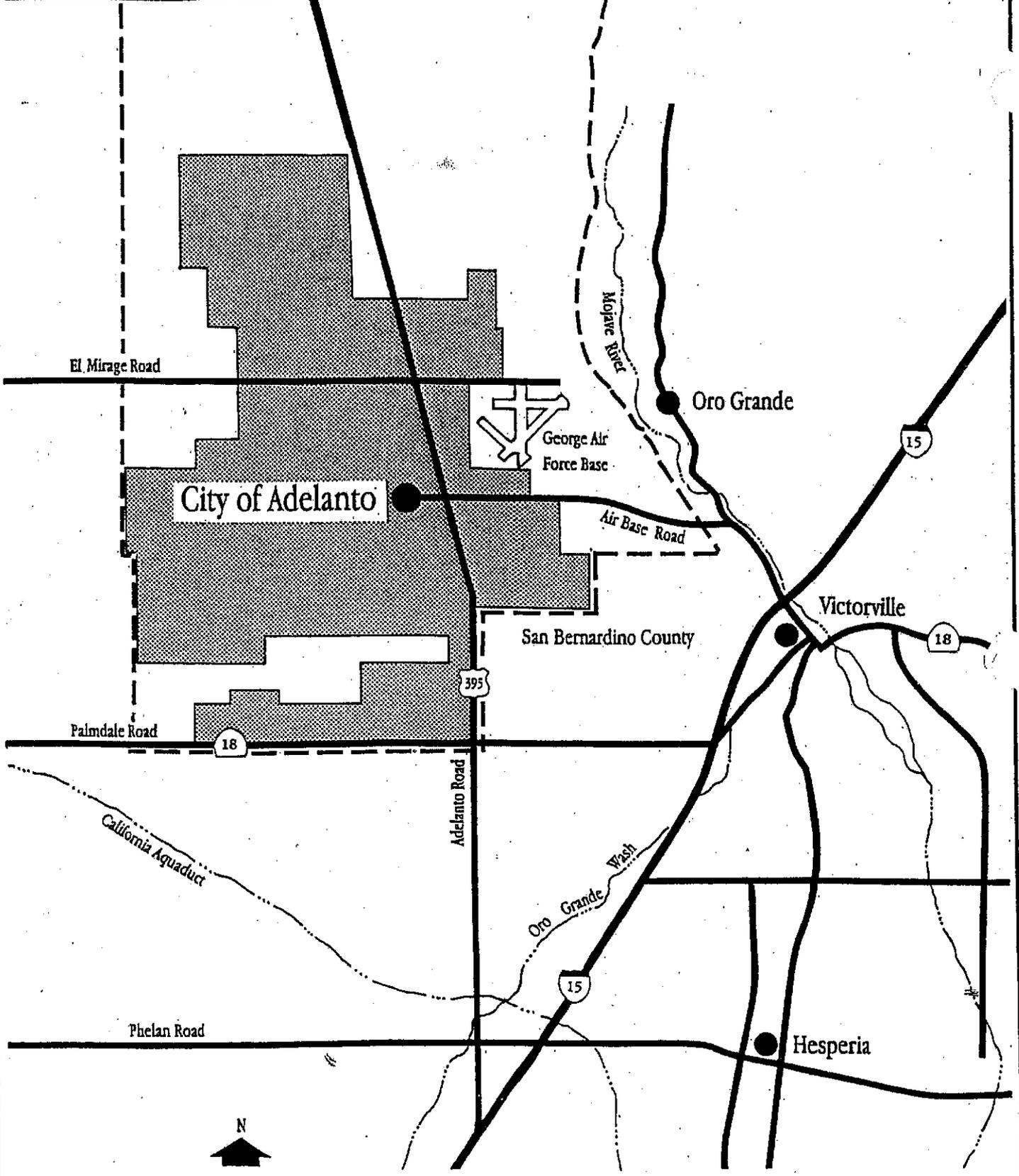
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Environmental Management

Exhibit No: I-3



C. Mojave River Basin Adjudication

The Superior Court of Riverside County entered an order adopting the Stipulated Judgement in the Mojave River Basin in Case No.208568 on January 10, 1996. The adjudication of the Basin was an effort to stop the continuing overdraft of the water resources of the Basin.

This Judgment was appealed by the ranchers and is presently on appeal to the Court of Appeals. The opening briefs are due within thirty (30) days. No settlement has been reached by the ranchers with the stipulating parties.

The Mojave River Basin is divided into three areas, Alto, Centro, and Baja. Part of the Judgment requires certain flows to leave one area and enter the next. If the flows are not adequate, then the Watermaster will charge make-up water assessments based upon the deficiency and apportioned to the water users. The Mojave Water Agency is to measure and calculate adequate flows from the Alto area into the Centro area at the Helendale fault, for example. In April 1997, the Mojave Water Agency, as Watermaster for the Mojave River Basin, sent invoices to the water users have objected to the measurement of flows leaving the Alto area and have objected to the 1996 Watermaster Report. The City of Adelanto has been assessed in excess of \$11,000.00 for this make-up assessment which is due and payable in July 1997.

The Final Judgment by the Riverside Superior Court did find that there is a continuing overdraft of the Mojave River Basin. In an attempt to eliminate the continued overdraft, the Decision and the Judgment establish a table of what it refers to as "Free Production Allowance" based on the parties' adjusted base annual water production. If a party produces water in excess of that allowance, a replacement assessment will be imposed to replace such excess production based on the costs of supplemental water. The replacement costs have increased by 60% in the last year. The Free Production Allowance is to be "ramped down until a safe yield is reached. The court, however, has continuing jurisdiction and, accordingly could require further ramp down prior to the end of the first five years.

The initial Free Production Allowance established from the City of Adelanto was 1,573 acre feet and for the city-George Air Force Base, 3,433 acre-feet for a total of 5006 acre-feet. This is the amount presently being assessed for biological assessments, make-up water assessments by the Water Master to the City of Adelanto.

The City filed a claim against the United States Air Force to return the water rights and property belonging to the City of Adelanto. This case was decided by the Armed Services Board of Contract Appeals in Case No. 46833 in August 1996. The decision determined that the property belonged to the City of Adelanto and had been leased to the United States. The decision also stated that the Air Force had

inactivated George Air Force Base and the United States was required to grant a license for the well facilities immediately. The Air Force has failed to convey this license at this time. The Air Force has prepared a Finding of Suitability to Terminate Lease on the Adelanto property but it has not yet been circulated for comment. Other parties presently managing the Base have purported to convey the water rights by themselves to another party in derogation of Adelanto's title. The process to clear the title has begun by notice to the parties.

D. Scope of Study

This Plan describes the existing water supplies and facilities and evaluates a variety of measures for their water conservation potential within AWA. This Plan includes the following elements as listed in Assembly Bill No. 797, Article 2:

- Estimates past, current, and projected water use segregating between residential, industrial, commercial, and governmental uses
- Identifies conservation measures currently adopted and being practiced
- Describes alternative conservation measures, if any, that would improve the efficiency of water use with an evaluation of their costs and their environmental and other significant impacts
- Provides a schedule of implementation for proposed actions as indicated by the plan
- Describes the frequency and magnitude of supply deficiencies, including conditions of drought and emergency, and the ability to meet short-term deficiencies
- Describes the status of wastewater reclamation
- Discusses exchanges or transfer of water on a short-term or long-term basis
- Discusses potential measures for the management of water system pressures and peak demands
- Presents incentives to alter water use practices, including fixture and appliance retrofit programs
- Discusses public information and educational programs to promote wise use and eliminate waste
- Discusses potential changes in pricing, rate structures, and regulations

A general provision of the Act incorporated into the Plan is " Each urban water supplier shall periodically review its plan once every five years. After the review it shall make any amendments or changes to its plan which are indicated by the review."

E. Project Team

The *City of Adelanto* Urban Water Management Plan was prepared under the direction of Mr. Roland (Dee) Dorval, P.E., Planning Director and City Engineer for the City of Adelanto with the Assistance of Urban Logic Consultants of Temecula, California.

F. Acknowledgments

Valuable assistance was provided by the City of Adelanto staff during the preparation of this study particularly by Mr. Jack Stonesifer, Water Department Superintendent, and Mr. Steve Self, Inspector, and by the staff of MWA including Mr. Norm Caouette, Director of Planning and Resources and Ms. Valerie Wiegenstein, Water Master Coordinator.

II. Water Conservation Measures

II. WATER CONSERVATION MEASURES

A. Introduction

This chapter addresses the use of water conservation methods in Adelanto beginning with those currently in effect by ordinance within the City. The chapter then provides a list of additional conservation methods which might be utilized and assesses the level of effort necessary to implement them. Table II-1 lists existing water conservation measures currently in effect within the City of Adelanto and their status as of 1997. Table II-2 lists a summary of other potential water conservation measures along with an initial recommendation of applicability to Adelanto.

The City of Adelanto has specifically sought to implement water conservation measures dating back to 1984, when the City passed Water Conservation Ordinance No. 286, which was intended to achieve a 10% reduction in water usage within the City. This ordinance addressed a variety of conservation measures and specific recommended actions to implement those measures.

**Table II-1
Adelanto Water Authority
Existing Conservation Measures
Ordinance No.286**

Measure	Recommended Action
Restrictions on gutter flooding	Continued Monitoring
Restrictions on overwatering	Continued Monitoring
Restrictions on hours of watering	Continued Monitoring
Restrictions on vehicle washing	Continued Monitoring
Restrictions on nonrecycling fountains	Review building plan submittals
Requirement to repair leaks	Continued enforcement
Restrictions on construction watering	Continued enforcement
Requirement for low flow toilets & fixtures	Review building plan submittals
Requirement for recycled cooling water	Review building plan submittals
Requirement for pool covers	Review building plan submittals
Requirement for hotel notices re: conservation	Review building plan submittals
Requirement for water saving devices	Review building plan submittals
Requirement for drought tolerant landscaping on new construction	Development mandatory water conserving landscape ordinance
Requirement for water conserving landscape fixtures	Review on landscape plan submittals
Requirement for max sprinkler head angle	Review on landscape plan submittals

**Table II-2
Adelanto Water Authority
Potential Water Conservation Measures**

Measure	Definition	Recommended
Increase System OM & M Budget/Water Rates	Implement increased OM & M activities noted below	
• Reduced Main Flushing	Increase chlorination dosage throughout the system	
• Corrosion Control Program	Replace damaged pipelines and repair damaged pipe coating and proper coating of field welding and welded tie-ins	
• Telemetry Control System	Install telemetry control system to monitor and operate system wells, pump stations, regulators and reservoirs.	
• Meter Testing & Replacement	Test and replace defective meters	✓
• Valve Mapping and Exercising Program	Map and exercise valves	
Pressure Management	Reduce system pressure to reduce leakage	
Peak Demand Management	Reduce fluctuations in seasonal and hourly water demands toward an average daily value	
Landscape Ordinance for All New Construction	Adopt landscape water conservation practices for new construction including drip irrigation, drought tolerant plant materials and automatic controllers	✓
Minimal Delivery Retrofit Program	Retrofitting of residential toilets and showers with water saving devices	✓
Water Conservation Advisory Committee	Formation of a Local Water Advisory committee to gain input and support for water conservation programs	
Expansion of Public Water Information	Emphasize the relationship between the individual consumer water use to the total AWA water demand	✓
	Teach water conservation methods and instill a conservation ethic	✓
	Prepare and distribute water conservation literature	✓
Implement Financial Incentives	Impose metering and unit pricing of irrigation construction water. Implement incentives to improve the efficiency of landscape water usage	
Domestic Water Well Ordinance	Adopt domestic water well ordinance to prohibit development of individual water systems and assure application of water conservation measures within AWA service area	✓

B. Water Conservation Measures

Measures recommended for consideration and inclusion in the Plan fall into six categories: inside residential and commercial measures, landscape measures, industrial measures, system measures, public relation and education measures, and policy measures. The majority of the programs recommended will focus on regulating water usage in new developments. This approach was determined to be appropriate since it is new developments which strain existing water supplies and have the potential to impact existing water rates. Also, water conservation measures are easiest and most cost effective to install in new construction because there are no removal or replacement costs. Less emphasis is placed on measures involving existing residential and commercial structures since, as a relatively new city overall, only a small percentage of Adelanto's existing structures are in need of significant upgrade. It is also intended that the conservation measures suggested here will be more fully developed and implemented during the preparation of the Recycled Water Master Plan as discussed in Section 6.

Conservation measures are recommended by the Plan for implementation in the next five years.

- Domestic Water Well Ordinance
- Meter Testing and Replacement
- Landscape Ordinance on All New Construction
- Expansion of Public Water Information
- Minimal Delivery Retrofit Program

1. Meter Testing and Replacement

Overall, AWA's water system is relatively new but some sections of the City are served by water meters that have outlived their usefull. These older water meters have the potential to understate water useage and some may contribute to system losses. Replacement of old water meters can potentially increase water revenues, reduce system losses and encourage conservation.

Economic

The economic impact of a program to replace old water meters should be offset by increased revenues resulting from currently understated water readings.

Environmental

There should be a positive environmental impact from a meter replacement program resulting from the elimination of leaky meters and through the encouragement of water conservation measures.

Social

Society should benefit from the improved efficiency of water use and metering.

Health and Safety

This measure should have no adverse impact on the health of safety of the public

Consumers

This measure should be positively concerned with equal application of water rates and fair water use measurement to all customers.

Technological Factors

These are no significant technological factors that would interfere with the implementation of this alternative.

Rating of Alternative

This alternative is highly recommended due to its minimal cost to the consumer resulting from increased revenues directly related to the replacement of detective meters.

2. Landscape Ordinance for All New Construction

Description

Presently the City of Adelanto reviews the conditions of approval for landscape practices on a project by project basis. With an approved landscape ordinance for new construction, the City of Adelanto can formally adopt landscape water conservation practices that will encourage landscaping which uses drought tolerant plant materials. Irrigation systems with automatic controllers and valves could be required and drip irrigation systems should be encouraged on all commercial and industrial developments. Existing regulations should also be reviewed. Ordinances that require or encourage landscaping practices requiring excessive water use should be reevaluated. Rotating use schedules should established for large irrigation systems.

Economic

The economic impact will be minimal because all new construction has to be landscaped anyway, so there should be no additional costs to consumers who landscape within water efficient landscape guidelines.

Environmental

There will be a positive benefit to the environment. Less water will be used for landscaping, less labor, fertilizers and pesticides will be required. This alternative will reduce future water supply deficiencies.

Social

Society benefits because of improved efficiency of water use and lower water use in new development. In addition, a Water Efficient Landscape Ordinance will subtly influence and enhance water "consciousness" by creating more and more attractive water efficient landscapes.

Health and Safety

This alternative has no adverse health or safety impacts. The adoption of this ordinance will require the use of appropriate plant materials. Plants contribute positively to micro-climate cooling, oxygen production, and removal of carbon dioxide from the atmosphere.

Consumers

This measure could possibly be perceived as a disadvantage by some consumers. This can be compensated by the shift of consumer values towards water efficiency and appropriate landscapes.

Technological Factors

In general, there are no technological factors which would interfere with the application of the Ordinance. Large landscapes will require well-designed irrigation systems and controllers. If soil moisture sensors are required by the City ordinance, there may be some technological considerations.

Rating of Alternative

This alternative is highly rated due to its minimal cost impact on consumers. Water efficient landscaping costs the same to install as higher water using landscapes. Future positive benefits, because water use (and therefore, monthly water costs) will be lower than otherwise expected.

Estimated Water Savings

Possibility of a 20 percent savings in water use resulting from water efficient landscape, compared to predicted water use for typical water intensive new commercial, industrial, or governmental landscape.

3. **Minimal Delivery Retrofit Program**

Description

This type of program may include distribution of a water conservation kit to existing users in older areas of the City. Retrofit kits could contain two shower flow restrictors, one toilet tank displacement bag, and two toilet tank leak detection dye tablets together with installation information and leak detection and repair tips. These kits are intended for use in existing non-conserving showerheads and toilets.

Economic

This program is cost effective to consumers. The installation of these devices will reduce current water and wastewater flows and will have direct economic benefits in conserving sewage treatment capacity and water resources.

Environmental

This alternative has positive benefit to the environment. Less water will be used for domestic uses resulting in reduced demand on water supply and will conserve sewage treatment plant capacity.

Social

Reduced water usage will decrease demand on future water supplies. Society benefits because it will conserve water supplies and defer the need for future sewage treatment facility uprisings.

Health and Safety

This alternative has no adverse health or safety impacts.

Consumers

A perceived disadvantage by some consumer groups is the additional effort involved in the installation of water conservation devices. This can be overcome by the distribution of clear and concise installation information. The AWA may also consider means to have someone available to the public to answer questions.

Technological Factors

The technology for each of the items in the kit has been successfully demonstrated. Shower flow restrictors constrict the flow rate to 3 gpm compared to unconstricted showerheads that have a rated flow of 5 to 8 gpm. Toilet tank displacement bags lessen the amount of water used to flush by holding a small amount of water out of use. Non-conserving toilets fitted with tank displacement bags use 4.8 gallons per flush, versus 5.5 gallons per flush for non-conserving toilet. Toilet leaks are detected using leak detection tablets. The tablets are placed in the toilet tank, turning the water a bright color. If the water is leaking from the tank to the toilet bowl, the water in the toilet bowl will turn color. Other devices that can be included in the kits have been tested to quantify their effectiveness.

Rating of Alternative

The cost to the Authority and the consumer for the purchase and installation of the retrofit kits is offset by water and monetary savings.

4. Expansion of Public and Water Education Program

Description

As a newly formed agency, the AWA has not developed any substantial promotional measures to educate the public on water conservation practices and recycled water use. A variety of steps can be taken to enhance this effort. Some of these are listed as follows:

- Keep the City and its department's apprised of water conservation information and kits available from the AWA.
- Distribute public information through newspaper articles and presentations to local organizations.
- Monitor water conservation goals regularly and make the community aware that it is meeting its targets.
- Implement in-school educational programs. Present landscape demonstrations such as xeriscaping and the use of drip irrigation.
- Actively promote and participate in MWA's annual "Water Awareness Week" in October of each year.

Economic

If water use is significantly reduced, this will be very cost effective to the AWA since it will not have to purchase additional water from MWA in excess of the City's free production allowance and the ultimate expansion of water storage and wastewater treatment facilities to accommodate new growth can be postponed.

Environmental

This alternative has positive benefits to the environment. Less water will be used and the need to mine water from the aquifers will be reduced.

Social

Society benefits because the efficiency of water use improves thus reducing marginal costs. Future costs of sewage treatment facilities will also be deferred.

Health and Safety

This alternative has no adverse health or safety impacts.

Consumers

This measure will help overcome the many perceived disadvantages associated with water conservation measures. This is done by the shift of consumer values towards water use efficiency. Consumers will develop a better understanding of the water shortage problem and, hence, a more positive attitude when it comes to dealing with conservation on a daily basis.

Technological Factors

The technology of communication is already in place. Use of this existing technology should be easily implemented. Use of the Internet and other electronic methods could be utilized as communication mediums when available to the City.

Rating of Alternative

This alternative is highly rated because educational materials are readily available and because of the low cost to implement.

5. Domestic Water Well Ordinance

Description

AWA should prepare and adopt a water well ordinance to ensure compliance with water conservation measures and to provide comprehensive, coordinated control of domestic water production, storage and transmission within the AWA service area. The ordinance should impose limitations on the construction of private wells and water systems in the City where domestic service can reasonably be provided by AWA. The ordinance should also require assignment of water rights to AWA for properties served or annexed into the City.

Economic

The economic impact will vary depending upon the particular type of use and related demand. Some land uses may be discouraged from locating in the City if an individual domestic water well and water system can be developed and operated for less cost than connection to the AWA system. However, AWA will in general be positively impacted economically in the long run by the ability to spread operations costs on a larger economic base.

Environmental

There will be a positive benefit to the environment due to the ability of AWA to implement water conservation measures on all domestic water users in the Service Area.

Social

Society benefits because of the ability to impose comprehensive water conservation measures throughout the AWA Service Area.

Health and Safety

The adoption of the ordinance will ensure uniform application of domestic water system standards in throughout the AWA Service Area.

Consumers

Most consumers will benefit from the Ordinance due to the downward pressure on rates.

Technological Factors

In general, there are no technological factors which would interfere with the application of the Ordinance.

Rating of Alternative

This alternative is highly rated due to its positive economic impact on consumers and the ability to encourage implementation of water conservation measures.

C. **Schedule for Implementation**

The AWA is presently in the process of implementing several of the water conservation measures, as indicated in Tables II-1 and II-2. Conservation measures recommended by the Plan but which are not presently implemented are listed below in accordance with the following general schedule for implementation as shown in Table II-3.

**Table II-3
Adelanto Water Authority
Schedule for Implementation of
Recommended Conservation Measures**

<u>Measure</u>	<u>Implementation Target Date</u>
• Domestic Water Well Ordinance	1997
• Meter Testing and Replacement	1998
• Landscape Ordinance for All New Construction	1999
• Expansion of Public Water Information Program	2000
• Minimal Delivery Retrofit Program	2001

D. **Additional Water Management Programs Not considered for Implementation**

In general, a number of alternatives have not been chosen for implementation for the following reasons:

- The alternative is already either being implemented or is in the planning stages.
- The state and/or federal government has or will be implementing laws that regulate and enforce all or part of the alternative being suggested. Therefore, further regulation would be redundant.

1. Ultra-Low-Flow (ULF) Ordinance for all New Construction

The California Code of Regulations, Title 24, regulated by Part 5 of the California Plumbing Code which is a division of the California Building Standards, requires ULF toilets in all new construction. The City already requires adherence to the Uniform Plumbing Code as stated in City Ordinance No. 312.

2. Reclamation Ordinance and Feasibility Study

The AWA is presently pursuing the siting and construction of a wastewater reclamation facility within the City limits to be operated and maintained by the Adelanto Public Utility Authority (AWA). The recycled water made available by the new facility could be used for existing schools, parks and golf courses, and for major new development projects.

3. System Water Audit

The distribution system water audit compares the amount of water produced (from wells, surface supplies) by AWA to the amount of water used by consumers (as reported by meter readings). The difference is unmetered water. After allowing for authorized unmetered uses such as fire fighting, main flushing, and public use, it can be assumed that the remaining unmetered water is explained by inaccurate meter readings, malfunctioning valves and leakage, and theft. Water audits should be done at least once a year.

4. Water Pressure Reduction and Leak Detection

Water lines are routinely tested for leaks and when leaks are found they are promptly repaired. AWA would be required to modify pressure zones to reduce normal operating pressures and where possible to change operating procedures to move customers from higher pressure zones to lower pressure zones. Additional work in this area is not considered cost effective.

III. Past, Current and Projected Water Supply

III. PAST, CURRENT AND PROJECTED WATER SUPPLY

A. Past and Current Water Supply

The Adelanto Water Authority currently receives all of its water supply from wells. MWA is aggressively pursuing a program of facilities construction to deliver imported water for recharge in the Adelanto area. There are no nearby facilities to deliver recycled water at the present time.

The AWA has a total of fifteen (15) wells (seven operating wells, one inactive well, and six test wells) with a production capability of approximately 6,160 gallons per minute (gpm) or 8.88 million gallons per day (mgd). Wells #4 and #5 have high fluoride content and, since August of 1995 when well #14 became operational, have not been operated regularly. These wells can be operated but require special public notification and blending with water from other wells. The City also receives water from wells on land along Shay Road owned by the City and leased to George Air Force Base. Tables III-1, Existing Well Characteristics - Adelanto and Tables III-2, Existing Well Characteristics - GAFB, present a summary of these wells and their current capacities.

Well No.	APN	Depth (feet)	Diameter (inches)	Year Constructed	Capacity	
					gpm	mgd
1	468-261-64	500	8	1984	test	-
2	Turner Road	555	8	1984	820	1.18
3	468-261-64	510	14	1985	inactive	-
4	Turner Road	660	14	1985	766	1.10
5	Turner Road	637	14	1985	930	1.34
6	Raccoon Street	1,970	14	1988	356	0.51
7	Raccoon Street	880	-	1989	388	0.56
8	468-261-29	300	16	1991	test	-
8a	Maverick Stadium	820	-	1991	600	0.86
9	468-261-29	295	16	1991	test	-
10	468-261-29	360	16	1991	test	-
11	468-261-29	70	8	1991	test	-
12	468-261-30	160	8	1992	test	-
13	468-261-04	220	8	1992	test	-
14	472-171-25	200	16	1995	2,300	3.31
TOTAL					6,160	8.88

Source: Table I-3, Domestic Water system Evaluation and Operations Forecast, November 17, 1995.

**Table III-2
Adelanto Water Authority
Existing Well Characteristics - GAFB**

Well No.	APN	Depth (feet)	Diameter (inches)	Year Constructed	Capacity	
					gpm	mgd
1	472-171-26	443	16	1961	335	0.48
2	472-171-25	120	16	1977	1,027	1.48
3	472-171-25	120	16	1982	940	1.35
4	472-171-25	120	16	1967	1,080	1.56
5	472-261-04	150	16	1979	944	1.36
6	472-261-04	101	16	pre 1950	900	1.30
7	472-261-04	101	16	pre 1950	1,000	1.44
8	472-171-25	122	16	1982	275	.40
TOTAL					6,501	9.37

Source: Table 6-1, *Adelanto Water Supply Report*, March 2, 1994.

Six of AWA's active wells are located approximately two miles east of the City near the Mojave River on City owned property in San Bernardino County while one well is located within the City limits at the new Maverick Stadium. George Air Force Base wells are located east of the City along Shay road adjacent to the Mojave River. All wells are within the Alto Subarea of the Mojave River Basin. Exhibit III-1, Well Site Map and Domestic Water System, shows the location of AWA wells.

Total annual groundwater production since 1980 is shown in Exhibit III-2, Historic Groundwater Production. This figure addresses both City wells and City wells at George Air Force Base. Together, these provide a complete historic record of the overall production from City owned wells.

Prior to 1994, City wells supplied the City with water while George Air Force Base wells were used almost exclusively for the military base. Base closure occurred in mid 1993 as evidenced by a substantial drop in well production at the GAFB wells in 1993/1994. Since that time, however, the City has begun to take a portion of their annual supply from the GAFB wells. In particular, of the total annual GAFB well production, the City received 106 acre-feet in 1992/1993, 94 acre-feet in 1993/1994, 1,211 acre-feet in 1994/1995, and 327 acre-feet in 1995/1996. GAFB continues to use water pumped from wells primarily for golf course irrigation. As GAFB usage has declined, the City's usage has steadily increased resulting in total water production which has been relatively constant. Total annual production from all wells has averaged approximately 4,294 acre-feet since 1979/1980. Production which has been primarily for City use exclusive of George Air Force Base has risen steadily from about 608 acre feet in 1979/1980 to about 3,653 acre feet in 1995/1996

(3,348 ac-ft from City wells and 327 acre-feet, from the 1,127 acre-feet total produced from GAFB wells).

B. Available Water Supply Resources

As previously indicated, groundwater is the District's only source of supply at the present time. It is evident that the surface flow and under flow of the Mojave River as well as the water which percolates into the Mojave River Basin aquifer is a limited resource which needs careful management.

1. Mojave River Basin Geology

Various investigations have been conducted to identify the geologic structure of the Mojave River Basin, better define groundwater movement, quantify the resources in the basin, assign water rights, and resolve basin overdraft conditions. Some of these include:

- *Mojave Water Agency Regional Water Management Plan*, prepared by Bookman-Edmonston Engineering, Inc., September 1993
- *Riparian Vegetation and its Water Use During 1995 along the Mojave River*, California, prepared by the United States Geologic Service and the California Department of Fish and Game, 1996
- *Groundwater and Surface Water Relation along the Mojave River*, prepared by the United States Geologic Service, 1996
- *Data and Water Table Map of the Mojave Groundwater Basin*, San Bernardino County, California, November 1992
- *First Annual Engineers Report on Water Supply for Water Year 1994-95*, prepared by the Mojave Water Agency, June 1996

The source of the Mojave River lies in the San Bernardino Mountains. There the rainfall and snow run-off give rise to the West Fork of the Mojave River and Deep Creek. These tributaries join at the foothills of the San Bernardino Mountains, at a point commonly known as "The Forks", to form the Mojave River. From The Forks, the river flows north 12 miles to Victorville/Adelanto, then continues 18 miles to Helendale. The Mojave River then turns northeast and continues past Barstow to Afton, approximately 90 miles from its beginning. The river then flows to its terminus in Silver Lake.

The Mojave Basin is composed of several alluvial filled valleys. The valleys and basins are filled with alluvial sediment washed down from the surrounding mountains. There are several faults that obstruct groundwater flow.

Exhibit III-1, Wellsite Map and Domestic Water System

Well Site Map and Domestic Water System



Water Pipelines



Adelanto Well Sites
COA Wells 1,2,3,4 & 5



Turner Well Sites
COA Well 14
31 Acre Ranch Site
COA Wells 8,9,10,11 & 12



Well 8a at Maverick Station



750,000 Gallon Water Tank
Booster Pump Station No. 2
Public Works Maintenance Yard



Booster Pump Station No. 3
COA Wells 6 & 7
2,3 Million Gallon Reservoirs



2,5 million Gallon Reservoirs
(Located 2.5 Miles South of Palmisole Road)

COA : City of Adelanto

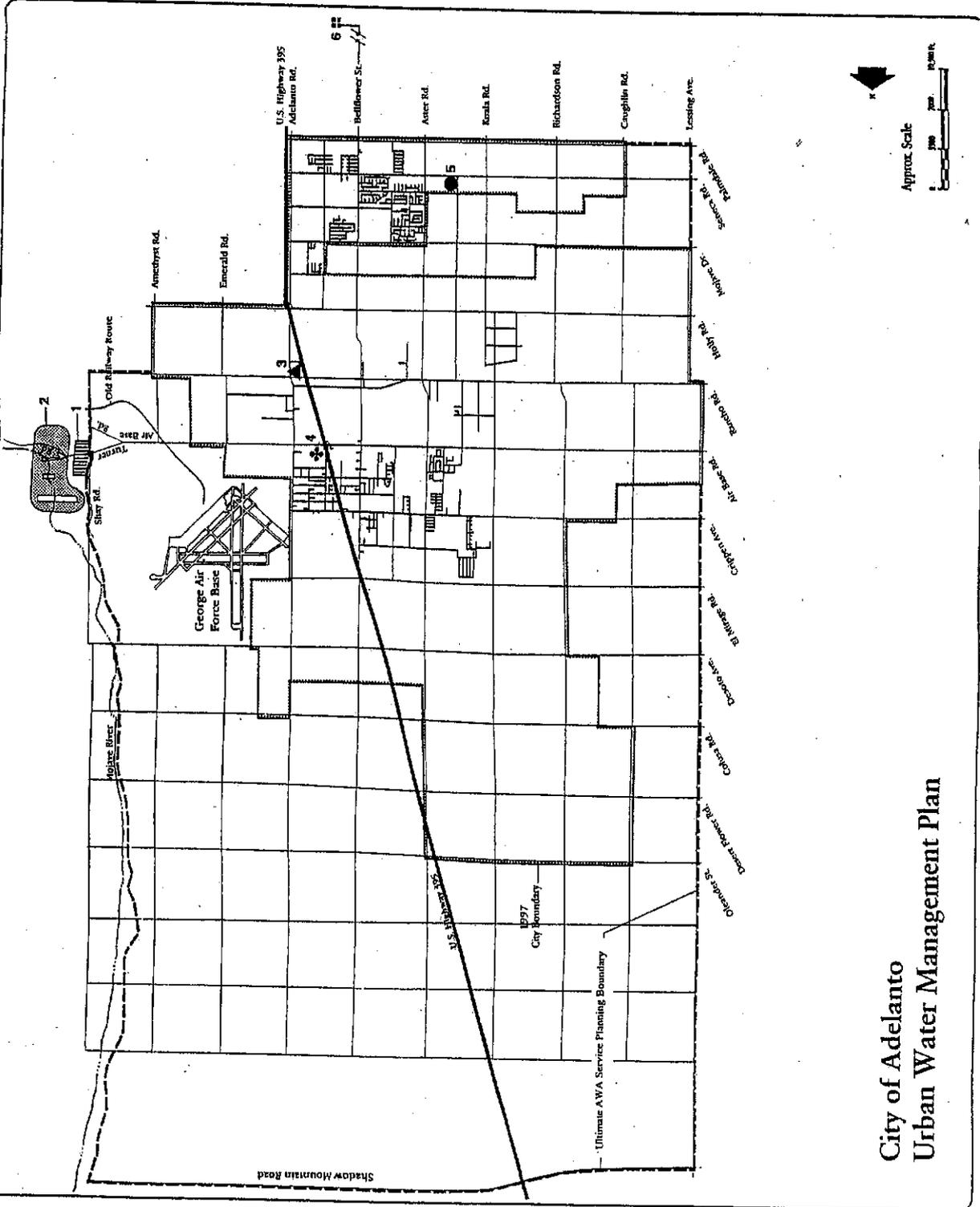
Urban Logic Consultants



Planning, Municipal Services,
Environmental Management

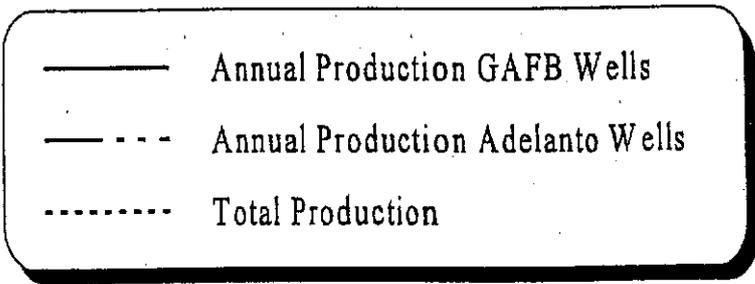
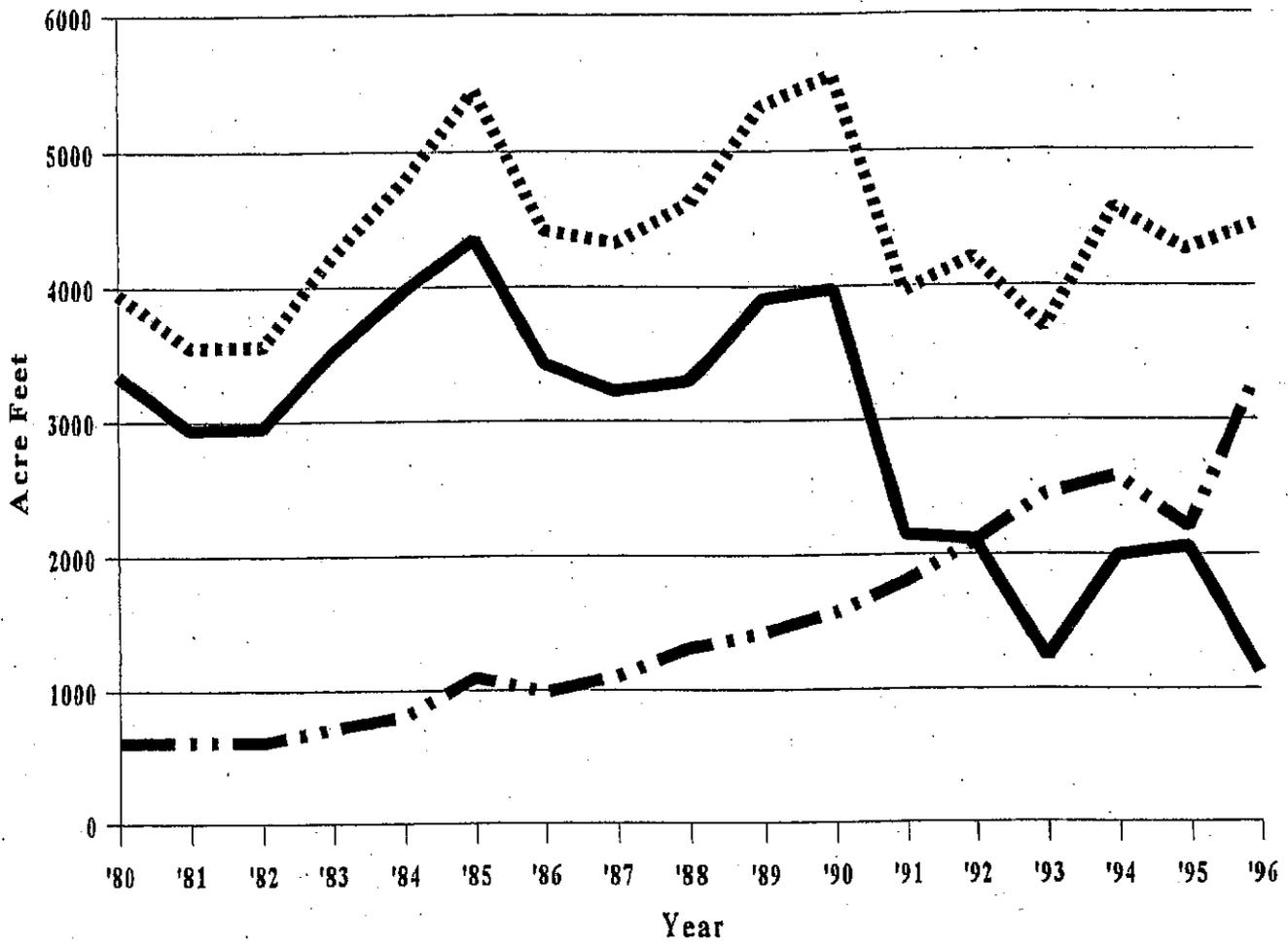
Exhibit No.: III-1

Graphics Prepared by Twigg Graphics



City of Adelanto Urban Water Management Plan

Historic Groundwater Production



The principal water-bearing formations in the Mojave River Basin are the alluvial fan deposits (alluvium) and the Mojave River channel deposits. The river channel deposits are the most important aquifer in the basin and probably the most permeable of the water-bearing formations. The river channel deposits range from 1/4 to 1-1/2 miles wide, receive recharge from the Mojave River, and are as much as 200 feet thick.

Throughout most of the Mojave River Basin the river channel deposits are bounded on the sides and bottom by the alluvium. Where the alluvium is predominantly clay, the flow of groundwater is restricted to the channel deposits. Where the alluvium is predominantly sand and gravel, groundwater generally flows from the channel deposits into the alluvium. The alluvium present throughout the Mojave River Basin ranges in thickness from a few inches to about 1,000 feet thick and contains most of the groundwater in storage in the basin. About 80 percent of the total basin recharge is from the Mojave River.

The classification of groundwater in the river channel deposits depends on the relative permeability of the underlying alluvium or the presence of shallow bedrock. In areas where the permeability of the alluvium is low, groundwater flow is restricted to the channel deposits. In this case, the groundwater is appropriately classified as a subterranean stream. Also, where the Mojave River passes through narrow gaps or canyons carved into bedrock groundwater in the channel deposits constitutes a subterranean stream.

In areas where the bounding alluvium is relatively permeable groundwater migrates from the channel deposits into the alluvium. Through this mechanism most of the Mojave River Basin is recharged. In this case, groundwater flow is not restricted at the boundary of the channel deposits and the appropriate classification of groundwater in the channel deposits is percolating water. In general, groundwater in the alluvium is appropriately classified as percolating groundwater as well. The groundwater cannot be called a subterranean stream because flow in the alluvium is not bounded by definite channels. The groundwater cannot be classified as underflow of the Mojave River because the groundwater does not have all the characteristics of underflow.

The Mojave River groundwater basin is the subsurface reservoir which yields water to wells drilled in the area. The groundwater basin area, or valley fill area, contains shallow, permeable alluvial deposit, and is underlaid and surrounded by relatively impermeable rock.

The surface flow on the Mojave River is the main source of water supply. The Mojave River Channel has the ability to absorb significant amounts of the flood flows that pass through the river's various reaches. The water absorbed in the stream channel then percolates downward to the water bearing formations. The absorption,

percolation and mounding of the flood flows is the major source of replenishment to the groundwater areas.

Subsurface flow into the Alto Subarea is derived from three localities: along the western boundary from percolation of run-off from Sheep Creek and Buckthorn Wash; as subsurface flow from Lucerne Valley; and as percolation from run-off at-the foot of the San Bernardino Mountains. Surface and subsurface flows from the Alto Subarea are received by the Mesa Subarea.

2. Effect of Basin Adjudication on Available Water Supply Resources

Any discussion of available water resources in the Mojave River Basin must consider the recent legal decisions to adjudicate the basin and develop a comprehensive solution to the basin's groundwater overdraft condition. The adjudication is discussed more fully in Section I. In particular, the water supply available to the AWA is limited by the "safe yield" production amounts as stipulated by the court and administered by the Mojave Water Agency as Watermaster. Under the stipulated judgement, Adelanto's water production would be limited by three factors: 1) the "free production allowance" identified by the court, 2) the amount of State Water Project (SWP) or other imported water available for purchase from MWA for recharge to offset excess production and 3) the AWA's ability to pay the replacement assessment which would be levied by MWA for excess production. The initial Free Production Allowance established for the City of Adelanto was 1,573 acre feet and for George Air Force Base, 3,433 acre-feet. This was then to be "ramped down" by 20% over a five year period until "safe yield" production levels within the basin were reached. As of a April 1997, the "ramp down" is in its fourth year. According to the Mojave Water Agency, the Alto Subarea is not likely to require additional ramp down beyond the 20% already mentioned, however, it is possible. Adelanto's right to water produced by George Air Force Base has not yet been determined by the courts or negotiated by responsible parties. Free Production Allowances for Adelanto and George Air Force Base are described in Table III-3, MWA Base Annual Production Allowances. These figures do not include water right transfers that Adelanto is currently pursuing and which are discussed later in this chapter.

**Table III-3
Adelanto Water Authority
MWA Base Annual Production Allowances**

	Free Production Allowances (Acre-Feet)				
	Base Year 1993/1994	2nd Year 1994/1995	3rd Year 1995/1996	4th Year 1996/1997	5th Year 1997/1998
City of Adelanto	1,573	1,494	1,415	1,337	1,258
Adelanto, City of - George AFB	3,433	3,261	3,089	2,918	2,746
Total	5,006	4,755	4,504	4,255	4,004

Source: Stipulated judgement for Mojave River Basin, Exhibit B, 9-25-95

The safe yield of the Adelanto groundwater basin can be maintained and/or increased by complying with the basin adjudication including purchasing S.P. water from MWA when overproduction occurs.

C. Alternative Water Supply

1. Imported Water Supply

The AWA is eligible to receive imported water from the Mojave Water Agency. The MWA entered into a contract with the Department of Water Resources (DWR) in 1963 for an imported water supply with a "maximum annual entitlement" building up to 50,800 acre-feet per year in 1990 from the State Water Project to be used for municipal and industrial purposes. MWA is currently completing a permanent transfer of water rights from the Berrenda Mesa Water District, a member of the Kern County Water Agency, in the Central Valley. This transfer will contribute an additional 20,000 acre-feet to MWA's annual entitlement from the State Water Project. Consequently, MWA's annual entitlement will be increased to 70,800 acre-feet per year. About 15,000 acre-feet of its entitlement supplies were ordered by MWA for delivery to the channel of the Mojave River for ground water recharge in the 1995-1996 period.

The method of allocating imported water among the various producers served by the Mojave Water Agency has not yet been established. Currently, if a producer exceeds the free production allowance, the producer is billed annually by MWA for the amount overproduced. To date there has been very little overproduction in the Basin but as the "ramp down" occurs MWA expects purchases to increase. Ultimately, MWA intends to use the Mojave River Basin's storage capability to "bank" water during wet years for use during drought periods. Groundwater levels would fluctuate from an acceptable high level to an acceptable low level depending on the yearly recharge. Overproduction fees would continue to be assessed and would provide a funding source to recharge the groundwater basin supply from SWP water following drought cycles.

MWA has been actively pursuing various construction projects to effectively import SWP water for basin recharge. These include the recent completion of the Morongo Basin Pipeline which is designed to recharge the Mojave River Channel at the Rock Springs Outlet between Hesperia and Apple Valley and the pending construction of the Mojave River Pipeline with a turnout to the Mojave River near Oro Grande slightly north of Adelanto. Both of these projects will allow recharge of the Alto Subarea from which Adelanto draws its water supply.

The Mojave Water Agency's contract entitlement is not a guaranteed amount available every year. At one time, during the initial planning stages of the SWP, this was virtually guaranteed. However the inability to construct all of the SWP Facilities

because of environmental concerns and the need to provide more water through the Delta to maintain water quality for fish and wildlife have all contributed to decreasing the long-term yield from the State Water Project. Reports have indicated that the dependable yield from the SWP is only about 50 to 60 percent of its contracted obligation. During drought periods the amount of water delivered to State Water Contractors dropped to 10 percent of the requested amount. (Requested amounts have typically been less than contract entitlements.)

Modifications to the State Water Contract in December of 1994 (Monterey Agreement, Appendix B) made more water available to urban users. "The Monterey Agreement" covers a number of issues and includes the ability for SWP contractors to improve their water management through greater and more flexible use by the contractors of existing SWP storage and water conveyance facilities and through the opportunity for urban contractors to purchase agriculture water entitlements.

In 1993, when the MWA Regional Water Management Plan was prepared, studies of water supply of the SWP under the Decision 1,485 of the State Regional Water Quality Control Board indicated that MWA could expect to receive approximately 43,000 acre-feet per year and that, for planning purposes, the MWA should expect no more than an average of 40,000 acre-feet per year of entitlement water from the SWP from its maximum annual entitlement of 50,800 acre-feet per year. Because MWA's annual entitlement is increasing by 20,000 acre-feet, the expected average would also increase. In order to achieve this, the MWA will have to maximize SWP deliveries in wet years to offset the short supplies in dry years such as were experienced in the late 1980's and early 1990's. This is possible because of the large unused groundwater storage capacity available in the Mojave River Basin.

Due to the effects of the basin adjudication, MWA is waiting for the various producers to complete ongoing water transfers and other negotiations before increasing its annual orders for SWP water. As stated above, MWA ordered only 15,000 acre-feet of SWP water in the 1995/1996 water year, significantly below its maximum annual entitlement. With the current plans for recharge and water rights in place, MWA does not anticipate any significant long term problems in delivering necessary water to producers in the Mojave River Basin.

2. Water Transfers

Water transfers are another means for a water producer to increase its access to state project water. The AWA, in coordination with the Mojave Water Agency, could pursue transfers of water from other State Water Contractors or their subagencies either on a permanent basis or temporary (e.g. law) basis. This would be done in coordination with the DWR and the other State Water Contractors. Transfers typically involve the purchase of water rights from an upstream user, who foregoes access to the water, instead allowing it to flow south where it is discharged to the

entity which had acquired the Free Protection Allowance. As stated above, the MWA is presently completing a permanent water transfer from the Central Valley. In addition, the City of Adelanto has completed the purchase and transfer of water rights for some 1,100 acre-feet of SWP water from Tom Rubik.

In addition to SWP water, water transfers from non SWP service areas are possible. This water could be conveyed in SWP facilities with the cost of transport paid by the Mojave Water Agency. MWA is currently pursuing agreements for several small demonstration projects (approximately 2,000 acre-feet each), one with the Natomas Central Water District involving delivery of Federal Central Valley Project Water and one with Broomieside Ranch for delivery of private water using SWP facilities.

3. Water Recycling

Section VI of this Plan discusses in more detail the potential supply of recycled water and major backbone facilities to transport and deliver recycled water for use within the AWA service area.

D. Summary

The AWA plans to continue pumping at its current rate or more to meet demand using its free production allowance as stated in the Mojave River Basin adjudication, arranging transfer of water rights from other producers and buying additional water production from MWD to allow supplemental pumping from the Authority's wells. For planning purposes, water available to the AWA to serve existing and new development in the near term is described in Table III-4, AWA Available Water Resources.

	1995/ 1996	1996/ 1997	1997/ 1998	1998/ 1999	1999/ 2000	2000/ 2001
City Free Production Allowance*	1,415.0	1,337.1	1,258.4	1,258.4	1,258.4	1,258.4
Hrubik Free Production Allowance Transfer		1,586.1	1,492.8	1,492.8	1,492.8	1,492.8
Carry over Free Production Allowance Rights		31.0				
Total	1,573.0	2,954.2	2,751.2	2,751.2	2,751.2	2,751.2
GAFB Free Production Allowance*	3,090.0	2,918.0	2,746.0	2,746.0	2,746.0	2,746.0

Source: Table B-1, Exhibit B, Stipulated Judgement for the Mojave River Basin Resolution 96-78

* Adelanto's right to the GAFB Free Production Allowance has not yet been determined.

The key to supporting continued growth in the AWA sphere of influence is the construction

of needed infrastructure for the import, recharge and storage of SWP Water because such water is necessary to alleviate groundwater overdraft conditions and create a stable supply of available water capable of supporting sustained growth within the Mojave River Basin.

Another key element, and equally important, is the construction of the Adelanto Waste Water System Project which will ultimately make reclaimed wastewater available to the City of Adelanto, thereby saving valuable fresh water resources for their highest and best use, domestic consumption. This project is discussed in Section VI.

IV. Past, Current and Projected Water Use

IV. PAST, CURRENT AND PROJECTED WATER USE

A. Past and Current Water Use

1. Current Water Demands

Using the City's well production records, existing water demands were determined using 1995-96 base year data. Because all water in Adelanto is supplied by wells, well pumpage records provide the best available information for documenting water demand. The City indicates that unaccounted water losses in the distribution system are not significant. The current level of water usage by the City is shown in Table IV-1, Current Water Use. Table IV-2 shows historic water usage by AWA.

	GAFB Wells	AWA Wells	All Wells
October '95	7,730,000	92,094,300	99,824,300
November '95	7,190,000	71,037,800	78,227,800
December '95	7,701,000	55,144,200	62,845,200
January '96	8,093,000	53,452,200	61,545,200
February '96	7,843,000	46,783,600	54,626,600
March '96	8,084,000	64,811,800	72,895,800
April '96	8,496,000	91,089,900	99,585,900
May '96	10,436,000	108,392,400	118,828,400
June '96	10,237,000	125,437,476	135,674,476
July '96	11,830,000	133,412,784	145,242,784
August '96	12,172,000	132,059,024	144,231,024
September '96	9,419,000	115,549,080	124,968,080
Annual Demand (GAL/Yr)			1,198,495,564
Annual Demand (MG/Yr)			1,198
Annual Demand (Acre-Feet/Yr)			3,676
Annual Demand (GPM)			2,280
Average Daily Demand (MGD)			3.28
Average Daily Demand in Max Month (MGD)			4.79
Maximum Month Demand (MG)			145.2
Maximum Day (July 29, 1996) Demand (MGD)			5.4
RATIO (Max Month : Year)			0.12
RATIO (Max Day : Avg Day)			1.65
RATIO (Avg Day in Max Month : Avg Day)			1.46

Source: City of Adelanto Well Production Records

**Table IV-2
Adelanto Water Authority
Historic Water Usage***

WATER YEAR	GAFB Wells (Acre-Feet)	AWA Wells (Acre-Feet)	TOTAL WATER USE (Acre-Feet)
1979/1980①	608	0	608
1980/1981①	616	0	616
1981/1982①	612	0	612
1982/1983①	715	0	715
1983/1984①	808	0	808
1984/1985①	1,095	0	1,095
1985/1986①	0	986	986
1986/1987①	0	1,103	1,103
1987/1988①	0	1,313	1,313
1988/1989①	0	1,423	1,423
1989/1990①	0	1,574	1,574
1990/1991②	0	1,986	1,986
1991/1992③	0	2,100	2,100
1992/1993③	47	2,393	2,440
1993/1994③	461	2,754	3,215
1994/1995③	1,426	1,924	3,350
1995/1996②	335	3,341	3,676

① *Adelanto Water Supply Report*

Roy C. Hampson & Associates

② *Mojave Water Ageway*

③ *City of Adelanto*

* Excludes GAFB Production for use outside Adelanto

On the basis of actual well production figures, a unit demand factor of 244 gallons per capita per day was determined by dividing the annual water consumption by the current population and then dividing this number by 365 days. This figure serves as a point of reference for other figures which may be developed and provides a way of determining Citywide water usage on the basis of population alone assuming that the ratio of the various land uses within the city remains roughly constant. A demand factor of about 200 gallons per capita per day is more representative of residential usage alone without a reclaimed water system while a factor of 150 gallons per capita per day would reflect residential usage with a percentage of the water being reclaimed and reused.

B. Projected Water Demands

The various land uses within the AWA's ultimate service area, based upon the 1994 Adelanto General Plan, were used as the basis for determining ultimate water demand. Dwelling unit and acreage estimates derived from these land uses were tabulated in Table X-1 of the General Plan Public Facility Element. By using these dwelling unit and acreage estimates, per dwelling unit and per acre demand factors were applied to develop a picture of future water demand. For ultimate water demands, a unit demand figure of 398 gallons per unit per day was used for residential land uses in accordance with the 1994 Adelanto General Plan. This demand factor assumes that a water reclamation system has been implemented. A unit demand figure of 1,500 gallons per acre per day was used for commercial and industrial land uses. Both of these demand factors are consistent with those used in the 1994 Adelanto General Plan.

A similar methodology was used for near term water demand which addresses development likely to occur within the next five. To determine near term water demand, existing demand was added to estimated demand for projects anticipated within the next five years within the City. The current average per capita demand factor of 244 gallons per person per day was applied to pending residential projects to approximate the incremental increase in water usage generated by residential growth. This was then added to the water generation of two proposed prison projects to arrive at total near term water demand.

**Table IV-3
Adelanto Water Authority
Ultimate Projected Water Use**

Land Use	Dwelling Units	Acres	Demand Factor	Demand (MGD)	Demand (GPM)	Demand (ac-ft/yr)	Percent of Total Demand
Desert/Single Family	46,945		396	18.59	12,910	20,814.2	34.4%
Med. Density Residential	11,155		396	4.42	3,068	4,945.8	8.2%
Manufacturing/ Industrial		12,241	1,500	18.36	12,751	20,558.1	34.0%
Commercial		2,646	1,500	3.97	2,756	4,443.8	7.4%
Airport		818	1,500	1.23	852	1,373.8	2.3%
Airport Development District		4,950	1,500	7.42	5,156	8,313.3	13.8%
Total				53.99	37,493	60,449.0	100.0%

Source: City of Adelanto General Plan, Public Facilities Element, Table X-1, 1994.

Table IV-3 illustrates the percent of total water use by general land use category estimated at buildout within AWA's projected service area.

The average daily demand for water will increase from the current average daily demand of over 3.28 MGD to nearly 54 MGD, over a 1,500% increase as the ultimate service area is developed. Assuming a growth rate of 3 percent, complete build out of the City's ultimate expansion area would take approximately 95 years.

A number of proposed developments that have received discretionary approvals are shown in Table IV-4 Pending Development Projects. The pending developments listed in Table IV-4 would add about 1,363 GPM (which equates to about 1.96 MGD or 233 acre feet per year) to the current demand. This is based on an average water demand of 395 gpd/unit using demand factors from the Adelanto General Plan. Assuming a 3 percent growth rate, The Pending Development Project buildout would occur in about 18 years.

**Table IV-4
Adelanto Water Authority
Pending Development Projects**

Project	Location	Acres	Resid Units	Proj. Popul.	Water Use (MGD)	Water Use (GPM)	Water Use (Ac-ft/yr)
TTM	Aster north of Bartlett Ave.	30	129	365	0.089	61.8	1.0
TTM	Mojave Dr. @ Aster Rd.	70	280	792	0.193	134.1	2.2
TTM	Mojave Dr. @ Jonathon St.	80	298	842	0.206	142.7	2.3
TTM	Auburn Ave. West of Hwy 395	10	32	90	0.022	15.3	0.2
TTM	Raccoon & Airbase Rd.	70	235	664	0.162	112.6	1.8
TTM	Fermontia & Victor Rd.	29	99	280	0.068	47.4	0.8
TTM	Bartlett & Rhode Island	20	85	240	0.059	40.7	0.7
TTM	Raccoon & Stevens	20	80	226	0.055	38.3	0.6
TTM	Palmdale & Bellflower	160	496	1,402	0.342	237.6	3.8
TTM	N. Crippen bet Astor & Stevens	40	159	449	0.110	76.2	1.2
TTM	Bartlett & Raccoon	20	79	223	0.054	37.8	0.6
TTM	Villa & Aster	40	128	362	0.088	61.3	1.0
TTM	Koala & Crippen	43	166	469	0.115	79.5	1.3
TTM	Airbase West of Beaver	40	160	452	0.110	76.6	1.2
TTM	Bervenien & Auburn	20	80	226	0.055	38.3	0.6
TTM	Palmdale & Stevens	30	108	305	0.074	51.7	0.8
TTM	Aster & Chapparal	3	9	25	0.006	4.3	0.1
TTM	Seneca & Bellflower	80	305	862	0.210	146.1	2.4
TTM	Auburn & Cypress	5	20	57	0.014	9.6	0.2
TTM	Verbenia & Villa	?	106	300	0.073	50.8	0.8
TTM	Seneca & Fermontia	20	36	102	0.025	17.2	0.3
TTM	Mojave & Jonathon	20	82	232	0.057	39.3	0.6
TTM	N. Victor West of Bellflower	13	80	226	0.055	38.3	0.6
TTM	W. of Bellflower N. of Victor	38	43	122	0.030	20.6	0.3
TTM	NE cor Victor & Verbenia	20	123	348	0.085	58.9	1.0
TTM	NE cor Jonathon & Villa	10	77	218	0.053	36.9	0.6
TTM	NW cor Seneca & Vinton	40	40	113	0.028	19.2	0.3
TTM	SE cor Mojave & Bellflower	127	164	464	0.113	78.6	1.3
TTM	NE cor Seneca & Delicious	40	164	464	0.113	78.6	1.3
TTM	NE cor Aster & Victor	77	313	885	0.216	149.9	2.4
TTM	Aster & Stevens	?	34	96	0.023	16.3	0.3
TTM	NW cor Delicious & Begonia	8	26	74	0.018	12.5	0.2
TTM	Seneca bet Aster & Verbenia	40	153	433	0.106	73.3	1.2
TTM	N side Seneca E. of Raccoon	15	57	161	0.039	27.3	0.4
TTM	N side Bartlett, E. of Rhode Island	20	81	229	0.056	38.8	0.6
TTM	Palmdale & Seneca	10	41	116	0.028	19.6	0.3
TTM	Delicious & Cornell	10	42	119	0.029	20.1	0.3
TTM	Vintage bet Koala & Otter	10	40	113	0.028	19.2	0.3
TTM	bet Bartlett & Airbase	77	317	896	0.219	151.8	2.4
TOTAL		1,405	4,967	14,042	3.426	2,379.1	38.4

Assumes 244 gallons per person per day in accordance with current City wide per capita water use. TTM: tentative tract map approved

Source: City of Adelanto

Residential growth in the next 5 years, the planning horizon for this document, is shown in Table IV-5, Near Term Residential Growth. Population growth serves as an indicator of water usage.

**Table IV-5
Adelanto Water Authority
Near Term Residential Growth**

Year	Population	Equivalent Dwelling Units
1996	13,353	3,916
1997	13,754	4,033
1998	14,166	4,154
1999	14,591	4,279
2000	15,029	4,407
2001	15,480	4,540

*1996 population from Calif. Dept. of Finance, Demographic Research Unit
Assumes annual growth rate of 3% from 1996.

Table IV-6, Average Daily Demand - Current, Near Term, and Ultimate, shows the near-term water demand taking into consideration current water demands plus growth in water usage anticipated in the next five years. This is expected to come primarily from a continued 3 percent population growth plus the expected addition of two new prisons to the Adelanto area. The average daily demand for water will increase from the current usage of over 3.3 MGD to nearly 4 MGD, a 21% increase in the next five years.

Table IV-6 Adelanto Water Authority Average Daily Demand - Current, Near Term and Ultimate					
1995-96 WATER DEMAND					
	Population		Existing Demand		
		(gpm)	(ac-ft/yr)	(mgd)	
All Uses*	13,353	2,280.0	3,676	3.28	
NEAR TERM WATER DEMAND					
	Population		Near Term Demand		
		(gpm)	(ac-ft/yr)	(mgd)	
Existing	13,353	2,280.0	3,676	3.28	
New Residential*	2,127	526.6	849	0.8	
New Prisons*		36.0	58	0.05	
TOTAL Near Term	15,480	2,842.6	4,583	4.13	
ULTIMATE WATER DEMAND					
	Acres	Units	Ultimate Demand		
			(gpm)	(ac-ft/yr)	(mgd)
Residential**		58,100	15,948	25,731	22.9
Commercial/Industrial***	20,655.0		21,545	34,717	31.0
TOTAL			37,493	60,448	53.9

Source: Adelanto General Plan, Table X-1, 1994

Adelanto Well Production Records, 1995-96

* 1997 Adelanto Water Authority Five Year Budget Forecast, Table IV-1.

** Assumes 395 gallons per unit per day, in accordance with General Plan, Table X-1.

*** Assumes 1,500 gallons per acre per day in accordance with General Plan, Table X-1.

Table IV-6 also shows the near term and ultimate average, demands at various buildout milestones within the District's ultimate area of service.

Since Adelanto is bound by the Mojave Basin Adjudication, the efforts of MWA to import the recharge water necessary to support a growing population will be critical in determining the amount of growth which the Mojave River aquifer can ultimately support. Because urban growth occurs incrementally, the philosophy of facility expansion and water purchases which MWA is currently pursuing is being done in anticipation of future growth and will allow urbanization to "pay its own way". Eventually, should MWA's efforts encounter some environmental, legal or physical roadblock, land use and land planning decisions made by those agencies which control land use approvals, i.e. the governing bodies of the City of Adelanto and San Bernardino County may be impacted to ensure that development does not outpace available water resources.

C. Potential Recycled Water Users

Section VI of this Plan discusses in more detail the potential users of recycled water within the AWA's service area.

V. Water Shortage Contingency Plan

V. WATER SHORTAGE CONTINGENCY PLAN

A. Introduction

The conservation and efficient use of urban water supplies can best be accomplished at local levels. As such, urban water suppliers are required to develop water management plans to limit the amount of water used to that which is reasonably necessary for beneficial use and to develop management measures that result in the most effective use of water to prevent its waste or unreasonable method of use.

B. Past, Current and Projected Water Supply

The Water Shortage Contingency Plan (Contingency Plan) requires the urban water supplier to provide an estimate of the minimum water supply available at the end of 12, 24, and 36 months, assuming the worst case water supply shortages.

Currently the Authority's sole source of water supply is from wells located in the Alto Subarea of the Mojave River Basin. As previously discussed in Section III, the City's increment of the safe yield in the Mojave River basin was established by the adjudication of the basin and the City's subsequent acquisition of water rights at 2,923 acre-feet for 1996/1997, reducing to 2,751 acre feet for 1997/1998 and beyond. This assumes, conservatively, that no additional water rights are acquired and that no recycled water is available to supplement groundwater supplies.

Historically, the local aquifer in the Adelanto area has not been a limiting factor in groundwater production. This is evidenced by the City's well production which has shown steady annual increase without significant fluctuation even during the drought periods of the 1980's. Under the basin adjudication, the City is allowed to pay MWA for annual production which exceeds the City's free production allowance. Although there does not appear to be any structural limitation on MWA's ability to deliver and store water, the free production allowance will be used for determining worst case supply in the land term conditions.

For the 1995/1996 water year, the watermaster determined that the combined production of Adelanto and Adelanto-George Air Force Base was 4,475 acre-feet or 31 acre-feet below the 4,506 acre-foot free production allowance for that year. With Adelanto's 1,586.1 acre-foot Hrubik Water Rights purchase coming on line in 1996/1997, if demand were to remain constant and assuming an additional 5% ramp down, the combined Adelanto/Adelanto-George Air Force Base free production allowance would be 5,497.2 acre-feet with an estimated unused water allocation of about 1,022 acre feet available for future growth.

In summary, then, the combined free production allowance of 5,497.2 acre-feet per year available from groundwater will provide the City with sufficient water to meet current needs during short-term drought periods within the next 12, 24, and 36 months.

C. Past, Current and Projected Water Use

The Contingency Plan must also include an estimate of past, current, and projected water use and, to the extent records are available, segregate those uses on the basis of residential (single and multi-family), industrial, commercial, government and agricultural customers. The current average daily demand is approximately 3.26 million gallons per day (MGD) or 3,654 acre-feet per year. The maximum day demand is approximately 5.4 MGD. Table V-1 illustrates the projected average daily combined GAFB/City of Adelanto average day demand and maximum day demand for the next 12, 24, and 36 months assuming an annual growth factor of approximately 3 percent.

Water Year	Average Day Demand (MGD)	Maximum Day Demand (MGD)
1995/96	3.99	6.6
1996/97	4.11	6.8
1997/98	4.23	7.0
1998/99	4.36	7.2
1999/00	4.49	7.4

* Assumes annual growth rate of 3% from 1995/96 demand of 3.99 MGD and a ratio of 1.65 maximum day to average day (Table IV-1).

It is anticipated that a majority of the increase in demand will come from the construction of two possible prisons along with growth in residential housing units.

Table V-2 illustrates the percent of total water use by land use designation estimated within AWA's projected service area.

Table V-2
Adelanto Water Authority
Total Projected Water Use by Land Use Designation

Land Use Type	Percent*
Residential	87.0%
Commercial	1.8%
Industrial	3.4%
Governmental	7.8%
• Dept. of Water & Power	
• School Districts	
• Adelanto Correctional Facility	
TOTAL	100.0%

* Percentages are approximate.

From the data in Table V-1 and the fact that the Adelanto area (the City and George Air Force Base) can currently rely on about 4.9 MGD (5,497.2 acre-feet) long term from the current groundwater supply under worst conditions, the AWA will not have a water shortage problem in the near future. Projected annual water demands will not exceed this supply until sometime after 1999/2000. Within the 5 year planning horizon, there should not be a need for overproduction from the Mojave River Basin. City wells have a production capacity of 8.88 MGD while those at George Air Force Base have a capacity of 9.37 MGD which is far in excess of the projected 1999/2000 maximum day demand of 7.4 MGD. As a result there is more than ample combined GAFB/City of Adelanto production capacity to meet peak demands.

D. Water Shortage Response

1. Demand Reduction Stages

As mentioned earlier, the Authority presently receives all of its water supply from underground sources. The quality of the water has a history of being of good quality. Although Adelanto has a relatively uninterrupted source of water to meet present demands, water shortage contingency planning is still important to the City in order to meet future demands during a prolonged drought condition. The Plan proposes a four-stage plan of action in the event of a long term drought condition or loss of supply. The action levels for each stage are as follows:

Stage 1: Stage 1 occurs when the Authority declares a water shortage and imposes voluntary water conservation. In this stage the Authority shall notify all its customers that water deliveries may be reduced. The Authority will recommend a voluntary 10 percent water use reduction or greater based on an established base year to be determined by the Authority at the time Stage I is implemented. At the same time the Authority shall start its own public awareness program to encourage the efficient use of water. This will be accomplished by printing articles in the local newspaper and distributing literature and publications to its customers. Public awareness programs will also include educational conservation programs that would be introduced in the schools.

Stage 2: Stage 2 occurs when the Authority determines voluntary water reduction goals are not being met and the declared water shortage has been in effect for two consecutive years or as otherwise determined appropriate by the Authority. In this stage the Authority shall continue its public awareness efforts and conduct a survey on the voluntary minimum 10 percent water use reduction program for Stage I. The Authority at this time will begin to establish a water conservation advisory committee. This committee will be comprised of officials from the Authority and the City of Adelanto.

Stage 3: Stage 3 occurs if the water shortage continues for four consecutive years or as otherwise determined appropriate by the Authority. In this stage the Authority will recommend a mandatory 10 percent and a voluntary 20 percent water use reduction from the established base year. The Authority will adopt a rate structure with financial incentives to encourage efficient water use. The Authority will also develop a plan and ordinance to enforce penalties for excessive water use and include prohibition against specific wasteful practices such as gutter flooding, open hose car washing, and driveway washdown, etc. The Authority will analyze the impacts of the Conservation Plan on the revenues and expenditures of the Authority and propose measures to overcome those impacts, such as adjustments in customer rates, to help pay for additional sources of water.

Stage 4: Stage 4 occurs if the declared water shortage continues for one year after Stage 3. In this stage the Authority shall conduct a survey on the mandatory 10 percent and voluntary 20 percent water use reduction programs and consider enforcing penalties described in the ordinance developed under Stage 3.

In addition to these reduction stages, the Authority recognizes the importance of long term groundwater management and to that end has taken steps to implement the stipulated judgement which adjudicates the Mojave Groundwater Basin.

2. Priority by Use

Priorities for use of available water during shortages are based on input from the Authority, City of Adelanto Fire Department, City of Adelanto Planning Department and legal requirements set forth in the California Water Code. Water allocations are established for all customers according to the following uses beginning with the highest priority:

- Minimum health and safety allocations for interior residential needs including care and shelter operations
- Commercial, industrial, institutional/government operations to maintain jobs and economic base of the community
- Permanent agriculture use and nurseries
- Annual agriculture use
- Existing exterior landscaping

- New services (building permits) not approved prior to declared water shortage

3. Determination of Reduction in Water Use and Effectiveness of Conservation Measures

The Authority keeps historic and current pumping records on all of its wells and implements a computer accounting system on its customer's water usage. These records are then used to determine seasonal and annual fluctuations in water use. Within the Authority, since total water pumped closely approximates water use, the Authority can compare pumping records from one year to the next to determine actual reductions in water use. The Authority also, through its accounting system, is able to determine historic and current use by service account and therefore track customer usage during a drought and evaluate the effectiveness of each conservation measure implemented under the Conservation Plan.

VI. RECYCLED WATER

A. Introduction

The use of recycled water (reclaimed wastewater) to supplement the water supply has been under consideration by the City for a number of years. Presently, Adelanto is in the initial stages of implementing an area-wide recycled water system including construction of new wastewater reclamation facilities to serve the City pursuant to the Adelanto Wastewater System Project. Approximately .565 MGD of effluent which is currently discharged by the City to the Victor Valley Wastewater Reclamation Authority (VWVRA) treatment facility could be provided to the AWA in accordance with Title 22 standards and eventual distribution through a recycled water system. Surplus recycled water could be percolated into the ground for recharge.

In achieving the goal of implementing a reclaimed water system in the City, bonds have been issued and sold and a budget established for preparation of a Reclaimed Water Master Plan and obtaining an NPDES permit for the discharge of reclaimed water as part of the Adelanto Wastewater System Project. Preliminary plans identify a new wastewater reclamation facility within the City along with a system of reclaimed water force mains, pump stations, and storage facilities. Potential users of reclaimed water include landscape irrigation (schoolyards, parks, public buildings, stadiums), industrial users, and prisons. With increasing interest in development in the City of Adelanto, opportunities for reclaimed water usage are expected to increase significantly.

1. Overview of the Recycled Water Plan

The City of Adelanto currently discharges approximately .565 MGD of effluent to the VWVRA treatment plant which is then discharged to the Mojave River. The City of Adelanto recently formed the Adelanto Public Utility Authority (APUA) to implement the Adelanto Wastewater System Project. APUA is currently in the process of siting, designing and constructing a new wastewater reclamation facility which will provide tertiary treatment to Title 22 standards. Until a recycled water system is in place, treated effluent from the facility would be discharged to percolation basins or would continue discharge to the Mojave River. In lieu of discharging future effluent for groundwater recharge, the AWA is considering the funding and implementation of a water recycling project.

The APUA will operate the treatment facility and the recycled water distribution system including pumping stations and distribution piping when constructed. The AWA will then enter into agreements with various users, such as the City, School District, Parks and Recreation District, industrial users, etc. for providing recycled water. The APUA will be responsible for metering and revenue collection as well as overall recycled water pumping, storage and distribution system operation and maintenance.

VI. Recycled Water

The APUA intends to ultimately serve recycled water to the extent possible for non-potable uses and as permitted by law. This would make potable water now used for irrigation, etc. available for new economic development. As new development occurs, the new projects would include appropriate piping systems to permit the use of recycled water for irrigation of street medians, greenbelts, parks and common areas. This concept then envisions limiting the use of potable quality water to potable water purposes to the extent practical. Surplus recycled water will be available during certain times of the year when normal irrigation demands are reduced. During these times, the surplus could be discharged to percolation basins or the Mojave River for recharge to the groundwater basin.

The recycled water system will be developed in phases to match both demand for recycled water and the availability of treated effluent for recycling.

B. Available Water for Recycling

Currently there is an average 7.0 million gallons per day (MGD) of wastewater treated at the VVWRA treatment plant. Of this amount, approximately .565 MGD is contributed by the City of Adelanto. This water, once treated, is discharged into the Mojave River. Because it provides a portion of the streamflow in the Mojave River, it is anticipated that current level of effluent flow will continue to be discharged to the river via percolation and/or live stream discharge. The amount of treated effluent in excess of .565 MGD will constitute the amount of water available for recycling.

C. Recycled Water Regulatory Requirements

Initially, the City intends to discharge recycled water to percolation basins and/or utilize live stream discharge to the Mojave River with ultimate use in excess of .565 MGD having the potential for use in a recycled water system throughout the City.

Reclaimed water use is regulated under California Administrative Code Title 22, Division 4, Environmental Health. The regulations were last updated in 1978. In 1995, the Department of Health Services (DOHS) was in the process of reviewing them with the idea of possibly making some changes to Title 22. The reclaimed water system envisioned by the City will comply with all current Title 22 requirements.

Any discharge of treated effluent to the Mojave River must also ensure that the RWQCB's groundwater and surface water quality objectives are maintained. The objectives are established to protect the beneficial uses of the ground and surface water and are presented in the *"Water Quality Control Plan for the Lahontan Region, North and South Basins"*, referred to here as the *"Basin Plan"* (Basin Plan). The 1991 revision of the 1975 Basin Plan is the current working document.

1. Basin Plan Water Quality Objectives

The Basin Plan identified the beneficial uses of groundwater in the Mojave River Hydrologic Unit, (the area underlying the City of Adelanto), as municipal and domestic supply, agricultural supply, industrial service supply, and aquaculture. The Basin Plan also identifies beneficial uses of surface water, including municipal and domestic supply, agricultural supply, groundwater recharge, water contact recreation, noncontact water recreation, commercial and sport fishing, cold freshwater habitat, warm freshwater habitat, and wildlife habitat.

The water quality objectives for groundwater in the Mojave River Hydrologic Unit, which ensure that these beneficial uses are maintained, include Total Dissolved Solids (TDS) of 445 and NO_3 as NO_3 of 6. These reflect the nearest downstream water quality objectives and are found on the Mojave River at Barstow. Surface water quality objectives have been established for ammonia, bacteria, pH, chlorine and other substances as specified in the Basin Plan. The Basin Plan also contains a nondegradation objective which requires the continued maintenance of existing high quality waters. This objective applies to all waters in the Lahontan Region including surface waters, wetlands, and groundwater.

The Basin Plan states that any water recycling project involving groundwater recharge must be carefully evaluated to ensure the water quality objectives are maintained.

D. Irrigation and Other Direct Uses

At the present time, recycled water uses envisioned within the City are those related to landscape irrigation of athletic fields, parks, playgrounds, schoolyards, and other public grounds. Additional future uses could include use in industrial processes, use at prisons where dual water systems are typically cost effective (Adelanto contains one existing and two pending prison sites), as well as use for dust control, soil compaction, cooling water, and wash water. Recycled water used for these purposes will be disinfected tertiary recycled water.

APUA is in the process of siting, designing, and building a treatment facility to provide disinfected tertiary effluent. No additional treatment is necessary.

1. Groundwater Recharge through Percolation Basins and/or live stream discharge

Until a reclaimed water system is in place, Adelanto will discharge tertiary treated wastewater to percolation basins for gradual groundwater recharge and will discharge directly to the Mojave River. Design and location of the basins will meet the requirements of the RWQCB. The location of the percolation ponds will be upgradient to the Mojave River Groundwater Basin.

2. Water Rights Issues

The ownership of wastewater discharged into a watercourse has become an issue when the wastewater discharger wants to implement a water recycling project which will result in a reduction of stream flow. In many instances the discharge has been ongoing for many years and downstream wetlands and/or fish and wildlife habitat may have been created based upon these flows. In the case of Adelanto, approximately .565 MGD currently treated at the VVWRA treatment facility will continue to be discharged to the Mojave River via percolation basins and/or live steam discharge. Presently, the VVWRA facility discharges an average of 7.0 MGD of secondary treated effluent to the Mojave River.

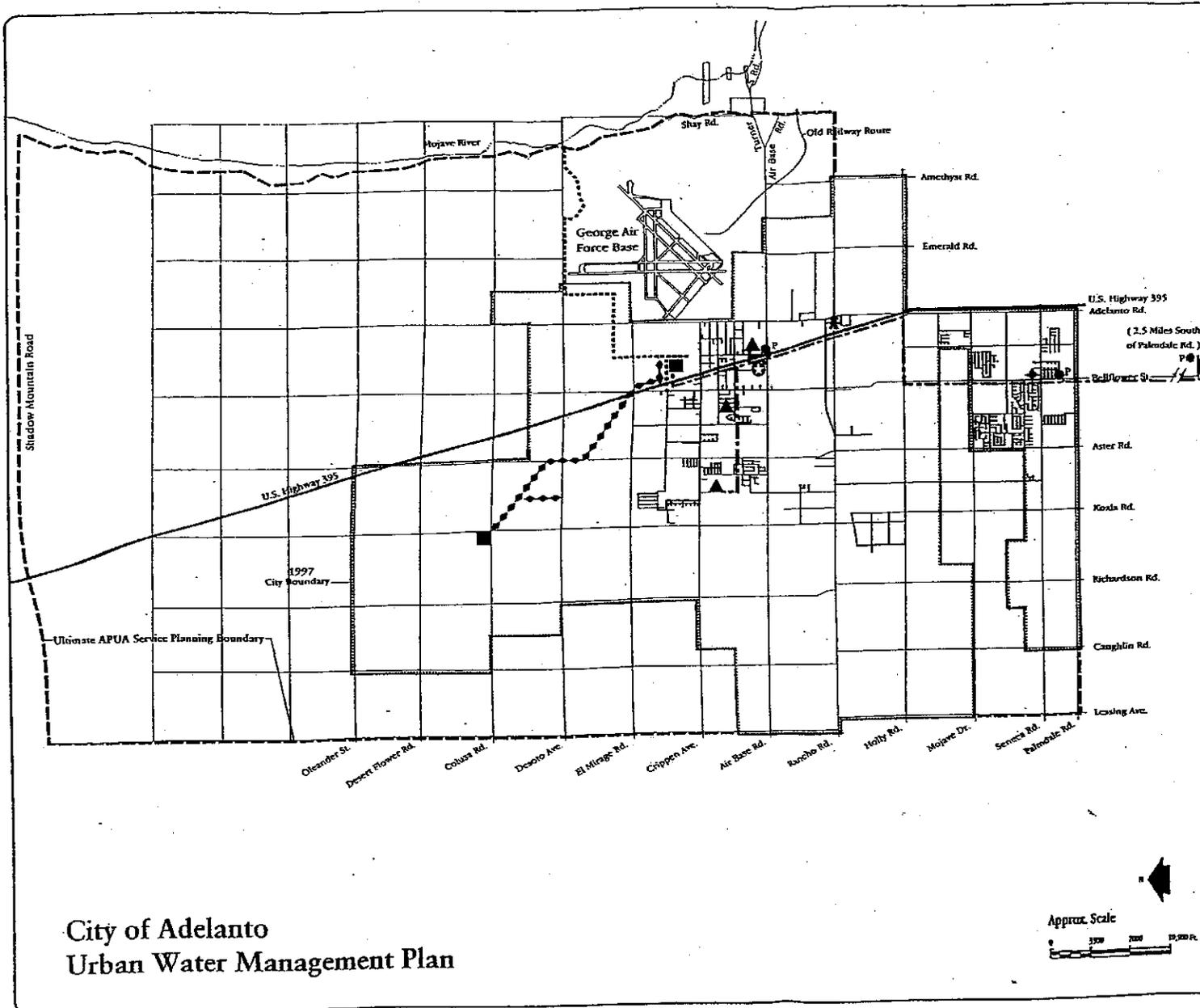
The adjudication of the Mojave River Groundwater Basin placed no restriction on a municipal agency's ability to produce and use reclaimed water even though reclamation could remove water which would otherwise be available to recharge the groundwater basin. The adjudication does, however, require that naturally occurring infiltration from subarea to subarea be maintained. In the case of the Alto Subarea, 21,000 acre feet of non-storm surface flow is required to pass through the Lower Narrows Gauge to the Mesa Subarea annually. Should reclamation occur within the Alto Subarea to such an extent that the 21,000 acre foot requirement is not met, an assessment known as a make-up water chance would be levied on all Alto Subarea producers to compensate producers in the Mesa Subarea.

E. Potential Recycled Water Users

As indicated earlier in this Plan there are no existing recycled water facilities the City of Adelanto, however the City is developing plans to establish such a system in the future. Exhibit VI-1, Reclaimed Water System, represents the initial concept plan for such a system. The initial system is expected to serve potential users including schools, parks, City Hall, and the Maverick Stadium. To serve these and other potential users with reclaimed water within the City would involve construction a very extensive distribution and storage network covering several pressure zones. It is envisioned that the recycled water system could serve the entire area eventually, so system sizing should consider that possibility. Quantification of potential recycled water use is not available at this time but will be developed as part of the master planning efforts for this system.

F. Adelanto Public Utility Authority Treatment Plant

The City of Adelanto's plans for the construction of a new wastewater reclamation facility capable of delivering tertiary treated effluent to Title 22 standards is an important first step in implementing the water recycling project described in this section. Presently Adelanto's .565 MGD of effluent is processed at the VVWRA treatment plant which achieves a secondary level of treatment before discharge to the Mojave River.



Conceptual Recycled Water System Map

- P Pump Station
- Reclaimed Water Force Main
- Water Reclamation Facility
- Adelanto Interceptor Sewer
- Sewer Trunk Main
- ▲ School
- ◆ School / Park
- ⊙ City Hall / Park
- * Stadium / Water Park

Urban Logic Consultants



Exhibit No.: VI-1

Graphics Prepared by Tully Graphics

City of Adelanto
Urban Water Management Plan

