# Antelope Valley

## INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Public Review
Draft
July 2007

Prepared by the
Regional Water Management
Group of the Antelope Valley
Integrated Regional Water
Management Group

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# Antelope Valley Integrated Regional Water Management Plan

*Public Review Draft*

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Prepared for

The Regional Water Management Group of the Antelope Valley Integrated Regional Water Management Plan

K/J Project No. 0689067

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## Compliance with Proposition 50 Required Elements

The AV IRWM Plan meets all the necessary required elements identified in Proposition 50 for an IRWM Plan as shown below.

**QUICK REFERENCE GUIDE**

| Standard | AV IRWM Plan Section/Reference |
|---|---|
| A. Regional Agency or Regional Water Management Group | 1.2.1 |
| B. Region Description | 1.0,2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.8, 3.2, 3.4.1, 3.4.2, 2.6, 2.7 |
| C. Objectives | 4.0; 5.0, 6.0, 7.0, 8.0 |
| D. Water Management Strategies | 5.1.1 |
| E. Integration | 6.1, 6.2, 6.3, Table 6-1, Table 6-2 |
| F. Regional Priorities | 7.3, 8.6.1.1, 8.6.1.2, 8.6.1.3 |
| G. Implementation | 5.0; 7.3; 7.4.1, 7.4.1.1, Table 7-2, 8.2.2, 8.5.1, Appendix F |
| H. Impacts and Benefits | 7.2.1.1, 7.2.1, 7.2.2, 7.2.3, 7.2.4 |
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| J. Data Management | 8.4.1, 8.4.2, 8.4.3, 8.5.2, 8.5.3, 8.4.4 |
| K. Financing | 8.3.3, 8.3.4, Table 8-4, Table 8-5 |
| L. Statewide Priorities | 6.2.2, Table 6-6 |
| M. Relation to Local Planning | 8.1.2, Table 8-2 |
| N. Stakeholder Involvement | 1.2.2, 1.2.4, 1.3.3, 8.2.2, 8.6, 8.6.2, 1.2.4.1,1.2.4.3, |
| O. Coordination | 1.2.2.4, 1.2.2.5, 8.1.1, Table 8-1 |

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# Executive Summary

## Antelope Valley Integrated Regional Water Management Plan Overview

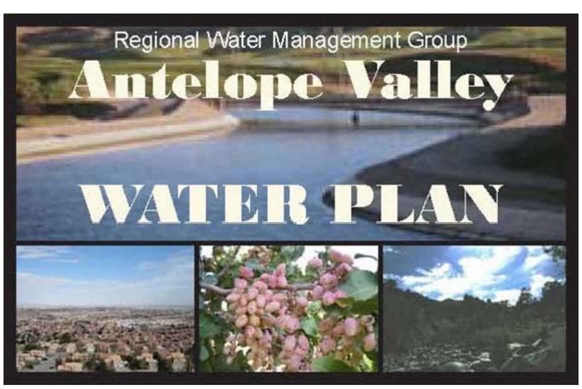
The California Water Plan 2005 update is the basis for all Integrated Regional Water Management (IRWM) planning efforts underway throughout the State, including this IRWM Plan for the Antelope Valley Region. It represents a fundamental transition in how the State looks at water resource management, and how the State government needs to be more involved at a local and regional level with governing agencies and interest groups to better identify and address State-wide water concerns.

The State recognizes that there is a need to consider a broader range of resource management issues, competing water demands, new approaches to ensuring water supply reliability, and new ways of financing.

IRWM planning was derived from Proposition 50 which was passed by California voters in November 2002, authorizing $3.4 billion in general obligation bonds to fund a variety of specified water and wetlands projects. It set aside $380 million for grants related to the implementation of IRWM Plans and is jointly administered by the California Department of Water Resources (DWR) and the State Water Resources Control Board (SWRCB).

Proposition 50 states that IRWM Plans should include a description of the region and participants, regional objectives and priorities, water management strategies, implementation, impacts and benefits, data management, financing, stakeholder involvement, relationship to local planning, and state and federal coordination. This Antelope Valley Integrated Regional Water Management Plan (the AV IRWM Plan) includes a discussion of the specified elements, as summarized below.

## Introduction (Section 1)




Several years ago, leaders and agencies in the Antelope Valley Region recognized the need for regional cooperation and planning. In an effort to represent the broad interests within the Antelope Valley Region, a number of organizations joined to form a Regional Water Management Group (RWMG) to work together and create this IRWM Plan. Members of the RWMG include the Antelope Valley-East Kern Water Agency (AVEK), Antelope Valley State Water Contractors Association (AVSWCA), City of Lancaster, City of Palmdale, Littlerock Creek Irrigation District, Los Angeles County Sanitation District (LACSD) Nos. 14 and 20, Los Angeles

County Waterworks District No. 40 (LACWWD 40), Palmdale Water District (PWD), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD).  These agencies agreed to contribute funds to help develop the AV IRWM Plan, provide and share information, review and comment on drafts, adopt the final AV IRWM Plan, and assist in future grant applications for the priority projects identified in this IRWM Plan.

In January 2007, the RWMG and other community participants (the Stakeholders) set about developing a broadly supported water resource management plan that defines a meaningful course of action to meet the expected demands for water within the entire Antelope Valley Region through 2035.  They chose to create the water resource management plan consistent with the State sponsored Integrated Regional Water Management Program that makes grant funds available to support sound regional water management.  The goals of the AV IRWM Plan are to address:

- How municipal and industrial (M&I) purveyors can reliably provide the quantity and quality of water that will be demanded by a growing population;

- Options to satisfy agricultural users' demand for reliable supplies of reasonable cost irrigation water; and

- Opportunities to protect and enhance the current water resources (including groundwater) and the environmental resources within the Antelope Valley Region.

## Region Description (Section 2)

The Antelope Valley Region of California is home to over 444,000 people living in many different communities. Residents within this Region have experienced tremendous changes over the past generation due to a rapid increase in population coming from nearby large cities.  Current forecasts of population growth suggest even larger changes will occur before 2035.  Water plays a central role in the health and well being of all residents within the Antelope Valley Region. People use water for drinking, bathing, household and outdoor activities, agriculture, business endeavors, recreation, and to sustain and enhance natural habitats.  This common need for water links communities together in many ways.  When anyone uses water, the ability of other people to use water within the Antelope Valley Region can be affected.

The Antelope Valley Region encompasses approximately 2,400 square miles in northern Los Angeles County, southern Kern County, and western San Bernardino County.  Major communities within the Antelope Valley Region include Boron, California City, Edwards Air Force Base, Lancaster, Mojave, Palmdale and Rosamond.  All of the water currently used in the Antelope Valley Region comes from two sources: (1) naturally occurring water within the Antelope Valley Region (surface water and groundwater accumulated from rain and snow that falls in the Antelope Valley and surrounding mountains), and (2) State Water Project water (surface water that is collected in northern California and imported into the Antelope Valley and other areas around the state).

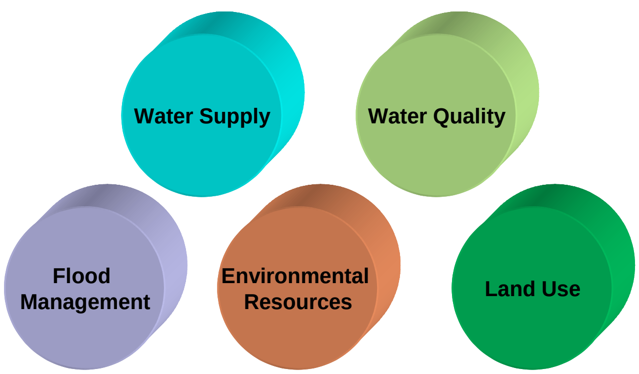
The number of residents within the Antelope Valley Region expanded more than 330 percent between 1970 and 2005, growing from 103,000 people in 1970 to 444,000 people in 2005.

Forecasters expect the population to continue to swell, potentially reaching 1,000,000 residents by the year 2035. As the number of people living and working in the Antelope Valley Region increases, the competition for water supply increases, and the challenge of maintaining good water quality and managing the interconnected water cycle becomes more challenging.

Creation of a proactive, "smart" design for the fast-developing Antelope Valley Region makes this IRWM Plan essential to efficient and effective water management.

## Issues and Needs (Section 3)

Water managers and local planners face many daunting challenges related to supporting the well being of the Antelope Valley Region. Past activities have created problems that need to be addressed and expected increases in population growth make resolving these problems even more difficult. In order to help address the broad challenges, the AV IRWM Plan was organized to address issues and needs in the following categories. Section 3 of the Plan describes these issues and needs in detail.




### *Supplies are Variable and Uncertain*

Determining the amount of water available for use at any given time (now or in the future) is more challenging than one might imagine. The amount of water supply available varies considerably due to changes in weather, rain and snow, and other conditions. All water supplies within the Antelope Valley Region come from two sources: (1) local rain and snow, or (2) imports of water from outside the Antelope Valley Region. The local water supplies come from rainfall and snowmelt that percolate into the groundwater aquifers or are captured in Littlerock Reservoir. Current estimates of water supplies made available from local rainfall and snowmelt vary widely (34,700 to 81,400 acre-feet per year (AFY)[1]). The currently available

[1] An AFY is enough water to cover an acre of land one foot deep and meet the water needs of a family of four for one year.

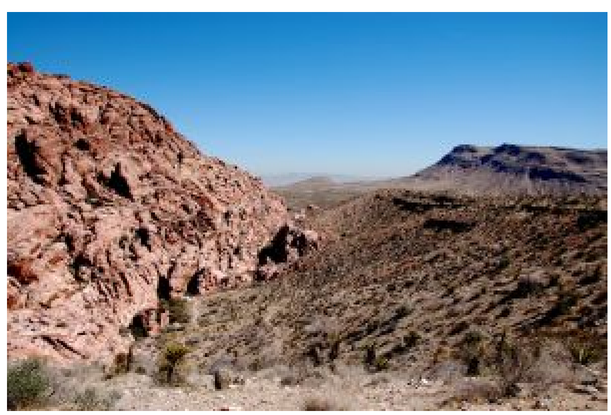
supplies from imported water can also vary widely from year to year (6,400 to 74,300 AFY).

### *Demand is Greater than Supply*

One fundamental challenge in the Antelope Valley Region is that demand for water exceeds available supplies. The demand for water clearly exceeds even the higher estimates of currently available supplies. By 2010 the demand for water in an average year by 2010 will be 269,000 AFY and by 2035 could be 400,000 AFY. Even using the higher estimates of available supply, this means demand could exceed supply by 68,400 AFY in 2010 and by 189,100 AFY in 2035. The expected imbalance between supply and demand in 2035 is about the same as currently available supplies. If communities do not begin conserving water more effectively, the Region will need twice the water as it currently has in order to meet demand in 2035.

Historically, water supplies within the Antelope Valley Region have been used primarily for agriculture; however, due to population growth, water demands from residential and business uses have increased significantly and this trend is expected to continue. The expected continuation of rapid growth in the Antelope Valley Region will affect water demand and increase the threat of water contamination from additional wastewater and urban runoff. More residents will also lead to higher demand for water-based recreation.

Much of the water used within the Antelope Valley Region is extracted from groundwater aquifers. The amount of water pumped within the Antelope Valley Region has varied tremendously since the early 1900's. The United States Geological Survey estimated that groundwater pumping in 1919 was about 29,000 AFY and reached as high as 400,000 AFY in the 1950's. For many of those years, the amount of water being pumped was greater than the amount of water being replenished, creating an imbalance within the groundwater aquifers. Because the amounts pumped were greater than the amounts being replenished, groundwater levels have declined significantly throughout the Antelope Valley Region. The long-term depletion of aquifers cannot be continued indefinitely without serious consequences. The historical declines in groundwater levels within the Antelope Valley Region have caused permanent damage to aquifers in some areas through land subsidence, or sinking.



In order to prevent further damage from declining groundwater levels, many water providers and managers within the Antelope Valley Region recognize the need to balance the water being pumped from the aquifers with the water being put back. In response to this need, a legal process called adjudication is currently underway. If the adjudication process is successful, groundwater users within the Antelope Valley Region will create and abide by a plan to stabilize groundwater levels and prevent further damage that can result from declining groundwater levels. While determining a method to balance groundwater use with the amount of water being replenished is a necessary piece to creating a viable water management strategy within the Antelope Valley Region, the adjudication will do nothing to provide the additional water supplies needed to meet the growing demands within the Antelope Valley Region.

Recognizing the need to identify meaningful actions beyond the adjudication, members of the Group and other community participants agreed to focus on actions beyond the adjudication in the Plan. Participants in developing the AV IRWM Plan encourage a quick and collaborative settlement of the adjudication process, but the contents of the AV IRWM Plan identify and recommend actions that go well beyond the adjudication. The actions identified in the AV IRWM Plan can help meet the larger needs of the Antelope Valley Region but will require a solution from the adjudication to stabilize groundwater levels.

### *Water Quality and Flood Management*

The groundwater basin within the Antelope Valley Region is an undrained, closed basin, meaning there is no outlet for water to flow to the ocean. When water enters a closed basin, any minerals or chemicals in the water typically accumulate in the basin. Currently, groundwater quality is excellent within the principal aquifer but is not as good toward the northern portion of the dry lake areas. Some portions of the basin contain groundwater with high fluoride, boron, and nitrate concentrations. Arsenic is another emerging contaminant of concern in the Antelope Valley Region and has been observed in LACWWD 40, PWD, Boron, and QHWD wells. Research conducted by the LACWWD and the United States Geological Survey has shown the problem to reside primarily in the deep aquifer, and it is not anticipated that the existing arsenic problem will lead to future loss of groundwater as a water supply resource for the Antelope Valley.

Portions of the Antelope Valley Region are also subject to flooding from uncontrolled runoff in the nearby foothills, which can be aggravated by lack of proper drainage facilities and defined flood channels. This runoff can negatively affect the water quality of the underlying groundwater basin, and can create stagnant ponds in places where clay soils beneath the surface do not allow for percolation to occur. The need for regional coordination of flood control efforts becomes more readily apparent as urban development and paved surfaces increase throughout the Antelope Valley Region, along with the frequency of local flood events.

### *Environmental Resources*

The Antelope Valley Region has many unique environmental features, and several plant and animal species are only found in this area. As the pressure for growth expands out into undeveloped or agricultural lands, the need to balance industry and growth against protection of endangered species and sensitive ecosystems requires difficult decisions and trade-offs, each resulting in a variety of unique impacts on water demands and supplies in the Region. The actions identified in the AV IRWM Plan can help to preserve open space and natural habitats in the greater the Antelope Valley Region while maximizing surface water and groundwater management efforts.

### *Water Management and Land Use*

What people do on the land of the Antelope Valley and how they do it directly impacts many aspects of life, including the water cycle, within the Antelope Valley Region. Historically throughout California, land use planning and water use planning have been done almost independently of one another. The challenges identified within the Plan clearly show a need for much closer collaboration between land use planning efforts and water management planning efforts. Continued development within the Antelope Valley Region depends heavily on the successful completion of the objectives presented in the Plan to meet the growing demand for recreational opportunities while minimizing or avoiding the loss of local culture and values.

## Objectives (Section 4)

The Stakeholders worked together to identify clear objectives and planning targets they want to accomplish by implementing the AV IRWM Plan (see Table ES-1). Although the AV IRWM Plan is intended to address the Antelope Valley Region's water resource management needs, this document also identifies several open space, recreation, and habitat targets as well. Refer to Section 4 of the AV IRWM Plan for details on how the objectives and targets were determined.

These objectives and planning targets represent the most important things the Stakeholders have chosen to work together to accomplish over the next several years. Everything done within the context of this IRWM Plan should contribute in some way to achieving these objectives. Also, because the planning targets are measurable, residents within the Antelope Valley Region can monitor how well the Plan is being implemented.

**TABLE ES-1**
**ANTELOPE VALLEY REGION OBJECTIVES AND PLANNING TARGETS**

| Objectives | Planning Targets |
|---|---|
| *Water Supply Management* | |
| Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035. | Reduce (68,400 to 189,100 AFY) mismatch of expected supply and demand in average years by providing new water supply and reducing demand, starting 2009. |
| | Provide adequate reserves (50,700 to 60,500 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009[2]. |
| | Provide adequate reserves (0 to 62,400 AF/ 4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009[3]. |
| Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP water deliveries. | Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer, by June 2010. |
| Stabilize groundwater levels at current conditions. | Manage groundwater levels throughout the basin such that a 10-year moving average of change in observed groundwater levels is greater than or equal to 0, starting January 2010. |
| *Water Quality Management* | |
| Provide drinking water that meets customer expectations. | Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period. |
| Protect aquifer from contamination. | Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period. |
| | Map contaminated sites and monitor contaminant movement, by December 2008. |
| | Identify contaminated portions of aquifer and prevent migration of contaminants, by June 2009. |

[2] Dry year reserves determined by taking the dry year mismatch and adding the average year supplement. Assumes that the average year supplement equals the average year mismatch for any given year. Range determined from the maximum and minimum reserves.

[3] As with single-dry year, multi-dry year reserves determined by summing the 4-year dry year mismatch and adding the 4-year average year supplement. Assumes that the average year supplement equals the average year mismatch for any given year. Range determined from the maximum and minimum reserves.

| Objectives | Planning Targets |
|---|---|
| Protect natural streams and recharge areas from contamination. | Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period. |
| Maximize beneficial use of recycled water. | Increase infrastructure and establish policies to use 33% of recycled water by 2015, 66% by 2025, and 100% by 2035. |
| *Flood Management* | |
| Reduce negative impacts of stormwater, urban runoff, and nuisance water. | Coordinate a regional flood management plan and policy mechanism by the year 2010. |
| *Environmental Resource Management* | |
| Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region. | Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface water and groundwater management by 2015. |
| *Land Use Planning/Management* | |
| Maintain agricultural land use within the Antelope Valley Region. | Preserve 100,000 acres of farmland in rotation[4] through 2035. |
| Meet growing demand for recreational space. | Contribute to local and regional General Planning documents to provide 5,000[5] acres of recreational space by 2035. |
| Improve integrated land use planning to support water management. | Coordinate a regional land use management plan by the year 2010. |

## Water Management Strategies (Section 5)

An overview and description of each of the Proposition 50 Water Management Strategies required to be considered in the AV IRWM Plan is provided in Section 5. These water management strategies include those that are currently utilized by the agencies and organizations in the Antelope Valley Region on an ongoing basis, the strategies now being implemented, and those that are planned for the future.

Additionally, in the AV IRWM Plan, the 20 different water management strategies identified in the IRWM Plan Guidelines (CWC §§ 79562.5 and 79564) were compared with those identified in the California Water Plan and then grouped into the AV IRWM Plan's five regional and broad-based water management strategy areas: water supply management; water quality management; flood management; environmental resource management; and land use management.

[4] The phrase "in-rotation" means that not all 100,000 acres will be in agricultural production at one time rather the land will be rotated in cycles to make most efficient use of the land.

[5] The City of Palmdale and City of Lancaster's General Plans provide a standard of 5 acres of parkland per 1,000 City residents. The Kern County General Plan provides a standard of 2.5 acres per 1,000 residents. The other local and regional General Plans do not provide a standard for "recreation or parkland" preservation. This planning target assumes a 2035 population of 1.0 million residents in the Antelope Valley Region.

To help identify the many potential projects in the Antelope Valley Region and to assess the contribution of these projects towards meeting the AV IRWM Plan objectives and planning targets (as identified in Table ES-1, above), a “Call for Projects” form was sent out to all the Stakeholders to give them the opportunity to submit their project concepts for consideration. The Call for Projects provided an avenue to engage the Stakeholders in the information-sharing aspect of Plan development, and resulted in identification of many projects that provide multiple benefits that span more than one water management strategy.

## IRWM Plan and Projects Integration, Evaluation and Prioritization (Sections 6 and 7)

Many local agencies and other community participants have worked well together to create a Plan that identifies challenging issues and needs being faced by all Antelope Valley residents. Fortunately, this IRWM Plan also identifies actions that can help meet the objectives for the Antelope Valley Region and identifies methods for cooperative implementation of those actions.

Table ES-2 lists the projects and actions that the Stakeholders believe will help meet the Regional objectives. Implementing the high priority actions will require focused effort, broad community support, political resolve, and money. The Stakeholders are actively pursuing financial assistance through several grant programs to help leverage local investments. The RWMG is also working to establish a secure and long-lasting way to coordinate resources to meet the growing needs of the entire Antelope Valley Region.

**TABLE ES-2**
**STAKEHOLDER PRIORITIZED PROJECTS**

<table>
<tr><th>Priority</th><th>Project</th><th>Project Sponsor</th></tr>
<tr><td colspan="3">Water Supply Groundwater Recharge/Banking Infrastructure Projects</td></tr>
<tr><td rowspan="4">High</td><td>Antelope Valley Water Bank</td><td>Western Development and Storage</td></tr>
<tr><td>Aquifer Storage and Recovery Project - Injection Well Development</td><td>LACWWD 40</td></tr>
<tr><td>Upper Amargosa Creek Recharge, Flood Control & Riparian Habitat Restoration Project</td><td>City of Palmdale, AVEK</td></tr>
<tr><td>Water Supply Stabilization Project – Westside</td><td>AVEK /AVSWCA/ LACWWD 40</td></tr>
<tr><td rowspan="3">Medium</td><td>Aquifer Storage and Recovery Project: Additional Storage Capacity</td><td>LACWWD 40</td></tr>
<tr><td>Lower Amargosa Creek Recharge & Flood Control Project</td><td>J. Goit/ City of Palmdale</td></tr>
<tr><td>Water Supply Stabilization Project – Eastside Project</td><td>AVEK</td></tr>
<tr><td colspan="3">Water Infrastructure Projects</td></tr>
<tr><td rowspan="3">High</td><td>Avenue K Transmission Main, Phases I-IV</td><td>LACWWD 40</td></tr>
<tr><td>Littlerock Dam Sediment Removal Project</td><td>PWD</td></tr>
<tr><td>Waste Water Pipeline</td><td>RCSD</td></tr>
</table>

| Priority | Project | Project Sponsor |
|---|---|---|
| Low | Avenue M and 60th Street West Tanks | LACWWD 40 |
| | Place Valves and Turnouts on Reclaimed Water Pipeline | RCSD |
| *Recycled Water Projects* | | |
| High | Antelope Valley Recycled Water Project Phase 2 | LACWWD 40/Palmdale/ LACSD |
| | Groundwater Recharge Using Recycled Water Project | City of Lancaster |
| Medium | Groundwater Recharge – Recycled Water Project | PWD |
| | Kern County and Los Angeles County Interconnection Pipeline | RCSD |
| | Regional Recycled Water Project Phase 3 | LACWWD 40/Palmdale/LACSD |
| | Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H | City of Lancaster |
| Low | Regional Recycled Water Project Phase 4 | LACWWD 40/Palmdale/ LACSD |
| *Water Conservation/Water Use Efficiency* | | |
| High | Comprehensive Water Conservation/Efficient Water Use Program | Antelope Valley Water Conservation Coalition/LACWWD/PWD |
| *Water Quality Projects* | | |
| High | Lancaster Water Reclamation Plan Stage V | LACSD |
| | Palmdale Water Reclamation Plan Existing Effluent Management Sites | LACSD |
| | Palmdale Water Reclamation Plan Stage V | LACSD |
| | Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation | LACWWD 40 |
| Medium | Lancaster Water Reclamation Plan Stage VI | LACSD |
| | Lancaster Water Reclamation Plan Proposed Effluent Management Sites | LACSD |
| | Palmdale Water Reclamation Plan Stage VI | LACSD |
| | Palmdale Water Reclamation Plan Proposed Effluent Management Sites | LACSD |
| | Palmdale Water District New Treatment Plant | PWD |
| Low | 42nd Street East, Sewer Installation | City of Palmdale |

| Priority | Project | Project Sponsor |
|---|---|---|
| *Flood Management Projects* | | |
| High | Development of Coordinated Antelope Valley Flood Control Plan | Cities of Lancaster, Palmdale, Los Angeles Department of Public Works (LADPW), Kern County |
| Medium | Quartz Hill Storm Drain | LADPW |
| | Anaverde Detention Basin, Dam & Spillway at Pelona Vista Park | City of Palmdale |
| | Barrel Springs Detention Basin and Wetlands | City of Palmdale |
| | Hunt Canyon Groundwater Recharge and Flood Control Basin | City of Palmdale |
| Low | 45th Street East Flood Control Basin (Q-East Basin) | City of Palmdale |
| | Avenue Q and 20th Street East Basin (Q-West Basin) | City of Palmdale |
| | Storm water Harvesting | Leona Valley Town Council |
| *Environmental Resource Management Projects* | | |
| High | Ecosystem and Riparian Habitat Restoration of Amargosa Creek; Avenue J to Avenue H | City of Lancaster |
| Medium | Tropico Park Pipeline Project | RCSD |
| *Land Use Management Projects* | | |
| High | Development of a Coordinated Land Use Management Plan | Cities of Lancaster, Palmdale, LADPW, Kern County /Antelope Valley Conservancy |
| | Amargosa Creek Pathways Project | City of Lancaster |

## Framework for Implementation (Section 8)

The AV IRWM Plan is a dynamic document that identifies monitoring guidelines and sets forth procedures for measuring the success, benefits, and impacts of the AV IRWM Plan. An ongoing management process is proposed for evaluating, updating and maintaining the Plan, and a comprehensive implementation framework has been developed to establish and identify a capital improvement program and financial plan for both construction and operation and maintenance of the projects and management actions selected as “high priority” (see Table ES-2, for a list of the high priority projects).

The 11 public agencies that have joined together to create the RWMG have recognized the value of working collectively towards meeting the regional goals identified in this Plan. In order to do this, they have signed a Memorandum of Understanding (MOU) to define what their roles and responsibilities are in developing and moving forward with implementation of the AV IRWM Plan. The decision-making structure of the MOU provides the RWMG with the responsibility to make formal decisions regarding the scope and content of the AV IRWM Plan. However, in moving forward after Plan adoption, the Stakeholders have agreed to establish a different type of legal structure, such as a Joint Powers Authority (JPA), to assist in administration of any potential grant funds and Plan implementation. The benefit of a new legal structure would be the consolidation of common jurisdictional powers, such as establishing and adopting new regional policies or becoming the contracting authority for construction of a high priority project, which the RWMG, as a planning entity, does not presently hold. The RWMG under an MOU can not legally carry out or approve the projects identified in the AV IRWM Plan.

Therefore, implementation of the seven high priority projects is currently the responsibility of the individual lead agency with the jurisdictional authority to approve the project. The Stakeholders and RWMG have chosen these projects because they want to take action on them within the next two years, and they directly address the objectives and targets of better management of resources within the Antelope Valley Region. Furthermore, implementing the projects together yield greater benefits to the Region then if each agency implemented on their own.

The collection, management, distribution and use of data collected as part of this IRWM Planning effort, and through implementation, are essential to making this a sustainable effort that will benefit the Antelope Valley Region for years to come. Data regarding water quantity and quality are currently collected and distributed by a number of different agencies. The Stakeholders have identified strategies in this IRWM Plan to ensure quick identification of data gaps, avoiding duplicative (and costly) studies that result in the same information, and integrating with other important regional, statewide programs, and federal needs.

This IRWM Plan identifies performance measures that will be used to evaluate strategy performance, monitoring systems that will be used to gather actual performance data, and mechanisms to change these strategies if the data collected shows the Antelope Valley Region's IRWM planning targets are not being met. The Stakeholders also recognized that additional technical detail is needed for several of the IRWM Plan's performance measures to be properly implemented and measurable. The Stakeholder group has agreed to continue to refine these performance measures as the AV IRWM Plan is finalized and adopted. In order to develop measures that will realistically provide the Stakeholder group with a mechanism to measure its progress out until the year 2035, the group has decided to commission a Performance Advisory Committee (PAC). The PAC will research, collaborate, and recommend a set of performance measures to the larger Stakeholder group for inclusion into the final AV IRWM Plan.

This IRWM Plan is necessarily a Stakeholder-driven Plan. The RWMG invites the public and interested Stakeholders to become active participants in the Region's ongoing efforts to:

- Identify, evaluate, prioritize, and implement solutions to the Region's complex water management issues, challenges, and conflicts; and
- Continue the development and evolution of this Plan.

# Section 1: Introduction

This Integrated Regional Water Management Plan (IRWM Plan) defines a clear vision and direction for the sustainable management of water resources in the Antelope Valley Region through 2035. This IRWM Plan contains a viable action plan to provide a wide range of crucial water-related services necessary to support the well-being of people living in this unique and vibrant part of Southern California. The IRWM Plan identifies existing key water-related challenges being faced by the residents of the Antelope Valley Region, along with projections of how these challenges will change by 2035. In response to current and expected challenges, this IRWM Plan provides a thorough inventory of possible actions to address the challenges, along with estimated costs and benefits of implementing each action. This IRWM Plan documents an extensive collaborative process that led to the selection of a robust combination of actions that will be implemented cooperatively by the stakeholders in the Antelope Valley Region.

Before efforts began to create this IRWM Plan, individual water purveyors and users were actively studying the effects of recent accelerated development of the Antelope Valley Region and were attempting to identify appropriate actions to address the growing pressure on water services. The recent acceleration of industrial and residential activity stimulated demand for both more water and higher quality water. Attempts by individual agencies to meet the growing challenges were frequently criticized and the atmosphere was one of mistrust with fierce competition among water users for limited water supplies. Water managers and stakeholders in the Antelope Valley Region began to recognize that some of the challenges being faced by residents could not be addressed using a single-agency or single-purpose perspective. They agreed that water resource needs in the Antelope Valley Region are highly interconnected and require a broad and integrated perspective in order to provide efficient and effective services throughout the Antelope Valley Region.

Acknowledging the need for a more comprehensive view, proactive stakeholders (including agencies with an interest in water and other resource management) in the Antelope Valley Region began meeting in May 2006 to improve communication and explore opportunities to leverage their resources. As a result, eleven public agencies formed the Antelope Valley Regional Water Management Group (RWMG) to lead stakeholders' collaborative efforts to resolve a growing number of water management challenges.

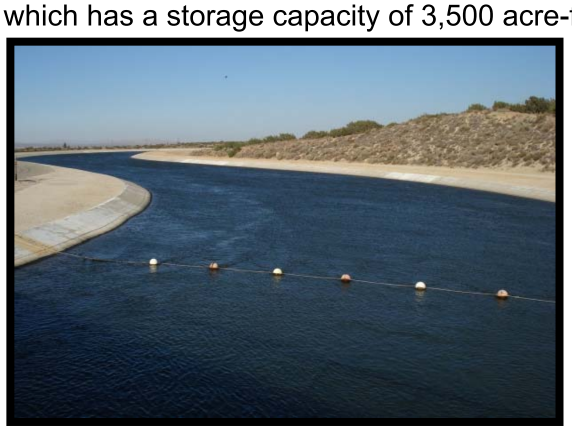
Early in their discussions, the stakeholders decided to develop a plan with a regional focus designed to identify a set of integrated solutions addressing goals for water supply, water quality, habitat improvement, and increased recreational parks and open space. The stakeholders acknowledged that no single funding source will be sufficient to pay for all of the warranted actions. This IRWM Plan addresses how to make wise use of all available funding sources, with an emphasis on improving regional self-sufficiency. This IRWM Plan identifies local and regional funding sources that may also be used to obtain state and federal funds from a variety of sources that require a local cost share.

This IRWM Plan creates opportunities for new partnerships and collaboration as well as documents a collective vision to meet water resource needs and improve the ecological health of the Antelope Valley Region. The quantitative planning targets provide investors the means to measure progress and account for the tangible community benefits. In short, this IRWM Plan describes a specific and financially feasible set of actions necessary to manage the precious water resources within this Antelope Valley Region through 2035 for the benefit of every resident.

## 1.1 Background

The Antelope Valley Region is a triangular-shaped, topographically closed basin bordered on the southwest by the San Gabriel Mountains, on the northwest by the Tehachapi Mountains, and on the east by a series of hills and buttes that generally follow the Los Angeles/San Bernardino County line (Figure 1-1, Antelope Valley IRWM Plan Region). The Antelope Valley Region encompasses approximately 2,400 square miles in northern Los Angeles County, southern Kern County, and western San Bernardino County, and covers the majority of the service area of the Antelope Valley-East Kern Water Agency (AVEK), the largest water wholesaler in the Antelope Valley Region. Major communities within the Antelope Valley Region include Boron, California City, Edwards Air Force Base (AFB), Lancaster, Mojave, Palmdale and Rosamond.

Water supply for the Antelope Valley Region comes from three primary sources: the State Water Project (SWP), surface water stored in the Littlerock Reservoir, and the Antelope Valley Groundwater Basin. The Antelope Valley Region's SWP contractual Table A Amount is approximately 160,000 acre-feet per year (AFY). With proper treatment, SWP water is generally high quality water well-suited for municipal and industrial (M&I) uses; however, the reliability of the SWP water supply is variable. Surface water stored at the Littlerock Reservoir, which has a storage capacity of 3,500 acre-feet (AF), is used directly for agricultural uses and for M&I purposes following treatment.



The Antelope Valley Groundwater Basin is a large basin comprised of a principal aquifer that yields most of the current groundwater supplies, and several less-used deep aquifers. Groundwater levels in some areas have declined significantly since the early 1900s due to over-extraction. Groundwater quality is excellent within most of the principal aquifer but degrades toward the northern portion of the dry lakes areas. High levels of arsenic, fluoride, boron, and nitrates are a problem in some areas of the Basin. The groundwater in the Basin is currently used for both agricultural and M&I uses.

Reclaimed water and stormwater are secondary sources of water supply. A portion of the effluent from the Antelope Valley Region's two large wastewater treatment plants, Los Angeles County Sanitation Districts' (LACSD) plants in Palmdale and Lancaster, are used for maintenance of wetlands, agricultural irrigation, landscape irrigation, and a park impoundment. Stormwater runoff from the Antelope Valley and the surrounding mountains and hills is usually carried by ephemeral streams. Except during the biggest rainfall events of a season, stormwater runoff quickly percolates into the stream bed and recharges the groundwater basin. Any runoff that reaches the dry lakes is generally lost to evaporation. Historically, water supplies within the Antelope Valley Region had been used primarily for agriculture; however, due to population growth beginning in the mid- 1980s, water demands from residential and industrial uses have increased significantly and this trend is expected to continue. Projections indicate that approximately 1 million people will reside in the Antelope Valley Region by the year 2035, nearly 125 percent more than currently live in the Antelope Valley Region.

The expected continuation of rapid growth in the Antelope Valley Region will affect water demand and increase the threat of water contamination from additional wastewater and urban runoff. More residents will also lead to higher demand for water-based recreation. Increasing demands coupled with recent curtailments of SWP deliveries have intensified the competition for available water supplies. This competition has often limited the water available for natural habitat within the Antelope Valley.

Thus, these potential impacts could affect most residents within the Antelope Valley Region. In order to establish a viable action plan that will inspire action, a broad representation of stakeholders throughout the Antelope Valley must be involved in formulating this IRWM Plan.

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**Figure 1-1 Antelope Valley Integrated Regional Water Management Plan Region**

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## 1.2 Stakeholder Participation

An extensive stakeholder outreach process is crucial to ensure that this IRWM Plan reflects the needs of the entire Antelope Valley Region, promotes the formation of partnerships, and encourages coordination with state and federal agencies. One of the benefits of this planning process is that it brings together a broad array of groups into a forum to discuss and better understand shared needs and opportunities. Residents of the Antelope Valley Region are facing rapidly changing conditions that increase the likelihood of serious disruption in water-related services or long-term degradation of water supply or environmental resources. Agencies and planning jurisdictions must work closely together in order to assure the delivery of clean reliable water while maintaining the quality of life in the Antelope Valley Region. If sufficient planning and preventative action is not taken, the consequences for the Antelope Valley Region are likely to be severe.

This IRWM Plan benefited from active participation by a wide range of stakeholders. Members of the RWMG and other stakeholders participated in fifteen stakeholder meetings, reviewed draft document materials, and provided extensive collaborative input to shape this IRWM Plan. For those topics that required further discussion during Plan development, stakeholders engaged in smaller, focused group dialogue to ensure that all stakeholder concerns were being considered while continuing to expedite this IRWM Plan development process. Through participation in stakeholder meetings (at a minimum, monthly, and maximum of three times a month) stakeholders have been exposed to a variety of opportunities for discovering and establishing mutually beneficial partnerships.

### 1.2.1 Regional Water Management Group

As described earlier, agencies in the Antelope Valley Region recognized the need for, and benefits of, regional cooperation and planning. In an effort to adequately represent the Antelope Valley Region, the RWMG was formed through a Memorandum of Understanding (MOU) (Appendix A). By signing the MOU, the agencies agreed to contribute funds to help develop this IRWM Plan, provide and share information, review and comment on drafts of this IRWM Plan, adopt the final IRWM Plan, and assist in future grant applications for the priority projects selected in this IRWM Plan.

The RWMG includes AVEK, Antelope Valley State Water Contractors Association (AVSWCA), City of Lancaster (Lancaster), City of Palmdale (Palmdale), Littlerock Creek Irrigation District (LCID), LACSDs14 and 20, Los Angeles County Waterworks District No. 40 (LACWWD 40), Palmdale Water District (PWD), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD). These participants' roles and responsibilities for managing water, natural resources, and land use within the Antelope Valley Region are discussed below:

#### 1.2.1.1 Antelope Valley-East Kern Water Agency

AVEK is a wholesale supplier of SWP water to the Antelope Valley Region. AVEK's service area encompasses nearly 2,400 square miles in northern Los Angeles and eastern Kern Counties as well as a small portion of Ventura County. AVEK was granted charter by the State in 1959 and became a SWP contractor in 1962.

AVEK is the third largest SWP contracting agency with a current contractual Table A amount of 141,400 AFY. Table A water is a reference to the amount of water listed in "Table A" of the contract between the SWP and the contractors and represents the maximum amount of water a contractor may request each year. This volume includes both agricultural and M&I SWP water, which AVEK distributes to M&I retailers in the Antelope Valley Region. AVEK estimates that it currently provides water to a population of approximately 285,000 persons through seventeen retail water agencies and water companies. Currently AVEK customers utilize approximately 75,000 AFY of its Table A Amount.

AVEK does not have production groundwater wells and does not provide recycled water. AVEK, however, does provide a small amount of SWP water to areas outside of the Antelope Valley. AVEK is also a partner in the Joint Powers Authority (JPA) for the AVSWCA.

#### 1.2.1.2 Antelope Valley State Water Contractors Association

The AVSWCA is a JPA of the three local SWP contractors of the Antelope Valley (AVEK, LCID, and PWD) that was formed in May 1999.

The AVSWCA has a declared Statement of Principals and Objectives to frame its roles and responsibilities:

- to make optimum use of available water supplies to meet current and anticipated demands;
- to confirm that the AVSWCA will not take away any water rights within the Antelope Valley;
- to develop plans for maximum cooperative use of the available water resources;
- to establish an equitable means of apportioning the benefit and burdens of water resource management;
- to prevent the export of native surface water and groundwater from the Antelope Valley and to develop reasonable limitations upon the export of any other water from the Antelope Valley;
- to provide a mechanism for the storage and recovery of water;

- to encourage the protection and preservation of surface water and groundwater quality;
- to develop conservation plans to promote reasonable beneficial use of water;
- to respect existing jurisdictional authority of the public agencies and water suppliers in the Antelope Valley;
- to solicit and welcome the advice, council and support of interested parties and the public in the implementation of these principals and objectives; and
- to conduct regularly scheduled meetings to advance these principles and objectives and discuss other matters of common interest.

In August 2006, the AVSWCA accepted responsibility as the facilitator for groundwater banking projects in the Antelope Valley.

#### 1.2.1.3 City of Lancaster

Lancaster is located at the northern edge of Los Angeles County in the Antelope Valley and borders the northern edge of Palmdale to the south. It is located 60 miles northeast of the Los Angeles Civic Center and is approximately 2,400 feet above sea level. It serves as a commercial, cultural and educational center for the high desert Antelope Valley. Lancaster is suburban in nature and enjoys a temperate year-round climate.

Lancaster is a highly acclaimed, award winning municipality. Lancaster has received seventeen League of California Cities Helen Putnam Awards of excellence and was one of ten cities in the nation to be honored with the City Livability award in 2000. It is the eighth-largest city in Los Angeles County, is also the County's fastest growing city, with a population of approximately 138,000 and an area of 94 square miles.

The Planning Department is responsible for development and implementation of a variety of short-, mid-, and long-range plans, including the City's General Plan, various specific plans, and the City's zoning and subdivision ordinances. The Public Works Department has received National Awards for Economic Development Programs and innovative Public Works projects, and it is responsible for various environmental compliance and conservation projects as well as flood control and stormwater management. The Parks, Recreation and Arts Department manages eleven City parks with more than 500 acres, including athletic fields, swimming pools, playgrounds and walking trails.

Lancaster is a General Law City, incorporated in 1977, and operating under Council-Manager form of government. The City government provides various municipal services related to water and natural resources management. Utility services within Lancaster are provided by several public and private agencies. Water service is primarily provided by LACWWD 40; and sewer service is provided by the LACSD 14.

#### 1.2.1.4 City of Palmdale

Palmdale, the first community within the Antelope Valley to incorporate as a city in 1962, is located in the northeast reaches of Los Angeles County, separated from Los Angeles by the San Gabriel Mountain range. Over the last 20 years, Palmdale has consistently been ranked in the top ten fastest growing cities in the U.S. based on percentage change. As of spring 2005, the population is estimated at 143,000, making Palmdale the sixth largest city in Los Angeles County and the largest "desert city" in California. With 105 square miles of land in its incorporated boundaries, Palmdale is in the top 100 largest cities in the U.S. in geographic area and as of 2005 ranks 150th by population in the U.S.

The Palmdale government provides various municipal services related to water and natural resource management. The Planning Department is responsible for the development and implementation of a variety of short-, mid-, and long-range plans, including the City's General Plan, various specific plans, and the City's zoning and subdivision ordinances. The Public Works Department is responsible for the development and maintenance of the City's flood control and stormwater management facilities. The Parks and Recreation Department's responsibilities include the administration, management and implementation of programs that maintain and beautify Palmdale's parklands and recreational facilities.

Utility services within Palmdale are provided by several public and private agencies. Water service is primarily provided by PWD and LACWWD 40; sewer service is provided by the LACSD 20; and refuse pickup and disposal service is provided by Waste Management, Inc. of the Antelope Valley under a franchise agreement with the City.

#### 1.2.1.5 Littlerock Creek Irrigation District

LCID is the smallest of the three SWP Contractors within the Antelope Valley. LCID's service area comprises approximately 17 square miles within the southeastern region of the Antelope Valley. The majority of LCID consists of unincorporated land east of the City of Palmdale, though a small portion of the city is within LCID's boundaries.

LCID receives raw water from the SWP, local surface water from Littlerock Reservoir and pumps groundwater. LCID's SWP contractual Table A amount is 2,300 AF and provides water to approximately 1,130 active service connections (LAFCO 2004).

LCID is a partner in the JPA for the AVSWCA and also participates in a joint use agreement with PWD for shared use of Littlerock Dam for treated water. LCID's surface water source is from surface runoff collected in Littlerock Reservoir. Littlerock Reservoir, which is co-owned with PWD, is fed by the runoff from the San Gabriel Mountains and has a useable storage capacity of 3,500 AF of water. PWD and LCID jointly have long-standing water rights to 5,500 AFY from Littlerock Creek flows (PWD 2001). LCID has an agreement with PWD to treat LCID's SWP and Littlerock Creek water when it is needed for potable use. LCID has one groundwater well for agriculture, four groundwater wells producing potable water and five one-million gallon tanks to store potable water for residential use (personal communication, LCID, 2005).

#### 1.2.1.6 Los Angeles County Sanitation District Nos. 14 and 20

LACSDs are a confederation of independent special districts serving about 5.1 million people in Los Angeles County. LACSD's service area covers approximately 800 square miles and encompasses 78 cities and unincorporated territory within the County. The agency is made up of 24 separate Sanitation Districts working cooperatively under a Joint Administration Agreement with one administrative staff headquartered near the City of Whittier. Each Sanitation District has a separate Board of Directors consisting of the Mayor of each city within that District and the Chair of the Board of Supervisors for county unincorporated territory. Each Sanitation District pays for its proportionate share of joint administrative costs. The Antelope Valley is served by the LACSD 14 and 20.

LACSD 14 was formed on August 31, 1938, to provide wastewater management services in the Antelope Valley. LACSD 14, whose service area is 45 square miles, serves a large portion of Lancaster as well as portions of Palmdale and adjacent unincorporated areas of Los Angeles County. LACSD 20 was formed on August 7, 1951, to provide wastewater management services for the Palmdale area. Its service area is approximately 31.4 square miles and serves the majority of residents within Palmdale, as well as adjacent unincorporated Los Angeles County areas.

The LACSD owns, operates, and maintains over 1,300 miles of main trunk sewers and 11 wastewater treatment plants with a total permitted capacity of 636.8 million gallons per day (mgd). The LACSD sewerage system currently conveys and treats approximately 510 mgd of wastewater. During 2004, a total of approximately 187 mgd of wastewater was treated to a tertiary level and approximately 35 percent (65 mgd) of the effluent was reused for a variety of applications. Operation of LACSD facilities influence the community and environment in the Antelope Valley by providing effluent to landscape and agricultural irrigation, industrial process water, recreational impoundments, wildlife habitat maintenance, and groundwater replenishment.

#### 1.2.1.7 Los Angeles County Waterworks District No. 40

LACWWD 40 is a public water agency that serves portions of the Cities of Lancaster and Palmdale, and several small communities in the eastern portion of the Antelope Valley. LACWWD 40 was formed in accordance with Division 16 Sections 55000 through 55991 of the State Water Code to supply water for urban use throughout the Antelope Valley. It is governed by the Los Angeles County Board of Supervisors with the Waterworks Division of the County Department of Public Works providing administration, operation and maintenance of LACWWD 40's facilities.

LACWWD 40 provides water service to approximately 162,000 residents through 53,000 service connections, and operates and maintains 46 wells, approximately 923 miles of water mains, 30 booster pumping stations, 59 water storage tanks with 65 million gallons of storage capacity. LACWWD 40's service area encompasses approximately 554 square miles which is comprised of eight regions serving customers in the communities of Lancaster (Region 4), Pearblossom

(Region 24), Littlerock (Region 27), Sun Village (Region 33), Desert View Highlands (Region 34), Northeast Los Angeles County (Region 35), Lake Los Angeles (Region 38), and Rock Creek (Region 39). It is noted that Regions 4 and 34 are integrated and operated as one system. Regions 24, 27, and 33 are also integrated and operated as one system.

LACWWD 40's permanent water supply is from its own groundwater wells. In order to protect this invaluable resource, LACWWD 40 utilizes water from the SWP to meet its customers' demands whenever the SWP supply is available. SWP water is obtained through connections to AVEK's facilities. During 2005, LACWWD 40 supplied 54,421 AF of water to its customers. Approximately 66 percent of the water served in its service area was purchased water from AVEK and the remaining 34 percent was groundwater from its wells.

#### 1.2.1.8 Palmdale Water District

PWD is a wholesaler and retailer of potable water. PWD was established in 1918 as the Palmdale Irrigation District (PID). The name was changed in 1973 to reflect the absence of agricultural water service. As stated above, PWD is also a partner in the JPA for the AVSWCA. PWD boundaries encompass approximately 187 square miles. Approximately 35 square miles are directly served by PWD and an additional two square miles are served through agreements with AVEK (the majority of the remaining area falls within the Angeles National Forest).

PWD has three sources for water: (1) imported water from SWP, of which it has a contractual Table A amount of 21,300 AFY, (2) local groundwater, and (3) surface water (Littlerock Reservoir, which is jointly owned by LCID, and PWD). Littlerock Reservoir has a storage capacity of 3,500 AF of water. Palmdale Lake stores the SWP water and any Littlerock Reservoir discharges until treatment and distribution. Groundwater wells produce approximately 40 percent of PWD's water supply. Recycled water is projected for use within the PWD service area in the future.

In general, PWD serves the eastern half of the City of Palmdale and adjacent unincorporated areas of Los Angeles County, and maintains over 26,000 service connections.

#### 1.2.1.9 Quartz Hill Water District

QHWD is an independent special district that was incorporated in 1955, with a service area of about 4.5 square miles located in the southwest end of the Antelope Valley at the north end of Los Angeles County.

QHWD's service area includes portions of both Cities of Lancaster and Palmdale as well as unincorporated County land between the two. Water service is provided to residential, commercial, industrial, and agricultural customers, as well as for environmental and fire protection uses.

QHWD is a retailer of imported water from AVEK and produces local groundwater. In 2004, QHWD imported approximately 4,099 AF of water from AVEK, and pumped approximately 1,348 AF of groundwater for distribution in its service area.

#### 1.2.1.10 Rosamond Community Services District

RCSD was formed in 1966 under the Community Services District Law, Division 3, Section 61000 of Title 6 of the Government code of the State of California. RCSD's service area boundary encompasses approximately 31 square miles of unincorporated residential, industrial, and undeveloped land. The majority of the land located within the RCSD's service area is undeveloped. The developed property focuses around central Rosamond, with the exception of the Tropico Hills.

RCSD provides water, sewer, lighting service, and public park maintenance services to residential, commercial, industrial, and agricultural customers, as well as water for environmental and fire protection uses.

RCSD is a retailer of imported water from AVEK and produces local groundwater. In 2004, RCSD imported approximately 1,191 AF of water from AVEK, and pumped approximately 1,990 AF of groundwater for distribution in its service area.

The composition of the RWMG provides a good cross-sectional representation of all water/natural resource and land-use management activities for the Antelope Valley Region. Table 1-1 provides a summary of participating agencies' roles and responsibilities specific to this IRWM Plan development and implementation.

**TABLE 1-1**
**PARTICIPATING ENTITIES**

| Agency | Roles and Responsibility |
|---|---|
| AVEK | Wholesaler of imported water to the Antelope Valley Region |
| AVSWCA | Members provide imported water to Antelope Valley |
| City of Lancaster | Provides land-use planning, environmental, flood management, and parks and recreation services |
| City of Palmdale | Provides land-use planning, environmental, flood management, and parks and recreation services |
| LCID | Supplies surface and imported water to the Antelope Valley Region |
| LACSD 14 | Provides collection and treatment of wastewater and supplies recycled water to portions of the Antelope Valley Region |
| LACSD 20 | Provides collection and treatment of wastewater and supplies recycled water to portions of the Antelope Valley Region |
| LACWWD 40 | Supplies water to portions of Los Angeles County |
| PWD | Supplies water to portions of Palmdale and adjacent unincorporated areas of Los Angeles County |
| QHWD | Supplies water to portions of the southwest end of Antelope Valley |
| RCSD | Supplies water to portions of unincorporated Kern County |

### 1.2.2 Planning Group ("Stakeholders")

In addition to the RWMG, this IRWM Plan has had the input of many other interested agencies and organizations. Membership in the stakeholder group was broadly extended to a number of entities and membership continues to grow. Neither a financial contribution nor agency status were required to be part of the collaborative IRWM Plan development process. Through extensive outreach efforts, individuals from disadvantaged, small, and rural communities as well as other interested groups are continually encouraged to participate, and are being informed of IRWM Plan development efforts through presentations, media relations, and information disseminated in their communities.

In an effort to reduce existing conflicts in the Antelope Valley Region, many of which have traditionally been experienced in areas that include both large and small communities, urban, rural, and agricultural interests, and no mechanism for joint planning and prioritization, this IRWM Plan has been prepared through a collaborative process of many agencies and organizations with an interest in improving water supply reliability and sufficiency, water quality, water conservation, flood control, natural habitat, and land-use planning in the Antelope Valley Region. This subsection lists all current stakeholders grouped into several categories and describes their roles in the planning process. The broad array of participants include the agencies that comprise the RWMG as well as an extensive mix of other cities and regulatory, environmental, industrial, agricultural, and land-use planning agencies that represent all areas of the Antelope Valley Region. A brief discussion of coordination efforts with local planning, State, and Federal agencies is also provided where appropriate.

Planning group meetings were held, at a minimum, monthly, to allow for discussion of issues facing the Antelope Valley Region. These meetings were open to the public and all other interested parties. Copies of the meeting minutes and presentations from these meetings are available on the project website (www.avwaterplan.org).

#### 1.2.2.1 State Water Project Contractors

The State Water Project Contractors include agencies that provide distribution of SWP water to the Antelope Valley. Each of these agencies is a member of the RWMG and was described in Section 1.2.1. These agencies include AVSWCA, AVEK, LCID, and PWD.

#### 1.2.2.2 Retail Water Purveyors

The retail water purveyors include agencies that have water management responsibilities in the Antelope Valley Region. Each of these agencies is a member of the RWMG and was described in Section 1.2.1. These agencies include LACWWD 40, QHWD, and RCSD.

#### 1.2.2.3 Local Jurisdictions/Land-Use Planning Agencies

Several land-use planning departments and agencies have been involved in the development and implementation of the projects and objectives of this IRWM Plan. Their participation provides a link between local planning agencies and this IRWM Plan by offering input in meetings, providing accurate and consistent land-use planning information, and incorporating local planning documents and goals into the IRWM Plan objectives. In addition, representatives of the Cities of Palmdale, Lancaster, California City, and Boron, and the Los Angeles and Kern County Departments of Regional Planning, participate in the meetings.

#### 1.2.2.4 Federal Agencies

Several federal agencies have been involved in the development and implementation of the objectives and projects for the IRWM Plan. Coordination with federal regulatory agencies is essential to the development and implementation of all recommended projects due to the need for regulatory and environmental approval prior to implementation. The federal agencies involved include: the United States Department of Agriculture, Natural Resources Conservation District, United States Geological Survey, and Edwards AFB. The role of Edwards AFB is to ensure that their natural resource management goals are incorporated into this IRWM Plan.

#### 1.2.2.5 Regulatory Agencies/State Agencies

Several state regulatory agencies have been involved in the development and implementation of the objectives and projects for this IRWM Plan. Their participation has focused particularly on water quality issues pertaining to groundwater recharge within the Antelope Valley Region. Coordination with state regulatory agencies is essential to the development and implementation of all recommended projects due to the need for regulatory and environmental approval prior to implementation. The Lahontan Regional Water Quality Control Board (RWQCB) has participated in preparing this IRWM Plan, and coordination regarding projects within this IRWM Plan has already begun. Furthermore, these agencies have had the chance to address items of concern on these projects at the monthly stakeholder meetings. The roles and responsibilities of these agencies are to ensure that regulatory compliance standards and goals are incorporated in this IRWM Plan. The agencies include: the Lahontan RWQCB, the California Department of Health Services, the California State Parks, and the California State Department of Fish and Game.

#### 1.2.2.6 Environmental Community

The role and responsibility of the environmental community is to ensure that goals for conservation and protection of the natural resources and habitat within the Antelope Valley are incorporated in this IRWM Plan. The environmental communities involved include the Antelope Valley Conservancy, the Antelope Valley Water Conservation Coalition, Antelope Valley Resource Conservation District and the Sierra Club.

#### 1.2.2.7 Building Industry

The Building Industry Association's role is to ensure land-use planning and growth management within the Antelope Valley is incorporated in this IRWM Plan. The building industry entities involved include two chapters of the Building Industry Association, the Antelope Valley Chapter and the Kern County Chapter.

#### 1.2.2.8 Agricultural/Farm Industry

Agricultural and Farm interests for the Antelope Valley Region have been represented by the Los Angeles County and Kern County Farm Bureaus as well as individual farm and land owners. Their role is to ensure that agricultural and farm interests are incorporated in this IRWM Plan.

#### 1.2.2.9 Wastewater Agency

Wastewater service for the Antelope Valley is provided by the LACSDs 14 and 20. The LACSD is a member of the RWMG and its roles and responsibilities are described in Section 1.2.1.

#### 1.2.2.10 Mutual Water Companies

There are several mutual water companies in the Antelope Valley that provide water-related services to the Antelope Valley Region. Their role is to ensure that their water management goals are incorporated in to this IRWM Plan. Mutual water companies involved include: Antelope Park Mutual Water Company, Edgemont Acres Mutual Water Company, El Dorado Mutual Water Company, Evergreen Mutual Water Company, Golden Valley Mutual Water, Land Projects Mutual Water, Little Baldy Water Company, Palm Ranch Irrigation District, Westside Park Mutual Water Company, and White Fence Farms Mutual Water Company.

#### 1.2.2.11 Media

Representatives of the Antelope Valley Press and the Mojave Desert News regularly attended RWMG stakeholder meetings and informed their readership of the goals and objectives of this IRWM Plan. Progress was regularly reported on in these two major area newspapers as well as other local papers.

#### 1.2.2.12 Others

Other agencies involved in the planning process include the Boron Community Services District, the Mojave Chamber of Commerce, California City Economic Development Commission, the Association of Rural Town Councils, and individual town councils throughout the Antelope Valley Region. The various town councils' roles are to ensure that their water, natural resource, fire suppression, flood control, and land-use planning goals are incorporated in this IRWM Plan. Inclusion and participation by these organizations marks a first for the area and ensures that the resulting IRWM Plan is truly regional. A copy of a sign-in sheet from one of the many Stakeholder meetings can be found in Appendix B.

### 1.2.3 Activities

This IRWM Plan was developed to evaluate and address regional issues while recognizing and honoring local conditions and preferences. In order to accomplish this delicate balance, an effective process to involve stakeholders and incorporate their input was necessary. The process centered on, at a minimum, monthly stakeholder meetings open to the public where attendees were invited to participate in several ways. Attendees were asked to participate in facilitated discussions of major items of interest, to review draft plan chapters, and to provide input on the agenda for upcoming stakeholder meetings. These meetings were announced to a broad distribution list via e-mail and all materials developed for use in stakeholder meetings were made available on the project website. The methods for stakeholder involvement and input are described below:

- Review of Plan Sections: This IRWM Plan synthesizes and extends a significant body of work related to water supply, water quality, and open space for the Antelope Valley Region. This information was synthesized and generated incrementally and provided to all interested stakeholders periodically for review. Given the incremental development and review cycle, stakeholders had multiple opportunities to provide input and the material was adopted only after the stakeholders reached facilitated broad agreement on the material. The subjects of the chapters include: introduction, Region description, key issues and needs, Plan objectives, water management strategy development, water management strategy integration, water management strategy prioritization and selection, and framework for implementation. These chapters incorporate and integrate stakeholder-generated information and aggregate this information across the entire Antelope Valley Region. In addition, a summary of existing plans, reports, studies, and interviews with selected stakeholders to obtain the individual perspective of those entities have been compiled for reference.

- Monthly Stakeholder Meetings: These meetings provide background on the planning process; identify issues, opportunities and constraints; consider opportunities for project integration, and identify comments on the chapters and draft plans. They also provide a forum for more detailed discussion of the issues related to development of this IRWM Plan, including the prioritization and selection of projects for Round 2 of Proposition 50, Chapter 8, Proposition 84, and Proposition 1E.

- Project Website: A project website was developed (www.avwaterplan.org) to facilitate the distribution of project information to stakeholders. The website contains background information about Plan development, a schedule of meetings, and contact information. The website also includes a database tool through which stakeholders could submit or review projects or project concepts. Since the project website was created in November 2006, it has received over 5,810 hits. A print out of the home page is included in Appendix C.

- Electronic and Written and Communications: Electronic mail was the main tool used to maintain a high level of stakeholder communication and engagement. All meetings and public hearing announcements were sent as far in advance as possible to stakeholders. Various stakeholder groups also forwarded these messages to their constituencies, thereby reaching additional stakeholders. In addition, written communications in the form of letters to cities and press releases to the media were utilized to expand awareness of, and participation in, this IRWM Plan development. Regular attendance at stakeholder meetings by members of the local press also went a long way toward keeping the residents of the Antelope Valley Region informed. Sample letters are provided in Appendix C.

### 1.2.4 Community Outreach

Community outreach within the Antelope Valley Region is a key component to a successful IRWM Plan. Simply stated, a regional plan should have regional input, and would incorporate the widest variety of stakeholders possible. Initial outreach efforts began in the early stages of the planning process and were targeted at improving overall stakeholder participation through increased agency and organized committee involvement. However, it soon became clear that this method of solicitation was not as effective with many of the smaller communities in the Antelope Valley with valuable input were not being represented at the general group meetings. Therefore, outreach efforts were accelerated in January of 2007 to broaden the scope to improve outreach to smaller communities in the region through the formation of the Public Outreach Subcommittee (Subcommittee).

The Subcommittee was composed of volunteer members representing a diverse cross section of the active Antelope Valley IRWM Plan stakeholders including cities, a farming entity, a local town council member, and wastewater and water agencies. The members soon developed and implemented a multifaceted outreach campaign to support the IRWM Plan that would more actively address the general public through improved media relations with the local press, increased information accessibility at the www.avwaterplan.org website, and more focused community outreach. The outreach strategy outlined subcommittee objectives, key messages, and tasks needed to reach the objectives. Overall, the two main goals of the Subcommittee were to:

- Encourage participation and solicit input into AV IRWM Plan development, and
- Educate target audiences about the purpose and benefits of the AV IRWM Plan

The varied background and knowledge and overall enthusiasm of the Subcommittee members proved very helpful in determining the most effective way to reach more Antelope Valley communities. As multiple tactics were discussed, a decision was made for Subcommittee members to begin outreach through the Antelope Valley Association of Rural Town Councils (Association) community meeting to obtain input from local leaders on the most effective ways to reach their residents. Members collectively prepared PowerPoint presentation materials that would introduce the collaborative IRWM Plan concept and its importance to the Antelope Valley while soliciting feedback about community outreach methods and project ideas that could be incorporated into the AV IRWM Plan. The Association unanimously advised the Subcommittee that the IRWM Plan presentation should be given at each of the individual Town Council meetings to reach the largest audience. The response was so positive that a couple town council meetings were scheduled immediately following the conclusion of the presentation.

With the newly-acquired information from the Association, the Subcommittee obtained a complete roster of the active rural town councils in the Antelope Valley from the Los Angeles County Board of Supervisor's Office and began an intense coordination effort to speak at the community meetings. At least two Subcommittee members volunteered to present at each outreach meeting scheduled. This allowed for a diversity of presenters to attend each meeting as well as demonstrated the united efforts being developed through participation in the IRWM Plan. In addition to the PowerPoint presentation, handouts were provided at each meeting that included detailed meeting schedules, project eligibility criteria, AV IRWM Plan goals, plan objectives, and technical assistance listings with contact information. Based upon community feedback, these materials were distributed to every attendee at each meeting in hardcopy and electronic formats and created in both English and Spanish. As meetings progressed, outreach materials continuously evolved to reflect the new information received. Table 1-2 contains a list of the community outreach meetings scheduled with the town councils.

**TABLE 1-2**
**COMMUNITY OUTREACH MEETINGS**

| Meeting/Event | Presenters | Meeting Date | Attendance |
|---|---|---|---|
| Hispanic Chamber of Commerce, Palmdale[(a)] | TBD | TBD | TBP |
| Division High School, Lancaster[(a)] | TBD | TBD | TBP |
| Association of Rural Town Councils[(a)] | LACWWD 40 | April 26, 2007 | 14 |
| Three Points Town Council | LACWWD 40 | May 12, 2007 | 13 |
| Antelope Acres Town Council | LACWWD/RCSD | May 16, 2007 | 16 |
| Lake Los Angeles Town Council[(a)] | LACSD | May 22, 2007 | 17 |
| Roosevelt Town Council[(a)] | City of Lancaster /LACWWD | May 29, 2007 | 19 |
| The Lakes Town Council | Leona Valley/PWD | June 2, 2007 | 80+ |
| Leona Valley Town Council | LACSD | June 11, 2007 | TBP |
| Juneteenth Festival - Sun Village | LACWWD 40/PWD | June 16, 17, 2007 | TBP |
| California City Economic Development Corporation | City of Lancaster/RCSD | June 21, 2007 | 35 |
| Boron Community Services District | LACWWD 40/RCSD | June 21, 2007 | TBP |
| Sun Village & Littlerock Town Councils[(a)] | LACWWD 40/AV Resources Conservation District/Kennedy Jenks | June 25, 2007 | 20 |
| Mojave Chamber of Commerce[(a)] | LACWWD 40/RCSD | June 28, 2007 | 25 |
| Littlerock Town Council[(a)] | LACWWD 40/PWD | July 12,2007 | 40 |
| Southern AV Community Draft Plan Review | Multiple | July 10, 2007 | 30 |
| Northern AV Community Draft Plan Review | Multiple | July 17, 2007 | TBP |
| Juniper Hills Town Council | LACSD | August 1, 2007 | TBP |
| TBD- to be determined, TBP –to be provided | | | |

Note: (a) DAC or DAC leaders present

While additional presentation materials were generated for more effective town council meetings, members also began analyzing census data, interviewing additional community organizations, and consulting with state representatives to better identify disadvantaged communities (DACs), environmental justice problems, underrepresented, and rural populations within the region.

Initial Research and Feedback

The following subsection outlines multiple areas of research utilized and information gathered about the Antelope Valley Region the subcommittee gathered to tailor outreach efforts that would more effectively spread the word about the AV IRWM Plan and provide the best assistance to each community. As a part of this research phase, Subcommittee members proactively solicited advice and input from the Department of Water Resources (DWR), the Lahontan RWQCB, and the Environmental Justice Coalition for Water (EJCW).

Census Data and Community Categorization

Through outreach and data gathering, the subcommittee categorized the smaller, rural communities into three categories: disadvantaged, isolated, and underrepresented.

*Disadvantaged Communities*

As defined by Proposition 50, Chapter 8, DACs are defined as having an annual median household income (MHI) that is less than 80 percent of the statewide annual median household income, which is $37,994 using Census 2000 data. To begin identifying disadvantaged areas in the Antelope Valley Region, subcommittee members conducted an initial assessment of the Antelope Valley Region using 2000 Census data. In order to provide the most accurate determination of the DACs in the Antelope Valley Region, MHI was compared at the census tract level. The analysis showed that approximately 20 census tracts within the Region have an MHI less than 80 percent of the statewide MHI. This equates to approximately 20 percent of the Antelope Valley Region's population. Census block information, which is more detailed than census tract level information, was further refined through the creation of a map with residential household areas. This allowed members to compare census tract and residential information to more-accurately pinpoint specific communities within the census blocks that were disadvantaged, as census blocks tend to cover large areas with very few residents. By identifying the actual residential areas within the blocks, subcommittee members could then effectively locate the organizations that would ensure communication with DAC community members. (See Figure 1-2) Using these methods, the following DACs and their critical water related needs were identified in the Antelope Valley Region:

Lake Los Angeles, Unincorporated Los Angeles County

- Interest in restoring Lake Los Angeles - could create reservoir for farming, fire usage, recreation, tourism/commercial, possible groundwater recharge site, possible use of recycled water.
- Provide flood control at Big Rock Creek Wash - heavy rains cause flooding along local roads.
- Transition from septic systems to sewer - they have some sewer lines installed but have not been used.

Littlerock, Unincorporated Los Angeles County

- Would like to see the creation and enforcement of zero-scaping ordinances designed for their community.
- Interested in opportunities for water recharge, banking, and conservation – although no specific examples were cited at the time.
- Concern about growth of communities vs. water reliability for the region.

Mojave, Unincorporated Kern County

- Water conservation concerns. Specifically, the Mojave School District is interested in constructing two new high schools in a water-efficient manner. The Outreach Subcommittee put the School District in contact with Mojave Utilities District and EJCW representative, Cindy Wise.

Portions of the City of Lancaster

- Critical water-related needs to be determined at scheduled community meetings.

Portions of the City of Palmdale (Desert View Highlands)

- Critical water-related needs to be determined at scheduled community meetings.

Roosevelt, Unincorporated Los Angeles County

- Primarily concerned with protecting their wells, protecting agricultural water rights, and preventing LACSD from "wasting water" on "new farms." An LACSD Outreach Subcommittee member followed up directly with community member concerns about the current and future LACSD water usage in their area.

Refer to Appendix C of the IRWM Plan for larger DAC Census Block and Residential Area Maps and Census data printouts.

*Underrepresented Communities*

A subset of disadvantaged communities are underrepresented communities. These communities are composed of minority communities living within disadvantaged communities. There are two areas within the Antelope Valley Region that were identified to meet this criterion, and they are both contained within the Cities of Lancaster and Palmdale. These cities are working to identify the exact community locations to receive public outreach, and additionally, the Hispanic Chamber of Commerce has been contacted in an effort to reach underrepresented minorities in these cities.

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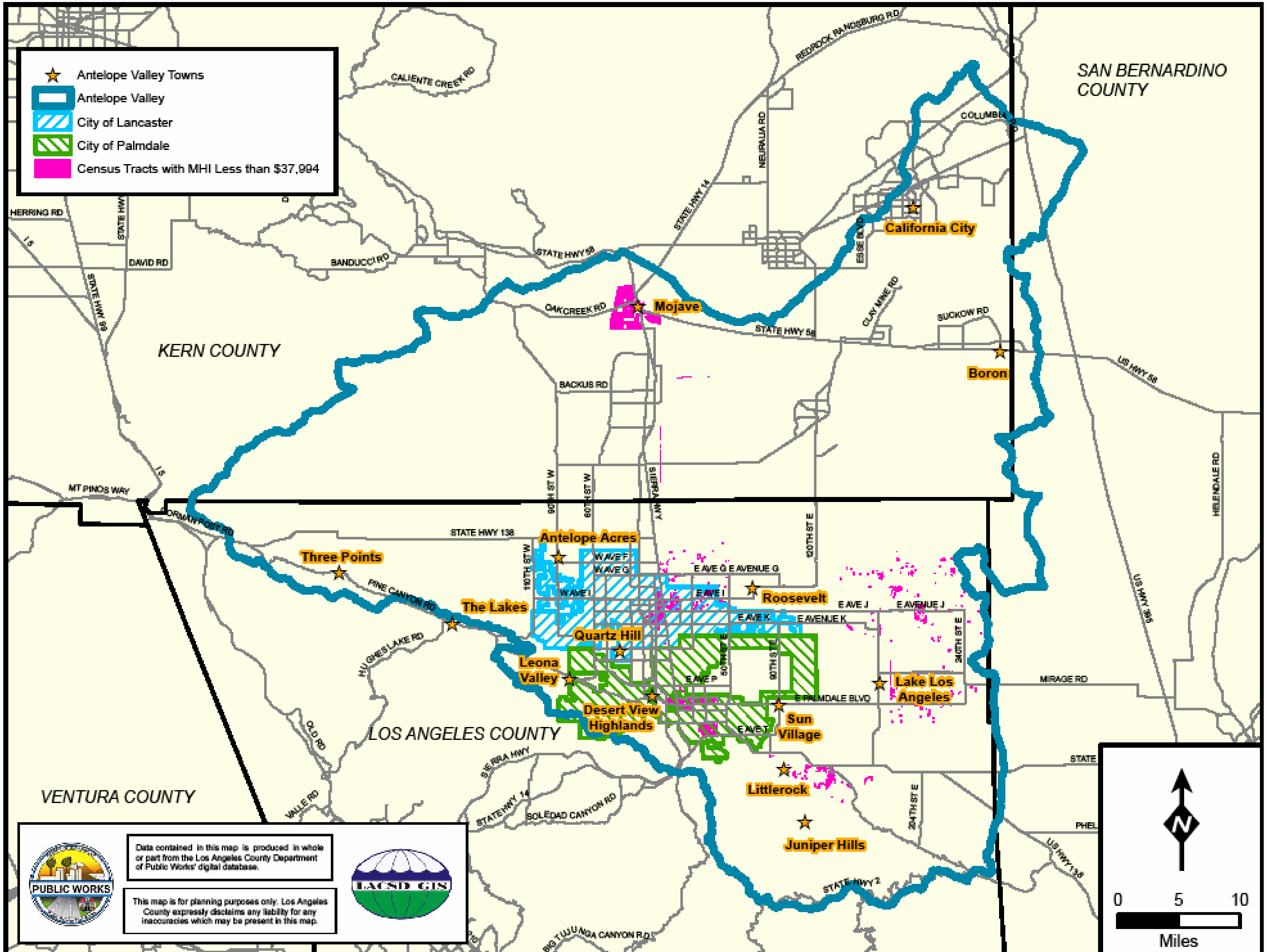


**Figure 1-2 Antelope Valley Disadvantaged Communities**

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*Rural/Isolated Communities*

Many communities that do not face the economic constraints of disadvantaged communities must deal with obstacles due to limited resources and geographic location. Many smaller, rural communities in the Antelope Valley Region are isolated, both politically and physically, from the agency and organizational happenings in the Antelope Valley Region, and the subcommittee agreed that these communities would also be incorporated into our IRWM Plan outreach efforts as a result of this isolation.

Native American Tribal Identification

Research and outreach efforts were also made to identify and contact local Native American tribal communities through contacts with other Antelope Valley community groups and research. Although no organized tribes were identified through this outreach process, an invitation was extended to those Native Americans who had expressed interest in water management planning activities in the area. Some Native American individuals within the Antelope Valley Region were reached but reported that their lineage groups were not land holders and, therefore, not recognized as tribes or nations.

The Antelope Valley Indian Museum further reports that during the late 19th and early 20th centuries, most American Indian residents remaining in the Antelope Valley integrated with the ever-expanding European culture in Southern California, and the binding group ties of earlier times began to be erode the cultural base. As such, there are no formal reservations or rancherias in the Antelope Valley.

#### 1.2.4.1 Disadvantaged Community Outreach

This section discusses how DACs were engaged for this IRWM Plan and demonstrates how the planning process can provide benefits to their communities. As mentioned, DACs were identified as key target audiences identified in the outreach efforts. During the data-gathering process, work continued to identify disadvantaged communities and to ensure that their issues and needs in terms of water and environmental resources were included in this IRWM Plan. Presentations and outreach focused on soliciting input and participation. The subcommittee emphasized that within the IRWM Plan, project ideas are evaluated based on their merits and not on the size or relative power of the project proponent. For example, within the IRWM Plan there are examples of smaller projects that had already been judged as high priority by the Stakeholder Group whose project proponents were small, traditionally underserved communities.

The DAC outreach strategy and action steps took advantage of existing efforts and relationships, worked directly with community leaders and RWMG members, and gathered and used input from all stakeholders. The members provided technical assistance and other resources, as well as encouraged participation from the smaller, disadvantaged communities in the Stakeholder Group.

The outreach subcommittee proceeded to contact community groups within the identified DACs to schedule outreach meetings. Contacts were made with the Mojave Chamber of Commerce, Mojave School District, and Mojave Utilities District based on information received from the Mojave Desert News reporter who covered the Stakeholder Group meetings. Subcommittee members representing the Cities of Palmdale and Lancaster assisted in arranging community meetings to present this IRWM Plan and gathered information from residents in the identified DAC areas of their respective cities. Town Council meetings in Lake Los Angeles, Littlerock, and Roosevelt were held in order to reach the DACs living in those areas.

One of the main topics of concern that initially surfaced for the region occurred at the Association of Rural Town Council meeting: the pending, controversial groundwater adjudication in the Antelope Valley. They expressed the feeling of being excluded from most planning efforts that they felt were dominated by large jurisdictions and agencies. This concern, although a separate issue from the IRWM Plan, is undoubtedly connected to the water issues for the region, and subcommittee members found the need to open the floor for discussion about this important concern. As a result of the tensions surrounding the legal adjudication, communities were asked if they would prefer to talk about the groundwater adjudication issues upfront before presentations were given. All communities indicated that initial discussion of groundwater adjudication issues would be useful and desirable. This approach helped to clarify the relationship between the adjudication and the IRWM Plan and to alleviate potential tensions due to the sensitivity of the topic. During the meetings, we emphasized that the IRWM Plan has provided a new way of working together in the region despite traditional barriers or ongoing disputes.

Concurrent with identification of underrepresented DAC areas, subcommittee members provided all meeting materials in printed and electronic formats and also prepared all materials in English and Spanish for distribution. Meeting materials included PowerPoint presentation, a listing of RWMG general stakeholder meetings, a list of technical resources, IRWM Plan goals and objectives, and a list of proposed project ideas.

Additionally, the governance structure of the IRWM Plan will be designed to encourage regional participation, to accept project proposals on an ongoing basis, and to continue to reach out to DACs and provide technical assistance to those who need it. Representation from DACs in the stakeholder group will be beneficial in implementing the Plan in a fair and balanced way.

#### 1.2.4.2 Rural Community Outreach

Outreach efforts were not limited to DACs, rather they extended to all communities in the Region to include taking the IRWM Plan message to traditionally-isolated and more rural areas of the Antelope Valley to include the following communities (see Figure 1-3):

- Antelope Acres
- Boron
- Juniper Hills
- Leona Valley
- Sun Village
- The Lakes Community
- Three Points

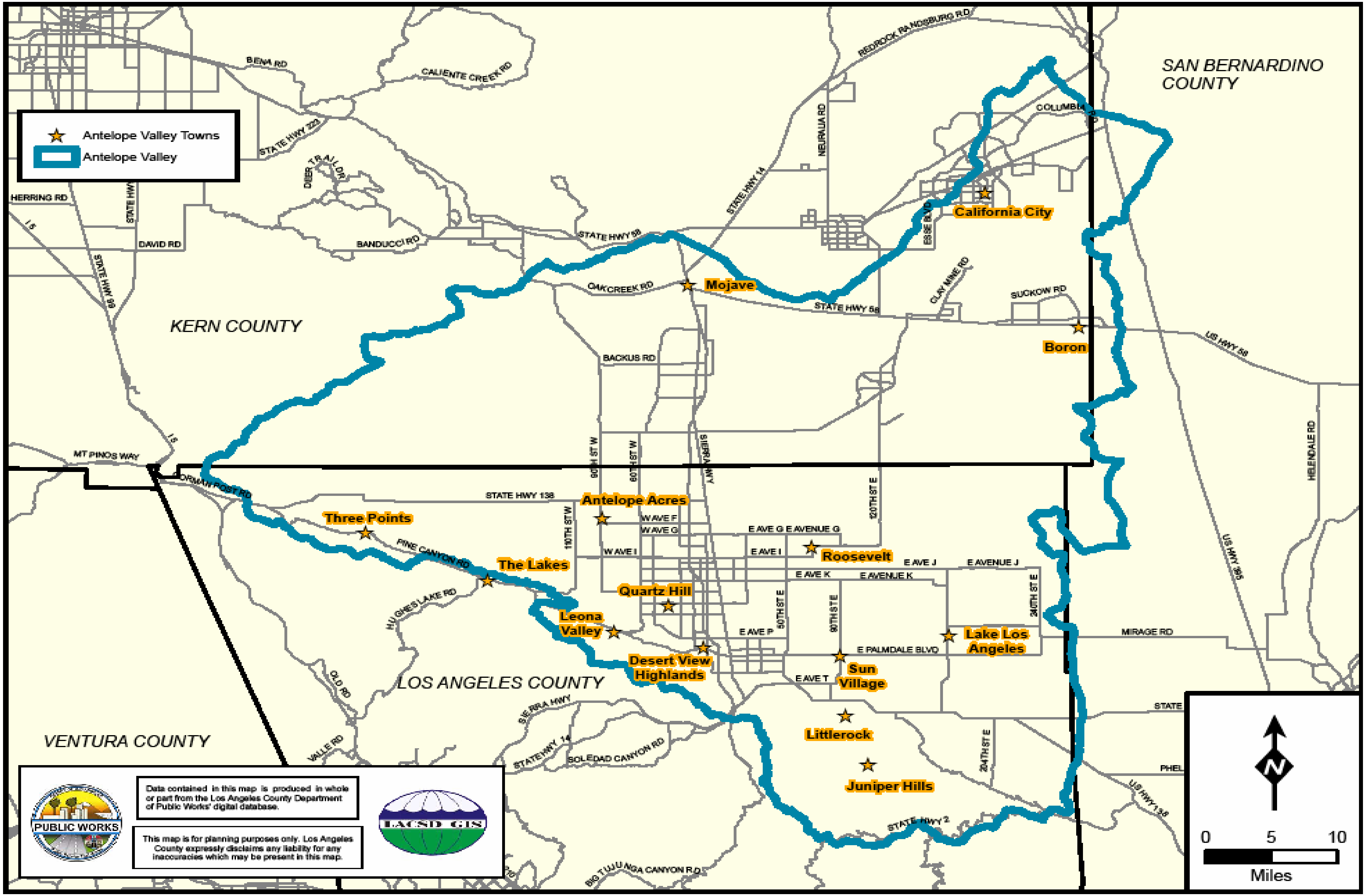


**Figure 1-3 Antelope Valley Towns**

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Although they are not considered 'disadvantaged,' these are towns that are generally very small in population, have fewer resources, and thus, a smaller organizational structure. Most often, these towns are not able to participate in many of the larger projects that municipalities are engaging in with respect to water and environmental resource related issues in the Antelope Valley Region. However, these communities were eager to participate in a Regional group in what, for most, was the first such collaborative effort. Areas like Antelope Acres, Boron, Leona Valley, and Three Points have relatively high median household incomes but have been frustrated in trying to get specific projects implemented or tying in to regional efforts because of the long distances which separate many communities in the Antelope Valley Region. This approach was believed to be the most effective way to reach the largest possible number of stakeholders and gather information from DACs, underrepresented, rural communities, and, therefore, all areas within the Antelope Valley Region within the short timeframe required by this IRWM Plan schedule.

In incorporating these rural areas into our outreach efforts, we had the ability to tour communities like Antelope Acres and Three Points while having direct conversations with residents about the concerns and issues facing their communities. As a result of these outreach efforts, subcommittee members were also invited to attend community events such as the Juneteenth Festival in Sun Village to continue further promote the AV IRWM Plan, and although resources within these communities are typically very limited, several communities proactively nominated representatives to attend the RWMG stakeholder meetings to be part of Plan development and to carry news back to their members and their community.

#### 1.2.4.3 Environmental Justice Outreach

Environmental justice is important to every community, and the Antelope Valley Region is no exception to this rule. The United States Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Simply stated, this means that no group of people should bear a disproportionate share of negative environmental consequences resulting from industrial, governmental, and commercial operations or policies.

To begin identifying potential environmental justice issues facing the Antelope Valley, subcommittee members performed independent research and contacted the Environmental Justice Coalition for Water (EJCW) for further documented information and expert advice. The EJCW was not aware of any water-related environmental justice concerns in the Antelope Valley Region. Additionally, the Subcommittee used the EPA EnviroMapper maps found on www.city-data.com (provided in Appendix C) to locate any hazardous waste sites within the Region. The EPA maps did show some hazardous waste landfills within the Region, but they did not appear to be located in populated areas or concentrated in any one community. Based on review of the EPA maps and discussions with EJCW, other non-governmental organizations and community members, it was discovered that there were no documented environmental justice issues in the Antelope Valley Region. However, subcommittee members continued to solicit input from community groups at every outreach meeting in an effort to reveal any undocumented environmental justice issues.

The EJCW provided valuable advice in successfully incorporating DACs into the IRWM Plan process that would help prevent future environmental justice issues from developing. The major suggestions made by the EJCW were the following:

- Provide technical assistance, both to facilitate participation, and to assist with project development.
- Include an Environmental Justice Community representative on the governing body.
- Ensure that the on-going governance structure defined in the Plan includes a prominent role for Environmental Justice communities, including some influence over which projects are selected for future implementation grants.
- Ensure that there is mechanism for Environmental Justice communities to participate in the evaluation of the plan over time.

Each of these suggestions were incorporated into the overall outreach strategy for the IRWM Plan. Technical resources were provided in the outreach presentation at each meeting with specific contact information of persons to call or email being identified directly. As feedback from individual communities was received, this resource list expanded, and community members had specific questions forwarded to appropriate agencies and organizations to receive further information. Additionally, the IRWM Plan was founded on the basis of broad agreement amongst all participating stakeholders. The selection of projects, the development of a governance structure, and the mechanism for updating the IRWM Plan are all dependent upon this foundation, and the DACs located in the Antelope Valley Region are ensured an equal voice in the Plan processes, current and future. This kind of collaboration is implemented as more members of the rural Town Councils, like Antelope Acres, Lake Los Angeles, and Roosevelt, join the RWMG stakeholder group after hosting IRWM Plan outreach meetings. Also of note is a potential environmental justice issue: water quality, specifically arsenic and nitrate contamination. Naturally-occurring arsenic contamination problems occur in many areas of the Antelope Valley, including DAC areas. There are projects included in the Plan to address arsenic contamination through treatment as well as efforts to develop additional projects to better understand the regional problem for arsenic and other contaminants. Therefore, arsenic contamination that could impact DACs are being addressed. Nitrate contamination is a water quality issue that has not been linked to an environmental justice concern because the disposal does not occur in or near any DAC.

The main concern regarding environmental justice seems to be directed toward the future. As the Antelope Valley Region continues to grow (Lancaster was designated as the fastest growing city in California in 2007), care will need to be taken to prevent creating environmental justice issues that unfairly affect certain communities. The IRWM Plan objectives of ensuring water supply, water quality, flood protection, wise land use management, and environmental protection must be consistently applied to future projects and development to benefit all residents equally. Land use planning must take into account to designate enough open space to meet the recreational needs of all communities and include habit preservation and restoration throughout the Valley.

As the Antelope Valley communities expand and evolve, the IRWM Plan Stakeholder group will continue to assess environmental justice concerns throughout implementation of the Plan.

#### 1.2.4.4 Media Coverage of Plan Preparation

Progress of the RWMG plan development was also covered by two reporters who regularly attended stakeholder meetings representing the Antelope Valley Press and the Mojave Desert News. Subcommittee members found that many residents were already aware of this IRWM Plan because of the continuous coverage by these two newspapers. Their exposure has greatly helped keep members of the general public and DACs informed about the IRWM Plan updates.

Additionally, two general public meetings were held in July to give an overview of the Draft IRWM Plan, answer questions and gather public feedback and comments. To increase involvement, one meeting was held in the southern portion of the region and the other, in the northern portion of the region.

#### 1.2.4.5 Requests for Follow-up Outreach

Once presentations were underway, Subcommittee members began to be contacted by individual community members with project ideas, and by the Mojave School District, a large school district serving one of the largest DAC areas in the Region. We also received invitations to attend community events, such as the Juneteenth Festival in Sun Village. Additionally, numerous town councils have requested a second presentation to discuss specific project ideas (Antelope Acres, Lake Los Angeles, Roosevelt, and Sun Village).

Thus far, subcommittee members have shared the responsibility of traveling and presenting the IRWM Plan at 14 community meetings throughout the Antelope Valley Region, all of which were disadvantaged, underrepresented, and/or rural communities. These meetings collectively reached hundreds of community members directly and many more indirectly when the information was shared by those attending, and the response has been overwhelmingly positive from all sects. Overall, presentation at these community meetings further solidified the two most important aspects of the IRWM Plan outreach strategy:

- To physically attend the individual community meetings held in areas to present information and solicit input, rather than holding a meeting and inviting community members to attend, and

- To provide resources and technical assistance so that these communities could fully develop any potential project proposals.

As a result of these direct interactions, the individual communities expressed appreciation at the genuine interest of the IRWM Plan group members to incorporate the ideas and willingness to listen to all community members as exhibited through the outreach meetings. These outreach efforts, motivated through the development of the IRWM Plan, have provided an invaluable step towards helping unify the very diverse region that is the Antelope Valley Region. Together, the

Public Outreach Subcommittee activities, in combination with the IRWM Plan Stakeholder meetings have reached over 40 public and non-governmental organizations, of which 20 percent represent disadvantaged communities. Six of the outreach meetings were in DACs, two of which reached primarily underrepresented minority communities. Our stakeholders believe the IRWM Plan to be a living document, and as such, community outreach will be ongoing and will continue to change as the plan and the region evolve.

All community outreach materials, including the DAC Outreach Plan, the Outreach Subcommittee meeting agendas and meeting minutes, various outreach materials, the Antelope Valley Water Plan presentation on CD-Rom (CD), Stakeholder testimonial videos on CD, press releases, correspondence from the EJCW and Native American Tribes, and other relevant community outreach information can be found in Appendix C of the IRWM Plan.

We expect the topics listed below to be updated as they are developed through additional DAC outreach and Plan Development:

- Specific critical water-related needs of such communities
- Document how the Plan identifies any water-related Environmental Justice concerns for the region.
- Discuss what mechanisms were used in development of the Plan to ensure that implementation of the Plan addresses Environmental Justice concerns.

## 1.3 Plan Development

This subsection provides a brief overview of the planning process utilized to develop this IRWM Plan.

### 1.3.1 Goals for Planning Group

The primary objective of this IRWM Plan is to develop a broadly supported water resource management plan that defines a meaningful course of action to meet the expected demands for water and other resources within the entire Antelope Valley Region through 2035. This IRWM Plan will address:

- How M&I purveyors can reliably provide the quantity and quality of water that will be demanded by a growing population;
- Options to satisfy agricultural users' demand for reliable supplies of reasonable cost irrigation water; and
- Opportunities to protect and enhance the current water resources (including groundwater) and the environmental resources within the Antelope Valley Region.

In order to achieve this objective, the Planning Group developed the following goals for the planning process:

1. Develop and Adopt an Integrated Regional Water Management Plan for a planning period between 2005 and 2035 by December 31, 2007 that:

   a. is written to be a useful tool to a broad range of organizations within our region;

   b. describes reasonably foreseeable water demands for our region during the planning period;

   c. characterizes the available water supplies for our region during the planning period;

   d. describes and evaluates potential management actions that we can take to meet the expected water demand of everyone within the region during the planning period;

   e. sets workable planning targets to be accomplished by specified future dates within the planning period;

   f. identifies potential and promising sources of money to pay to implement this IRWM Plan;

   g. sets priorities for implementation;

   h. is flexible and responsive to changing conditions;

   i. satisfies the guidelines published by DWR for IRWM Plans;

   j. satisfies the requirements published by DWR for AB 3030 groundwater management plans; and

   k. qualifies entities within our region to apply for water related grant funds from State sources such as Proposition 50, and Proposition 84, and Proposition 1E.

2. Discuss and describe how all broad-based regional planning efforts are related and how they will be coordinated:

   a. IRWM Plan;

   b. Adjudication;

   c. Water Storage District Proposal;

   d. Water Banking JPA; and

   e. Others.

3. Establish cooperative relationships, new partnerships, and an optimistic approach to create a useful regional plan.

4. Each member of the RWMG will take ownership in this IRWM Plan and collaborate to produce, implement, and update a widely accepted plan.

5. Conduct strategic education and outreach to the public informing the target audiences of the following:

    a. the need for regional planning;

    b. benefits of a cooperative approach;

    c. the priorities for implementation;

    d. how the public can participate; and

    e. others?

6. Identify a back-up plan for meeting grant application deadlines.

While these goals for the planning group were envisioned to be reached by the end of 2007, many of these goals are recognized to continuing value and will require further efforts in the future.

### 1.3.2 Planning Process

This planning process recognized the importance of three key elements to any successful public policy planning exercise: people, information, and action. First and foremost, this planning process was for the benefit of the people in the Antelope Valley Region. This regional planning process was designed to provide a forum for safe and effective dialogue among the various groups of stakeholders. The group agreed to the following steps for interaction through a professionally facilitated process while developing this IRWM Plan:

- Adopt Specific Measurable Attainable Relevant Time-based (SMART) goals;
- Create a safe place for interaction;
- Establish a clear course of action;
- Demonstrate tangible progress; and
- Iterate until group is satisfied.

Second, the regional planning process must provide useful, broadly accepted information that can support clear action. The information gathering and generation portion of this process is summarized in Figure 1-4, Antelope Valley IRWM Plan Planning Process. It includes the following key steps:

- Identify the Antelope Valley Region's issues and needs: Illustrate the issues and needs of the Antelope Valley Region related to water resources in a manner that reflects the majority of Stakeholder concerns. These issues and needs are what drives the Stakeholders into taking action, and are discussed in Section 3.

- Identify clear plan objectives: Collectively establish the quantifiable objectives that the regional entities will work together to accomplish between now and 2035. These objectives and the planning targets that will be used to help measure their progress are discussed in Section 4.

- Water Management Strategy Development: Involves reviewing existing documents to identify projects within the following water management strategy areas (WMSA) that could satisfy these IRWM Plan objectives: water supply, water quality, flood management, environmental management, and land use management. Also includes a discussion of the Call for Projects in which Stakeholders submitted projects for inclusion in the IRWM Plan. Water Management Strategy development is discussed in more detail in Section 5.

- Integration: Includes intra- and inter- water management strategy integration between projects of a particular WMSA and between WMSAs themselves. Integration is discussed in more detail in Section 6.

- Evaluation and Prioritization: Includes identifying short-term and long-term regional priorities, evaluating and ranking Stakeholder-identified projects and management actions, and identifying which projects the group would take “action” on first. This step is presented in Section 7. This section also includes a discussion of the impacts and benefits of the IRWM Plan, and a discussion of the benefits and costs of the prioritized projects chosen for implementation.

Third, this planning process must empower the entities within the Antelope Valley Region to take meaningful action. The implementation plan presented in Section 8 provides the linkage to local planning entities, the governance structure and framework for implementing the Plan, options for financing, sources of funding and a list of performance measures that will be used to gauge progress, data management tools, and a means to update the Plan into the future.

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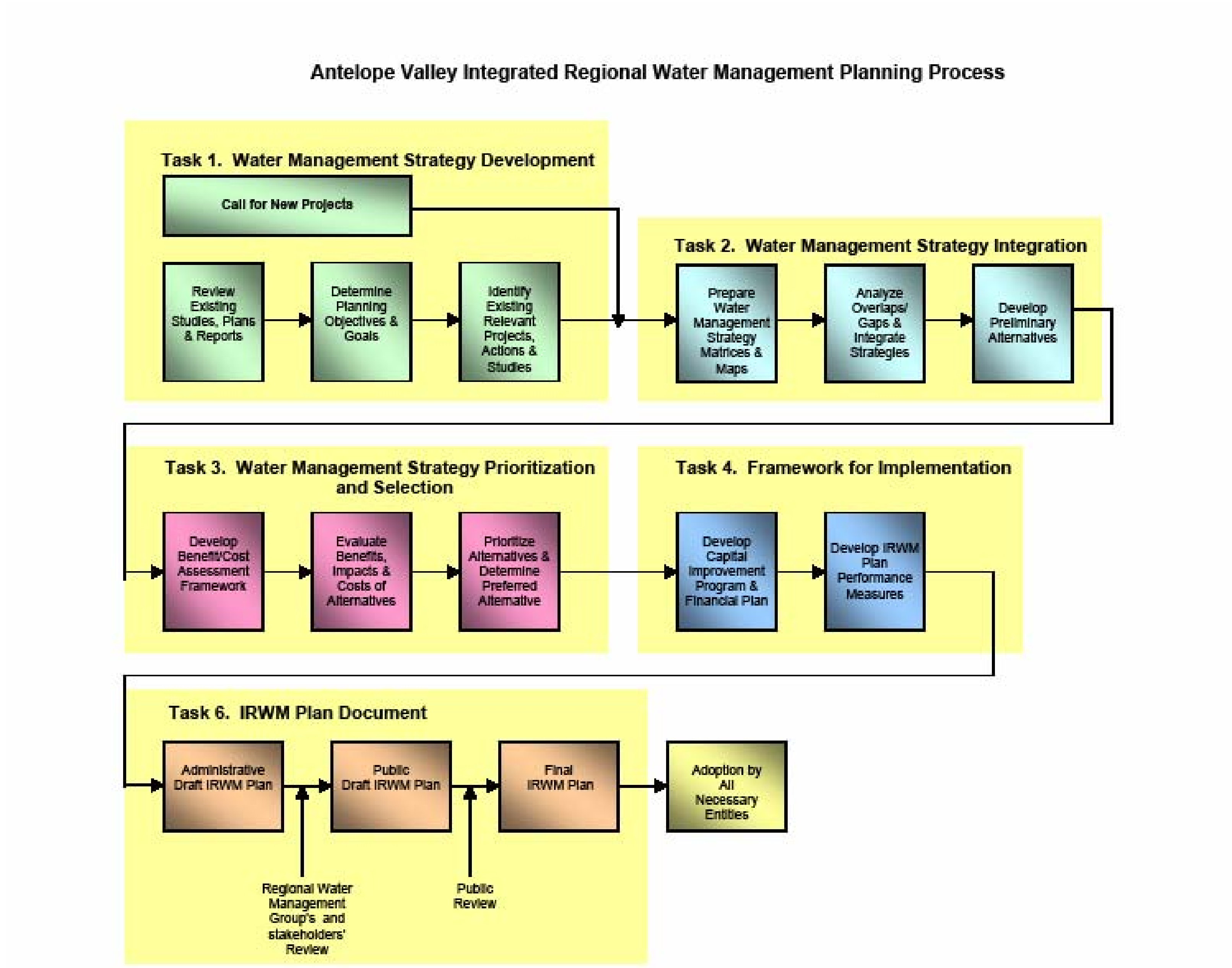


**Figure 1-4 Antelope Valley IRWM Plan Planning Process**

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### 1.3.3 Potential Obstacles to Plan Implementation

One potential obstacle to implementation of the IRWM Plan is the pending adjudication of the Antelope Valley Groundwater Basin. The IRWM Plan's water supply analysis is based on assumptions made regarding availability and reliability of the groundwater supply and was used to identify specific objectives and planning targets for the IRWM Plan. Thus it is possible that the outcome of the adjudication may require a change in the assumptions as well as the objectives and planning targets, which may delay implementation of the IRWM Plan. Additionally, the adjudication may place limitations not currently considered on the groundwater banking and recharge projects included for implementation. However, the IRWM Plan is meant to be a dynamic planning document and as such will be updated at a minimum of every two years with the project priority list being kept up-to-date as discussed in Section 8.6.2.

### 1.3.4 Groundwater Management Plan

This IRWM Plan defines a clear vision and direction for the sustainable management of water resources in the Antelope Valley Region through 2035. Inherent to this discussion is how groundwater will be managed to help meet the needs within the Antelope Valley Region now, and into the future. While a groundwater management plan currently does not exist for the Antelope Valley Groundwater Basin as a whole, one has been developed for the RCSD service area. There is the need, however, to develop a groundwater management plan for the Antelope Valley Region in order to provide a better understanding of the Antelope Valley Groundwater Basin and to recommend various strategies that result in a reliable water supply for all basin users and help meet increasing water demands. Therefore, the IRWM Plan will also meet the requirements for an AB 3030 Plan and establish a groundwater management plan for the whole basin.

The Groundwater Management Act (California Water Code Part 2.75 Section 10753), originally enacted as Assembly Bill (AB) 3030 (1992) and amended by Senate Bill (SB) 1938 (2002), provides the authority to prepare groundwater management plans. The intent of AB 3030 is to encourage local public agencies and water purveyors to adopt formal plans to manage groundwater resources within their jurisdiction.

Within the scope of Water Code Section 10753.8, a local groundwater management plan can potentially include up to twelve technical components, although this IRWM Plan need not be restricted to those specific components. This IRWM Plan addresses all the relevant components related to Groundwater Management Plans in the Water Code, as well as the components recommended by the California DWR in California's Groundwater, Bulletin 118 (DWR, 2004). Nothing in this IRWM Plan will supersede the pending adjudication of the Antelope Valley Groundwater Basin. Table 1-3 provides a checklist at the end of this section to indicate where in this IRWM Plan specific Groundwater Management Plan components are located.

**TABLE 1-3**
**GROUNDWATER MANAGEMENT PLAN**
**CHECKLIST ACCORDING TO REQUIRED COMPONENTS**

**Required Components**

| Items to Address | Section of Law | Location in Plan |
|---|---|---|
| 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 C (Community Outreach Materials) |
| Provide basin management objectives for the groundwater basin that is subject to this IRWM Plan. | 10753.7(a)(1) | Section 4 |
| 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) | Section 3 |
| 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) | Section 1 and Section 8 |
| Adoption of monitoring protocols for the components in Water Code Section 10753.7(a)(1) | 10753.7 (a)(4) | Table 8-8 |
| 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 this IRWM 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) | Figure 2-9 |

# Section 2: Region Description

This section presents a regional description for the Antelope Valley Region including location, climate, hydrologic features, land uses, population and demographic information, and regional growth projections. The Antelope Valley Region description emphasizes that the combination of the increasing population growth, the lack of proper water-related infrastructure, the need to maintain existing water levels in the groundwater basin, and the unparalleled opportunity to create a proactive, "smart" design for the fast-developing Antelope Valley Region makes this Integrated Regional Water Management (IRWM) Plan essential to efficient and effective water management in the Antelope Valley Region.

## 2.1 Region Overview

The 2,400 square miles of the Antelope Valley Region lie in the southwestern part of the Mojave Desert in southern California. Most of the Antelope Valley Region is in Los Angeles County and Kern County, and a small part of the eastern Antelope Valley Region is in San Bernardino County. For the purposes of this IRWM Plan, the Antelope Valley Region is defined by the Antelope Valley's key hydrologic features; bounded by the San Gabriel Mountains to the south and southwest, the Tehachapi Mountains to the northwest, and a series of hills and buttes that generally follow the San Bernardino County Line to the east, forming a well-defined triangular point at the Antelope Valley Region's western edge. The drainage basin was chosen as the boundary for this IRWM Plan because it has been used in several older studies such as "Land Use and Water Use in the Antelope Valley" by the United States Geological Survey (USGS) and "The Antelope Valley Water Resource Study" by the Antelope Valley Water Group. The area within the boundary also included key agencies dealing with similar water management issues such as increasing population, limited infrastructure, and increasing pumping costs with shared water resources and, therefore, it was an appropriate boundary to define the Antelope Valley Region for this IRWM Plan.

Water demands within the Antelope Valley Region are serviced by a variety of water purveyors, including large wholesale agencies, irrigation districts, special districts providing primarily water for municipal and industrial (M&I) uses, investor-owned water companies, mutual water companies, and private well owners. Water supply for the Antelope Valley Region comes from three primary sources: the State Water Project (SWP), local surface water runoff that is stored in Little Rock Reservoir, and the Antelope Valley Groundwater Basin, with recycled water and stormwater used as secondary sources of water supply. Rapid development demands on water availability and quality, coupled with the potential curtailments of SWP deliveries due to prolonged drought periods, have intensified the competition for available water supplies. Consensus is needed to develop a water resource management plan and strategy that addresses the needs of the M&I purveyors to reliably provide the quantity and quality of water necessary to serve the continually expanding Antelope Valley Region, while concurrently addressing the need of agricultural users to have adequate supplies of reasonably-priced irrigation water. For these reasons, the Antelope Valley Region is an appropriate area for integrated regional water management. Figure 1-1, Antelope Valley IRWM Plan Region, provides an overview of the Antelope Valley Region.

## 2.2 Location

As discussed above, the Antelope Valley Region, as defined for the purposes of this IRWM Plan, encompasses most of the northern portion of Los Angeles County and the southern region of Kern County. Bordered by the mountain ranges to the north, south, and west and the hills and buttes along the east, the Antelope Valley Region is composed of the following major communities: Boron, California City, Edwards Air Force Base (AFB), Lancaster, Mojave, Palmdale, and Rosamond. Smaller communities include Littlerock and Quartz Hill. The communities are predominantly concentrated in the eastern portions of the Antelope Valley Region.


Four major roadways traverse the Antelope Valley Region. The Antelope Valley Freeway (State Route 14) and the Sierra Highway both bisect the Antelope Valley Region from north to south. The Pearblossom Highway (Highway 138) traverses the southeastern and central-western portions of the Antelope Valley Region in an east-west direction. Highway 58 traverses the northern portion of the Antelope Valley Region in an east-west direction. Refer to Figure 2-1, Antelope Valley Service Districts, and Figure 2-2, Antelope Valley City Boundaries and Special Districts, for maps showing the locations of the major roads, county lines, city lines, special districts, and water agency service areas within the Antelope Valley Region.

There are four nearby areas that are currently represented by, or that are in the process of developing, IRWM Plans. These consist of the Mojave Water Agency IRWM Plan in the Lahontan Hydrologic Region; the Upper Santa Clara River IRWM Plan in the Los Angeles Hydrologic Region; the Los Angeles IRWM Plan in the Los Angeles Hydrologic Region; and the Watersheds Coalition of Ventura County IRWM Plan, which includes the Ventura River, lower Santa Clara River and Calleguas Creek watersheds, also within the Los Angeles Hydrologic Region. The relatively small portions of the Antelope Valley that are located in San Bernardino County are served by the Mojave Water Agency (MWA) and were included in the MWA IRWM Plan. Thus demands from these areas and any proposed projects serving these areas were not accounted for in this IRWM Plan to avoid significant overlap with the MWA IRWM Plan. The MWA has submitted a letter of support for our Region boundary. Letters of Support are provided in Appendix H. These four plan areas nearly surround the Antelope Valley Region (the Kern County areas north and northwest of the Antelope Valley Region are not currently covered by an IRWM Plan), which means that the Antelope Valley IRWM Plan will play an integral role in completing watershed analyses for the Lahontan Region and provide an important link to the neighboring Los Angeles Hydrologic Regions. The collective efforts of these interconnected IRWM Plan will not only benefit their respective regions, but the watersheds of Southern California as a whole.

## 2.3 Climate Statistics

Comprising the southwestern portion of the Mojave Desert, the Antelope Valley Region ranges in elevation from approximately 2,300 feet to 3,500 feet above sea level. Vegetation native to the Antelope Valley Region are typical of the high desert and include Joshua trees, saltbush, mesquite, sagebrush, and creosote bush. The climate is characterized by hot summer days, cool summer nights, cool winter days, and cool winter nights. Typical of a semiarid region, mean daily summer temperatures range from 63 degrees Fahrenheit ($^oF$) to $93^oF$, and mean daily winter temperatures range from $34^oF$ to $57^oF$. The growing season is primarily from April to October. However, most rainfall occurs between December and March, and cultivated crops and non-native plants must rely heavily on irrigation. Surface runoff for the Antelope Valley Region is divided between Little Rock and Santiago Canyons and precipitation ranges from 5 inches per year along the northern boundary to 10 inches per year along the southern boundary. Annual variations in precipitation are important to the annual variations in applied water required for crop production and landscape maintenance. Rainfall records indicate that runoff may be available and retained for artificial groundwater recharge use (USGS 1995).

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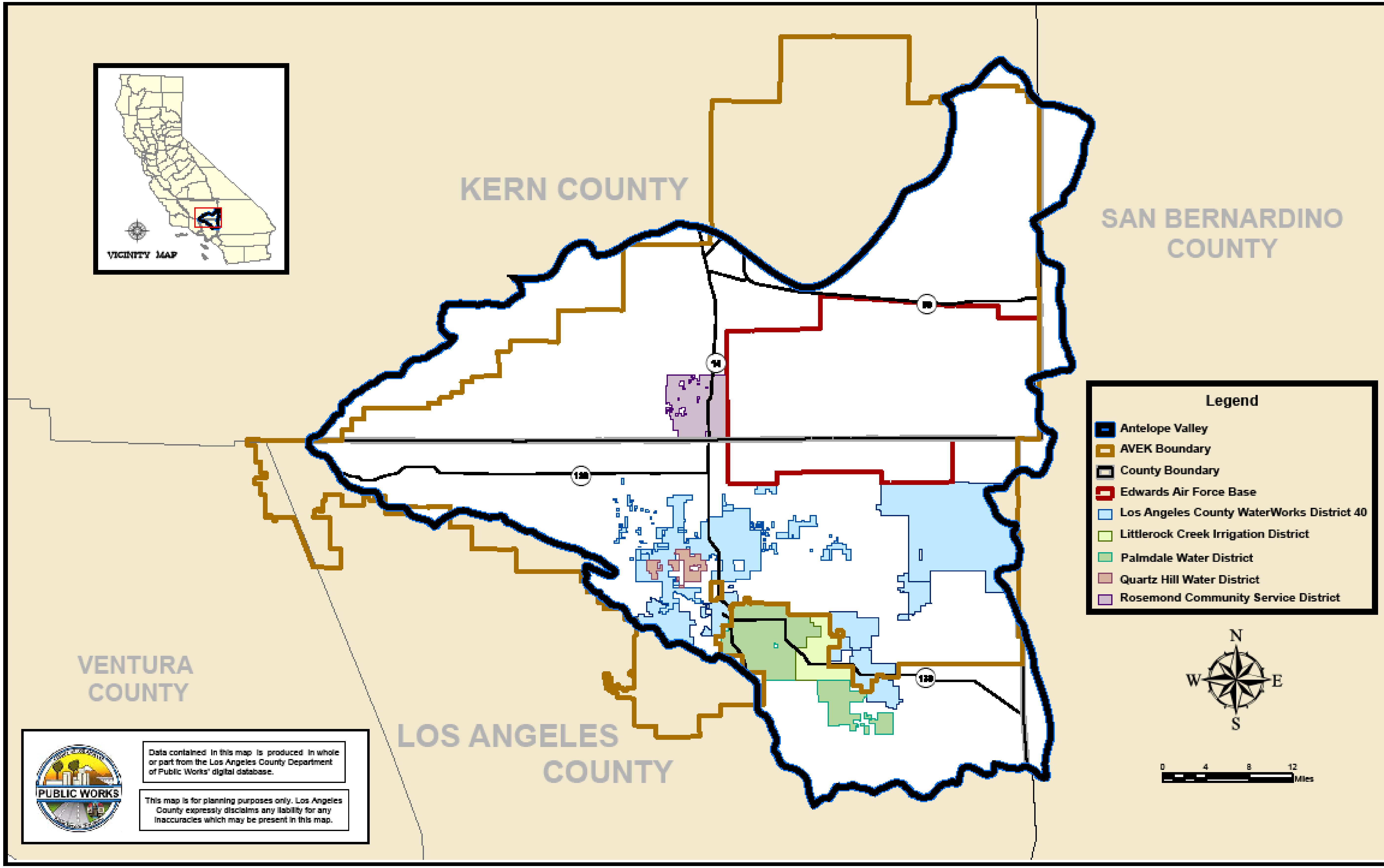


**Figure 2-1 Antelope Valley Service Districts**

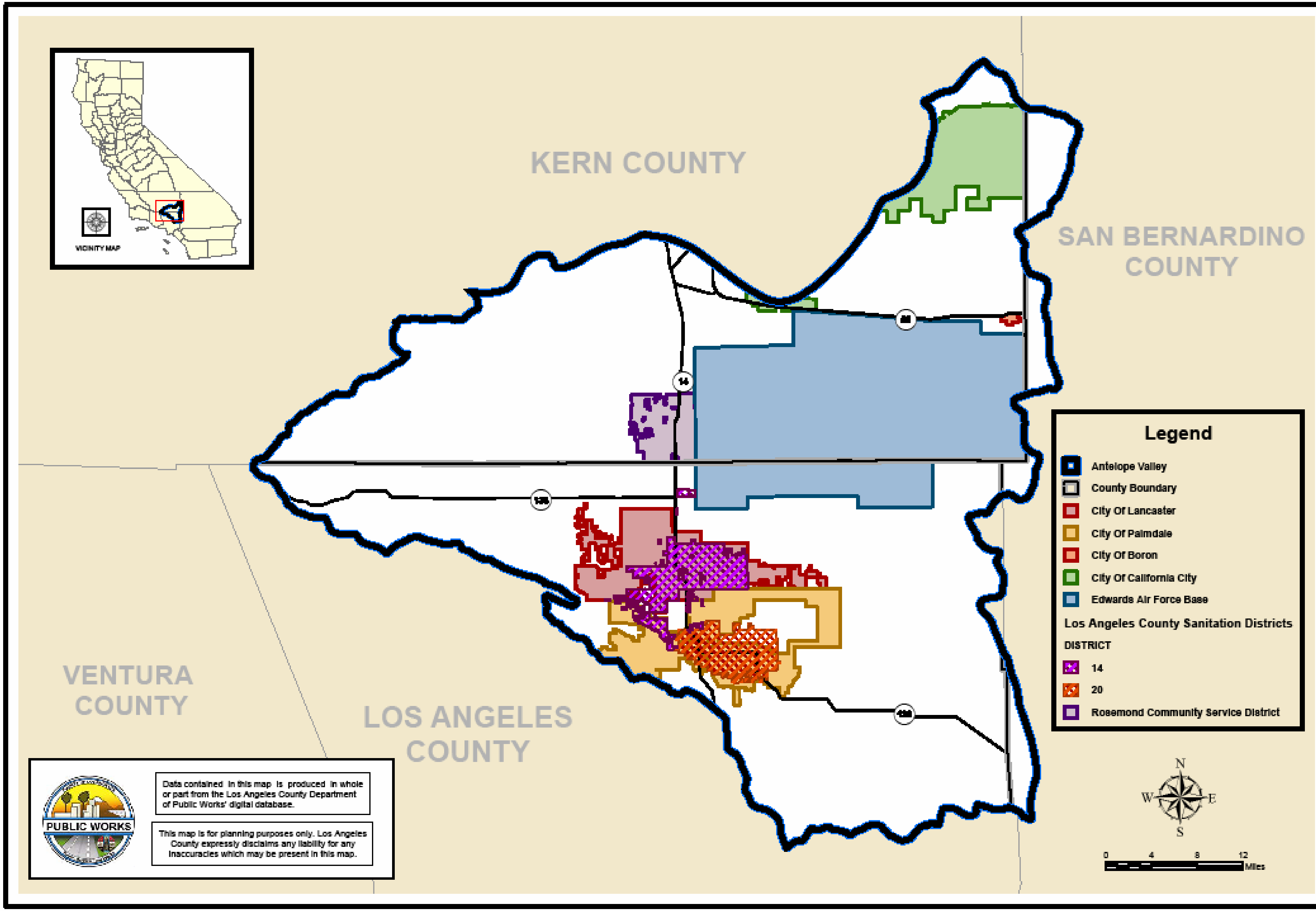


**Figure 2-2 Antelope Valley City Boundaries and Special Districts**

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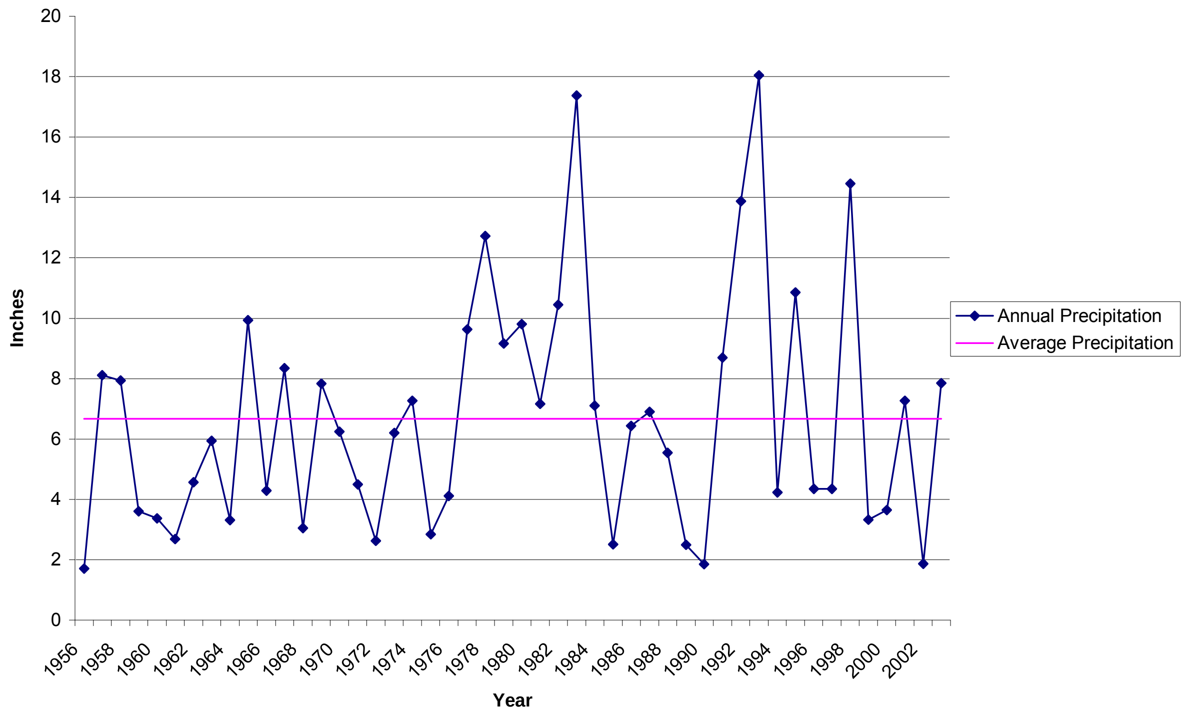
Figure 2-3, Annual Precipitation, summarizes the historical annual precipitation for the Antelope Valley Region, based on the data for rain gauge Station 455B Lancaster.

**FIGURE 2-3**
**ANNUAL PRECIPITATION**




<u>Source</u>: 1956-1990, NOAA Climatological Data, as presented in Law Environmental (1991); 1991-2006, LACDPW, Water Resources Division Station 455B Lancaster.

Table 2-1 and the following charts provide a summary of the Antelope Valley Region's climate. Climatic data is based on data collected from 1931 to 2005. Figures 2-4 and 2-6 present the average maximum and minimum temperature and the average rainfall and monthly evapotranspiration (ETo) in the Antelope Valley Region.

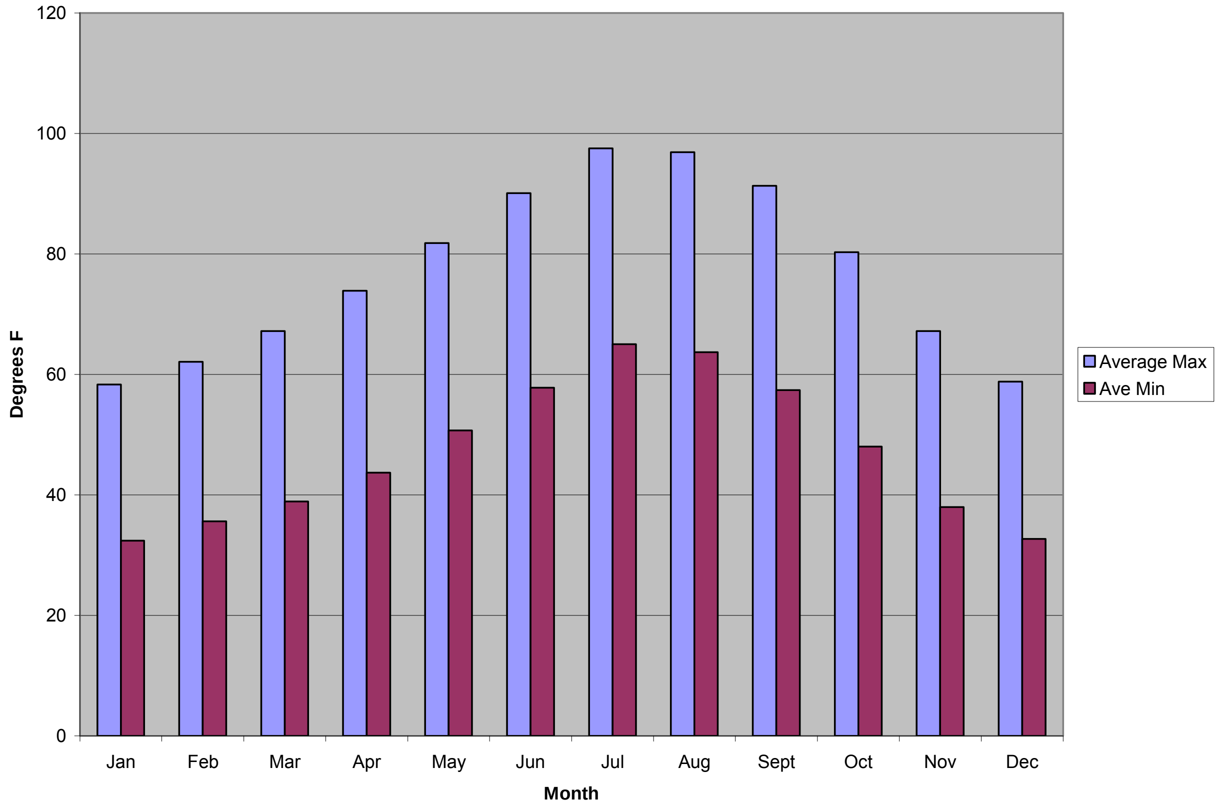
**TABLE 2-1**
**CLIMATE IN THE ANTELOPE VALLEY REGION**

| | Jan | Feb | Mar | Apr | May | Jun |
|---|---|---|---|---|---|---|
| Standard Monthly Average ETo (inches)(a) | 2.02 | 2.61 | 4.55 | 6.19 | 7.30 | 8.85 |
| Average Rainfall (inches)(b) | 1.51 | 1.65 | 1.28 | 0.48 | 0.13 | 0.04 |
| Average Max Temperature(°F)(b) | 58.3 | 62.1 | 67.1 | 73.9 | 81.8 | 90.1 |
| Average Min Temperature (°F)(b) | 32.4 | 35.6 | 38.9 | 43.7 | 50.7 | 57.8 |

| | Jul | Aug | Sept | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|
| Standard Monthly Average ETo (inches)(b) | 9.77 | 8.99 | 6.52 | 4.66 | 2.68 | 2.05 | 66.19 |
| Average Rainfall (inches)(b) | 0.05 | 0.18 | 0.20 | 0.34 | 0.68 | 1.37 | 7.91 |
| Average Max Temperature(°F)(b) | 97.5 | 96.9 | 91.3 | 80.3 | 67.2 | 58.8 | 77.1 |
| Average Min Temperature (°F)(b) | 65.0 | 63.7 | 57.4 | 48.0 | 38.0 | 32.7 | 47.0 |

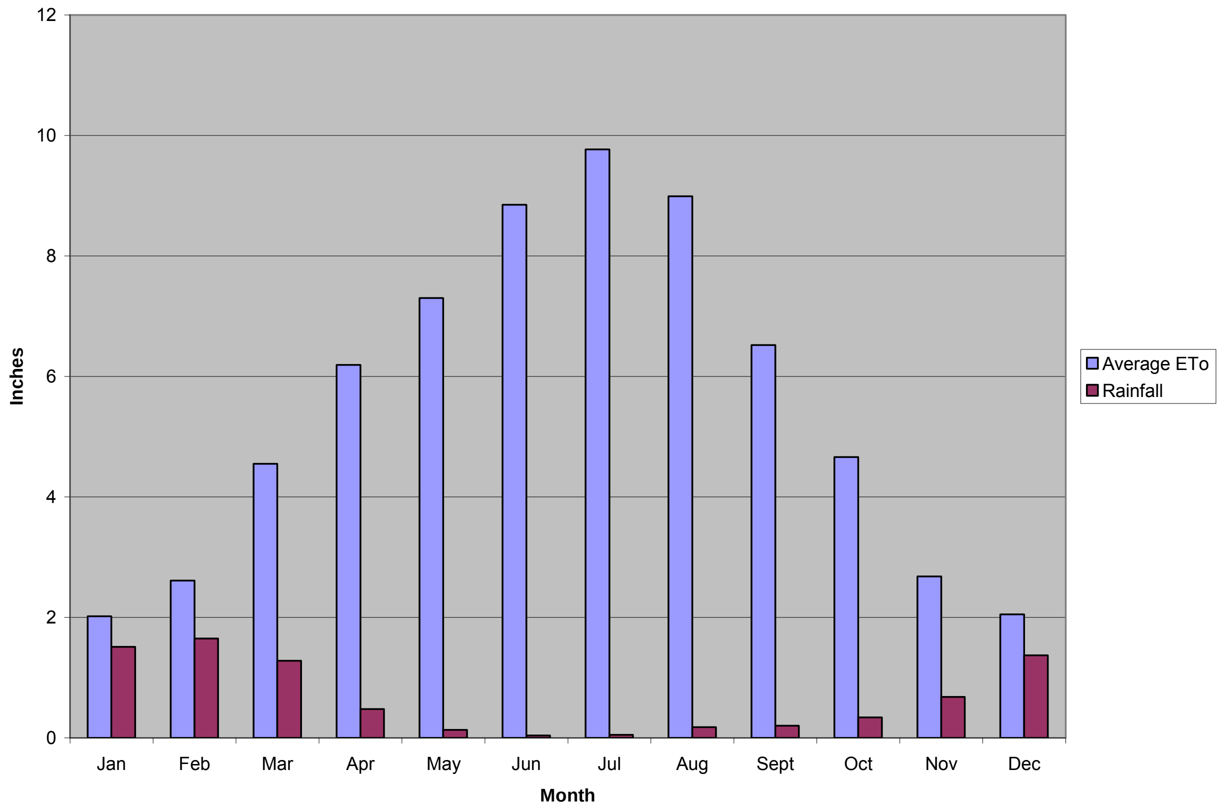
Notes:
(a) CIMIS Data for Palmdale No. 197 Station since April 2005.
(b) Western Regional Climate Center, Palmdale Station for the Years 1931 to 2005.

**FIGURE 2-4**
**AVERAGE MAXIMUM AND MINIMUM TEMPERATURE**
**IN THE ANTELOPE VALLEY REGION**



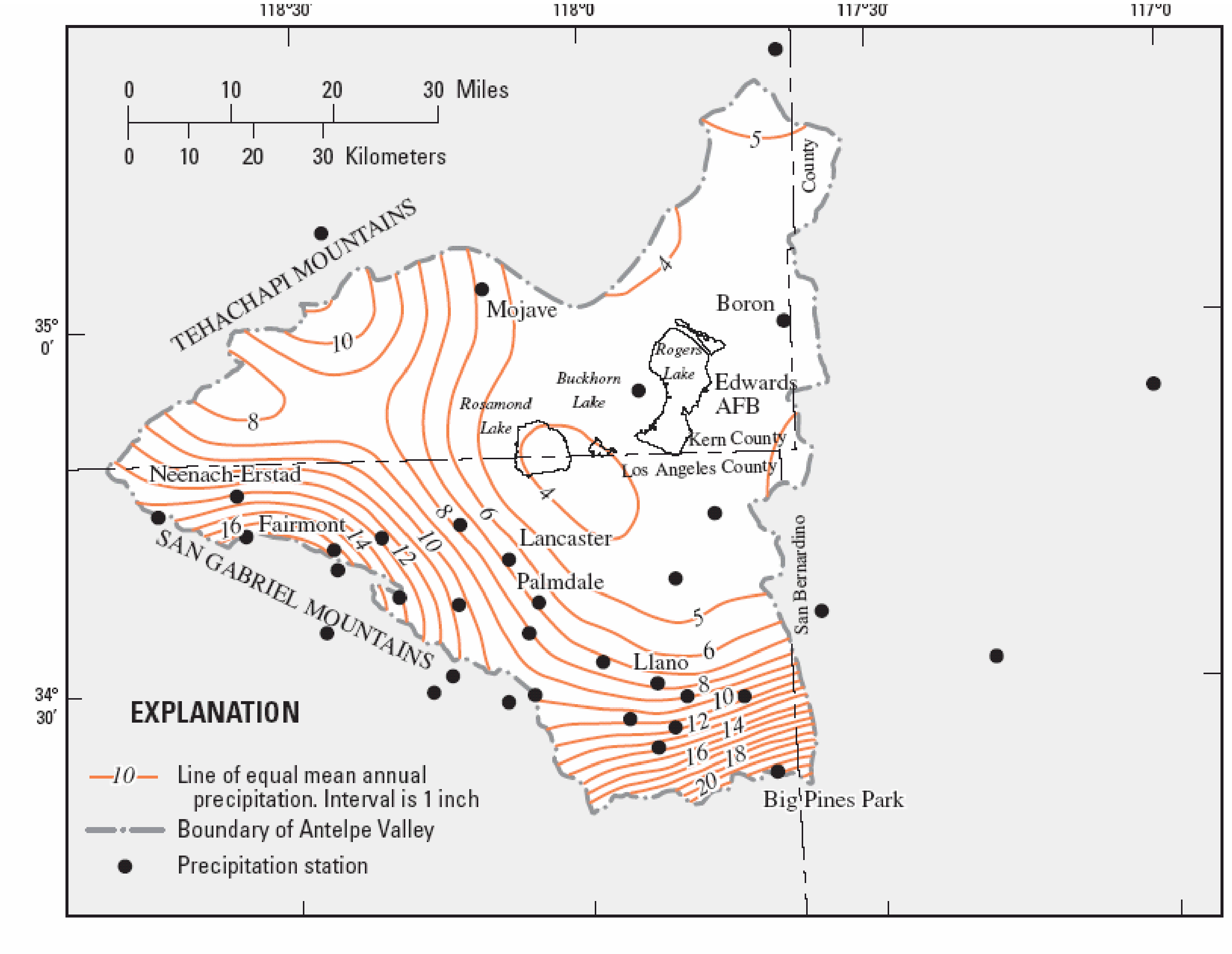

Source: Western Regional Climate Center, Palmdale Station for the Years 1931 to 2005.

**FIGURE 2-5**
**AVERAGE RAINFALL AND MONTHLY EVAPOTRANSPIRATION (ETo) IN THE ANTELOPE VALLEY REGION**




<u>Source</u>: CIMIS Data for Palmdale No. 197 Station since April 2005 and Western Regional Climate Center, Palmdale Station for the Years 1931 to 2005.

**FIGURE 2-6**
**MAP OF ANNUAL PRECIPITATION FOR THE ANTELOPE VALLEY REGION**




Source: "Precipitation depth-duration and frequency characteristics for Antelope Valley, Mojave Desert, California" Author(s): Blodgett, J. C., Los Angeles County (Calif.), Geological Survey (U.S.) Sacramento, Calif. : U.S. Geological Survey ; Denver, CO : Earth Science Information Center, Open-File Report Section [distributor], 1996.

## 2.4 Hydrologic Features

The Antelope Valley Region is a closed topographic basin with no outlet to the ocean. All water that enters the Valley Region either infiltrates into the groundwater basin, evaporates, or flows toward the three dry lakes on Edwards AFB; Rosamond Lake, Buckhorn Lake, and Rogers Lake. In general, groundwater flows northeasterly from the mountain ranges to the dry lakes. Due to the relatively impervious nature of the dry lake soil and high evaporation rates, water that collects on the dry lakes eventually evaporates rather than infiltrating into the groundwater (LACSD 2005). The surface water and groundwater features of the Antelope Valley Region are discussed in more detail below and depicted in Figure 2-7.

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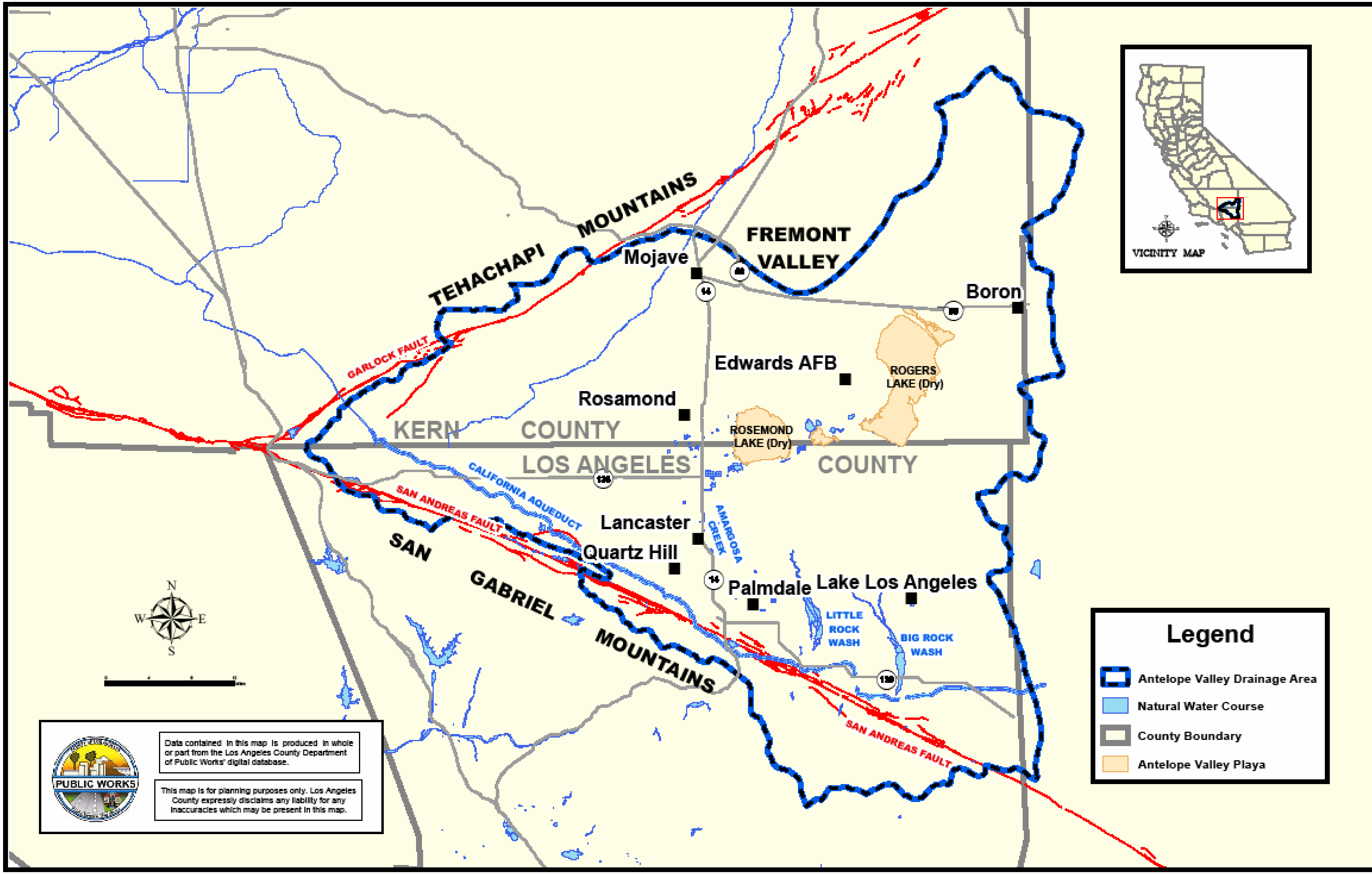


**Figure 2-7 Antelope Valley Hydrologic Features**

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### 2.4.1 Surface Water

Surface water flows are carried by ephemeral streams. The most hydrologically significant streams begin in the San Gabriel Mountains on the southwestern edge of the Antelope Valley Region and include, from east to west, Big Rock Creek, Little Rock Creek and Amargosa Creek, and Oak Creek from the Tehachapi Mountains. Amargosa Creek runs south/north and is between the State Route 14 and Sierra Highway. The hydrologic features are shown on Figure 2-7.

#### 2.4.1.1 Little Rock Reservoir

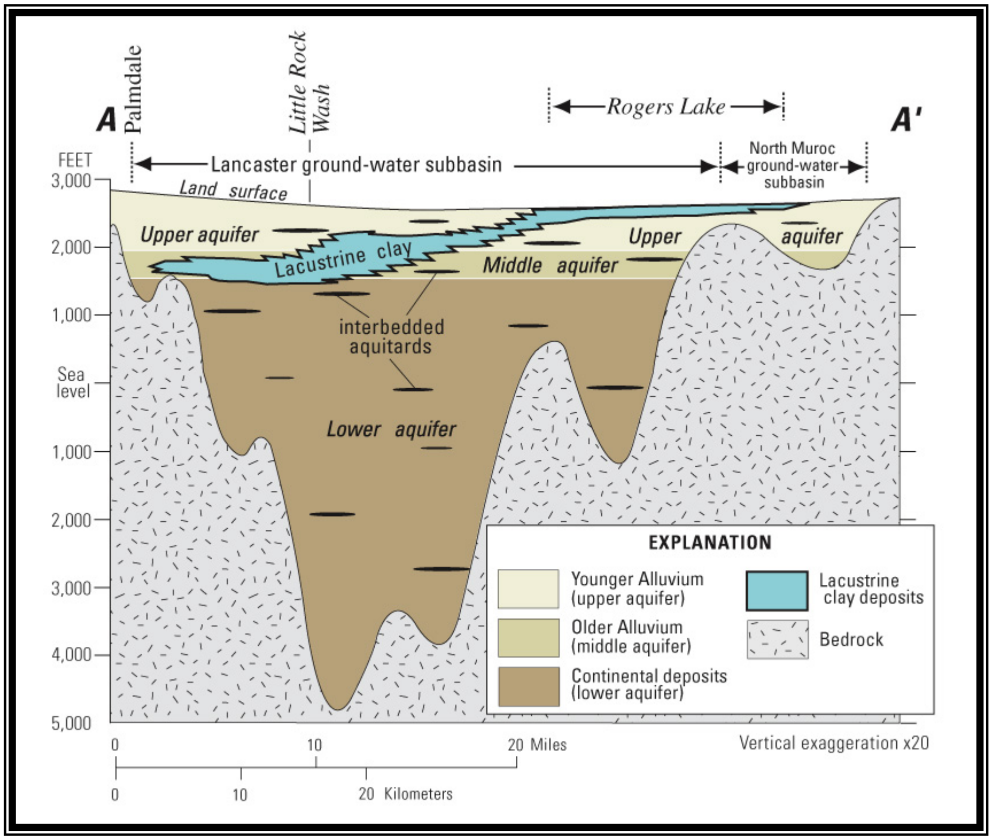
Little Rock Creek is the only developed surface water supply in the Antelope Valley Region. The Little Rock Reservoir, jointly owned by Palmdale Water District (PWD) and Littlerock Creek Irrigation District (LCID), collects runoff from the San Gabriel Mountains. The reservoir currently has a useable storage capacity of 3,500 acre-feet (AF) of water (PWD 2001). Historically, water stored in the Little Rock Reservoir has been used directly for agricultural uses within LCID's service area and for M&I uses within PWD's service area following treatment at PWD's water purification plant.

#### 2.4.1.2 Dry Lakes and Percolation

Surface water from the surrounding hills and from the Antelope Valley Region floor flows primarily toward the three dry lakes on Edwards AFB. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley Region from the surrounding mountains, quickly percolates into the stream bed, and recharges the groundwater basin. Surface water flows that reach the dry lakes are generally lost to evaporation. It appears that little percolation occurs in the Antelope Valley Region other than near the base of the surrounding mountains due to impermeable layers of clay overlying the groundwater basin. See Figure 2-8 for a sample cross-sectional illustration of the clay layer as it is positioned between the upper and lower aquifers in the Antelope Valley Region.

USGS estimates that of the 1.5 million AF of precipitation in the Antelope-Fremont Valley each year, approximately 76,000 AF percolate to the groundwater reservoirs, while the remaining is lost to evaporation (1987).

**FIGURE 2-8**
**CROSS SECTIONAL VIEW OF THE CLAY LAYER BETWEEN THE UPPER AND LOWER AQUIFERS IN THE ANTELOPE VALLEY REGION**




Source: USGS 2000b

### 2.4.1.3 Geology and Soils

The Antelope Valley represents a large topographic and groundwater basin in the western part of the Mojave Desert in southern California. It is a prime example of a single, undrained, closed basin, and it is located at an approximate elevation of 2,300 to 2,400 feet above mean sea level. Antelope Valley Region occupies part of a structural depression that has been downfaulted between the Garlock, Cottonwood-Rosamond, and San Andreas Fault Zones. The Antelope Valley Region is bounded on the southwest by the San Andreas Fault and San Gabriel Mountains, the Garlock Fault and Tehachapi Mountains to the northwest, and San Bernardino County to the east. Consolidated rocks that yield virtually no water underlie the basin and crop out in the highlands that surround the basin. They consist of igneous and metamorphic rocks of pre-Tertiary age that are overlain by indurated continental rocks of Tertiary age interbedded with lava flows (USGS 1995).

Alluvium and interbedded lacustrine deposits of Quaternary age are the important aquifers within the closed basin and have accumulated to a thickness of as much as 1,600 feet. The alluvium is unconsolidated to moderately consolidated, poorly sorted gravel, sand, silt, and clay.

Older units of the alluvium are somewhat coarser grained, and are more compact and consolidated, weathered, and poorly sorted than the younger units. The rate at which water moves through the alluvium, also known as the hydraulic conductivity of the alluvium, decreases with increasing depth.

During the depositional history of the Antelope Valley Region, a large intermittent lake occupied the central part of the basin and was the site of accumulation of fine-grained material. The rates of deposition varied with the rates of precipitation. During periods of relatively heavy precipitation, massive beds of blue clay formed in a deep perennial lake. During periods of light precipitation, thin beds of clay and evaporative salt deposits formed in playas or in shallow intermittent lakes. Individual beds of the massive blue clay can be as much as 100 feet thick and are interbedded with lenses of coarser material as much as 20 feet thick. The clay yields virtually no water to wells, but the interbedded, coarser material can yield considerable volumes of water.

Soils within the area are derived from downslope migration of loess and alluvial materials, mainly from granitic rock sources originating along the eastern slopes of the Tehachapi and San Gabriel Mountains. Additional detailed information on soil types and their distribution can be found in the Lancaster Water Reclamation Plant (WRP) 2020 Plan Final Environmental Impact Report (EIR). Additional soils maps of the Antelope Valley Region will be included in the final IRMW Plan.

### 2.4.2 Groundwater

The Antelope Valley Groundwater Basin is comprised of two primary aquifers: (1) the upper (principal) aquifer and (2) the lower (deep) aquifer. The principal aquifer is an unconfined aquifer and historically had provided artesian flows due to perched water tables in some areas. These artesian conditions are currently absent due to extensive pumping of groundwater. Separated from the principal aquifer by clay layers, the deep aquifer is generally considered to be confined. In general, the principal aquifer is thickest in the southern portion of the Antelope Valley Region near the San Gabriel Mountains, while the deep aquifer is thickest in the vicinity of the dry lakes on Edwards AFB.

Groundwater has been, and continues to be, an important resource within the Antelope Valley Region. Prior to 1972, groundwater provided more than 90 percent of the total water supply in the Antelope Valley Region; since 1972, it has provided between 50 and 90 percent (USGS 2003). Groundwater pumping in the Antelope Valley Region peaked in the 1950s (USGS 2000a), and it decreased in the 1960s and 1970s when agricultural pumping declined due to increased pumping costs from greater pumping lifts and higher electric power costs (USGS 2000a). The rapid increase in urban growth in the 1980s resulted in an increase in the demand for municipal and industrial (M&I) water and an increase in groundwater use. Projected urban growth and limits on the available local and imported water supply are likely to continue to increase the reliance on groundwater.

Although the groundwater basin is not currently adjudicated, an adjudication process has begun and is in the early stages of development. Although there are no existing restrictions on groundwater pumping, pumping may be altered or reduced as part of the adjudication process.

#### 2.4.2.1 Groundwater Subunits

The complex Antelope Valley Groundwater Basin is divided by the USGS into twelve subunits as shown on Figure 2-9. Groundwater basins are generally divided based upon differential groundflow patterns, recharge characteristics, and geographic location, as well as controlling geologic structures. The Antelope Valley Groundwater Basin's subunits are: Finger Buttes, West Antelope, Neenach, Willow Springs, Gloster, Chaffee, Oak Creek, Pearland, Buttes, Lancaster, North Muroc, and Peerless. The USGS mentions that groundwater levels in these subunits have improved in some areas due to the importation of SWP water to the Antelope Valley Region, and declined in others due to increased groundwater pumping. Each subunit has varying characteristics, and the current conditions in each subunit are briefly summarized below (USGS 1987).

Subunit Characteristics, listed generally from north to south and west to east (USGS 1987):

*Finger Buttes*: A large part of this subunit is in range and forest lands. Flow is generally from southwest to southeast. Depth to water varies, but is commonly more than 300 feet.

*West Antelope*: Groundwater flows southeasterly to become outflow into the Neenach subunit. Depth to water ranges from 250 to 300 feet.

*Neenach*: Groundwater flow is mainly eastward into the "principal" and "deep" aquifers of the Lancaster subunit. Depth to water ranges from 150 to 350 feet.

*Willow Springs*: Groundwater flows southeast and ultimately enters the Lancaster subunit. This subunit receives recharge for intermittent surface flows from the surrounding Tehachapi Mountain area. Depth to water ranges from 100 to 300 feet.

*Gloster*: Groundwater flows to the east and southeast as outflow to the Chaffee subunit. Depth to water levels for the southeast area of the subunit are 50 and 100 feet; other water level data is sparse.

*Chaffee*: Groundwater moves into this subunit from Cache Creek, adjacent alluvial fans to the west and, in lesser amounts, from the Gloster subunit. Water moves eastward in the western part of the subunit, and northward in the southern part, generally toward the City of Mojave. Water levels range from 50 to 300 feet.

*Oak Creek*: This unit is recharged by flows from the Tehachapi Mountains. Groundwater flows are generally to the southeast, with some southward flows toward the Koehn Lake area. Data for depth to water is not available.

*Pearland*: Substantial recharge to this subunit comes from Littlerock and Big Rock Creeks. Groundwater generally moves from southeast to northwest, with outflow to the Lancaster subunit. Water levels range from 100 to 250 feet.

*Buttes*: Groundwater generally moves from southeast to northwest, with outflow to the Lancaster subunit. Depth to water ranges from 50 to 250 feet.

*Lancaster*: This is the largest and most economically important subunit, in both size and water use. Due to the use of this subunit, depths to water levels vary widely, being generally greater in the south and west. Pumping depressions can be observed in various locations. There are two major aquifers in the subunit, the "principal" and "deep" aquifers, separated by clay layers. As noted above, groundwater moves into the subunit from the Neenach, West Antelope and Finger Buttes subunits. Groundwater also moves into the principal aquifer from the Buttes and Pearland subunits. The Lancaster subunit underlies Lancaster, Palmdale, Quartz Hill, Rosamond, Antelope Acres and other smaller communities.

*North Muroc*: This unit underlies part of the Rogers Lake and Edwards AFB area. Groundwater moves north and west, then north again and possibly into the Peerless subunit. Data on depth to groundwater is not available.

*Peerless*: Little information is available on this subunit, which cannot be clearly delineated, but represents the eastern limit of highly developed water-bearing deposits. As of the date of the USGS report, water levels had declined by as much as 150 feet and flow was toward a pumping depression.

#### 2.4.2.2 Groundwater Quality

Groundwater quality is excellent within the principal aquifer but degrades toward the northern portion of the dry lake areas. Considered to be generally suitable for domestic, agricultural, and industrial uses, the water in the principal aquifer has a total dissolved solids (TDS) concentration ranging from 200 to 800 milligrams per liter (mg/L). The deeper aquifers typically have higher TDS levels. Hardness levels range from 50 to 200 mg/L and high fluoride, boron, and nitrates are problematic in some areas of the basin. Arsenic is another emerging contaminant of concern in the Antelope Valley Region and has been observed in Los Angeles County Waterworks District (LACWWD) 40, PWD, and Quartz Hill Water District (QHWD) wells. Research conducted by the LACWWD and the USGS has shown the problem to reside primarily in the deep aquifer, and it is not anticipated that the existing arsenic problem will lead to future loss of groundwater as a water supply resource for the Antelope Valley Region. Additionally, portions of the Basin have experienced nitrate levels above the maximum contamination limit (MCL) of 10 mg/L.

#### 2.4.2.3 Groundwater Storage Capacity and Recharge

The total storage capacity of the Antelope Valley Groundwater Basin has been reported at 68 million acre-feet (MAF) (Planert and Williams 1995 as cited in DWR 2004) to 70 MAF

(DWR 1975 as cited in DWR 2004). The groundwater basin is principally recharged by deep percolation of precipitation and runoff from the surrounding mountains and hills (see Figure 2-9 for a depiction of groundwater basin boundaries). Estimates of groundwater natural recharge rates range from about 31,200 to 80,400 acre-feet per year (AFY) based on a variety of approaches (USGS 2003, USGS 1993). Other sources of recharge to the basin include artificial recharge and return flows from agricultural irrigation, urban irrigation, and wastewater management activities. Depending on the thickness and characteristics of the unsaturated zone of the aquifer, these sources may or may not contribute to recharge of the groundwater. As previously stated, precipitation over the Antelope Valley Region floor is generally less than 10 inches per year and ETo rates (along with soil requirements) are high; therefore, recharge from direct infiltration of precipitation is considered negligible (Snyder 1955; Durbin 1978 as cited in USGS 2003). Estimates of the amount of recharge to the basin attributable to the types of recharge (other than mountain-front or precipitation infiltration) could not be found.

The basin has historically shown large fluctuations in groundwater levels. Data from 1975 to 1998 show that groundwater level changes over this period ranged from an increase of 84 feet to a decrease of 66 feet (Carlson and Phillips 1998 as cited in DWR 2004).

In general, data collected by the USGS (2003) indicate that groundwater levels appear to be falling in the southern and eastern areas of the Antelope Valley Region and rising in the rural western and far northeastern areas of the Antelope Valley Region. This pattern of falling and rising groundwater levels correlates directly to changes in land use over the past 40 to 50 years. Falling groundwater levels are generally associated with areas that are developed and rising groundwater levels are generally associated with areas that were historically farmed, but have been largely fallowed during the last 40 years. However, recent increases in agricultural production, primarily carrots, in the northeastern and western portions of the Antelope Valley Region may have reduced rising groundwater trends in these areas (LACSD 2005).

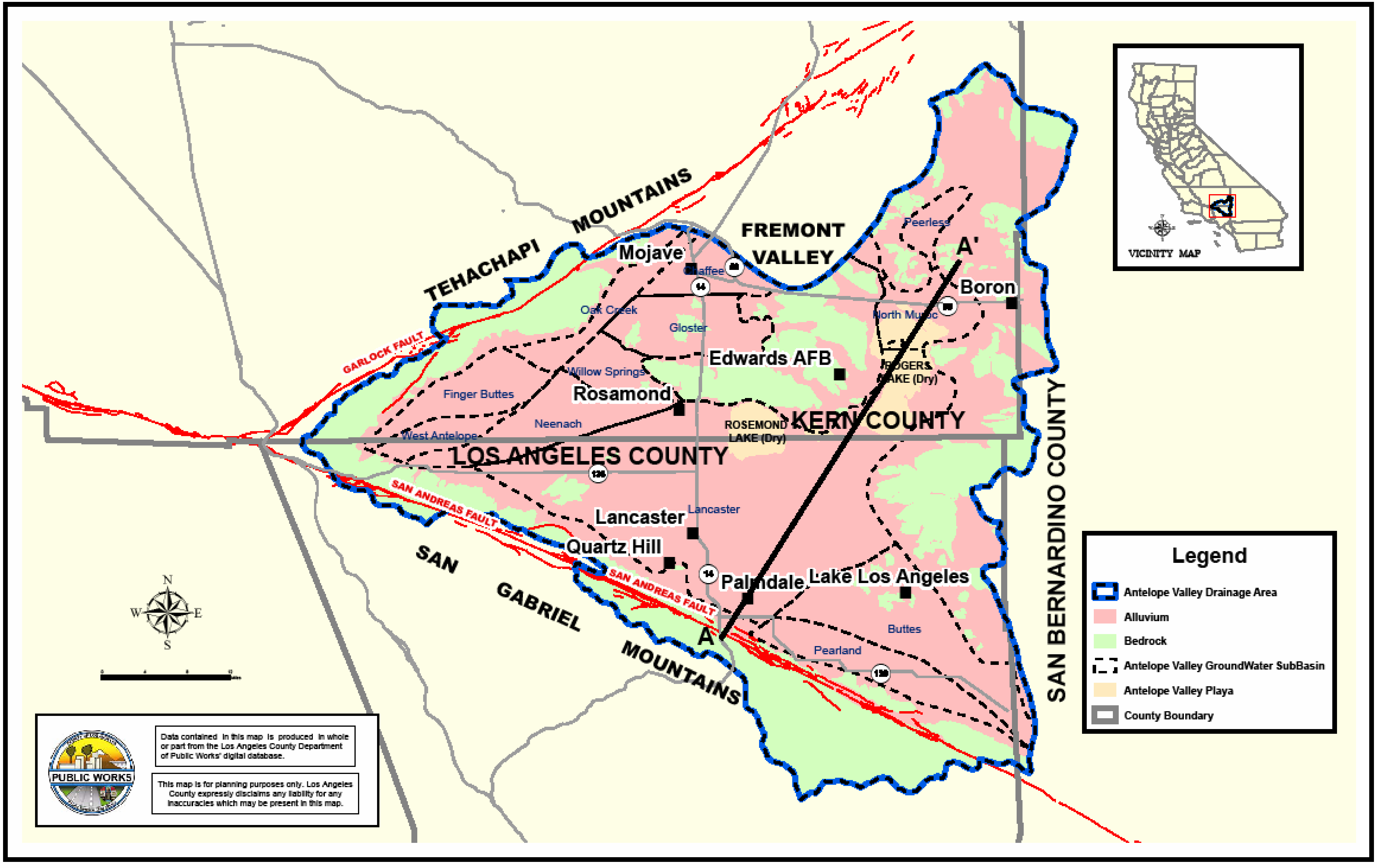



**Figure 2-9 Antelope Valley Groundwater Basin Subunits**

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#### 2.4.2.4 Groundwater Extraction

According to the USGS (2003), groundwater extractions have exceeded the estimated natural recharge of the basin since the 1920's. This overdraft has caused water levels to decline by more than 200 feet in some areas and by at least 100 feet in most of the Antelope Valley Region (USGS 2003). Extractions in excess of the groundwater recharge can cause groundwater levels to drop and associated environmental damage (e.g., land subsidence).

Groundwater extractions are reported to have increased from about 29,000 AF in 1919 to about 400,000 AF in the 1950's, when groundwater use in the Antelope Valley Region was at its highest (USGS 1995). Use of SWP water has since stabilized groundwater levels in some areas of the Antelope Valley Region. In recent years, groundwater pumping has resulted in subsidence and earth fissures in the Lancaster and Edwards AFB areas, which has permanently reduced storage by 50,000 AF (DWR 2004). Although an exact groundwater budget for the basin is not available, data estimates pertaining to groundwater production are available from the early 1900's through 1995. The most recent estimates from the USGS contend that during the 1991 through 1995 period, groundwater pumpage averaged 81,700 AFY (USGS 2003).

In the Lancaster basin, the groundwater generally moves northeasterly from the San Gabriel and Sierra Pelona Mountains to Rosamond and Rogers dry lakes. Heavy pumping has caused large groundwater depressions that disrupt this movement (LACSD 2005).

## 2.5 Land Use

Figure 2-10 presents a map of major existing land use categories within the Antelope Valley Region, characterized and grouped together according to broad water use sectors. The map was created with Los Angeles County and Kern County Planning Department GIS parcel level data. Each major land use category is identified, below, including the types of "like water uses" assigned to each category.

- Residential: Residential uses include a mix of housing developed at varying densities and types. Residential uses in the Antelope Valley Region include single-family, multiple-family, condominium, mobile home, low-density "ranchettes," and senior housing.

- Commercial/Office: This category includes commercial uses that offer goods for sale to the public (retail) and service and professional businesses housed in offices (doctors, accountants, architects, etc.). Retail and commercial businesses include those that serve local needs, such as restaurants, neighborhood markets and dry cleaners, and those that serve community or regional needs, such as entertainment complexes, auto dealers, and furniture stores. Also included in this category are government offices that have similar water duty requirements as a typical commercial/office use.

- Industrial: The industrial category includes heavy manufacturing and light industrial uses found in business, research, and development parks. Light industrial activities include some types of assembly work, utility infrastructure and work yards, wholesaling, and warehousing.

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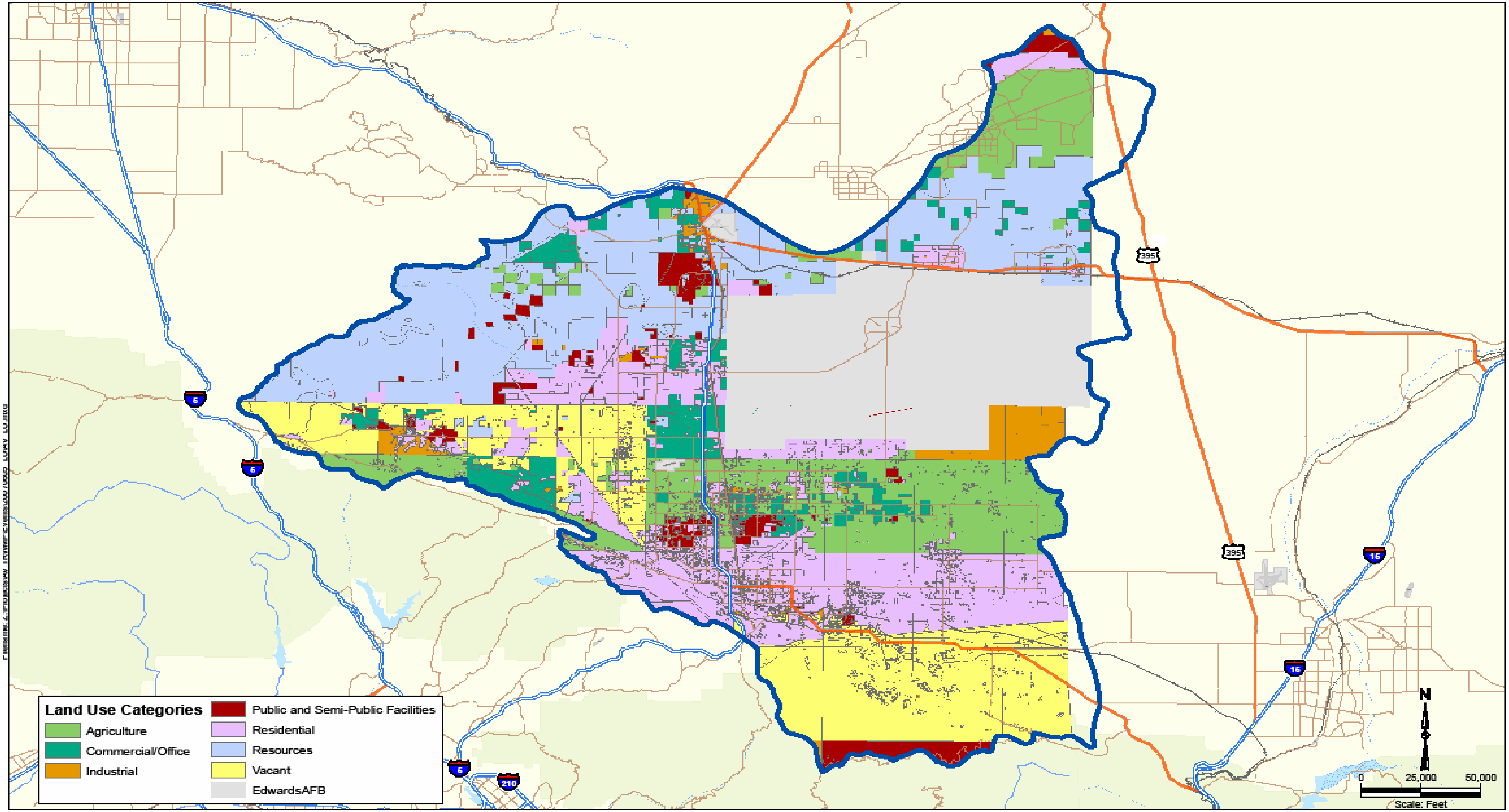


**Figure 2-10 Current Land Use Designations for the Antelope Valley Region**

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- Public and Semi-Public Facilities:  Libraries, schools, and other public institutions are found in this category.  Uses in this category support the civic, cultural, and educational needs of residents.

- Resources:  This category encompasses land used for private and public recreational open spaces, and local and regional parks.  Recreational use areas also include golf courses, cemeteries, water bodies and water storage.  Also included in this category are mineral extraction sites.

- Agriculture:  Agricultural lands are those in current crop, orchard or greenhouse production, as well as any fallow lands that continue to be maintained in agricultural designations or participating in tax incentive agricultural programs.

- Vacant:  Vacant lands are undeveloped lands that are not preserved in perpetuity as open space or for other public purposes.

## 2.6 Social and Cultural Values

The story of the Antelope Valley Region's development helps to unveil the range of local cultural values that characterize the area.  The continuing tradition of its historically rural character, combined with the emergent influence of the aerospace industry and metropolitan Los Angeles, give meaning to the diverse and, in some cases divergent, lifestyles and values that define the Antelope Valley Region's collective goals and challenges for the future.

Historically, agriculture was the Antelope Valley Region's predominant land use, characterized by dry wheat farming in the west, alfalfa on the Antelope Valley Region floor, and orchards on its southern fringes.  The City of Palmdale was settled over 100 years ago as a residential community by Swiss and German migrants from the Midwest.  At the time, land in the Antelope Valley Region sold for fifty cents an acre.  The development of the Southern Pacific Railroad connected the Antelope Valley Region to Los Angeles and the Central Valley and spurred the first large influx of white settlers to the Antelope Valley Region.  Most of the Antelope Valley Region's smaller communities emerged around this same time as agricultural settlements or local farm trade centers.

In 1933, the U.S. Department of Defense established Edwards Air Force Base (AFB), (then called Muroc Army Air Field) east of Rosamond and roughly 60 kilometers northeast of Palmdale's current city limits.  Because of the vast landing area provided by Edwards AFB's dry lake beds, it was the original site of NASA space shuttles landings, as well as the site of other important aeronautical events.  To this day U.S. military flight testing is a large and important part of Edwards AFB operations.

As a result of increased governmental defense spending in the 1950's, the Antelope Valley Region underwent a dramatic change in character. In 1952, the aerospace industry officially took hold at U.S. Air Force Plant 42. Plant 42 in northeast Palmdale is home to Lockheed Martin, Boeing, Northrop Grumman and BAE systems, among other significant aeronautical companies.

Increasing development pressures in the 1980's were in part driven by the continuing appeal of the Antelope Valley Region's high desert climate as well as land values lower than those in the Los Angeles metropolitan area. As the Los Angeles population rapidly expanded into the Antelope Valley Region, the desire for more cultural amenities and new skills and resources increased and the Antelope Valley Region became more metropolitan in character. The increase in population and the development of tract housing, retail centers and business parks has altered the formerly low density, rural and agrarian character of many local communities.

Today, competing demands are placed on limited available resources. Many of these competing demands stem from the range of local cultural values that characterize the Antelope Valley Region. Decisions regarding future land use and the dedication of water resources will need to weigh varying agricultural, metropolitan, and industrial needs as they continue to develop and as the balance between these interests continues to change.

The Lancaster Community Visioning Report helps to shed light on the current interplay of these interests and how they may influence the direction of future planning and growth Antelope Valley Region-wide. The Visioning Report presents a common vision for the future of Lancaster and the Antelope Valley Region that is focused on the following priorities:

- Balancing growth
- Ensuring economic well-being
- Strengthening Community Identity
- Improving public safety
- Promoting Active Living
- Focusing on Education and Youth
- Supporting Environmental Conservation

These priorities were echoed throughout the IRWM Plan visioning process, where Stakeholders routinely expressed the need to develop a balance of resources, while preserving the area's natural environment and rural history. These ideals were further emphasized during each of the outreach meetings with the Rural Town Councils and community members in the Antelope Valley Region. Despite the need to ensure economic vitality and longevity by bringing new industry and employment opportunities to the Antelope Valley Region, residents of the Antelope

Valley Region believe that preserving a hometown feel and developing a strong sense of neighborhood stability are critical to maintaining the identity of the community and, in turn, that of the Antelope Valley Region. The preservation of existing natural open space, achieved in part through a development strategy focused on infill and parcel redevelopment combined with environmental conservation, are key components of preserving the Antelope Valley Region's rural character and strengthening the health, vitality and security of growing urban areas.

## 2.7 Economic Conditions and Trends

Historically, the economy within the Antelope Valley Region has focused primarily on agriculture, and crops grown in the Antelope Valley Region have included alfalfa, wheat, barley, and other livestock feed crops. However, the area is in transition as the predominant land use shifts from agricultural uses to residential and industrial uses.

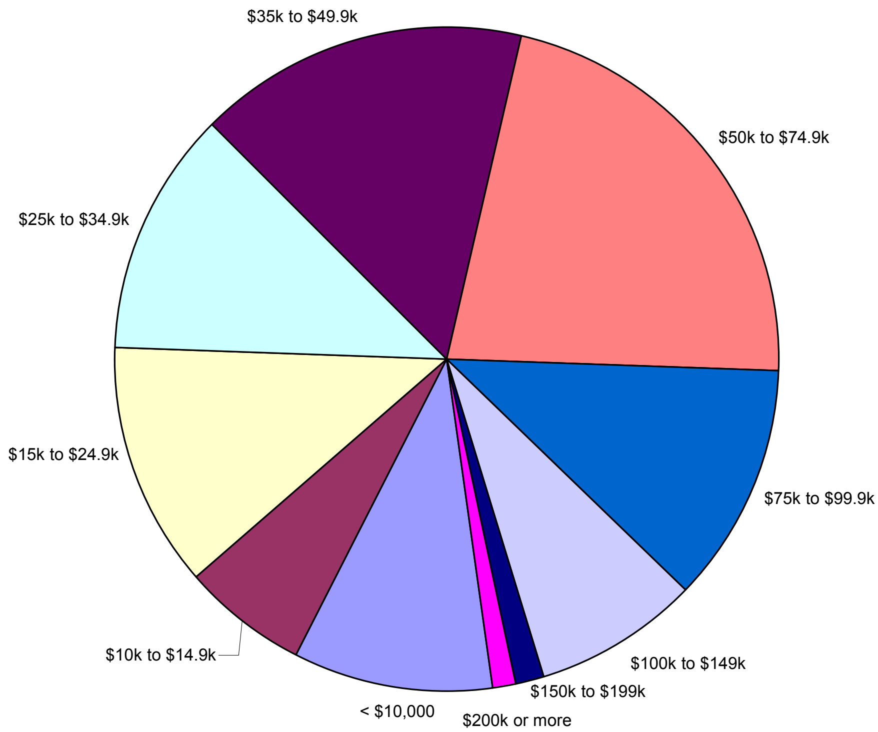
The increase in residential land use and its impact on the economy is evident from the population growth in the Antelope Valley Region, which is discussed in Section 2.8. With significantly lower home prices than in other portions of Los Angeles County, the Antelope Valley Region housing market has seen an increase as people choose to commute to the Los Angeles area. According to the Antelope Valley Building Industry Association (BIA) (2006), a number of trends over the last couple of years can be seen from single- and multi-family households in the Antelope Valley Region. Even after acknowledging the recent slowing of the housing market, the BIA recognized that the Antelope Valley Region is the last large available open space "opportunity" for development in Southern California, whether it be for residential, commercial/industrial/retail or agricultural land uses. As such, the BIA predicted that the Antelope Valley Region is expected to continue to grow in population and sustained residential growth is necessary for a strong, vibrant economy (BIA, 2006).

Industry in the Antelope Valley Region consists primarily of manufacturing for the aerospace industry and mining. Edwards AFB and the U.S. Air Force Flight Production Center (Plant 42) provide a strong aviation and military presence in the Antelope Valley Region. Mining of borate in the northern areas and of salt extract, rock, gravel, and sand in the southern areas contribute to the Antelope Valley Region's industrial economy.

As previously mentioned, ensuring economic well-being is a key social and cultural value of the Antelope Valley Region's community.

As shown in Table 2-2 and Figure 2-11, approximately 55 percent of the Antelope Valley Region's population has a household income of less than $50,000, approximately 22 percent of the population has a household income between $50,000 and $74,999, and approximately 22 percent has a household income of $75,000 or higher.

**FIGURE 2-11**
**INCOME LEVELS FOR THE ANTELOPE VALLEY REGION**




## 2.8 Population

This subsection provides demographic information from the 2000 Census as well as regional growth projections.

### 2.8.1 Demographics

Table 2-2 provides a summary of the human demographics for the Antelope Valley Region as determined by 2000 U.S. Census Bureau data. Regional data was estimated from the data for the census tracts within the regional boundaries. Although Figure 1-5 shows several Disadvantaged Communities (DACs) near Boron, the Median Household Income (MHI) for Boron does not reflect this. This is mainly a direct result of the 1.2 percent of the Boron population with average salary above $200,000, which increases the overall median income level for Boron.

Figure 2-11 below shows the breakdown of the income levels in the Antelope Valley Region as laid out in Table 2-2.

## TABLE 2-2
## DEMOGRAPHICS SUMMARY FOR THE ANTELOPE VALLEY REGION

| Area | Lancaster | Palmdale | Unincorp. LA County | California City | Boron | Mojave | Rosamond | Edwards AFB | Unincorp. Kern County | Antelope Valley Region |
|---|---|---|---|---|---|---|---|---|---|---|
| Age Structure (by %) | | | | | | | | | | |
| under 5 | 8.0 | 9.3 | 6.9 | 6.7 | 7.3 | 9.1 | 7.6 | 14.0 | 5.8 | 8.1 |
| 5-9 | 9.5 | 11.5 | 9.4 | 8.2 | 6.7 | 9.5 | 9.8 | 10.6 | 7.5 | 10.0 |
| 10-14 | 9.2 | 11.5 | 10.3 | 9.8 | 8.4 | 8.8 | 9.9 | 8.7 | 8.7 | 10.3 |
| 15-19 | 8.6 | 8.9 | 7.9 | 8.6 | 8.0 | 8.0 | 8.4 | 5.7 | 7.2 | 8.2 |
| 20-24 | 6.4 | 5.4 | 5.3 | 4.7 | 4.4 | 5.9 | 5.0 | 17.0 | 2.6 | 5.6 |
| 25-34 | 13.8 | 12.7 | 12.2 | 10.3 | 9.5 | 12.1 | 12.6 | 25.1 | 6.6 | 12.3 |
| 35-44 | 17.5 | 18.4 | 20.2 | 17.5 | 15.7 | 15.6 | 19.4 | 17.0 | 18.0 | 18.5 |
| 45-54 | 11.6 | 11.3 | 13.3 | 14.6 | 15.2 | 11.6 | 12.2 | 1.6 | 15.8 | 12.1 |
| 55-59 | 3.7 | 3.2 | 3.9 | 4.9 | 5.9 | 4.2 | 3.9 | 0.1 | 6.2 | 3.7 |
| 60-64 | 2.9 | 2.2 | 3.0 | 4.0 | 5.8 | 4.4 | 3.3 | 0.1 | 5.6 | 3.0 |
| 65-74 | 4.6 | 3.4 | 4.5 | 6.8 | 7.7 | 6.3 | 5.0 | 0.1 | 11.4 | 4.8 |
| 75-85 | 3.0 | 1.7 | 2.4 | 3.2 | 4.8 | 3.6 | 2.3 | 0.1 | 4.4 | 2.6 |
| 85 and over | 1.0 | 0.4 | 0.6 | 0.8 | 0.7 | 0.9 | 0.6 | 0 | 0.4 | 0.7 |
| Median Household Income | $41,127 | $46,941 | NA | $45,735 | $40,625 | $24,761 | $42,307 | $36,915 | NA | -- |
| Income Levels (by %) | | | | | | | | | | |
| < $10,000 | 9.7 | 8.8 | 8.5 | 10.6 | 14.8 | 24.9 | 6.8 | 0 | 6.8 | 9.6 |
| $10k to $14.9k | 7.0 | 5.7 | 5.6 | 6.4 | 11.9 | 6.6 | 5.4 | 1.3 | 4.7 | 6.2 |
| $15k to $24.9k | 13.4 | 10.5 | 9.8 | 11.4 | 11.7 | 18.8 | 10.4 | 19.0 | 10.4 | 11.9 |
| $25k to $34.9k | 13.0 | 11.3 | 10.6 | 12.0 | 8.6 | 12.8 | 13.2 | 24.7 | 8.8 | 12.0 |
| $35k to $49.9k | 16.2 | 16.7 | 17.1 | 12.7 | 19.4 | 15.9 | 17.0 | 25.3 | 12.7 | 16.2 |
| $50k to $74.9k | 20.5 | 23.0 | 22.6 | 25.3 | 19.4 | 11.8 | 26.6 | 21.1 | 29.1 | 21.8 |
| $75k to $99.9k | 10.4 | 12.9 | 13.1 | 12.1 | 8.9 | 5.4 | 13.8 | 6.6 | 11.2 | 11.6 |
| $100k to $149k | 7.3 | 8.8 | 9.9 | 7.2 | 4.0 | 3.9 | 5.2 | 2.0 | 11.8 | 8.0 |
| $150k to $199k | 1.3 | 1.5 | 1.3 | 1.4 | 0 | 0 | 0.7 | 0 | 2.6 | 1.4 |
| $200k or more | 1.2 | 0.8 | 1.5 | 0.9 | 1.2 | 0 | 0.9 | 0 | 1.7 | 1.2 |
| Population Density(persons per sq. mile) | 1,263 | 1,112 | 70.1 | 107.0 | 88.8 | 9.7 | 91.9 | 19.4 | 14.5 | 96.6 |
| Languages spoken[(a)] | | | | | | | | | | |
| English | 78% | 66% | 75% | 85% | 78% | 79% | 77% | 88% | 91% | 75% |
| Spanish | 17% | 29% | 19% | 9% | 19% | 17% | 20% | 6% | 6% | 20% |
| French | 1% | <1% | <1% | 1% | <1% | <1% | <1% | <1% | <1% | <1% |
| Tagalog | 1% | 1% | 1% | 1% | 2% | <1% | 2% | 2% | <1% | 1% |
| German | <1% | <1% | <1% | <1% | <1% | <1% | <1% | 1% | 1% | <1% |
| Other (all <1%) | 2% | 4% | 5% | 4% | 1% | 4% | 1% | 3% | 2% | 4% |

Note: (a) For age 5 and up, 2000 Census Tract Data.

## 2.8.2 Regional Growth Projections

Growth in the Antelope Valley Region proceeded at a slow pace until 1985. Between 1985 and 1990, the growth rate increased approximately 1,000 percent from the average growth rate between the years 1956 to 1985 as land uses shifted from agricultural to residential and industrial. The historical and projected population for the Antelope Valley Region is shown in Table 2-3. Historical population estimates were based on the Geolytics normalization of past U.S. Census tract data to 2000 census tract boundaries. This normalization allows for a direct comparison of the past U.S. Census tract population data. These Census tracts were then assigned to the individual jurisdictions in the Antelope Valley Region to determine the jurisdiction's population. Projections for the Cities of Lancaster and Palmdale were derived from Southern California Association of Governments (SCAG) estimates. Population projections for the Kern County portion of the Antelope Valley Region and unincorporated Los Angles County portion of the Antelope Valley Region assume the SCAG estimated annual growth rate of 4.2 percent for the Antelope Valley Region. Projections indicate that approximately 1 million people will reside in the Antelope Valley Region by the year 2035. This represents an increase of approximately 125 percent from the 2005 population. Figures 2-12 and 2-13 below graphically depict these population projections.

**TABLE 2-3**
**POPULATION PROJECTIONS**

| | 1970[(a)] | 1980[(a)] | 1985[(b)] | 1990[(a)] | 2000[(a)] | 2005 | 2015 | 2035 |
|---|---|---|---|---|---|---|---|---|
| Boron[(d)] | 3,000 | 3,000 | 3,000 | 3,000 | 2,000 | 2,000 | 3,000 | 5,000 |
| California City[(d)] | 2,000 | 3,000 | 4,000 | 6,000 | 8,000 | 9,000 | 12,000 | 20,000 |
| Edwards AFB[(d)] | 10,000 | 9,000 | 8,000 | 7,000 | 7,000 | 7,000 | 10,000 | 16,000 |
| Mojave[(d)] | 4,000 | 5,000 | 5,000 | 7,000 | 6,000 | 7,000 | 9,000 | 14,000 |
| Rosamond[(d)] | 4,000 | 5,000 | 6,000 | 9,000 | 15,000 | 17,000 | 22,000 | 38,000 |
| Unincorporated Kern County[(d)] | 1,000 | 2,000 | 3,000 | 8,000 | 12,000 | 13,000 | 17,000 | 28,000 |
| Lancaster[(c)] | 41,000 | 51,000 | 55,000 | 98,000 | 113,000 | 142,000 | 192,000 | 283,000 |
| Palmdale[(c)] | 17,000 | 22,000 | 24,000 | 67,000 | 96,000 | 146,000 | 218,000 | 380,000 |
| Unincorporated Los Angeles County[(d)] | 20,000 | 29,000 | 33,000 | 69,000 | 88,000 | 100,000 | 129,000 | 215,000 |
| **Antelope Valley Region** | **103,000** | **128,000** | **140,000** | **275,000** | **346,000** | **444,000** | **612,000** | **1,000,000** |

Notes: Projections Rounded to the nearest 1,000 people.
(a) Based on Geolytics Normalization of Past U.S. Census Tract Data to 2000 Census Tract Boundaries.
(b) Based on an Interpolation of the 1980 and 1990 U.S. Census Data.
(c) SCAG projections for North Los Angeles County Subregion. 2035 Estimates assume same growth rate as in 2030.
(d) Projections assume the SCAG Growth Rate of 4.2 percent for the Antelope Valley Region.

**FIGURE 2-12**
**POPULATION PROJECTIONS**

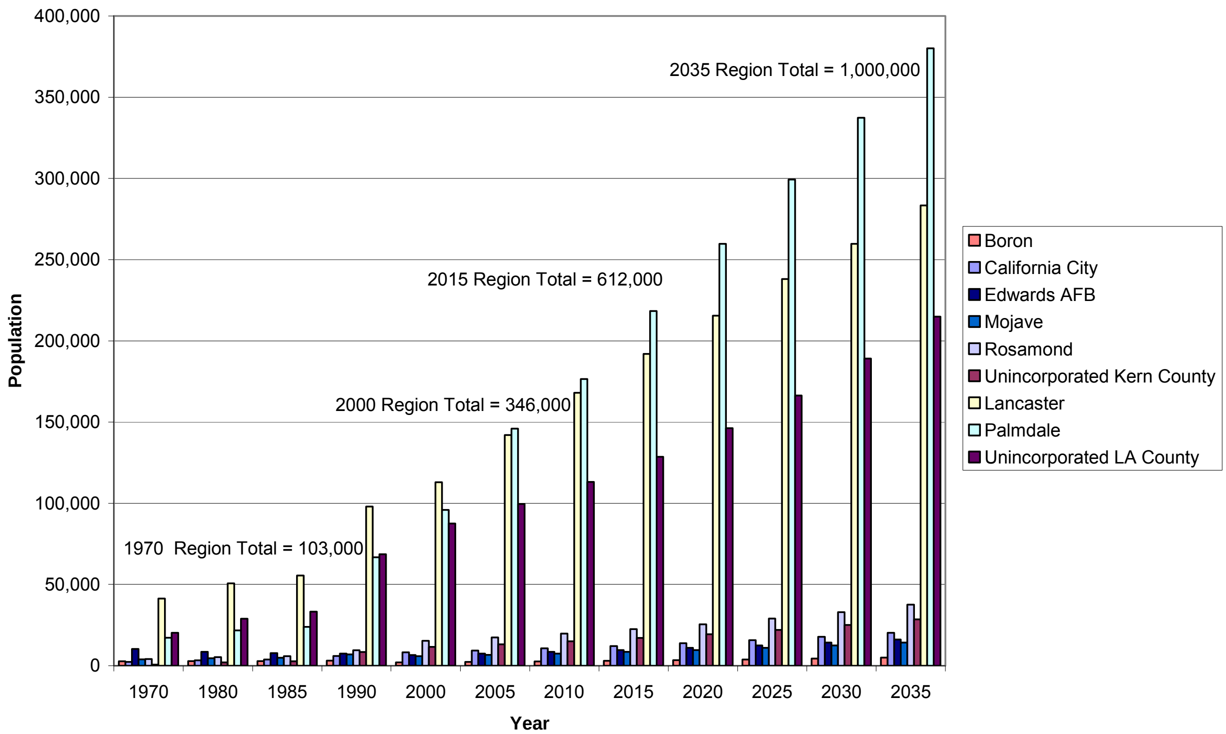
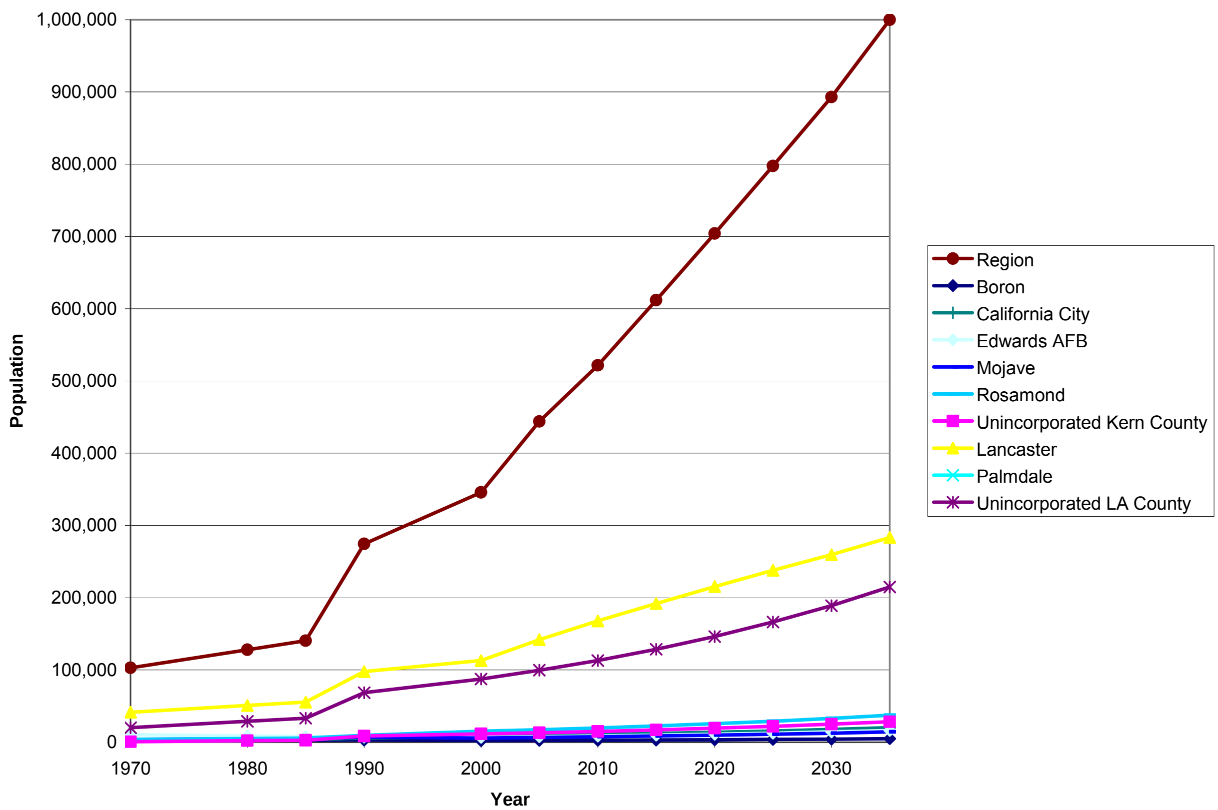


**FIGURE 2-13**
**ANTELOPE VALLEY REGION POPULATION**



# Section 3: Issues and Needs

The purpose of this section is to identify the issues, needs, challenges and priorities for the Antelope Valley Region through the year 2035 related to water supplies and other resources within the Antelope Valley Region. The section will assess the current and projected water demands of the Antelope Valley Region, which include agricultural and municipal and industrial (M&I) demands on groundwater, imported water, and recycled water as well as an analysis of the current and projected supplies needed to meet those demands. In addition, an assessment of the water quality issues and challenges affecting these sources will be presented. A discussion of the flood management, environmental resource management, and land use planning issues will be presented, as these issue areas affect the water supply and demand requirements within the Antelope Valley Region. Finally, a discussion of the issues and needs specific to the underrepresented communities within the Antelope Valley Region are discussed.

## 3.1 Water Supply Management Assessment

As rapid development has increased the demand for both more and higher quality water in the Antelope Valley Region, the competition for available water supplies has also increased. Developing new water supplies and protecting existing water supplies, recognizing the lack of proper infrastructure and the need to maintain the groundwater levels, is crucial to successfully meeting the future water demands within the Antelope Valley Region.

In order to assess the water supply for the Antelope Valley Region, a water budget approach was utilized in-lieu of a direct comparison of supply and demand to better capture the regional understanding of the groundwater basin. Figure 3-1 presents a schematic of the water budget elements and their relationships to each other. The main components of the water budget include water entering, surface storage, groundwater storage, direct deliveries, recycle/reuse, demands, and water leaving. Each of these components is discussed in more detail below.

### 3.1.1 Water Entering

This component of the water budget includes sources of water from outside of the Antelope Valley Region entering the water budget boundary, such as precipitation and imported water.

#### 3.1.1.1 Precipitation

As discussed in Section 2, the average annual precipitation for the Antelope Valley Region is approximately 7 inches per year. Precipitation entering the Antelope Valley Region is either lost to evaporation (see Section 3.1.7), percolates to groundwater storage as natural recharge (see Section 3.1.3.3), or is carried as runoff to surface storage (see Section 3.1.2.1).

[NOTE TO READER: Additional text regarding precipitation may be added after receipt and review of the Hydrology Manuals for Los Angeles and Kern County before the draft document becomes Final.]

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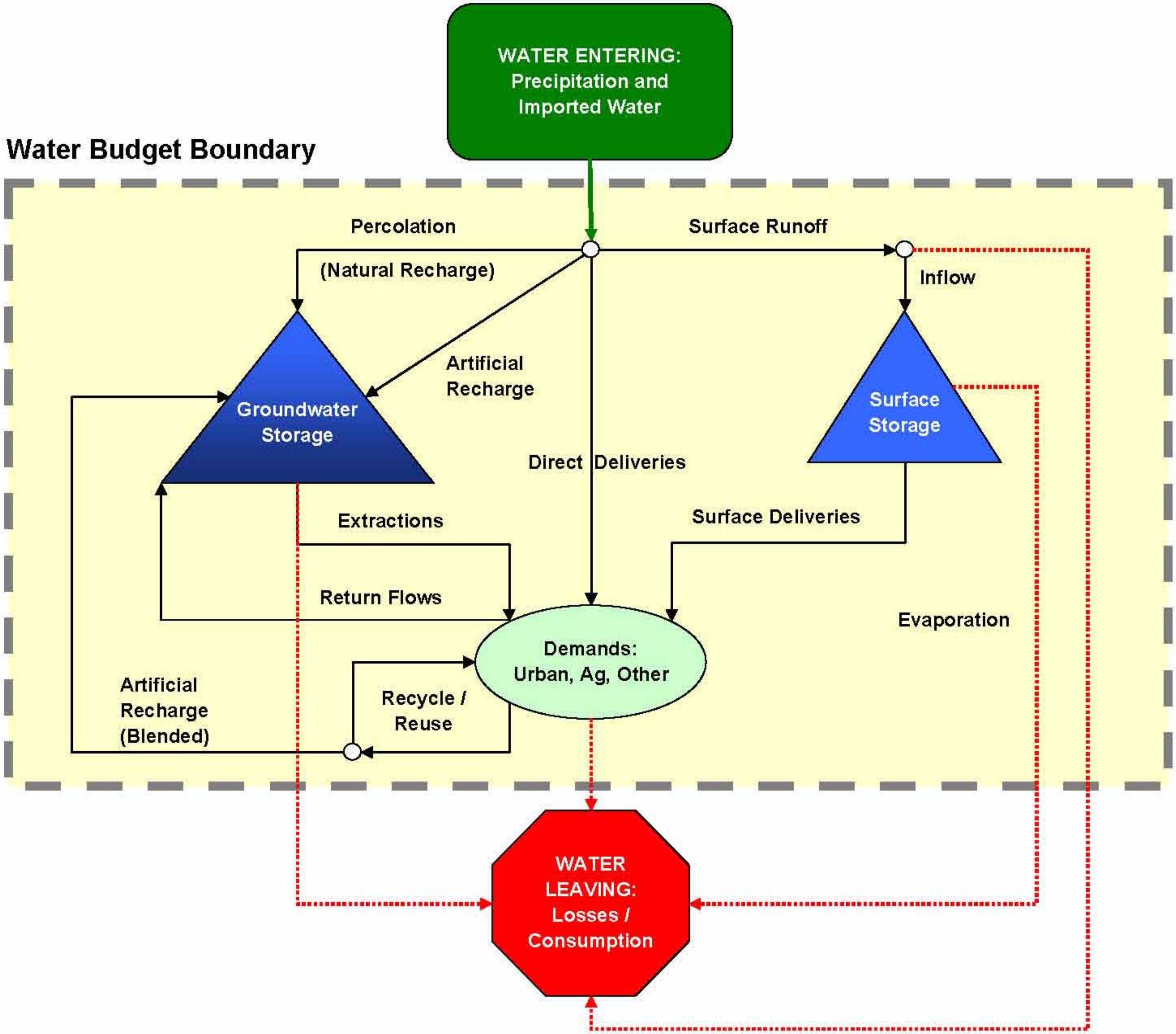


**Figure 3-1 Water Budget Schematic**

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#### 3.1.1.2 Imported Water

Imported water entering the Antelope Valley Region could come from a number of sources including the State Water Project (SWP), desalination, or transfers/exchanges with surrounding agencies. Currently, the only source of imported water to the Antelope Valley Region is SWP water. SWP water enters the Antelope Valley Region as direct deliveries (see Section 3.1.4) or artificial recharge to groundwater storage (see Section 3.1.3.4).

##### *3.1.1.2.1 Imported Water Infrastructure*

Imported water to the Antelope Valley Region is generally SWP water that is released from Lake Oroville into the Feather River where it then travels down the river to its convergence with the Sacramento River, the state's largest waterway. Water flows down the Sacramento River into the Sacramento-San Joaquin Delta. From the Delta, water is pumped into the California Aqueduct. The Antelope Valley Region is served by the East Branch of the California Aqueduct. Water taken from the California Aqueduct from the local SWP Contractors is then treated before distribution to their customers.

The Antelope Valley-East Kern Water Agency (AVEK) currently treats SWP water with four Water Treatment Plants (WTPs) that are capable of treating approximately 104,260 acre-feet per year (AFY) of imported water. The main WTP, Quartz Hill WTP, is rated for 65 million gallons per day (mgd) (72,870 AFY). The Eastside WTP, expanded in 1988, provides a treatment capacity of 10 mgd (11,210 AFY). Rosamond WTP is a 14 mgd (15,695 AFY) capacity treatment plant. The fourth AVEK plant, Acton WTP, has a capacity of 4 mgd (4,484 AFY) and is located outside of the Antelope Valley Region boundaries. Los Angeles County Waterworks District 40 (LACWWD 40), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD) all receive treated water from AVEK and thus have no SWP treatment facilities of their own.

Palmdale Water District's (PWD's) water treatment plant capacity is 30 mgd (33,632 AFY), but it is limited to treating 28 mgd (31,390 AFY) in accordance with the California Department of Public Health (DPH) (formerly the Department of Health Services) requirements to keep one filter offline in reserve (PWD 2001). Planned improvements at the plant will increase its capacity to 35 mgd. PWD is also in the preliminary design stage for a new water treatment plant with an initial capacity of 10 mgd.

Littlerock Creek Irrigation District (LCID) has an agreement with PWD to treat its raw SWP water and thus has no treatment facilities of its own.

Major water-related infrastructure in the Antelope Valley Region is shown on Figure 3-2.

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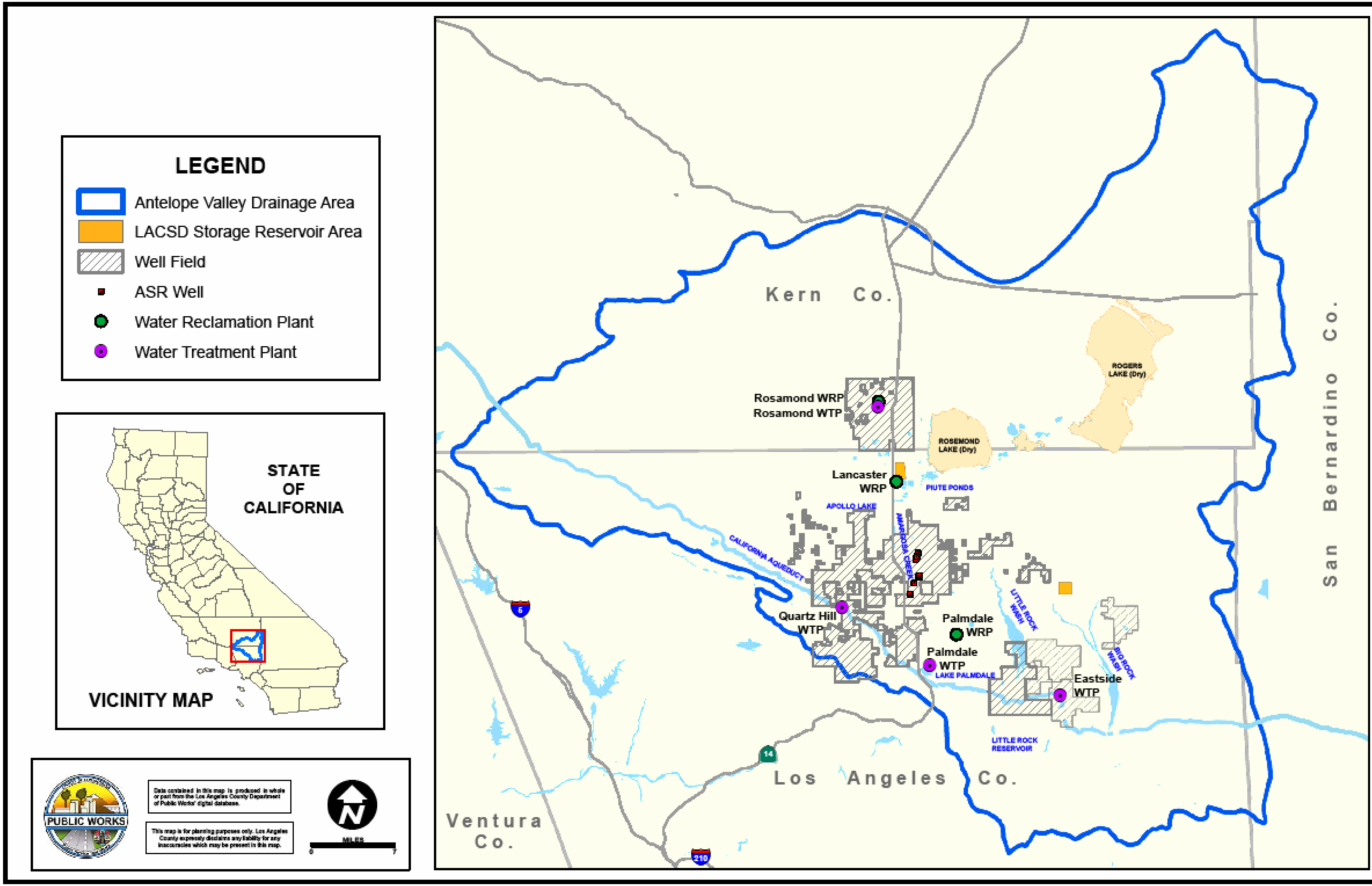


**Figure 3-2 Major-Water Related Infrastructure**

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#### *3.1.1.2.2 Reliability*

The amount of SWP supply that would be available for a given water demand is highly variable and depends on 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 variability of SWP deliveries is described in the California Department of Water Resources (DWR's) "Final 2005 SWP Reliability Report" (Reliability Report), the intent of which is to assist SWP contractors in assessing the reliability of the SWP component of their overall supplies.

In the Reliability 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 73 years of hydrology history. The results are interpreted as the capability of the SWP to meet the assumed demand, over a range of historic conditions, for that assumed set of physical facilities and operating constraints. Although new facilities are planned to increase the water delivery capability of the SWP (such as delta improvements), the analyses contained in the Reliability Report assume no additional facilities.

The Reliability Report shows that existing SWP facilities will on average receive 69 percent of their full Table A Amount for current demand conditions and 77 percent of their full Table A Amount for 2025 demand conditions. This means that the SWP, using existing facilities operated under current regulatory and operational constraints, and with all contractors requesting delivery of their full Table A Amounts in most years, could deliver 77 percent of total Table A Amounts on a long-term basis. The Reliability Report also projects that SWP deliveries during multiple-year dry periods could average about 25 to 40 percent of total Table A Amounts and could possibly be as low as 5 percent during an unusually dry single year (the driest in 73 years of historical hydrology). DWR set the 2006 SWP allocation at 100 percent. The initial allocation for 2007 has been set at 60 percent of Contractor requested amounts and may increase during the winter months (DWR 2006).

## 3.1.2 Surface Storage

### 3.1.2.1 Runoff

Surface water in the Antelope Valley Region is generally runoff from Littlerock and Santiago Canyons in the Angeles National Forest that is intercepted by the Littlerock Dam and Reservoir. Littlerock Reservoir is co-owned by PWD and LCID. PWD and LCID jointly have long-standing water rights to 5,500 AFY from Littlerock Creek flows. Raw water is conveyed to Lake Palmdale for treatment and use via the Palmdale Ditch.

One of the existing actions of the PWD is to conduct a study to determine the feasibility of enhancing the yield at Littlerock Reservoir. This study may show or quantify any additional source of runoff available to the Antelope Valley Region that is currently lost due to inadequate storage facilities. Additionally, there may be the potential for additional runoff from Amargosa Creek. However, at this time, there is no quantification of additional runoff available to the Antelope Valley Region.

### 3.1.2.2 Surface Deliveries

LCID is currently able to purchase 1,000 AFY, or 25 percent yield from the reservoir from PWD, whichever is less (PWD 2001). This amount exists until the 1992 reservoir rehabilitation agreement between PWD and LCID ends in 2042. When the 50-year term of the agreement expires, LCID regains its water rights according to the 1922 agreement between PWD and LCID. The 1922 agreement states that LCID has the exclusive right to the first 13 cubic feet per second (cfs) measured at the point of inflow to the reservoir. Flows greater than 13 cfs will be shared by PWD and LCID, with 75 percent to PWD and 25 percent to LCID. In addition, each district is allotted 50 percent of the Littlerock Reservoir storage capacity (PWD 2001). Currently, water from Littlerock Reservoir is only used for M&I uses.

A hydrological model of the Littlerock Reservoir has indicated that annual diversions (surface deliveries) range between 1,180 to 15,900 acre-feet (AF) (PWD 2001). Table 3-1 provides a summary of the historical surface deliveries from Littlerock Reservoir.

**TABLE 3-1**
**HISTORICAL SURFACE DELIVERIES FROM LITTLEROCK RESERVOIR (AFY)**

| Year | PWD Diversions | LCID Diversions | Total Diversions |
|---|---|---|---|
| 1975 | 1,586 | 1,513 | 3,099 |
| 1980 | 913 | 1,950 | 2,863 |
| 1985 | 1,460 | 1,375 | 2,835 |
| 1990 | 110 | 200 | 310 |
| 1995 | 3,771 | 0 | 3,771 |
| 2000 | 6,500 | 0 | 6,500 |
| 2005 | 6,900 | 0 | 6,900 |

Source: PWD 2001.

#### *3.1.2.2.1 Surface Water Infrastructure*

The surface water storage facilities in the Antelope Valley Region include Littlerock Reservoir and Lake Palmdale. Littlerock Reservoir has a useable storage capacity of 3,500 AF of water.

Littlerock Reservoir discharges into Lake Palmdale, which has a capacity of approximately 4,129 AF (PWD 2001). Lake Palmdale stores both surface water runoff and SWP imported water until the water is conveyed from the lake through a 42-inch pipeline to PWD's water treatment plant.

#### *3.1.2.2.2 Reliability*

In the PWD 2005 Urban Water Management Plan (UWMP), historical data was used to determine how the reliability of the Littlerock Dam and Reservoir surface water supplies would be affected for an average, single-dry, and multi-dry water years. An average water year results in approximately 4,400 AFY, which includes allotments for both LCID and PWD. This estimate is based on annual averages for years with average precipitation and should not be confused with the average expected yield of the reservoir, which is the annual average for all water years.

For a single-dry water year, the annual yield is approximately 300 AFY. In a multi-dry water year, Littlerock Dam and Reservoir is expected to yield 2,200 AFY.

According to the PWD 2001 Water Master Plan, a reliability analysis was performed for the reservoir yield using actual hydrology from 1949 to 1999, obtained from the Los Angeles Department of Public Works (LADPW). This analysis projected surface deliveries ranging from 1,178 to 15,900 AFY. The average annual yield was estimated to be 7,396 AFY.

#### 3.1.2.3 Evaporative/Conveyance Losses

There is an estimated conveyance loss of 9 percent for surface water deliveries (PWD 2001). This reduces the expected average annual yield to approximately 6,920 AFY. Additionally, there are evaporative losses at the reservoir site. In the PWD 2001 Water Master Plan, evaporative loss was estimated using monthly data for the Antelope Valley Region and reservoir area-capacity curve. Evaporative losses were incorporated into the expected annual surface deliveries and therefore do not need to be accounted for separately.

### 3.1.3 Groundwater Storage

#### 3.1.3.1 Overview of Groundwater Storage

##### *3.1.3.1.1 Groundwater Infrastructure*

LCID has five (5) groundwater wells that supplied approximately 2,160 AFY of water in 2004. Four (4) of the wells provide potable water and one well is strictly for agricultural use.

LACWWD 40 has 42 wells with a combined maximum pumping capacity of approximately 55.5 mgd (62,172 AFY).

PWD has 26 equipped groundwater wells and four (4) additional drilled, unequipped wells throughout the Lancaster and Pearland groundwater subunits and the San Andreas Rift Zone. The total capacity for all PWD wells operating is 31,321 AFY, which includes the capacity for unequipped wells. PWD's total groundwater pumping in 2004 was 11,046 AFY. One (1) of the San Andreas Rift Zone wells was taken out of production due to elevated nitrate concentrations.

QHWD currently operates seven (7) wells for a total maximum pumping capacity of 6,831 AFY. The District is currently constructing a pipeline to two (2) more wells drilled a couple of years ago (QHWD 2006). In total, these nine (9) wells are expected to increase capacity to 8,448 AFY. QHWD pumped approximately 1,450 AFY until 2001 when a shortage in SWP water required the QHWD to increase pumping to 3,050 AFY (QHWD 2002).

Rosamond Community Service District (RCSD) pumps about 1,800 to 2,000 AFY from five (5) wells.

##### *3.1.3.1.2 Reliability*

Since long-term recharge is expected to be stable, it is anticipated that groundwater pumping, and hence supply, will be reliable even in short-term and multiple year droughts. Thus groundwater is considered a very reliable supply for the Antelope Valley Region. However, the pending adjudication may affect how much groundwater can physically be supplied to the Antelope Valley Region in the future. It is important to note that the return flows are dependent upon anticipated demand and may fluctuate with any change in the anticipated demand. The return flows estimates are meant to indicate a sense of the impact of return flows to the groundwater basin.

#### 3.1.3.2 Percolation

For purposes of this IRWM Plan, direct percolation on the Antelope Valley Region floor is assumed to be 0 AFY. However, there is the potential for direct percolation on the Antelope Valley Region floor to have an impact to the overall water budget. This component of the water budget is currently being studied in the Antelope Valley Region, and if new information is discovered that greatly differs from this assumption, this IRWM Plan may be amended to reflect this.

#### 3.1.3.3 Natural Recharge

Natural recharge can be variable and difficult to quantify. Historical estimates of natural recharge have ranged from 30,300 AFY to 81,400 AFY based on a variety of approaches (USGS 2003, USGS 1993). The earliest estimates of natural recharge ranged from 50,000 AFY to 81,400 AFY and were based on limited streamflow and rainfall data (USGS 1993). Later estimates were based on developing a relationship between rainfall and runoff and ranged from 40,280 AFY to 53,000 AFY (USGS 1993). The most recent estimate of recharge was based on a groundwater model, which modified the natural recharge estimate to 30,300 AFY to achieve balance within the model (USGS 2003).

For the purposes of this IRWM Plan, the full range of estimates (30,300 AFY to 81,400 AFY) is utilized to approximate natural recharge. Furthermore, natural recharge is assumed to occur from direct percolation in the surrounding alluvial and from stream runoff to the alluvial fans. This IRWM Plan may be amended to incorporate any new information regarding natural recharge that is developed in the future.

#### 3.1.3.4 Artificial Recharge

One typical source of artificial recharge is through Aquifer Storage and Recovery (ASR) projects. ASR projects involve the storage of water in an aquifer via artificial groundwater recharge when water is available (usually during spring runoff), and recovery of the stored water from the aquifer when water is needed (usually late summer). The source of water used for ASR can vary. Currently, the only sources of ASR water available to the Antelope Valley Region are SWP water and recycled water. Although the City of Lancaster is developing a groundwater recharge project with blended recycled water, currently only SWP water is utilized for ASR in the Antelope Valley Region.

LACWWD 40 is currently the only agency within the Antelope Valley Region that is actively using ASR as a water supply management practice. Their program includes the use of new or existing wells for direct injection of water into the aquifer. LACWWD 40's ASR program operates under a Conditional Waiver of Waste Discharge Requirements, for a period of 5 years with groundwater monitoring requirements stipulated in the waiver. The waiver stipulates that LACWWD 40 can only inject water to fill the basin to the 2,150 feet groundwater contour interval. This groundwater depression has a radius of approximately 2 miles centered around the middle of Lancaster. The permit allows for injection up to 6,843 AFY. During Winter 2005/06, LACWWD 40 used four (4) wells to store approximately 1,500 AF in the groundwater basin (personal communication, David Pedersen, LADPW).

##### *3.1.3.4.1 Aquifer Storage and Recovery (ASR) Infrastructure*

LACWWD 40 started the 2006 ASR program in November with 6 wells in operation, with a combined injection rate of 2,500 to 3,000 gallons per minute (gpm) (personal communication, David Pedersen, LADPW). Approximately 10 additional new ASR wells are currently planned for development with operation potentially beginning as early as 2008.

##### *3.1.3.4.2 Reliability*

ASR water is only to be used during dry water year conditions (personal communication, David Pedersen, LADPW) and is assumed to be 100 percent reliable. Future estimates of availability will assume maximum injection rates and continuation of the permitting Waiver. For average year conditions, it was assumed that the maximum injection rate (6,843 AF) of SWP would be added to the ASR each year, with the exception of 2005 in which only 1,500 AFY was injected. Thus by 2010, a total of 29,000 AFY will have been injected (1,500 [for 2005] plus 4 x 6,843 [for 2006 to 2009]). This stored ASR water will then be available for pumping in dry year conditions. The volume available from storage in dry years was assumed to be the difference in the existing and maximum pumping rates, or approximately 31,600 AF. Thus, for a single dry year occurring in 2010, the stored 29,000 AFY is assumed to be available for pumping in 2010. For a multi-dry year starting in 2010, again 29,000 AFY is assumed to be available with the lesser of the 31,600 AFY available pumping capacity or the full supply deficit being pumped. Any remaining water in ASR storage is then considered to be available in 2011. This process is repeated for each subsequent year in that 5-year interval. Availability of water in ASR storage for 2015, 2020, 2025, and 2030, assumes average water year conditions have occurred prior to that year (i.e., full availability of ASR stored water).

#### 3.1.3.5 Return Flows

The term return flows refers to the part of applied water that is not consumed by evapotranspiration and that migrates to an aquifer or surface water body. For purposes of this IRWM Plan return flows were determined by the following equations:

$$\text{Return Flows} = \text{Water}_{\text{applied}} - \text{Water}_{\text{required}}$$

$$\text{Water}_{\text{required}} = \text{Irrigation Efficiency (IE)} * \text{Water}_{\text{applied}}$$

Substituting the second equation into the first,

$$\text{Return Flows} = \text{Water}_{\text{applied}} - \text{IE}* \text{Water}_{\text{applied}} = (1-\text{IE}) * \text{Water}_{\text{applied}}$$

For the Antelope Valley Region there are three types of return flows: agricultural, urban, and recycle/reuse return flows. Each of these is discussed in more detail below.

#### *3.1.3.5.1 Agricultural Return Flow*

Agricultural return flow rates were determined using the projected range of supply available for agricultural use and an irrigation efficiency of 75 percent. Assuming an irrigation efficiency of 75 percent and the equation above, agricultural return flows would be 25 percent (1-0.75 = 0.25) of the agricultural water applied. The agricultural water applied was assumed to be the water available for agricultural use and was determined by applying the projected percentages of agricultural demand to the total projected water deliveries (sum of the surface deliveries, imported water deliveries, recycled water, banked ASR water, natural recharge, and return flows). Projected percentages of agricultural demand are presented in Table 3-9. Basing the return flows on the available supply, as opposed to demand, allows for a better representation of future supplies. Estimates based on demand can overestimate supply since they include return flows on future demands which may not be met if there is not sufficient supply. Table 3-2 provides the projected agricultural return flows.

Previous studies have indicated that there is some time-delay between when the water is applied to when it actually reaches the aquifer, however these estimates have varied from 1 to 2 years to as much as 10 years (USGS 2003). For the purposes of this IRWM Plan, no time-delay is included since the water budget comparison is for long-term averages over the entire basin (or steady-state conditions), which absorb the variations from the time-delay.

**TABLE 3-2**
**PROJECTED AGRICULTURAL RETURN FLOW (AFY)**

| | Average Year | | | | Single Dry Water Year | | | | Multi-Dry Water Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Total Water Delivered | % Ag | Applied Ag Water[(a)] | Ag Return Flow[(b)] | Total Water Delivered | % Ag | Applied Ag Water[(a)] | Ag Return Flow[(b)] | Total Water Delivered | % Ag | Applied Ag Water[(a)] | Ag Return Flow[(b)] |
| **2010** | **201,000** | **47** | **95,000** | **24,000** | **159,000** | **49** | **78,000** | **19,000** | **219,000** | **49** | **107,000** | **27,000** |
| **2015** | **205,000** | **43** | **89,000** | **22,000** | **160,000** | **45** | **72,000** | **18,000** | **221,000** | **45** | **99,000** | **25,000** |
| **2020** | **208,000** | **40** | **83,000** | **21,000** | **160,000** | **41** | **66,000** | **17,000** | **221,000** | **41** | **92,000** | **23,000** |
| **2025** | **211,000** | **37** | **78,000** | **19,000** | **163,000** | **38** | **62,000** | **16,000** | **221,000** | **38** | **85,000** | **21,000** |
| **2030** | **211,000** | **34** | **72,000** | **18,000** | **163,000** | **36** | **58,000** | **15,000** | **222,000** | **36** | **79,000** | **20,000** |
| **2035** | **211,000** | **32** | **67,000** | **17,000** | **163,000** | **33** | **54,000** | **14,000** | **221,000** | **33** | **74,000** | **18,000** |

Notes: Numbers rounded to the nearest 1,000 AF.
(a) The agricultural water applied was assumed to be the water available for agricultural use and was determined by applying the projected percentages of agricultural demand from Table 3-9 to the total projected water deliveries (sum of the surface deliveries, imported water deliveries, recycled water, banked ASR water, natural recharge, and return flows).
(b) Assumes return flow rate of 25 percent of water applied.

It is important to note that any changes in the projected agricultural land-use will directly affect the agricultural return-flow. Increasing temperatures due to global warming also influence agricultural demand by increasing natural plant evapotranspiration (ETo) rates and crop water use, resulting in declining agricultural return flows.

#### *3.1.3.5.2 Urban Return Flows*

The ratio of indoor to outdoor water use for the Antelope Valley Region was used to estimate the return flows from deep percolation resulting from urban water use. The statewide average for outdoor water use is approximately 50 percent of total residential demand. However, estimates of outdoor water use for the Antelope Valley Region are closer to 70 percent (personal communication, David Pedersen, LADPW).

[NOTE TO READER: This 70 percent will be compared to a calculation of outdoor water use involving summer water demand and winter treatment plant flows upon receipt of additional data. Winter treatment plant flows will be assumed to be equivalent to indoor water use since there is minimal outdoor water use during winter months. Summer water demand is then assumed to be equivalent to the total indoor and outdoor water use. Thus subtracting the winter treatment plant flow from the summer water demand would yield an estimate of outdoor water use for the Antelope Valley Region. The outdoor water use is then compared to the total water demand to get a percentage of outdoor water usage. This calculation will be added to this IRWM Plan prior to completion.]

As with agricultural use, an irrigation efficiency of 75 percent is assumed, and thus urban return flows are 25 percent of outdoor urban applied water. Outdoor urban applied water was assumed to be 70 percent of total urban applied water. As with agricultural use, the total urban applied water was assumed to be the water available for urban use and was determined by applying the projected percentages of urban demand (shown in Table 3-9) to the total projected water deliveries. Table 3-3 provides a summary of anticipated urban return flows.

**TABLE 3-3**
**PROJECTED URBAN RETURN FLOW (AFY)**

| Year | Average Year | | | | Single Dry Water Year | | | | Multi-Dry Water Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total Water Delivered | % Urban | Outdoor Urban Applied Water[(a)] | Urban Return Flow[(b)] | Total Water Delivered | % Urban | Outoor Urban Applied Water[(a)] | Urban Return Flow[(b)] | Total Water Delivered | % Urban | Outdoor Urban Applied Water[(a)] | Urban Return Flow[(b)] |
| **2010** | **201,000** | **53** | **74,000** | **19,000** | **159,000** | **51** | **57,000** | **14,000** | **219,000** | **51** | **78,000** | **20,000** |
| **2015** | **205,000** | **57** | **81,000** | **20,000** | **160,000** | **55** | **62,000** | **15,000** | **221,000** | **55** | **85,000** | **21,000** |
| **2020** | **208,000** | **60** | **88,000** | **22,000** | **160,000** | **59** | **66,000** | **16,000** | **221,000** | **59** | **90,000** | **23,000** |
| **2025** | **211,000** | **63** | **93,000** | **23,000** | **163,000** | **62** | **70,000** | **18,000** | **221,000** | **62** | **95,000** | **24,000** |
| **2030** | **211,000** | **66** | **97,000** | **24,000** | **163,000** | **64** | **74,000** | **18,000** | **222,000** | **64** | **100,000** | **25,000** |
| **2035** | **211,000** | **68** | **101,000** | **25,000** | **163,000** | **67** | **76,000** | **19,000** | **221,000** | **67** | **104,000** | **26,000** |

Notes: Numbers rounded to the nearest 1,000 AF.
(a) Outdoor urban applied water was assumed to be 70 percent of total urban applied water. The urban water applied was assumed to be the water available for urban use and was determined by applying the projected percentages of urban demand from Table 3-9 to the total projected water deliveries (sum of the surface deliveries, imported water deliveries, recycled water, banked ASR water, natural recharge, and return flows).
(b) Assumes a return flow rate of 25 percent of outdoor water applied.

#### *3.1.3.5.3 Recycle/Reuse Return Flows*

To determine the projected recycle/reuse return flows, projected recycled water demands (see Section 3.1.5) are subtracted from the future water reclamation plant (WRP) capacities, since return flows from urban outdoor use are considered separately. Historically, a significant portion of treated effluent was lost to evaporation from both the Palmdale and Lancaster WRPs effluent management sites. However, due to recent changes in effluent management, effluent not used for urban recycled water use will be applied to agricultural re-use sites throughout the Antelope Valley Region, thus evaporative losses are limited to oxidation ponds and storage sites. Palmdale WRP currently has 149 acres of effluent management sites and, with an evaporation rate of 83 inches per year (6.9 feet/year), approximately 1,030 AF are lost to evaporation annually (personal communication, Brian Dietrick, Los Angeles County Sanitation District [LACSD]). Similarly, Lancaster WRP plans for approximately 600 acres for storage reservoirs (240 acres existing and 360 acres planned) for a loss of 4,150 AFY due to evaporation. Assuming no urban recycled water demand, the LACSD would require approximately 11,400 acres of agricultural re-use sites to be developed over the next 15 years. It is anticipated that these re-use sites would mostly be alfalfa with some wheat/sudan grass. Application rates at these sites would be less than agronomic rates. An argonomic rate is the rate of nutrient application to fulfill a plant's nitrogen requirements while minimizing the amount of nutrients that pass to groundwater. From personal communication with LACSD, the return flow at these sites is expected to be between 10 and 20 percent. A return flow of 10 percent has been used in this IRWM Plan as it represents a more conservative estimate of the return flow.

Table 3-4 presents the projected wastewater return flows for both Palmdale and Lancaster WRPs. These estimates will vary with changes in recycled water use and changes in effluent management at the agricultural re-use sites.

**TABLE 3-4**
**PROJECTED RECYCLE/REUSE RETURN FLOW**

| Year | MGD[(a)] | AFY[(a)] | Recycled Water Demand (AFY) | Evaporation Loss at Effluent Management Sites (AFY)[(b)] | Total Applied to Ag Reuse Sites (AFY)[(c)] | Return Flow from Ag Reuse Sites (AFY)[(d)] |
|---|---|---|---|---|---|---|
| Palmdale WRP | | | | | | |
| 2010 | 13.2 | 14,800 | 0 | 1,000 | 13,800 | 1,400 |
| 2015 | 16.4 | 18,400 | 0 | 1,000 | 17,400 | 1,700 |
| 2020 | 19.5 | 21,800 | 0 | 1,000 | 20,800 | 2,100 |
| 2025 | 22.4 | 25,100 | 0 | 1,000 | 24,100 | 2,400 |
| 2030 | 25.5 | 28,600 | 0 | 1,000 | 27,600 | 2,800 |
| 2035 | 25.5 | 28,600 | 0 | 1,000 | 27,600 | 2,800 |
| Lancaster WRP | | | | | | |
| 2010 | 14.8 | 16,600 | 3,400 | 4,200 | 9,000 | 900 |
| 2015 | 19.0 | 21,300 | 3,400 | 4,200 | 13,700 | 1,400 |
| 2020 | 23.0 | 25,800 | 3,400 | 4,200 | 18,200 | 1,800 |
| 2025 | 27.1 | 30,400 | 3,400 | 4,200 | 22,800 | 2,300 |
| 2030 | 31.2 | 34,900 | 3,400 | 4,200 | 27,300 | 2,700 |
| 2035 | 31.2 | 34,900 | 3,400 | 4,200 | 27,300 | 2,700 |

Notes: All values rounded to nearest 100 AFY.
(a) LACWWD 40 2006.
(b) Assumes an evaporation rate of 6.9 AF/acre (personal communication, Brian Dietrick, LACSD). For Palmdale WRP, assumes 149 acres of effluent management sites. For Lancaster WRP, assumes 600 acres of effluent management sites (LACSD 2004).
(c) Total plant capacity less recycled water demand and evaporative losses rounded to nearest 500 AF.
(d) Assumes a return flow rate of 10 percent.

#### 3.1.3.6 Extractions

Groundwater for the Antelope Valley Region is extracted from the Antelope Valley Groundwater Basin, as described in Section 2. Historically, groundwater has been the primary water supply source for the Antelope Valley Region.

When significant pumping in the Antelope Valley Region began (early 1900's), a decline in groundwater levels ensued in response to the change in the extraction versus recharge ratio. These changes varied spatially and temporally across the Antelope Valley Region. For instance, the eastern portion of the Buttes and Pearland subunits (described in Section 2.4.2.1) had relatively unchanged groundwater levels (declines of approximately 20 feet), whereas the western portion of these subunits had declines up to 100 feet. The groundwater level changes in the Lancaster subunit were more dramatic and varied with land use, with depressions of up to 200 feet in 1961 in areas with increased agricultural pumping (City of Lancaster 2007). With the introduction of SWP water and increasing urbanization, the water table depressions have either stabilized or increased in the Antelope Valley Region. However, a significant pumping depression from concentrated municipal groundwater pumping is still evident within the southern portion of the Lancaster subunit, between the Cities of Palmdale and Lancaster. Figures 3-3 to 3-7 provide a set of contour maps of the groundwater levels for the Antelope Valley Region from 1915 to 2006.

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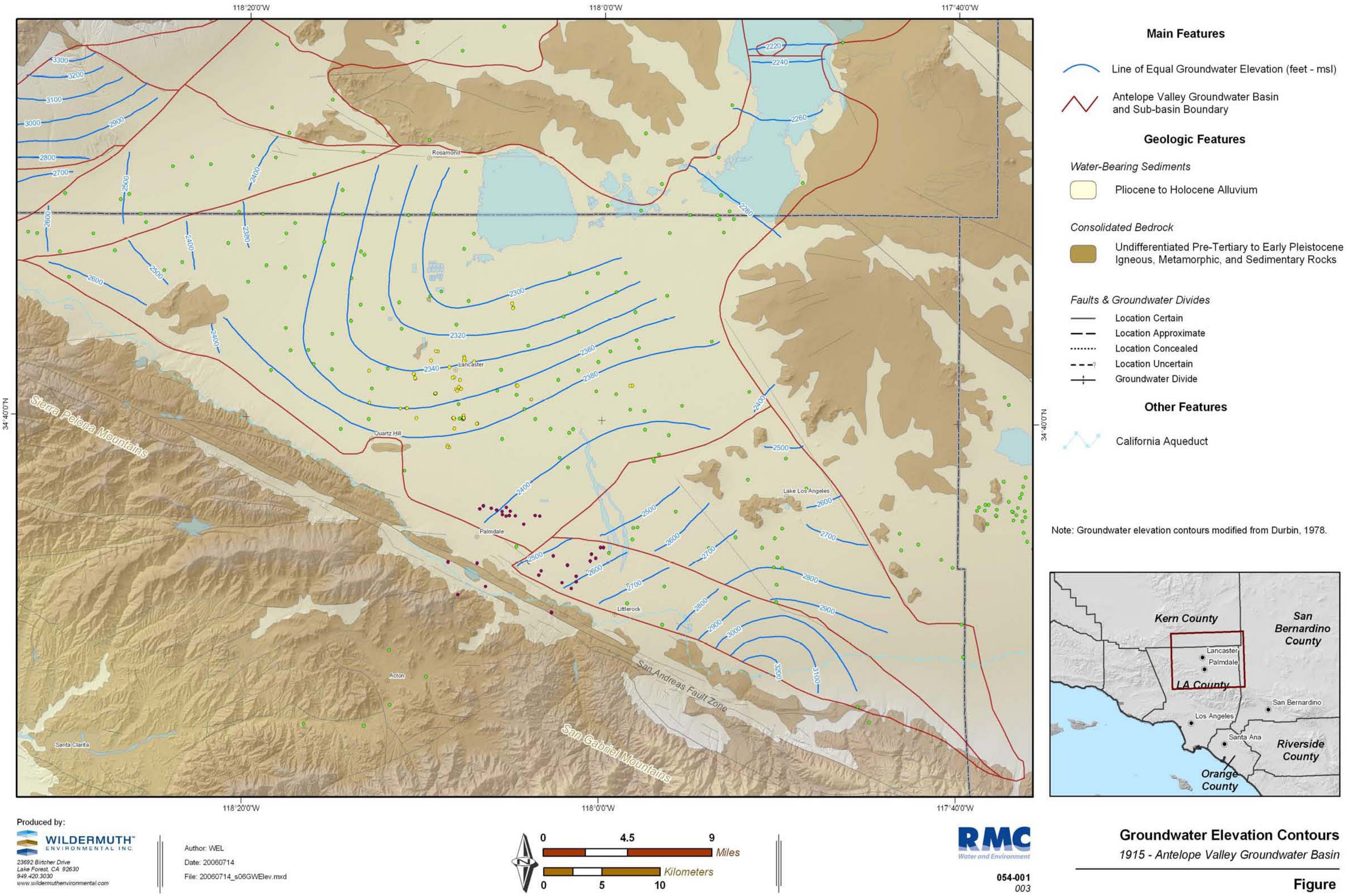
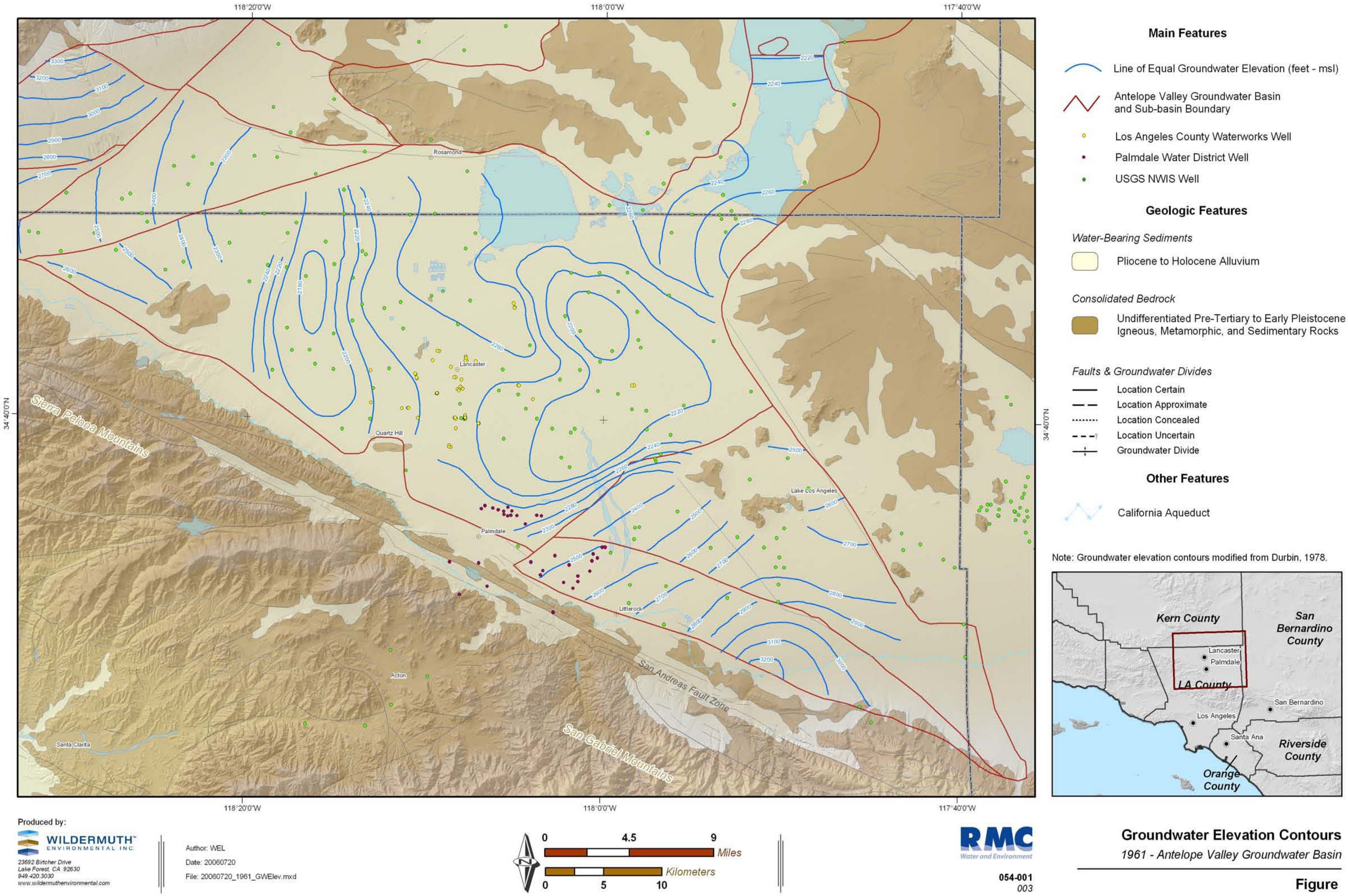


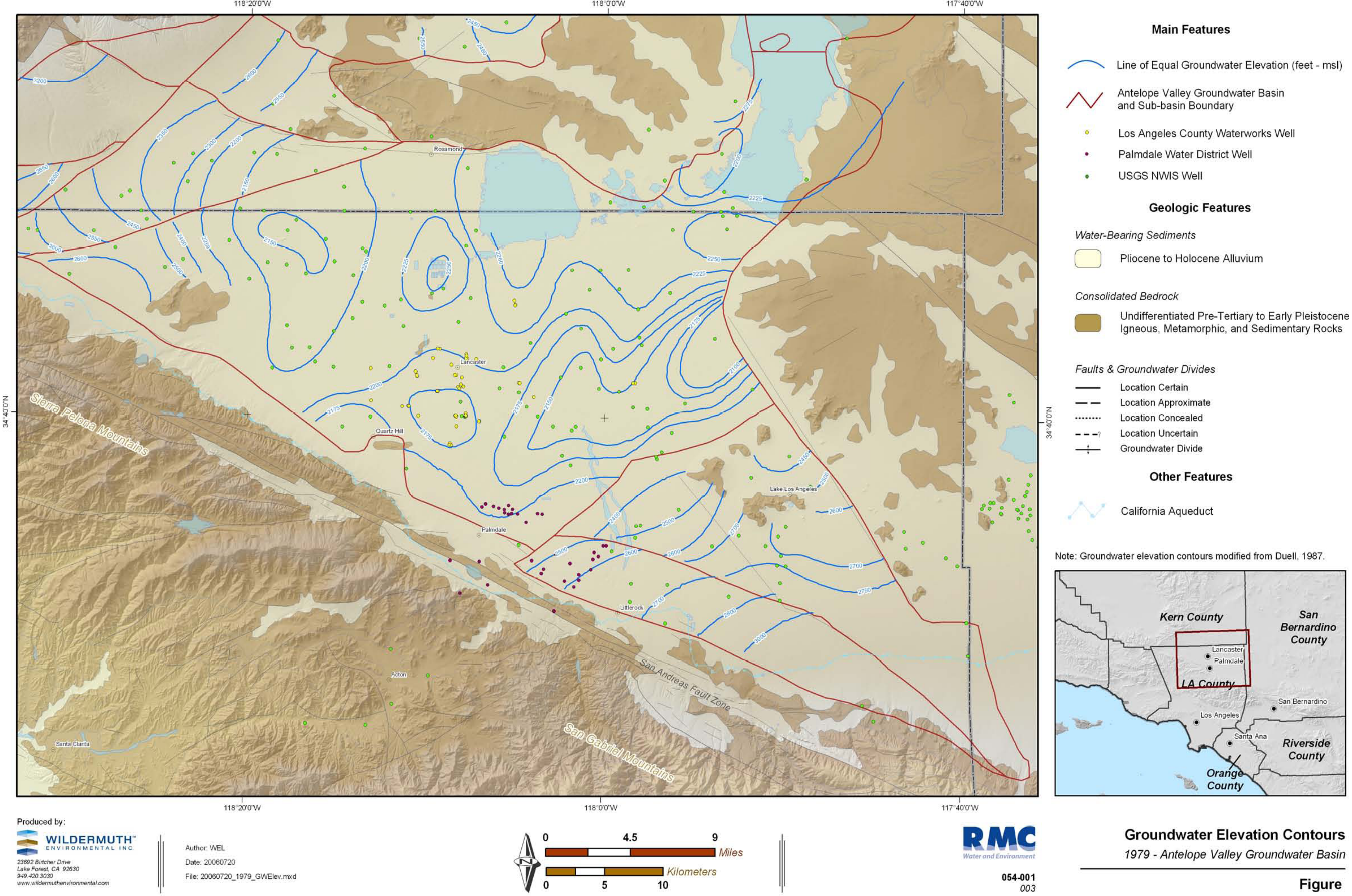

Source: "Groundwater Recharge Feasibility Study," City of Lancaster 2007.

**Figure 3-3 1915 Groundwater Level Contour Map of the Region**



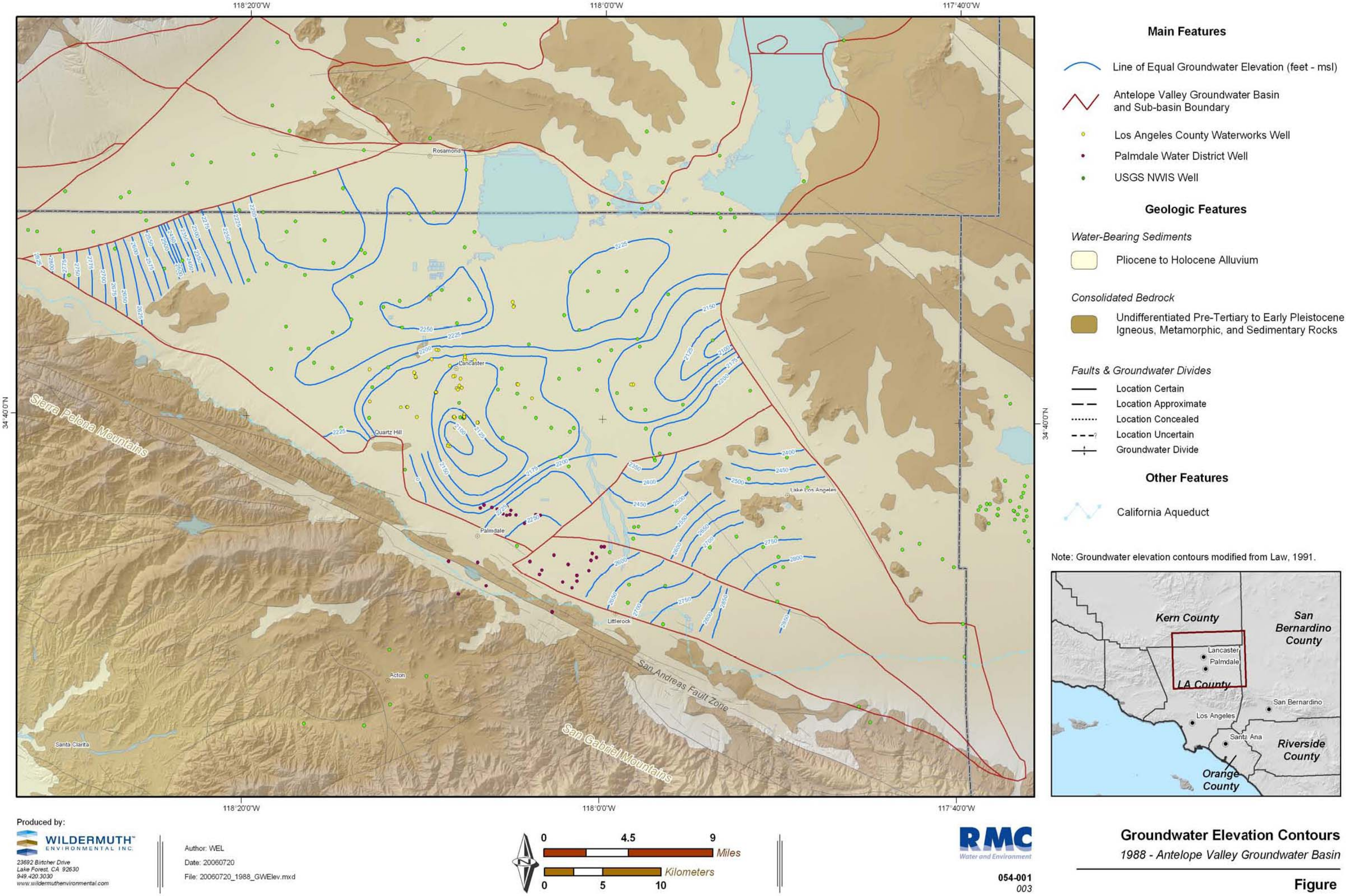

Source: "Groundwater Recharge Feasibility Study," City of Lancaster 2007.

**Figure 3-4 1961 Groundwater Level Contour Map of the Region**



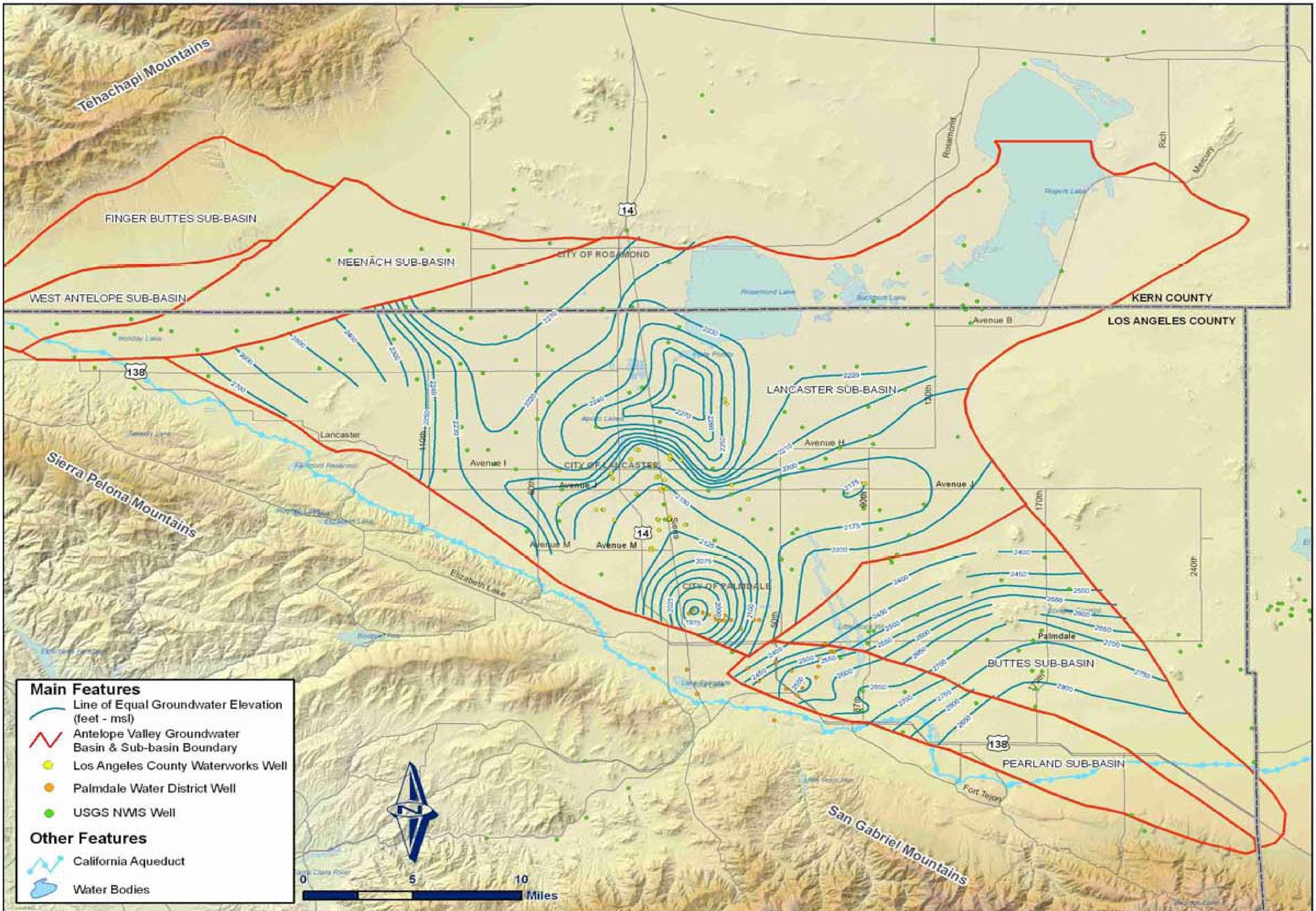

Source: "Groundwater Recharge Feasibility Study," City of Lancaster 2007.

**Figure 3-5 1979 Groundwater Level Contour Map of the Region**




Source: “Groundwater Recharge Feasibility Study,” City of Lancaster 2007.

**Figure 3-6 1988 Groundwater Level Contour Map of the Region**



SOURCE: See Appendix C of Antelope Valley Groundwater Recharge Feasibility Study Report (RMC, 2006)

Source: "Groundwater Recharge Feasibility Study," City of Lancaster 2007.

**Figure 3-7 2006 Groundwater Level Contour Map of the Region**

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In order to ensure a zero net change in groundwater levels, it is assumed that future extractions of groundwater will be limited to the available groundwater supplies (sum of the natural recharge and the allowable extractions of banked ASR water).

#### 3.1.3.7 Losses/Subsurface flow

Losses from evaporation and riparian evapotranspiration are discussed in Section 3.1.7 and have been included in the overall estimate of water loss for the water budget. Since the basin is a relatively closed basin, losses from subsurface flow are assumed to be negligible for the purposes of this IRWM Plan.

### 3.1.4 Direct Deliveries

Direct deliveries to the Antelope Valley Region consist of the SWP water contracted through the AVEK, LCID, and PWD. The SWP is operated by DWR for the benefit of the SWP contractors. The SWP is the nation's largest state-built water and power development and conveyance system. The SWP includes 660 miles of aqueduct and conveyance facilities from Lake Oroville in the north to Lake Perris in the south. It also includes pumping and power plants, reservoirs, lakes, storage tanks, canals, tunnels, and pipelines that capture, store, and convey water to 29 water agencies.

The SWP is contracted to deliver a maximum 4.17 million AFY of Table A water to the 29 contracting agencies. Table A water is a reference to the amount of water listed in “Table A” of the contract between the SWP and the contractors and represents the maximum amount of water a contractor may request each year. AVEK, which is the third largest state water contractor, has a Table A Amount of 141,400 AFY. Approximately three (3) percent of AVEK’s Table A Amount has historically been delivered to areas outside of the Antelope Valley Region.

By October 1st of every year, each contractor provides DWR a request for water delivery up to their full Table A Amount. Actual delivery from DWR may vary from the request due to variances in supply availability resulting from hydrology, storage availability, regulatory or operating constraints. When supply is limited, water is allocated based on a percentage of full contractual Table A Amounts.

A summary of the historical deliveries of SWP to the Antelope Valley Region are provided in Table 3-5. The table illustrates the Antelope Valley Region’s increasing dependence on SWP water.

**TABLE 3-5**
**SUMMARY OF HISTORICAL WHOLESALE (IMPORTED) SUPPLY (AFY) ANTELOPE VALLEY REGION**

| Year | AVEK Deliveries | AVEK Table A | PWD Deliveries | PWD Table A | LCID Deliveries | LCID Table A | Region Deliveries | Region Table A |
|---|---|---|---|---|---|---|---|---|
| 1975 | 8,068 | 35,000 | 0 | 5,580 | 520 | 520 | 8,588 | 41,100 |
| 1980 | 72,407 | 69,200 | 0 | 11,180 | 191 | 1,150 | 72,598 | 81,530 |
| 1985 | 37,064 | 40,000 | 1,558 | 14,180 | 0 | 1,730 | 38,622 | 55,910 |
| 1990 | 47,206 | 132,100 | 8,608 | 17,300 | 1,747 | 2,300 | 57,561 | 151,700 |
| 1995 | 47,286 | 138,400 | 6,961 | 17,300 | 480 | 2,300 | 54,727 | 158,000 |
| 2000 | 83,577 | 138,400 | 9,060 | 21,300 | 0 | 2,300 | 92,637 | 162,000 |
| 2004 | 97,203 | 141,400 | 23,184 | 21,300 | 0 | 2,300 | 121,882 | 165,000 |

Source: DWR 2005a

Future availability of the SWP water was estimated by DWR in its Reliability Report (2005). For an average water year, it is anticipated that 69 percent of the Table A Amount in 2005 and 77 percent in year 2025 would be available for delivery to contractors. For a single dry water year, delivery of Table A water decreases to 4 percent for 2005 and 5 percent in year 2025. For a multi-dry water year, delivery of Table A water is estimated at 32 percent for 2005 and 33 percent in year 2025. For the purposes of this IRWM Plan, 2030 and 2035 deliveries were estimated at the 2025 delivery percentages. Table 3-6 provides a summary of future SWP availability to the Antelope Valley Region.

However, AVEK is currently unable to beneficially apply its entire Table A amount of SWP water, even during years when the full Table A amount is available. This inability to fully use available supply stems from the variability of demand during winter and summer, and the existing infrastructure to receive, store, and deliver water to users. AVEK currently provides most of their water through direct deliveries to meet current demand. When demand is high during summer months, the aqueduct bringing water to AVEK has a conveyance capacity below the demand for water. During the winter months, demand is much lower than aqueduct capacity. If AVEK had sufficient infrastructure to receive and store the water when it can take delivery during the winter months, it could then deliver that water during higher demands or during times when less SWP water is available.

The maximum amount of Table A water AVEK currently can put to beneficial use in an average water year is approximately 81,750 AFY (assuming 400 gpm deliveries from June 15 to September 31 and 150 gpm deliveries for the rest of the year). However, this conveyance constraint into the Antelope Valley Region does not affect dry year conditions since the availability of SWP water in a dry year is significantly less than the aqueduct capacity. Therefore, for the purposes of this IRWM Plan AVEK's Table A Amounts available for use within the Antelope Valley Region for dry year conditions is calculated to be 137,150 AFY. LCID and PWD have Table A Amounts of 2,300 AFY and 21,300 AFY, respectively. Thus, the total available Table A Amount for the Antelope Valley Region is 105,350 AFY and 160,750 AFY for average and dry year conditions, respectively.

**TABLE 3-6**
**SUMMARY OF PROJECTED WHOLESALE (IMPORTED) SUPPLY (AFY) ANTELOPE VALLEY REGION**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| Average Year[(a)] | 74,000 | 77,000 | 79,000 | 81,000 | 81,000 | 81,000 |
| Reliability[(b,c)] | 70% | 73% | 75% | 77% | 77% | 77% |
| Single Dry Year[(d)] | 6,000 | 6,000 | 6,000 | 8,000 | 8,000 | 8,000 |
| Reliability[(b)] | 4% | 4% | 4% | 5% | 5% | 5% |
| Multi-Dry Year[(d)] | 51,000 | 53,000 | 53,000 | 53,000 | 53,000 | 53,000 |
| Reliability[(b)] | 32% | 33% | 33% | 33% | 33% | 33% |

Notes: Numbers rounded to nearest 1,000 AFY.
(a) Assumes supply equivalent to the Antelope Valley Region's total Table A Amount (105,350 AFY) times the reliability, after adjusting for the local conveyance facility constraints.
(b) Determined from DWR's Final 2005 "State Water Project Reliability Report" (DWR 2005b).
(c) Future construction, facility improvements, or other actions can increase the reliability of SWP supplies (e.g., the CALFED Bay-Delta Program, the Napa Accord, and the South Delta Improvement Program). As these improvements are made and Contractor demands increase, the SWP is currently projected to be able to deliver an average of about 77 percent.
(d) Assumes supply equivalent to the Antelope Valley Region's total Table A Amount (160,750 AFY) times the reliability.

## 3.1.5 Recycle/Reuse

### 3.1.5.1 Recycled Water Sources

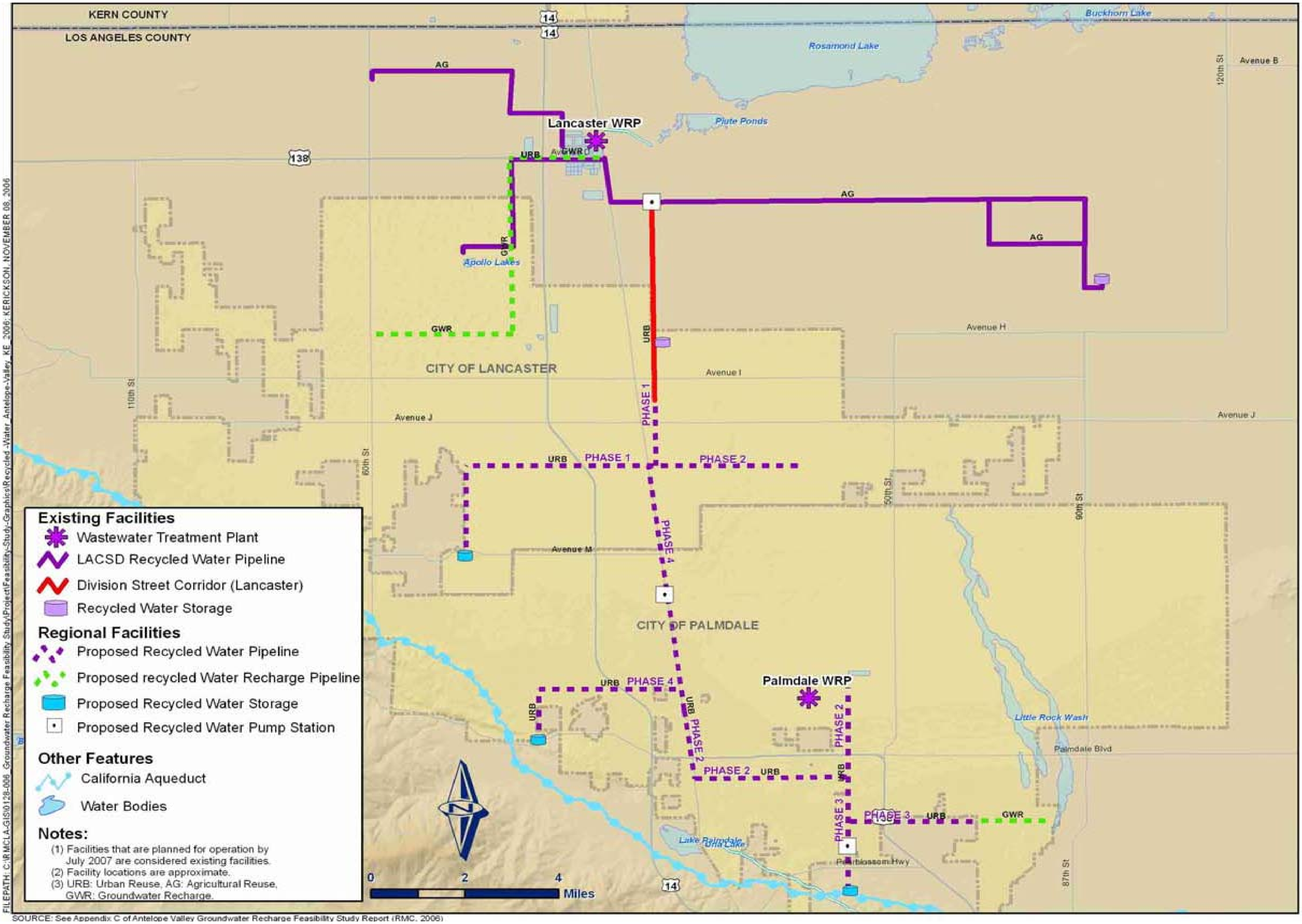
Currently, the only recycled water in the Antelope Valley Region that is treated to a tertiary level is a small percentage of the wastewater at the Lancaster WRP through additional onsite facilities of the Antelope Valley Tertiary Treatment Plant (TTP). In the future, recycled water may be available from three primary sources: (1) Lancaster, (2) Palmdale WRPs, and (3) the Rosamond Wastewater Treatment Plant (WWTP). Since the RWMG emphasized the need to maximize beneficial use of water supplies within the Antelope Valley Region, the proposed recycled water users served by these WRPs and identified in the "2005 Antelope Valley Water Facilities Planning Report" have been included in the Water Budget estimates for this Plan. This presumes that significant investments will be made to expand and upgrade treatment plants to develop these recycled water supplies (as described in Section 5.2.2). If the necessary investments are not made, the expected future water supplies for the Antelope Valley Region must be reduced by the amounts shown in Table 3-7. Figure 3-8 shows the locations of the proposed facilities and infrastructure necessary to provide the recycled water quantities shown in Table 3-7.

Table 3-7 provides a summary of the projected availability of the recycled water to the Antelope Valley Region through 2035.

**TABLE 3-7**
**POTENTIAL AVAILABILITY OF RECYCLED WATER (AFY)**
**TO ANTELOPE VALLEY REGION**

| | **2005** | **2015** | **2035** |
|---|---|---|---|
| Lancaster WRP | 13,000 | 21,000 | 35,000 |
| Palmdale WRP | 12,000 | 18,000 | 29,000 |
| Rosamond WWTP | 0 | 1,000 | 1, 000 |
| **Total Study Area** | **25,000** | **40,000** | **65,000** |

Source: LACWWD 40 2006, rounded to nearest 1,000 AFY.




Source: "Groundwater Recharge Feasibility Study," City of Lancaster 2007.

**Figure 3-8 Proposed Recycled Water Infrastructure**

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#### *3.1.5.1.1 Recycled Water Infrastructure*

Distribution Pipeline: As shown in Figure 3-8, the City of Lancaster's existing recycled water distribution, which serves Apollo Lakes and Nebeker Ranch, will be expanded for urban reuse as part of the Division Corridor Project over the next 10 years. Figure 3-8 also shows the LACWWD 40 Recycled Water Backbone distribution pipeline proposed to expand urban reuse in the Antelope Valley Region.

Lancaster WRP: The Lancaster WRP, built in 1959 and located north of the City of Lancaster, is owned, operated, and maintained by Los Angeles County Sanitation District No. 14 (LACSD 14). Lancaster WRP, which has a permitted capacity of 16.0 mgd, treated an average flow of 13.3 mgd in 2004 to secondary standards for agricultural irrigation, wildlife habitat, maintenance, and recreation. Additionally, up to 0.5 mgd is currently treated to tertiary standards and used to replace evaporative losses at the Apollo Lakes Regional County Park.

LACSD 14 plans to upgrade the existing Lancaster WRP to a total capacity of 18 mgd by 2010 with a proposed future upgrade to 21 mgd by 2012. Tertiary treated effluent from the upgraded Lancaster WRP will be available for municipal reuse in addition to the existing uses.

Palmdale WRP: Palmdale WRP, built in 1953 and located on two sites adjacent to the City of Palmdale, is owned, operated, and maintained by LACSD 20. Palmdale WRP, which has a permitted capacity of 15.0 mgd, treated an average flow of 9.4 mgd in 2004 to secondary standards for land application or agricultural irrigation. A recent revision to the Waste Discharge Requirements, due to concerns about nitrate in the groundwater, required LACSD 20 to eliminate their existing practice of land application and agricultural irrigation above agronomic rates of treated effluent by October 15, 2008. By November 15, 2009, LACSD 20 is required to prevent the discharge of nitrogenous compounds to the groundwater at levels that create a condition of pollution or violate the water quality objectives identified in the 1994 Water Quality Control Plan for the Lahontan Region (1994 Basin Plan). In response, Palmdale WRP will be upgraded to 15.0 mgd with full tertiary treatment by 2011. All tertiary treated water is anticipated to be used for agricultural and municipal reuse.

Rosamond WTTP: Rosamond WWTP, located in the City of Rosamond, is owned, operated, and maintained by the RCSD. Rosamond WWTP, which has a permitted capacity of 1.3 mgd, treated an average flow of 1.1 mgd to undisinfected secondary standards for landscape irrigation on-site in 2005. RCSD plans to increase the capacity to 1.8 mgd through the addition of a 0.5 mgd tertiary treatment facility. Thus far, the expansion has been approved for State Revolving Funding and is currently obtaining the necessary permits from the Lahontan Regional Board. Construction on the 0.5 MGD plant expansion is expected to start in November or December, 2007, with completion 16 to 18 months afterwards. Through coordination with LACSD, RCSD also plans on incorporating two connecting points with LACSD tertiary water pipelines on 20th and 60th Streets West, at Avenue A. RCSD is also considering construction of a new WWTP in the western portion of the Antelope Valley Region that will handle the new developments to the west and northwest. Rough calculations indicate it will be a 3.5 mgd plant with tertiary capabilities, with construction potentially around 2012 (personal communication, Claud Seal, RCSD). Once constructed, the plants would provide tertiary treated recycled water for landscape irrigation at median strips, parks, schools, senior complexes and new home developments.

#### *3.1.5.1.2 Reliability*

Recycled water is assumed to be 100 percent reliable since it is based on a consistent water supply and is not expected to change for average, single-dry, or multi-dry year water conditions. Usefulness of recycled water as a supply is limited more by recycled water infrastructure and demand for recycled water than reliability of such water as a supply.

### 3.1.5.2 Recycled Water Demand

Table 3-8 summarizes the existing recycled water demand from existing urban contracts that any of the WRPs or WTPs already have in place. These existing contracts are discussed below:

#### *3.1.5.2.1 Lancaster WRP Existing Contracts for Recycled Water*

There are three (3) existing commitments for recycled water from the Lancaster WRP as follows:

1. The Lancaster WRP 2020 Facilities Plan Final Environmental Impact Report (EIR) commits LACSD 14 to maintain Piute Ponds (specifically at a rate sufficient to maintain a minimum of 400 wetted acres of habitat). LACSD 14 staff calculates this to be an average of 2.62 mgd excluding any overflows.

2. The Los Angeles County Parks and Recreation Department has an existing contract with the LACSD 14 to deliver tertiary water to Apollo Park where it is used to for recreational uses. The park's usage averages approximately 0.15 mgd, and peaks to 0.5 mgd during summer months.

3. There is a Memorandum of Agreement (MOA) between LACSD 14 and Edwards Air Force Base (AFB) for discharge to a series of shallow impoundments south of Piute Ponds for recreational duck hunting. The effluent is discharged between November 1 and April 15 and averages approximately 0.26 mgd.

Items 1 through 3 above total 3.03 mgd (or 3,400 AFY) of recycled water that is already contracted to users from Lancaster WRP and is thus assumed as the Antelope Valley Region's recycled water demand.

#### *Palmdale WRP Existing Contracts for Recycled Water*

There are two (2) existing commitments for recycled water from the Palmdale WRP as follows:

1. LACSD 20 entered into a 20-year lease agreement with LAWA in 2002 for a 2,680 acre effluent management site on the WRP property. As part of the lease agreement, the LAWA has first right of refusal for any tertiary treated water that comes from the WRP.

2. There is one (1) existing contract with Harrington Farms, a pistachio grower, which expires in 2008, for secondary effluent. This contract expires before tertiary effluent is available in 2010. The contract with Harrington Farms for secondary effluent states that

the farmer is NOT guaranteed use of the tertiary treated water if another user wants to buy the tertiary water. Therefore, this contract is not included for future commitments of recycled water from the Palmdale WRP.

Although there is the potential to provide 65,000 AFY of recycled water, this is not an accurate estimate of future recycled water supply since distributions systems and end users are required to make use of that supply. Thus it is more accurate to estimate future recycled water supply by the anticipated demand. Demand estimates tend to be less than available supply due to limitations of infrastructure, willingness to use recycled water, and seasonal variations in demand. Thus Table 3-8 provides the anticipated future recycled water demand to be served by the proposed backbone system developed in the LACWWD 40 2006 “Antelope Valley Facilities Planning Report.” Additionally, at this time, no recycled water users have been identified for Rosamond and thus recycled water demand for this area was assumed to be zero. The Facilities Report only provides estimates of M&I demand and therefore it does not include any potential recycled water use for agriculture. In order to serve the users identified in the Facilities Report (approximately 13,300 AFY), the necessary treatment plant upgrades at the two WRPs and regional recycled water distribution system would need to be implemented as described in Section 5.2.2.

Additionally, the City of Palmdale is considering the development of a power plant that would provide power for local residents and businesses in the greater Antelope Valley Region area. According to a Draft 2006 “Palmdale Power Plant: Overview of Water Supply Issues” report, the hybrid Power Plant includes a 525 megawatt (MW) combined cycle process unit with a 50 MW solar system for a total capacity of 575 MW. Startup is expected in 2010.

The cooling water demands of the Power Plant are expected to be approximately 3,400 AFY and would vary depending on the time of year and Power Plant operation. Using recycled water produced by the Palmdale WRP is considered to be the preferred source for cooling water.

**TABLE 3-8**
**SUMMARY OF PROJECTED RECYCLED WATER (AFY)**
**TO ANTELOPE VALLEY REGION**

| | Reliability | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Average Water Year | 100% | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| Single-Dry Water Year | 100% | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| Multi-Dry Water Year | 100% | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |

Notes: All numbers rounded to nearest 100 AF.

### 3.1.6 Water Demands

The following subsection discusses the historical, current and projected water demands for the Antelope Valley Region. The demands are presented with urban demand (based on per capita estimates) and two agricultural scenarios (average and dry year estimates). Projected water demands for the Antelope Valley Region are presented in Table 3-9 and graphically presented in Figures 3-9 and 3-10.

[NOTE TO READER:  Per capita demands will be compared to household demands in the Final IRWM Plan.]

**FIGURE 3-9**
**REGIONAL DRY YEAR WATER DEMAND**

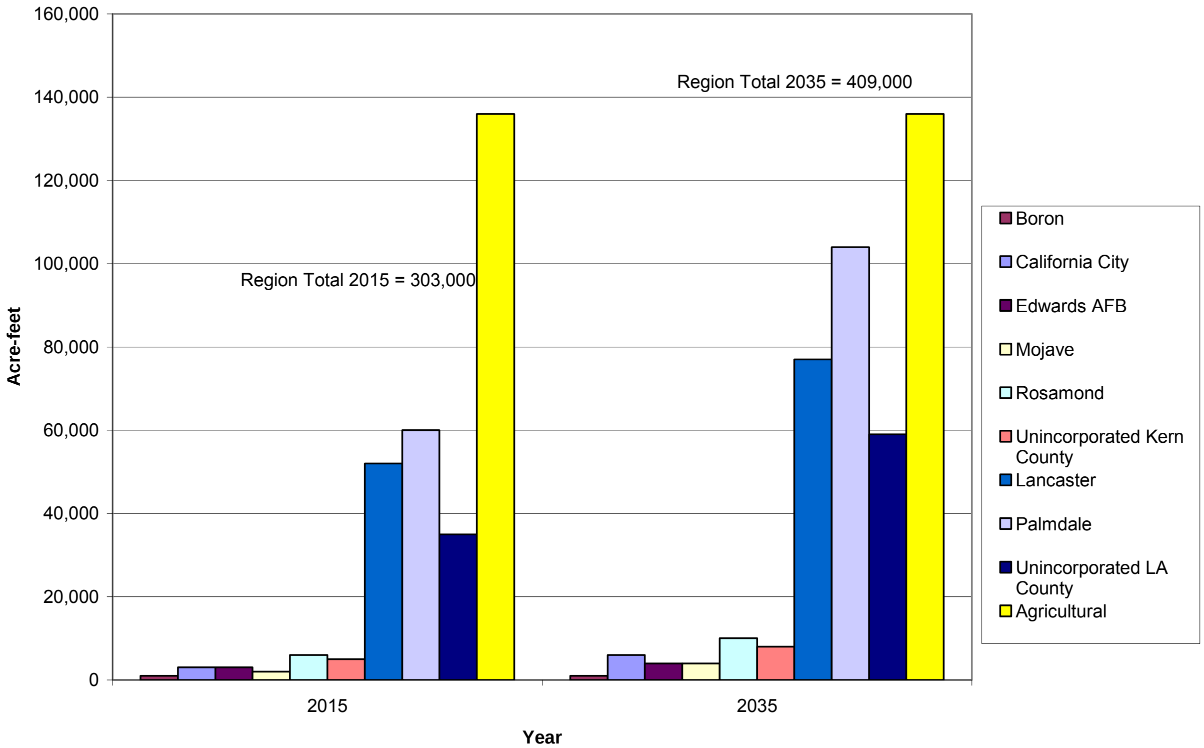


**FIGURE 3-10**
**REGIONAL AVERAGE YEAR WATER DEMAND**

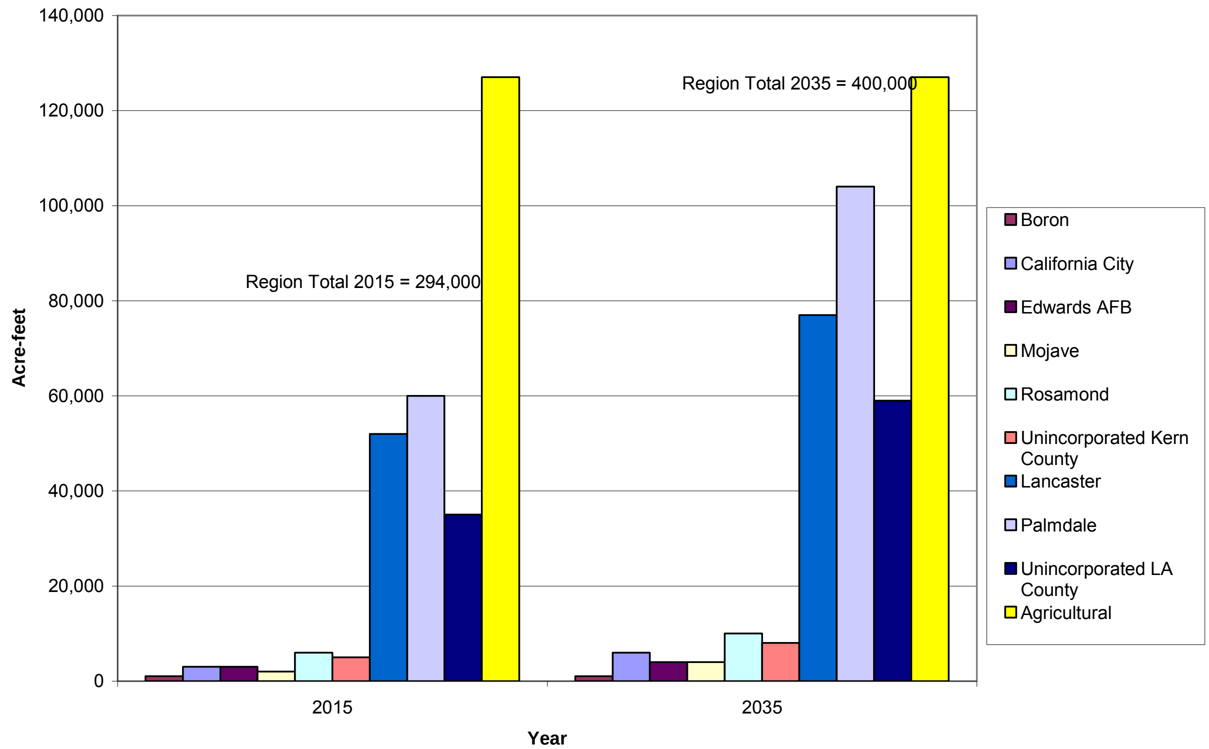


**TABLE 3-9**
**WATER DEMAND PROJECTIONS (AF) FOR THE ANTELOPE VALLEY REGION**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| *Urban Demand* | | | | | | |
| Boron | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| California City | 3,000 | 3,000 | 4,000 | 4,000 | 5,000 | 6,000 |
| Edwards AFB[(a)] | 2,000 | 3,000 | 3,000 | 3,000 | 4,000 | 4,000 |
| Mojave | 2,000 | 2,000 | 3,000 | 3,000 | 3,000 | 4,000 |
| Rosamond | 5,000 | 6,000 | 7,000 | 8,000 | 9,000 | 10,000 |
| Unincorporated Kern County | 4,000 | 5,000 | 5,000 | 6,000 | 7,000 | 8,000 |
| Lancaster | 46,000 | 52,000 | 59,000 | 65,000 | 71,000 | 77,000 |
| Palmdale | 48,000 | 60,000 | 71,000 | 82,000 | 92,000 | 104,000 |
| Unincorporated LA County | 31,000 | 35,000 | 40,000 | 45,000 | 52,000 | 59,000 |
| **Subtotal Urban Demand** | 142,000 | 167,000 | 193,000 | 217,000 | 244,000 | 273,000 |
| *Agricultural Demand* | | | | | | |
| Agricultural Demand Dry Year | 136,000 | 136,000 | 136,000 | 136,000 | 136,000 | 136,000 |
| Agricultural Demand Average Year | 127,000 | 127,000 | 127,000 | 127,000 | 127,000 | 127,000 |
| **Total Region Dry Year Demand** | 278,000 | 303,000 | 329,000 | 353,000 | 380,000 | 409,000 |
| **Total Region Average Year Demand** | 269,000 | 294,000 | 320,000 | 344,000 | 371,000 | 400,000 |
| | | | | | | |
| **Average Year Percent Urban** | 53 | 57 | 60 | 63 | 66 | 68 |
| **Average Year Percent Ag** | 47 | 43 | 40 | 37 | 34 | 32 |
| | | | | | | |
| **Dry Year Percent Urban** | 21 | 55 | 59 | 62 | 64 | 67 |
| **Dry Year Percent Ag** | 49 | 45 | 41 | 38 | 36 | 33 |

Notes: All numbers rounded to nearest 1,000 AF.
(a) Projections subject to review and update by Edwards AFB.

#### 3.1.6.1 Urban (Municipal and Industrial) Demand

Urban water demands were developed from the population projections presented in Table 2-3 (in Section 2) and assume a regional water use per capita estimate of 243 gallons per day (gpd) per person (or 0.273 AFY per person). This per capita water use estimate was determined using a weighted average of total per capita water use estimates for the major water supply agencies in the Antelope Valley Region as shown by Table 3-10. As discussed in Section 2, growth rates within an agency are consistent and thus an average per capita water use is an appropriate estimate of demand. The rate of water use in areas provided by other urban water suppliers were assumed to have minimal impact on the average and therefore were not included.

The per capita water use values could be reduced in the future with the implementation of more robust demand management measures, which could reduce the average use per person.

**TABLE 3-10**
**PER CAPITA URBAN WATER USE IN THE ANTELOPE VALLEY REGION**

| Agency | Average Per Capita Urban Water Use (AFY/person) | 2005 Population | Average Urban Water Demand (AFY)[e] |
|---|---|---|---|
| AVEK[a] | 0.101 | 98,000 | 10,000 |
| LCID[b] | 0.367 | 2,900 | 1,000 |
| LACWWD 40[c] | 0.373 | 157,000 | 59,000 |
| PWD[d] | 0.280 | 106,000 | 30,000 |
| QHWD[c] | 0.353 | 16,000 | 5,000 |
| RCSD[c] | 0.191 | 16,000 | 3,000 |
| Total | --- | 394,000 | 107,000 |
| **Region Average Per Capita Water Use[f] (AFY/person)** | | | **0.273** |

Notes: All numbers rounded to the nearest 1,000.

(a) As determined from data in the AVEK's 2005 Urban Water Management Plan (UWMP). Values exclude Los Angeles County Waterworks District 40 (LACWWD 40), QHWD, and RCSD population and demand from AVEK totals. Per capita use was calculated from the 2005 population and urban water demand from the table.
(b) Values exclude Littlerock Creek Irrigation District (LCID) agricultural demand.
(c) Based on values provided in the Antelope Valley 2005 Integrated UWMP.
(d) Per capita water use based on 12-month running average of PWD demands and data from PWD's 2005 UWMP.
(e) Demand determined by multiplying per capita water use by the current population.
(f) Antelope Valley Region per capita water use determined by divided total water demand by total population.

### 3.1.6.2 Agricultural Water Demand

Historical total applied agricultural water demand (1972 to 1995) for the Antelope Valley Region is summarized in Table 3-11. Historical agricultural demand was determined by multiplying estimated crop water requirements from the County Farm Advisors by the crop acreages provided by the Los Angeles and Kern County Agricultural Commissioners Inspection Reports. Please note that these crop water requirements are currently undergoing review by the University of California Cooperative Extension (UCCE) but have already been agreed upon by the County Farm Bureaus. The crop water requirements are discussed in more detail below.

Prior to 2000, an accounting of the agricultural acreage within the Kern County portion of the Antelope Valley Region was not available. Historically, it has been assumed that Kern County agricultural groundwater demand was 18 percent of Los Angeles County agricultural groundwater demand. The 18 percent was determined by the USGS in 2003 from land-use maps and agricultural pumpage data for Los Angeles County in 1961 and 1987. The ratio of pumpage per acre of agricultural land was then applied to agricultural land-use data for Kern County to estimate agricultural pumpage for the Kern County part of the Antelope Valley Region for those years. In both 1961 and 1987, agricultural pumpage in the Kern County part of the Antelope Valley Region was about 18 percent of the annual agricultural pumpage in the Los Angeles County part of the Antelope Valley Region. However, from the recent Kern County Crop Inspection Reports, it is evident that the Kern County portion total agricultural demand is closer to 35 percent of the total agricultural water demand of the Los Angeles County portion.

**TABLE 3-11**
**HISTORICAL AGRICULTURAL WATER USE IN THE ANTELOPE VALLEY REGION**

| Year | Los Angeles County Ag Demand (AF) | Kern County Ag Demand (AF) | Total Ag Demand (AF) |
|---|---|---|---|
| 1999 | 97,000 | 35,000 | 132,000 |
| 2000 | 109,000 | 36,000 | 145,000 |
| 2001 | 101,000 | 37,000 | 138,000 |
| 2002 | 105,000 | 39,000 | 144,000 |
| 2003 | 110,000 | 34,000 | 144,000 |
| 2004 | 104,000 | 27,000 | 131,000 |
| 2005 | 98,000 | 29,000 | 127,000 |

Note: Numbers rounded to the nearest 1,000 AF and assume average water year crop requirements.

#### *3.1.6.2.1 Crop Water Requirements*

Crop water use in the Antelope Valley Region can vary significantly from State-wide averages due to the unique requirements presented by the Antelope Valley Region's climate and physical characteristics, including low rainfall, sandy soils, and heavy winds. Thus, it is appropriate to develop crop water requirements specific to the Antelope Valley Region. It is anticipated that a similar approach will be used in the Adjudication process.

Crop water requirements have been developed, in a draft report that is currently undergoing review, by the Los Angeles County Agricultural Commissioner in collaboration with UCCE. These estimates are roughly two times larger than the State-wide averages.

The first step in determining the crop water requirements involves determining the evapotransipiration for each crop (ETc) using the following equation:

ETc= Kc * ETo

Where Kc is the crop coefficient and ETo is the reference evapotranspiration.

An estimate of the ETo for Lancaster was developed based on data from the California Irrigation Management Information System (CIMIS) weather station in Victorville, CA and historical water use ETo values for Palmdale. The Kc varies with the crop, its stage of development and the frequency of irrigation, but is independent of the location. Crop coefficients were adapted from a variety of published reports. The crop coefficients are presented in Table 3-12. Table 3-13 provides the ETc estimates for the Antelope Valley Region.

## TABLE 3-12
## CROP COEFFICIENT (KC) ESTIMATES

| Date | Alfalfa[(a)] | Sudan[(b)] | Sod | Onions | Melons | Peas/ Beans | Deciduous Fruit Trees[(c)] | Carrots | Potatoes |
|---|---|---|---|---|---|---|---|---|---|
| 1-Jan | 0.40 | | 0.87 | | | | | | |
| 15-Jan | 0.40 | | 1.07 | | | | | | |
| 1-Feb | 1.00 | | 1.19 | | | | | 0.31 | |
| 15-Feb | 1.15 | | 1.45 | | | | | 0.31 | |
| 1-Mar | 1.15 | | 2.08 | 0.30 | 0.18 | | 0.25 | 0.31 | 0.55 |
| 15-Mar | 1.05 | | 2.54 | 0.30 | 0.18 | 0.14 | 0.54 | 0.55 | 0.61 |
| 1-Apr | 1.05 | | 2.80 | 0.30 | 0.34 | 0.14 | 0.60 | 0.82 | 0.88 |
| 15-Apr | 1.05 | | 3.20 | 0.53 | 0.72 | 0.46 | 0.66 | 1.03 | 1.16 |
| 1-May | 1.05 | | 3.60 | 0.83 | 1.11 | 1.11 | 0.72 | 1.11 | 1.21 |
| 15-May | 1.05 | | 4.01 | 1.14 | 1.11 | 1.15 | 0.79 | 1.13 | 1.19 |
| 1-Jun | 1.05 | | 4.25 | 1.14 | 1.11 | 1.15 | 0.84 | 1.05 | 0.87 |
| 15-Jun | 1.05 | 0.3 | 4.52 | 1.14 | 0.78 | 0.93 | 0.86 | 1.00 | 0.55 |
| 1-Jul | 1.05 | 0.85 | 4.85 | 1.04 | 0.29 | 0.49 | 0.92 | | |
| 15-Jul | 1.05 | 1.10 | 4.83 | 0.92 | | | 0.94 | | |
| 1-Aug | 1.05 | 0.85 | 4.50 | 0.80 | | | 0.94 | | |
| 15-Aug | 1.05 | 1.10 | 4.28 | 0.68 | | | 0.94 | | |
| 1-Sep | 1.05 | 0.85 | 3.75 | | | | 0.94 | | |
| 15-Sep | 1.05 | 1.00 | 3.27 | | | | 0.91 | | |
| 1-Oct | 1.05 | 1.10 | 2.90 | | | | 0.85 | | |
| 15-Oct | 1.05 | 1.10 | 2.48 | | | | 0.79 | | |
| 1-Nov | 1.05 | | 1.70 | | | | 0.70 | | |
| 15-Nov | 0.40 | | 1.07 | | | | | | |
| 1-Dec | 0.40 | | 0.97 | | | | | | |
| 15-Dec | 0.40 | | 0.90 | | | | | | |

Sources: Hansen, B.R.; Shwannkl, L.; and Fulton, A. “Scheduling Irrigation: When and How much Water to Apply,” Water Management Series Publication Number 3396, Department of Land, Air & Water Resources, University of California, Davis.
Pruitt, W.O.; Fereres, E.; Kelta, K.; and Snyder, R.L., “Reference Evapotranspiration (ETo) for California,” UC Bull. 1922.

Notes:

(a) Kc of 1.05 takes into account reduced ETo during the cuttings throughout the season.

(b) Sudan was cut on 7/1, 8/16, and 10/16. ETo reduced for 1 to 2 weeks after cutting.

(c) Deciduous Fruit Tree Crop Coefficient were adapted from Orloff, S.B., “Deciduous Orchard Water Use: Clean Cultivated Trees for a Normal Year in Littlerock,” Local Extension Publication.

### TABLE 3-13
### CROP EVAPOTRANSPIRATION (ETC) ESTIMATES FOR THE ANTELOPE VALLEY REGION

| Date | Pasture/Sod ETo[(a)] | Alfalfa | Sudan | Sod | Onions | Melons | Peas/Beans | Deciduous Fruit Trees | Carrots | Potatoes |
|---|---|---|---|---|---|---|---|---|---|---|
| 1-Jan | 0.87 | 0.35 | 0.00 | 0.87 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15-Jan | 1.07 | 0.43 | 0.00 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1-Feb | 1.19 | 1.19 | 0.00 | 1.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.37 | 0.00 |
| 15-Feb | 1.45 | 1.67 | 0.00 | 1.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 |
| 1-Mar | 2.08 | 2.39 | 0.00 | 2.08 | 0.62 | 0.37 | 0.00 | 0.52 | 0.64 | 1.14 |
| 15-Mar | 2.54 | 2.41 | 0.00 | 2.54 | 0.76 | 0.46 | 0.36 | 1.37 | 1.40 | 1.55 |
| 1-Apr | 2.80 | 2.94 | 0.00 | 2.80 | 0.84 | 0.95 | 0.39 | 1.68 | 2.30 | 2.46 |
| 15-Apr | 3.20 | 3.36 | 0.00 | 3.20 | 1.70 | 2.30 | 1.47 | 2.11 | 3.30 | 3.71 |
| 1-May | 3.60 | 3.78 | 0.00 | 3.60 | 2.99 | 4.00 | 4.00 | 2.59 | 4.00 | 4.36 |
| 15-May | 4.01 | 4.21 | 0.00 | 4.01 | 4.57 | 4.45 | 4.61 | 3.17 | 4.53 | 4.77 |
| 1-Jun | 4.25 | 4.46 | 0.00 | 4.25 | 4.85 | 4.72 | 4.89 | 3.57 | 4.46 | 3.70 |
| 15-Jun | 4.52 | 4.75 | 1.36 | 4.52 | 5.15 | 3.53 | 4.20 | 3.89 | 4.52 | 2.49 |
| 1-Jul | 4.85 | 5.09 | 4.12 | 4.85 | 5.04 | 1.41 | 2.38 | 4.46 | 0.00 | 0.00 |
| 15-Jul | 4.83 | 5.07 | 5.31 | 4.83 | 4.44 | 0.00 | 0.00 | 4.54 | 0.00 | 0.00 |
| 1-Aug | 4.50 | 4.73 | 3.83 | 4.50 | 3.60 | 0.00 | 0.00 | 4.23 | 0.00 | 0.00 |
| 15-Aug | 4.28 | 4.49 | 4.71 | 4.28 | 2.91 | 0.00 | 0.00 | 4.02 | 0.00 | 0.00 |
| 1-Sep | 3.75 | 3.94 | 3.19 | 3.75 | 0.00 | 0.00 | 0.00 | 3.53 | 0.00 | 0.00 |
| 15-Sep | 3.27 | 3.43 | 3.27 | 3.27 | 0.00 | 0.00 | 0.00 | 2.98 | 0.00 | 0.00 |
| 1-Oct | 2.90 | 3.05 | 3.19 | 2.90 | 0.00 | 0.00 | 0.00 | 2.47 | 0.00 | 0.00 |
| 15-Oct | 2.48 | 2.60 | 2.73 | 2.48 | 0.00 | 0.00 | 0.00 | 1.96 | 0.00 | 0.00 |
| 1-Nov | 1.70 | 1.79 | 0.00 | 1.70 | 0.00 | 0.00 | 0.00 | 1.19 | 0.00 | 0.00 |
| 15-Nov | 1.07 | 0.43 | 0.00 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1-Dec | 0.97 | 0.39 | 0.00 | 0.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15-Dec | 0.90 | 0.36 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **TOTAL (inches)** | **67.08** | **66.88** | **31.70** | **67.08** | **37.48** | **22.18** | **22.29** | **48.27** | **25.96** | **24.18** |

Note: (a) Pasture ETo was drafted by B.L. Sanden, Kern County Farm Advisor 2002 and modified by G.L. Poole, Los Angeles County Farm Advisor 2004.

The ETc is an estimate of the net water requirements for a crop (i.e., the amount of water) that is required for proper plant growth. Additionally, there are net water requirements for the crop which occur outside of the growing season. These include water applied to prepare the soil for planting, fumigation, and to prevent wind erosion. The sum of the ETc and these non-growing water requirements consist of the overall net crop requirement. The net water requirement does not account for water losses from inefficient irrigation systems, deep percolation, or runoff. In order to determine the gross water requirement, or the total amount of water which must be applied to the crop, the following calculation is used:

Gross Water Requirement = Net Water Requirement/Irrigation System Efficiency

The irrigation system efficiency used in this study, 75 percent, was developed from field observations by the University of California researchers and the Natural Resources Conservation Service (NRCS). Irrigation efficiency is the ratio of irrigation water used in evapotranspiration to the water applied or delivered to a field or farm.

A summary of the crop water requirements is presented in Table 3-14. The crop water requirements for a single dry year and multi-dry years are the same. It is assumed that approximately 3 inches of net water requirement would be met by rainfall for average water years and thus average year water requirements include a reduction in the total net water requirements.

## TABLE 3-14
## CROP WATER REQUIREMENTS FOR THE ANTELOPE VALLEY REGION

| Water Requirements | Pasture | Alfalfa | Sudan | Sod | Onions | Melons | Peas/Beans | Deciduous Fruit Trees | Carrots | Potatoes |
|---|---|---|---|---|---|---|---|---|---|---|
| Net ETo | 67.08 | 66.88 | 31.70 | 67.08 | 37.48 | 24.01 | 22.29 | 48.27 | 25.96 | 24.18 |
| Net Soil | | | | | 3.54 | | | | 4.46 | |
| Net Non-Growing | 0.00 | 6.00[(a)] | 4.00 | 4.00 | 6.00[(b)] | 4.00 | 4.00 | 0.00 | 6.50[(b)] | 4.00 |
| Total Net Dry Years (in.) | 67.08 | 72.88 | 35.70 | 71.08 | 47.02 | 28.01 | 26.29 | 48.27 | 36.92 | 28.18 |
| Total Net Average Years (in.) | 64.08 | 69.88 | 32.70 | 68.08 | 44.02 | 25.01 | 23.29 | 45.27 | 33.92 | 25.18 |
| Irrigation Efficiency (%) | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Total Gross for Dry Years (in.) | 89.44 | 97.17 | 47.60 | 94.77 | 62.69 | 37.35 | 35.06 | 64.36 | 49.23 | 37.57 |
| Total Gross for Dry Years (AF) | 7.45 | 8.10 | 3.97 | 7.90 | 5.22 | 3.11 | 2.92 | 5.36 | 4.10 | 3.13 |
| Total Gross for Average Years (in.) | 85.44 | 93.17 | 43.60 | 90.77 | 58.69 | 33.35 | 31.06 | 60.36 | 45.23 | 33.57 |
| Total Gross for Average Years (AF) | 7.12 | 7.76 | 3.63 | 7.56 | 4.89 | 2.78 | 2.59 | 5.03 | 3.77 | 2.80 |

Notes:
(a) Assumes a 5-year life of an alfalfa stand. Includes the water requirement for pre-irrigation before field preparation and planning, and irrigation before and after application of herbicides.
(b) Includes water requirements for pre-irrigation before field preparation, fumigation, and “water capping” after fumigation.

#### *3.1.6.2.2 Crop Acreages*

Data regarding crop acreages in the Antelope Valley Region were available from a variety of sources as discussed below. Table 3-15 provides a comparison of the acreages from these sources.

**TABLE 3-15**
**COMPARISON OF ESTIMATES OF CROP ACREAGES**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|
| *LA Ag Commissioner[(a)]* | | | | | | | |
| Field Crops | NA | NA | 11,592 | 11,234 | 11,305 | 10,624 | 11,975 |
| Vegetable/Root Crops | NA | NA | 12,282 | 15,804 | 14,763 | 13,312 | 10,760 |
| Fruits/Nut/Grapes Crops | NA | NA | 2,866 | 1,947 | 1,955 | 1,920 | 2,117 |
| Misc Nursery | NA | NA | 621 | 617 | 599 | 608 | 675 |
| **Antelope Valley Region Total** | **----** | **----** | **27,361** | **29,602** | **28,622** | **26,464** | **25,526** |
| *Farm Advisor Inspection Reports* | | | | | | | |
| Field Crops | 10,840 | 11,718 | 12,055 | 10,960 | 10,420 | 10,063 | 10,645 |
| Vegetable/Root Crops | 11,387 | 13,727 | 11,996 | 16,096 | 16,300 | 13,501 | 12,015 |
| Fruits/Nut/Grapes Crops | 1,943 | 2,133 | 2,197 | 1,541 | 1,647 | 1,618 | 1,638 |
| Misc Nursery | 375 | 300 | 325 | 321 | 375 | 413 | 450 |
| **Antelope Valley Region Total** | **24,545** | **27,878** | **26,573** | **28,918** | **28,742** | **25,594** | **24,748** |
| *AVEK Satellite Imagery[(b)]* | | | | | | | |
| **AVEK Composite Total** | **23,424** | **18,543** | **24,726** | **23,288** | **28,943** | **23,452** | **21,109** |

Notes:
(a) Acreages for Kern County were estimated using the ratios of LA County Ag to Kern County Ag from the Inspection Reports.
(b) Acreages listed here are for the AVEK service area only and thus should be less than Antelope Valley Region Totals.

- Agricultural Commissioner Crop Reports: Each year, the Los Angeles County Agricultural Commissioner issues crop reports for the Los Angeles County portion of Antelope Valley Region. The benefit of these reports is that they are published and available for public review. The disadvantage is they tend to group crops with varying water use requirements together, making an accurate estimate of agricultural demand difficult.

- Agricultural Inspection Reports: Another more detailed source of crop acreages are the Pesticide Inspection Reports from the Agricultural Farm Advisors. The benefit is that the data is crop-specific and based on actual visits to the various farms in both Los Angeles and Kern County portions of the Antelope Valley Region. The disadvantage is that this data is not generally available and limited to farms that use pesticides. However, the data for the Los Angeles County portion of the Antelope Valley Region was consistent with the Agricultural Commissioner Crop Reports, with a difference of only 2 to

3 percent. Therefore, crop acreages from the agricultural inspection reports are used to project demand since they have the added benefit of consisting of Kern County data as well as being crop-specific.

- AVEK Agricultural Data: The third source of agricultural acreage available for the Antelope Valley Region are AVEK records. Acreages were determined from satellite imagery from the Landsat program by Dr. Hong-lie Qui California State University. Acreages of irrigated fields within the AVEK service area were determined for summer and winter periods. A composite acreage was also determined from at least two images of different seasons to represent areas that were cultivated at least once in that year. The benefit of this data is that it includes acreages for both Los Angeles and Kern County portions of the Antelope Valley Region. The disadvantage of this data is that it is limited to the AVEK service area and thus does not provide estimates for the Antelope Valley Region as a whole. However, total estimates of acreage are consistent with the other sources of acreage data, given that AVEK's service area is smaller than the Regional boundaries.

#### *3.1.6.2.3 Projected Agricultural Demand*

Projected water year agricultural demand is summarized in Table 3-16. Projections assume that crop acreages will remain approximately the same as in 2005 with the understanding that some shifting of acreages between crops may occur.

Table 3-16 provides the estimates of agricultural water use for average and dry water years.

**TABLE 3-16**
**AGRICULTURAL WATER USE IN THE ANTELOPE VALLEY REGION**

| | | Average Water Year | | Dry Water Years | |
|---|---|---|---|---|---|
| **Crop** | **Acreage[a]** | **Gross Crop Water Requirements (AF/acre)[b]** | **Gross Water Demand (AFY)[c]** | **Gross Crop Water Requirements (AF/acre)[b]** | **Gross Water Demand (AFY)[c]** |
| *Field Crops* | | | | | |
| Alfalfa Hay | 6,720 | 7.76 | 51,100 | 8.10 | 54,400 |
| Grain Hay | 3,455 | 3.63 | 12,500 | 3.97 | 13,700 |
| Sudan Hay | 220 | 3.63 | 800 | 3.97 | 900 |
| Irrigated Pasture | 250 | 7.12 | 1,800 | 7.45 | 1,900 |
| *Vegetable Crops* | | | | | |
| Onions | 3,125 | 4.89 | 15,300 | 5.22 | 16,300 |
| Melons & Pumpkins | 60 | 2.78 | 200 | 3.11 | 200 |
| *Fruits/Nuts/Grapes* | 1,638 | 5.03 | 8,200 | 5.36 | 8,800 |
| *Root Crops* | 8,830 | 3.77 | 33,300 | 4.10 | 36,200 |
| *Misc. Nursery* | 450 | 7.12 | 3,200 | 7.45 | 3,400 |
| *(mostly SOD)* | | | | | |
| **TOTAL Projected Ag Demand (AFY)** | **24,748** | | **127,000** | | **136,000** |

Notes: Totals rounded to the nearest 1,000 AF.
(a) Data from Farm Advisors Inspection Reports.
(b) From Farm Advisor gross crop water requirements specific to Antelope Valley Region.
(c) Acreage multiplied by crop water requirements.

## 3.1.7 Water Leaving

The final component to the Water Budget is water leaving the Antelope Valley Region. This includes water lost (either to evaporation or from subsurface flow) and water consumed. Total losses in the Antelope Valley Region have been estimated at approximately 10,000 AFY (USGS 1993). This estimate includes losses attributed to streambed wetting, riparian evapotranspiration, surface and soil evaporation, and diversions.

## 3.1.8 Water Budget Comparisons

### 3.1.8.1 Average Water Year

Table 3-17 and Figure 3-11 provide a comparison of the supply and demand for the Antelope Valley Region for an average water year. As shown by the comparison, future demand exceeds the existing and planned water supplies through 2035. From the information in Table 3-17, projected reserves needed in an average year were determined and are summarized in Figure 3-14. It is assumed that average year required reserves equal the average year mismatch. A range for the required reserves was determined from the maximum and minimum of the individual year reserves. For an average water year the range of required reserves is 68,400 AFY to 189,100 AFY. Additional projects and management actions to remedy these supply deficits are discussed in Section 5, Water Management Strategies, and Section 6, Project Integration and Objectives Assessment.

### 3.1.8.2 Single-Dry Water Year

Table 3-18 and Figure 3-12 provide a comparison of the supply and demand for the Antelope Valley Region for a single-dry water year. As shown by the comparison, future demand exceeds the existing and planned water supplies through 2035. From the information in Table 3-18, projected reserves needed in a single dry year were determined and are summarized in Figure 3-15. It is assumed that single dry year required reserves equal the single dry year mismatch plus the average year reserve. A range for the required reserves was determined from the maximum and minimum of the individual year reserves. For a single dry water year the range of required reserves is 50,700 AFY to 60,500 AFY. Additional projects and management actions to remedy these supply deficits are discussed in Section 5, Water Management Strategies, and Section 6, Project Integration and Objectives Assessment.

### 3.1.8.3 Multi-Dry Water Year

Figure 3-13 provides a comparison of the supply and demand for the Antelope Valley Region for a multiple-dry water year. Tables 3-19 through 3-24 provide a comparison of the supply and demand for the Antelope Valley Region for a multi-dry water year in 5-year increments. As shown by the comparisons, future demand exceeds the existing and planned water supplies through 2035. From supply and demand projections, projected reserves needed in a 4-year multi dry year were determined and are summarized in Figure 3-16. It is assumed that multi-dry year required reserves equal the multi-dry year mismatch plus the average year reserves for the same 4-year period. A range for the required reserves was determined from the maximum and minimum of the 4-year reserves. For multi-dry water years the range of required reserves is 0 AFY to 62,400 AFY. Additional projects and management actions to remedy these supply deficits are discussed in Section 5, Water Management Strategies, and Section 6, Project Integration and Objectives Assessment.

**FIGURE 3-11**
**WATER SUPPLY SUMMARY FOR AN AVERAGE WATER YEAR**

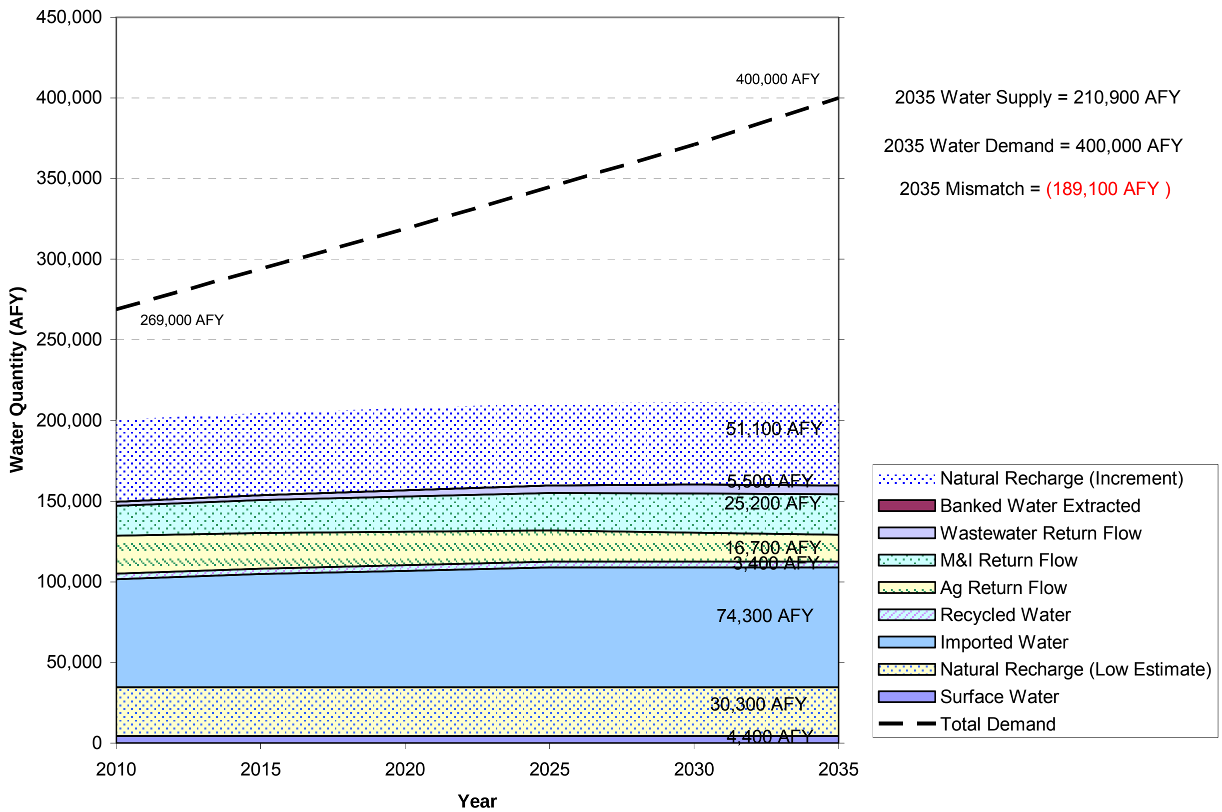


**FIGURE 3-12**
**WATER SUPPLY SUMMARY FOR A SINGLE DRY WATER YEAR**

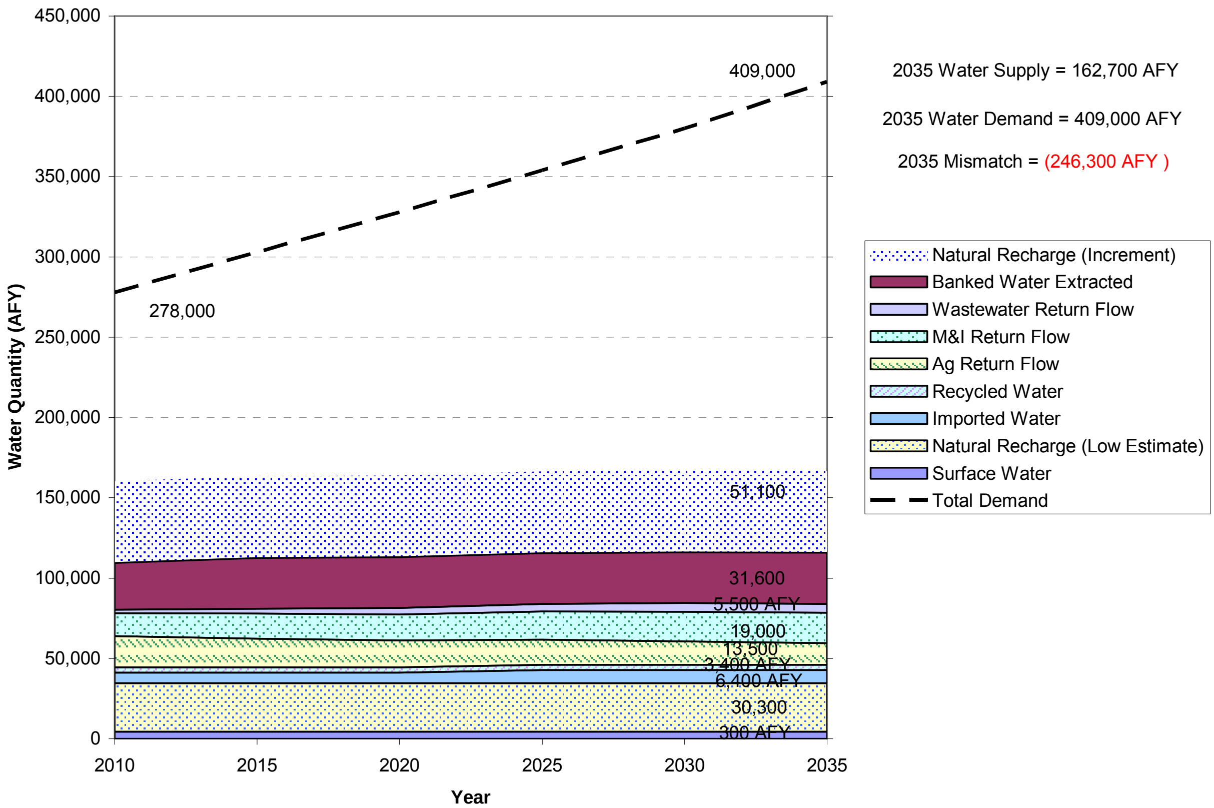


**FIGURE 3-13**
**WATER SUPPLY SUMMARY FOR A MULTI-DRY WATER YEAR**

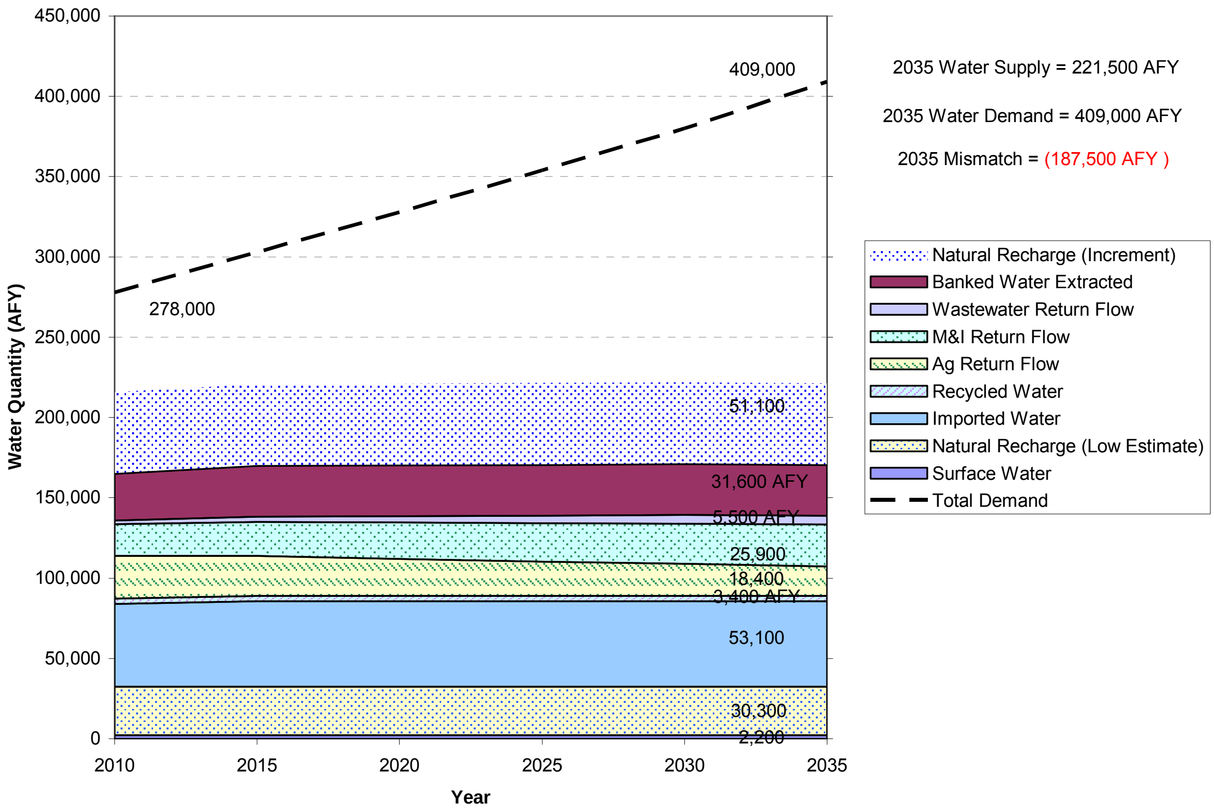


**TABLE 3-17**
**WATER BUDGET COMPARISON FOR AN AVERAGE WATER YEAR**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| Natural Recharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 0 | 0 | 0 | 0 | 0 | 0 |
| Return Flows | | | | | | |
| *Ag RF* | 23,700 | 22,100 | 20,700 | 19,400 | 18,100 | 16,700 |
| *Urban RF* | 18,500 | 20,400 | 21,900 | 23,300 | 24,300 | 25,200 |
| *WW RF* | 2,300 | 3,100 | 3,900 | 4,700 | 5,500 | 5,500 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries[a]** | 66,900 | 70,100 | 72,200 | 74,300 | 74,300 | 74,300 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 4,400 | 4,400 | 4,400 | 4,400 | 4,400 | 4,400 |
| **Total Supply** | **200,600** | **204,900** | **207,900** | **210,900** | **211,400** | **210,900** |
| **Demands[b]** | | | | | | |
| Urban Demand | (142,000) | (167,000) | (192,000) | (218,000) | (244,000) | (273,000) |
| Ag Demand | (127,000) | (127,000) | (127,000) | (127,000) | (127,000) | (127,000) |
| **Total Demand** | **(269,000)** | **(294,000)** | **(319,000)** | **(345,000)** | **(371,000)** | **(400,000)** |
| **Supply and Demand Mismatch** | **(68,400)** | **(89,100)** | **(111,100)** | **(134,100)** | **(159,600)** | **(189,100)** |

Notes:
(a) Direct Deliveries consist of the total SWP water available as shown in Table 3-6 minus the 6,800 AFY of SWP water that is banked to ASR in average water years and is thus not available to meet demand.
(b) Demand includes groundwater extractions.

**FIGURE 3-14**
**AVERAGE WATER YEAR RESERVES**

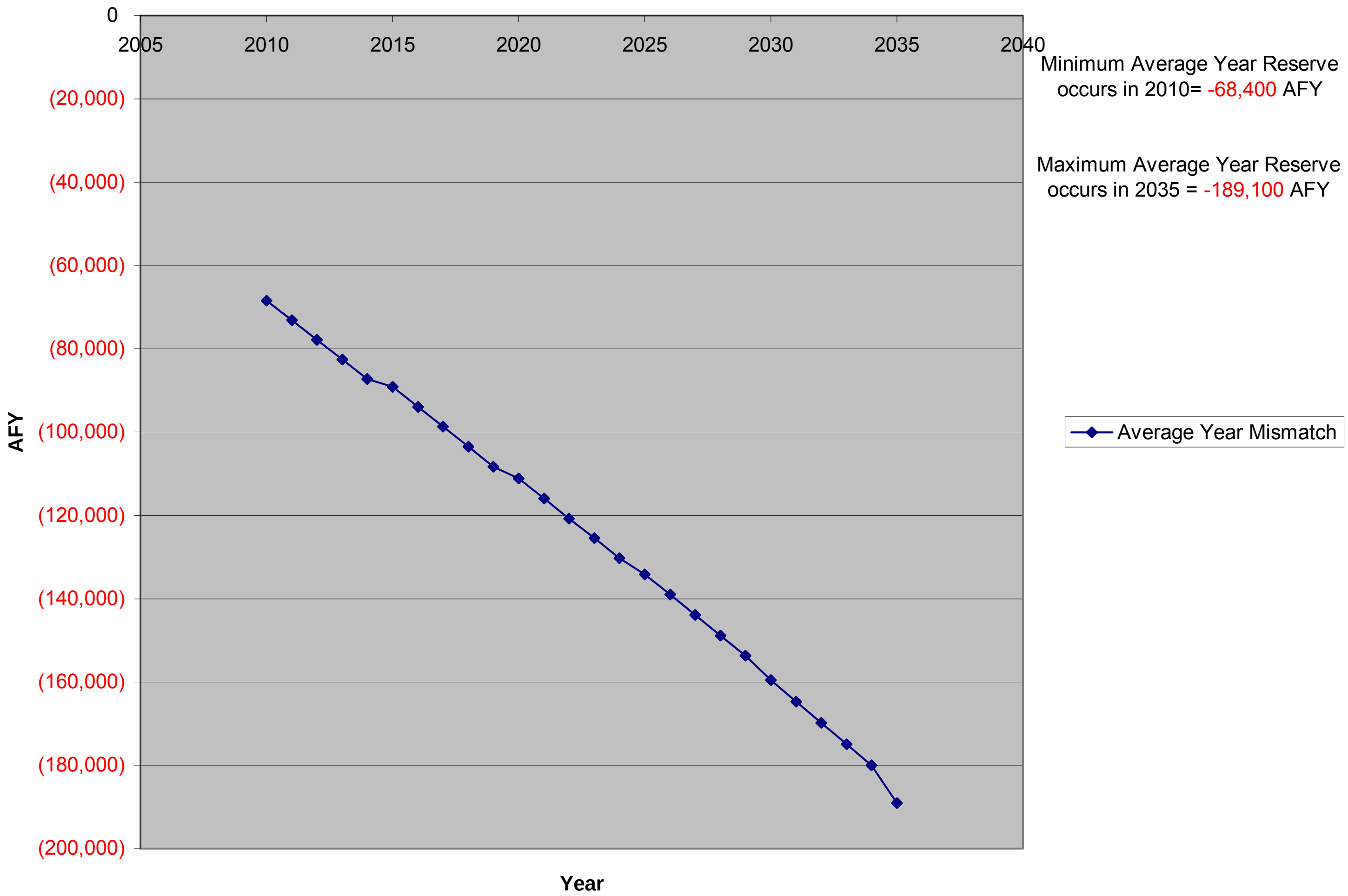


**TABLE 3-18**
**WATER BUDGET COMPARISON FOR A SINGLE-DRY WATER YEAR**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| Natural Recharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 29,000 | 31,600 | 31,600 | 31,600 | 31,600 | 31,600 |
| Return Flows | | | | | | |
| *Ag RF* | 19,500 | 17,900 | 16,600 | 15,600 | 14,600 | 13,500 |
| *Urban RF* | 14,200 | 15,400 | 16,400 | 17,500 | 18,300 | 19,000 |
| *WW RF* | 2,300 | 3,100 | 3,900 | 4,700 | 5,500 | 5,500 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 6,400 | 6,400 | 6,400 | 8,000 | 8,000 | 8,000 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 300 | 300 | 300 | 300 | 300 | 300 |
| **Total Supply** | **156,500** | **159,500** | **160,000** | **162,500** | **163,100** | **162,700** |
| **Demands[a]** | | | | | | |
| Urban Demand | (142,000) | (167,000) | (192,000) | (218,000) | (244,000) | (273,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(278,000)** | **(303,000)** | **(328,000)** | **(354,000)** | **(380,000)** | **(409,000)** |
| **Supply and Demand Mismatch** | **(121,500)** | **(143,500)** | **(168,000)** | **(191,500)** | **(216,900)** | **(246,300)** |

Note: (a) Demand includes groundwater extractions.

**FIGURE 3-15**
**SINGLE DRY WATER YEAR RESERVES**

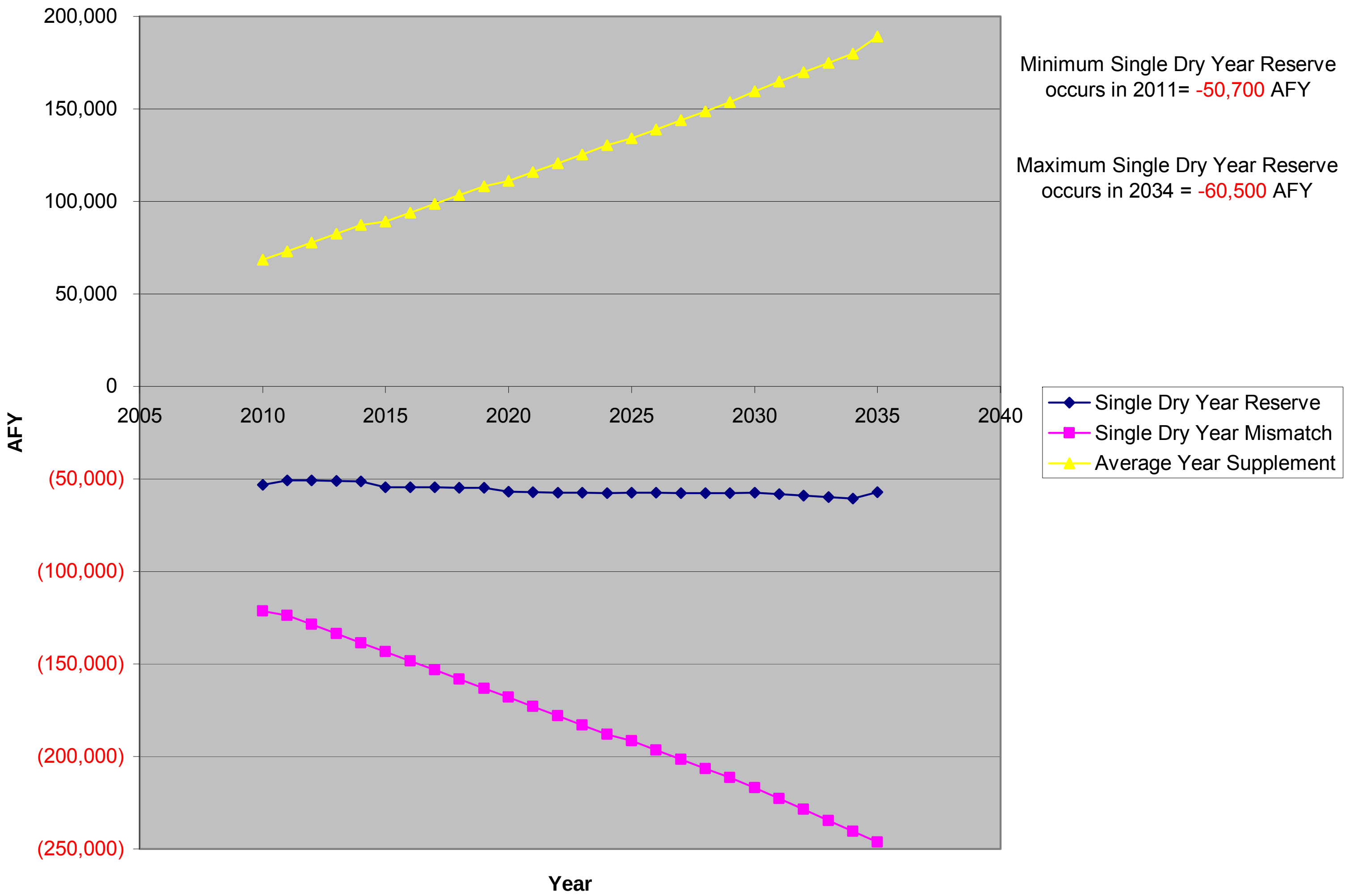


**TABLE 3-19**
**WATER SUPPLY AND DEMAND COMPARISON FOR A MULTI-DRY WATER YEAR**
**YEARS 2010 TO 2035**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| NaturalRecharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 29,000 | 31,600 | 31,600 | 31,600 | 31,600 | 31,600 |
| Return Flows | | | | | | |
| *Ag RF* | 26,700 | 24,800 | 22,900 | 21,300 | 19,900 | 18,400 |
| *Urban RF* | 19,500 | 21,300 | 22,700 | 23,900 | 24,900 | 25,900 |
| *WW RF* | 2,300 | 3,100 | 3,900 | 4,700 | 5,500 | 5,500 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 51,400 | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 |
| **Total Supply** | **215,900** | **220,900** | **221,200** | **221,600** | **222,000** | **221,500** |
| **Demands[(a)]** | | | | | | |
| Urban Demand | (142,000) | (167,000) | (192,000) | (218,000) | (244,000) | (273,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(278,000)** | **(303,000)** | **(328,000)** | **(354,000)** | **(380,000)** | **(409,000)** |
| **Supply and Demand Mismatch** | **(62,100)** | **(82,100)** | **(106,800)** | **(132,400)** | **(158,000)** | **(187,500)** |

Notes: Values assume 4-year dry period begins in the year shown.
(a) Demand includes groundwater extractions.

**TABLE 3-20**
**WATER SUPPLY AND DEMAND COMPARISON FOR A MULTI-DRY WATER YEAR**
**YEARS 2010 TO 2015**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| NaturalRecharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 29,000 | 0 | 0 | 0 | 0 | 0 |
| Return Flows | | | | | | |
| *Ag RF* | 26,700 | 26,300 | 25,900 | 25,500 | 25,100 | 24,800 |
| *Urban RF* | 19,500 | 19,900 | 20,300 | 20,700 | 21,100 | 21,300 |
| *WW RF* | 2,300 | 2,500 | 2,700 | 2,900 | 3,100 | 3,100 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 51,400 | 51,700 | 52,000 | 52,300 | 52,600 | 53,100 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 |
| **Total Supply** | **215,900** | **187,100** | **187,300** | **187,500** | **187,700** | **189,300** |
| **Demands[(a)]** | | | | | | |
| Urban Demand | (142,000) | (147,000) | (152,000) | (157,000) | (162,000) | (167,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(278,000)** | **(283,000)** | **(288,000)** | **(293,000)** | **(298,000)** | **(303,000)** |
| **Supply and Demand Mismatch** | **(62,100)** | **(95,900)** | **(100,700)** | **(105,500)** | **(110,300)** | **(113,700)** |

Note: (a) Demand includes groundwater extractions.

## TABLE 3-21
## WATER SUPPLY AND DEMAND COMPARISON FOR A MULTI-DRY WATER YEAR
## YEARS 2015 TO 2020

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| NaturalRecharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 31,600 | 31,400 | 0 | 0 | 0 | 0 |
| Return Flows | | | | | | |
| *Ag RF* | 24,800 | 24,400 | 24,000 | 23,600 | 23,200 | 22,900 |
| *Urban RF* | 21,300 | 21,600 | 21,900 | 22,200 | 22,500 | 22,700 |
| *WW RF* | 3,100 | 3,300 | 3,500 | 3,700 | 3,900 | 3,900 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 |
| **Total Supply** | **220,900** | **220,800** | **189,500** | **189,600** | **189,700** | **189,600** |
| **Demands**[(a)] | | | | | | |
| Urban Demand | (167,000) | (172,000) | (177,000) | (182,000) | (187,000) | (192,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(303,000)** | **(308,000)** | **(313,000)** | **(318,000)** | **(323,000)** | **(328,000)** |
| **Supply and Demand Mismatch** | **(82,100)** | **(87,200)** | **(123,500)** | **(128,400)** | **(133,300)** | **(138,400)** |

Note: (a) Demand includes groundwater extractions.

**TABLE 3-22**
**WATER SUPPLY AND DEMAND COMPARISON FOR A MULTI-DRY WATER YEAR**
**YEARS 2020 TO 2025**

| | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| Natural Recharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 31,600 | 31,600 | 31,600 | 2,200 | 0 | 0 |
| Return Flows | | | | | | |
| *Ag RF* | 22,900 | 22,600 | 22,300 | 22,000 | 21,700 | 21,300 |
| *Urban RF* | 22,700 | 22,900 | 23,100 | 23,300 | 23,500 | 23,900 |
| *WW RF* | 3,900 | 4,100 | 4,300 | 4,500 | 4,700 | 4,700 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 |
| **Total Supply** | **221,200** | **221,300** | **221,400** | **192,100** | **190,000** | **190,000** |
| **Demands[(a)]** | | | | | | |
| Urban Demand | (192,000) | (197,200) | (202,400) | (207,600) | (212,800) | (218,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(328,000)** | **(333,200)** | **(338,400)** | **(343,600)** | **(348,800)** | **(354,000)** |
| **Supply and Demand Mismatch** | **(106,800)** | **(111,900)** | **(117,000)** | **(151,500)** | **(158,800)** | **(164,000)** |

Note: (a) Demand includes groundwater extractions.

**TABLE 3-23**
**WATER SUPPLY AND DEMAND COMPARISON FOR A MULTI-DRY WATER YEAR**
**YEARS 2025 TO 2030**

| | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| Natural Recharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 31,600 | 31,600 | 31,600 | 31,600 | 4,600 | 0 |
| Return Flows | | | | | | |
| *Ag RF* | 21,300 | 21,000 | 20,700 | 20,400 | 20,100 | 19,900 |
| *Urban RF* | 23,900 | 24,100 | 24,300 | 24,500 | 24,700 | 24,900 |
| *WW RF* | 4,700 | 4,900 | 5,100 | 5,300 | 5,500 | 5,500 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 |
| **Total Supply** | **221,600** | **221,700** | **221,800** | **221,900** | **195,000** | **190,400** |
| **Demands[(a)]** | | | | | | |
| Urban Demand | (218,000) | (223,200) | (228,400) | (233,600) | (238,800) | (244,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(354,000)** | **(359,200)** | **(364,400)** | **(369,600)** | **(374,800)** | **(380,000)** |
| **Supply and Demand Mismatch** | **(132,400)** | **(137,500)** | **(142,600)** | **(147,700)** | **(179,800)** | **(189,600)** |

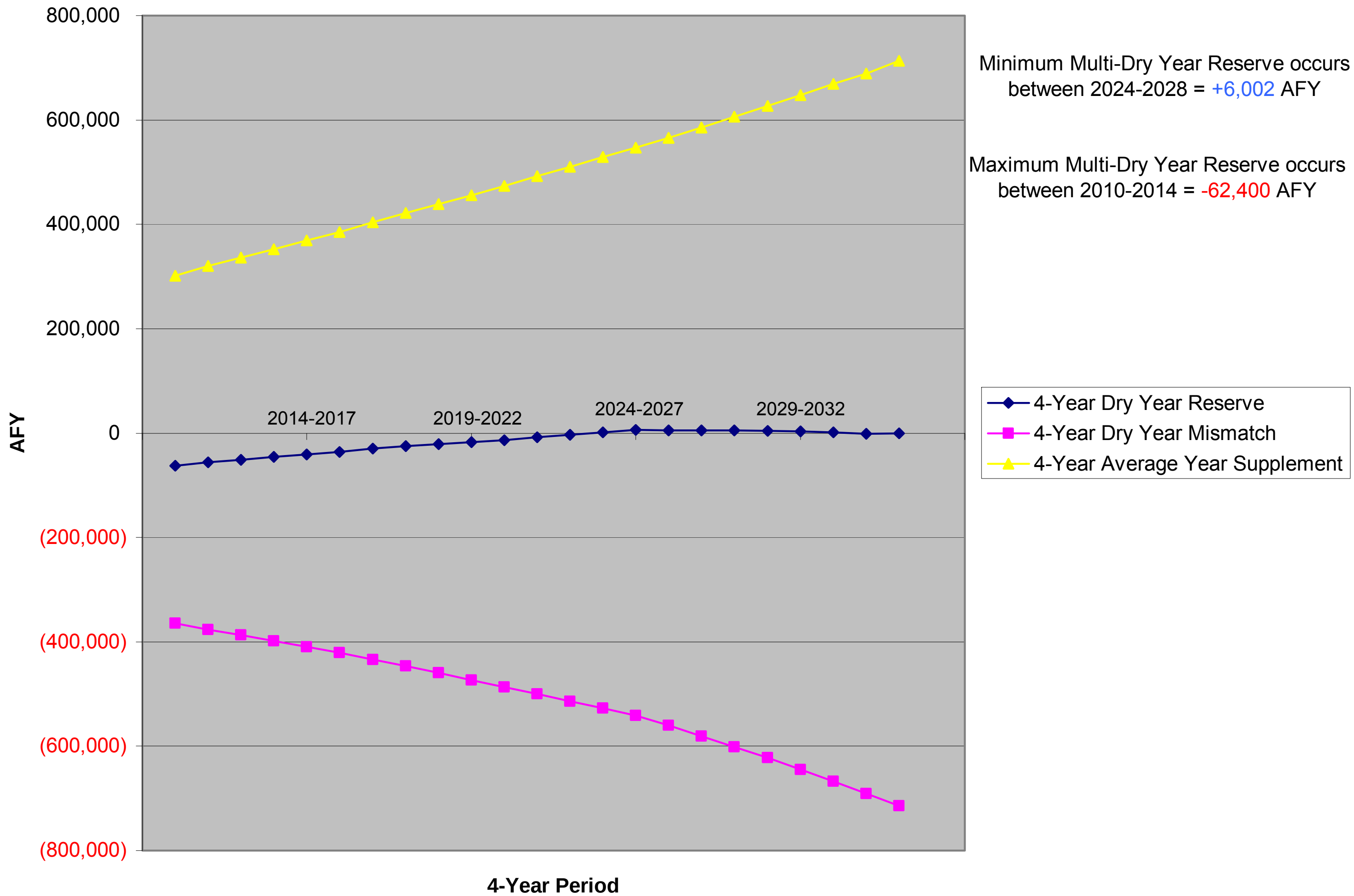
Note: (a) Demand includes groundwater extractions.

**TABLE 3-24**
**WATER SUPPLY AND DEMAND COMPARISON FOR A MULTI-DRY WATER YEAR**
**YEARS 2030 TO 2035**

| | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| Natural Recharge (Low Estimate) | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 | 30,300 |
| Natural Recharge (Increment) | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 | 51,100 |
| Banked ASR Water Extracted | 31,600 | 31,600 | 31,600 | 31,600 | 31,600 | 7,000 |
| Return Flows | | | | | | |
| *Ag RF* | 19,900 | 19,600 | 19,300 | 19,000 | 18,700 | 18,400 |
| *Urban RF* | 24,900 | 25,100 | 25,300 | 25,500 | 25,700 | 25,900 |
| *WW RF* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| Subsurface Flow Loss | 0 | 0 | 0 | 0 | 0 | 0 |
| **Direct Deliveries** | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 | 53,100 |
| **Recycle/Reuse** | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| **Surface Storage** | | | | | | |
| Surface Deliveries | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 |
| **Total Supply** | **222,000** | **221,900** | **221,800** | **221,700** | **221,600** | **196,900** |
| **Demands[(a)]** | | | | | | |
| Urban Demand | (244,000) | (249,800) | (255,600) | (261,400) | (267,200) | (273,000) |
| Ag Demand | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) | (136,000) |
| **Total Demand** | **(380,000)** | **(385,800)** | **(391,600)** | **(397,400)** | **(403,200)** | **(409,000)** |
| **Supply and Demand Mismatch** | **(158,000)** | **(163,900)** | **(169,800)** | **(175,700)** | **(181,600)** | **(212,100)** |

Note: (a) Demand includes groundwater extractions.

**FIGURE 3-16**
**MULTI-DRY WATER YEAR RESERVES**



### 3.1.9 Regional Water Supply Issues, Needs, Challenges, and Priorities

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to water supplies include the following, which are discussed in greater detail below:

- Regional reliance on imported water;
- Groundwater use is not managed;
- Existing facilities have limitations;
- Land subsidence effects; and
- Global warming effects.

#### 3.1.9.1 Reliance on Imported Water

As shown from the supply and demand comparison, the Antelope Valley Region depends on SWP for approximately 65 percent of its total supply in an average year, approximately 35 percent of its total supply in a multi-dry year, and less than 10 percent of its total supply in a single-dry year.

The availability of SWP supply is known to be variable. It fluctuates from year to year depending on precipitation, regulatory restrictions, legislative restrictions, and operational conditions, and is particularly unreliable during dry years. The DWR Reliability Report (2005b) anticipates a minimum delivery of 4 percent of full Table A Amounts for 2005 demand conditions and 5 percent of full Table A Amounts for 2025 demand conditions. The Antelope Valley Region likely cannot meet expected demands without imported water, and the variable nature of the supply presents management challenges to ensure flexibility.

#### 3.1.9.2 Groundwater is Not Managed

One of the more prevalent concerns in the Antelope Valley Region relates to management of the Antelope Valley Groundwater Basin. Groundwater has and continues to be an important resource within the Antelope Valley Region. As discussed in Section 2, groundwater has provided between 50 and 90 percent of the total water supply in the Antelope Valley Region since 1972 (USGS 2003). Projected urban growth, coupled with limits on the available local and imported water supply, are likely to continue to increase the reliance on groundwater. If the groundwater basin is not managed wisely, the basin can become overdrafted and reduce the long-term viability of the groundwater supply.

The following Assembly Bill (AB) 3030 elements are also associated with groundwater supply management within the Antelope Valley Region. A discussion of how these elements are addressed in this IRWM Plan is provided below.

**Mitigation of Conditions of Overdraft.** Although the groundwater basin is not currently adjudicated, an adjudication process has begun and is in the early stages. Although there are no existing restrictions on pumping, water rights may be assigned as part of the adjudication process. The groundwater adjudication process is a project evaluated in this IRWM Plan.

**Replenishment of Groundwater Extracted by Water Producers.** Several groundwater recharge and banking projects are being considered and evaluated as part of this IRWM Plan. The goals of these projects are to recharge/bank sufficient groundwater supply in wet years for use during dry years, thereby minimizing long-term impacts to groundwater levels.

**Monitoring of Groundwater Levels and Storage.** Groundwater level and storage monitoring is a direct indicator of the groundwater supply. The Water Supply Management Strategy (WSMS) (provided in Section 5) will include management and compilation of existing water levels and water quality monitoring data to facilitate analysis of current conditions, and to help plan for the future.

**Facilitating Conjunctive Use Operations.** Conjunctive use operations relate to the combined use of surface water and groundwater to optimize resources and minimize adverse effects of using a single source. Conjunctive use will be facilitated as part of this IRWM Plan through many of the water supply management projects in the WSMS described in more detail in Section 5. Conjunctive use opportunities with native water is limited, however, due to the relatively small amount of native surface and groundwater available. Thus, the success of conjunctive use operations will depend heavily on the ability to import water from outside of the Antelope Valley Region.

#### 3.1.9.3 Limitations of Existing Supply

The Antelope Valley Region water agencies have typically relied on imported water and/or groundwater for their water supply needs. Currently, these water supplies are limited by SWP supply fluctuations, groundwater basin overdraft and the need for facility improvements. The water agencies and municipalities are pursuing various alternatives, such as recycled water and recharge programs, to decrease their reliance on imported water and groundwater sources.

SWP water reliability is a function of hydrologic conditions, state and federal water quality standards, protection of endangered species and water delivery requirements. Though the SWP contracts contain maximum Table A Amounts for each contractor, this is not a guarantee of how much imported water will be available for delivery each year.

Water agencies in the Antelope Valley Region cannot entirely rely on groundwater pumping either, because excessive pumping for many years has stressed the basin. According to the USGS, groundwater pumping in the Antelope Valley Region has exceeded the recharge rate every year since the early 1920s (USGS 2003). This approach to groundwater pumping will change in the future, as the adjudication process for establishing groundwater rights in the Antelope Valley Region began in 2005.

Additionally, as detailed below in Section 3.5, “Land Use Management Assessment” water is a limiting factor of the Antelope Valley Region’s growth rate. In order to accommodate this projected growth the supply of water in the Antelope Valley Region must be increased.

#### 3.1.9.4 Limitations of Existing Facilities

In order to address the deficiency in supply, the water supply agencies in the Antelope Valley Region will need to modify existing infrastructure to accommodate an increase in delivery capacity for the new supply.

AVEK's Quartz Hill WTP will require an expansion to approximately 97 mgd to treat LACWWD 40's projected demands (LACWWD 40 1999). Furthermore, as previously mentioned, AVEK has capacity constraints in the summer and limited demand for water during the winter months. Thus, additional storage or recharge in the winter months is required in order for them to beneficially use their full Table A amount.

LACWWD 40's facilities improvements will include new wells, reservoirs and pipelines throughout its system to meet current and projected water supply requirements. Additional connections with AVEK will be needed to maximize use of available imported water. LACWWD 40 is pursuing the use of recycled water as an alternative source for irrigation and recharge purposes. LACWWD 40 has also started the Lancaster ASR Project in an effort to recharge treated SWP water for extraction at a later time (LACWWD 40 1999).

PWD's plan for improvements and expansion of its existing infrastructure is currently being developed in its 2006 Water System Master Plan Update. According to PWD's 2006 Strategic Plan, PWD is identifying additional water sources by investigating the potential to increase the yield from Littlerock Reservoir, water conservation, recycled water (urban irrigation and groundwater recharge), additional Table A SWP water, and water transfers. The 2006 Master Plan Update will also provide a plan for infrastructure upgrades, which includes development of an existing system hydraulic model and identifying improvements needed to mitigate existing deficiencies.

QHWD plans to enlarge existing wells or drill new wells to meet additional demands. There are no plans for QHWD to invest in recycled water in the near future because tertiary treatment and recycled water pipelines are too costly. QHWD does intend to recharge local aquifers when excess surface water is available and is currently equipping new wells with appropriate piping (QHWD 2002).

RCSD will need new wells, a reservoir, and additional transmission mains to meet projected demands (RCSD 2004).

Furthermore, the current planned regional recycled water distribution system would only deliver water to M&I users. Additional infrastructure would be required to deliver recycled water to any potential agricultural users other than the LACSD effluent management sites or adjacent users.

#### 3.1.9.5 Effects of Land Subsidence

Groundwater use in the Antelope Valley Region was at its highest in the 1950s and 1960s as a result of agricultural demands (USGS 1994a). According to USGS, land subsidence in Antelope Valley Region was first reported by Lewis and Miller in the 1950s (USGS 1992). Since then, studies have shown subsidence levels of up to 7 feet occurring in some areas of Antelope Valley Region (see Figure 3-17). Conversations held with various agencies and companies indicate that within the Antelope Valley Region, the Lancaster and Edwards AFB areas are currently experiencing problems or damages that appear to be related to land subsidence (see Figure 3-18).

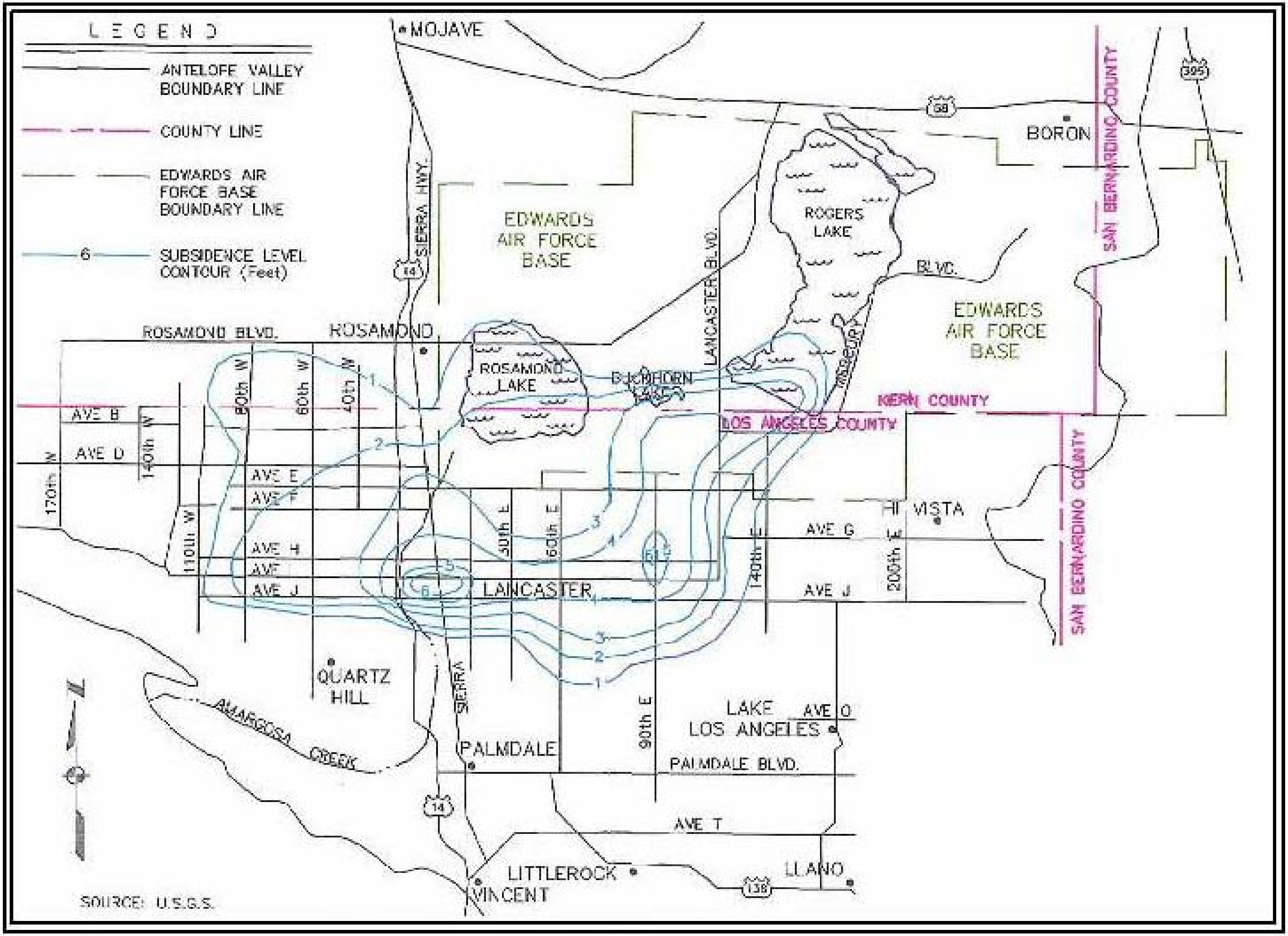



**Figure 3-17 Subsidence Levels in Antelope Valley**

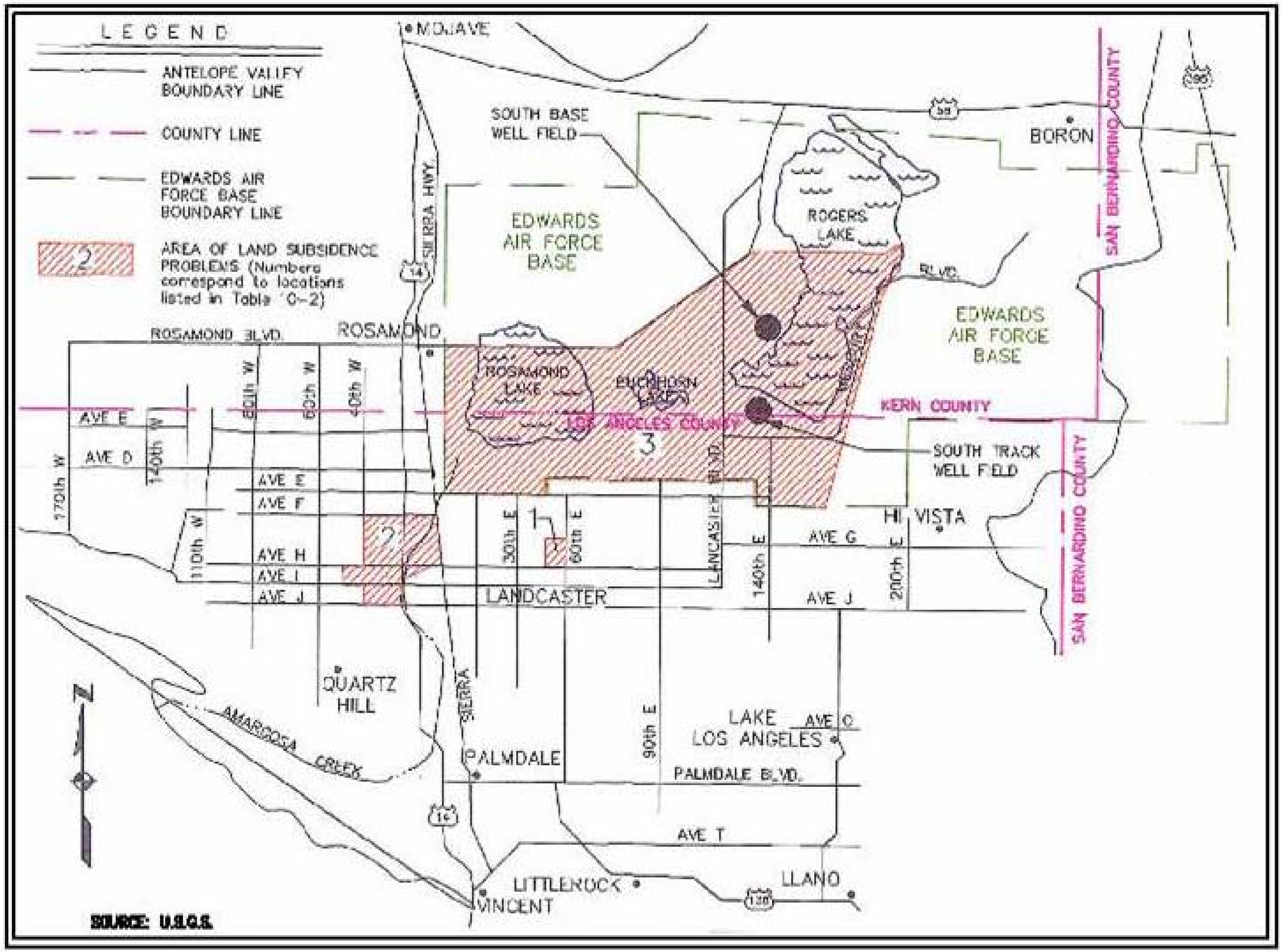



**Figure 3-18 Areas of Potential Land Subsidence in Antelope Valley**

Land subsidence results in the following impacts:

- Development of cracks, fissures, sink-like depressions and soft spots.
- Change in natural drainage patterns often resulting in increased areas of flooding or increased erosion.
- Degradation of groundwater quality.
- Permanent reduction in groundwater storage capacity.
- Change in gradient in gravity pipelines (sanitary and storm sewers) or canals often resulting in lost capacity.
- Damage to well casings, pipelines, buildings, roads, railroads, bridges, levees, etc.
- Costs associated with repairs and rebuilding.
- Costs associated with construction of new facilities such as pumping stations for gradient changes.
- Reduction in land value.
- Lawsuits.
- Increased pumping costs.

Table 3-25 lists land subsidence problems identified in Antelope Valley Region.

The following paragraphs present brief discussions on several studies done on land subsidence in Antelope Valley Region.

USGS Report 92-4035. USGS (1992) reported that as much as 2 feet of land subsidence had affected Antelope Valley Region by 1967 and was causing surface deformations at Edwards AFB. Fissures, cracks and depressions on Rogers Lake were affecting the use of the lakebed as a runway for airplanes and space shuttles. In addition, depressions, fissures and cracks on the lakebed may not be detected until aircraft or space shuttles exceed the load capacity of the soil. Another concern was potential contamination of the water table through fissures which can provide direct access for toxic materials.

To determine the significance of land subsidence conditions, bench marks were surveyed using a Global Positioning System (GPS) in 1989. Differential levels were surveyed for 65 bench marks from 1989 to 1991. It was discovered that total land subsidence ranged from 0.3 to 3.0 feet.

USGS Report 93-4114. USGS (1993b), reported that land subsidence effects had been noted on Rogers Lake in the form of depressions, fissures and cracks. The report identified pumping of groundwater as the cause of the land subsidence. As much as 90 feet of groundwater level decline has occurred in the South Base well field, and an average annual compaction rate of $5.57 \times 10^{-2}$ feet was measured at the Holly site near the South Track well field (see Location 3 on Figure 3-18).

USGS 1994 Draft Report. USGS (1994) revealed that land subsidence throughout Antelope Valley Region has reached nearly 7 feet. As shown on Figure 3-18, USGS indicated that subsidence levels of 6.6 feet have occurred near Avenue I and Division Street, and Avenue H and 90th Street East. The draft report stated that there was a general correlation between groundwater level declines and the distribution and rate of subsidence. In addition, the report estimated a conservative loss of approximately 50,000 AF of storage in the groundwater subbasin in the area that has been affected by 1 foot or more of land subsidence.

Geolabs, February 1991. A study done by Geolabs - Westlake Village (1991) studied a 10 square mile area in Lancaster identified to have fissures and sink-like depressions (see Location 2 on Figure 3-18). The report identified fissures ranging in width from one inch to slightly over one foot. The lengths of the fissures ranged mainly between 50 to 200 feet, with the longest continuous fissures in the 600-700 foot range. Sinkholes ranged mainly between one to five feet deep and less than four feet in diameter. One sinkhole measured 20 feet long and 15 feet wide. The report concluded that the fissures were due to tensional forces created by subsidence, which may be related to groundwater withdrawal due to the correlation between areas of significant subsidence and areas of pronounced groundwater level decline. Areas of concern identified in the report are included in Table 3-25.

1995 Water Resource Study. In addition to reviewing the reports summarized above, companies and agencies within the Antelope Valley Region were surveyed regarding potential damages attributable to groundwater level declines and field visits of affected areas were conducted. Companies and agencies surveyed include the following:

- AVEK
- CALNEV Pipelines
- Lancaster, Redevelopment Center
- Lancaster, Road Maintenance Department
- Palmdale, Engineering Department
- Palmdale, Road Maintenance Department
- LACSD
- Edwards AFB
- Kern County Flood Plain Management Section
- Los Angeles County Waterworks District, Sewer Department
- RCSD
- Southern California Gas Company
- Southern Pacific Railroad
- State Fire Marshall, Pipeline Safety Division

Other than those damages identified in the reports summarized above, structural damage to the wastewater treatment plant building on Edwards AFB was the only other potentially significant damage identified and may or may not be attributable to land subsidence. Other minor existing damage that may or may not be attributable to groundwater level declines includes cracked sidewalks and pavement. To assess existing and potential degradation to the groundwater supply, an attempt was made to correlate typical stormwater runoff constituents and similar constituents in the groundwater supply. The hypothesis was that areas of fissuring should show higher degrees of contamination if runoff was reaching the aquifers through the fissures.

The Los Angeles County Watershed Management Division monitors surface water; however it does not monitor typical stormwater constituents, only general minerals. Therefore, it is currently unknown whether groundwater degradation due to subsidence is occurring in Antelope Valley Region. However, should fissuring continue, degradation to the groundwater supply could be a potential problem and should be investigated. Individual water purveyors servicing the area where fissuring is occurring may test for some of the constituents found in stormwater, from which data may be obtained.

In addition to subsidence-related problems, groundwater level declines of up to 200 feet in the Antelope Valley Region have resulted in increased pumping costs. USGS (1994) cites the increased pumping costs as the primary reason for a decline in agricultural production during the 1970s. The LACWWDs adds that attractive land development areas along with increased pumping costs have contributed towards agricultural decline.

It is recommended that monitoring of subsidence levels and groundwater levels continue in the Antelope Valley Region as indicators of future problems due to subsidence and current progress toward balancing groundwater use. Monitoring of groundwater quality for typical stormwater constituents in areas of fissures is recommended as an indicator of the degradation potential due to fissures.

**TABLE 3-25**
**LAND SUBSIDENCE CONCERNS FOR THE ANTELOPE VALLEY REGION**

| Location | Description | Maximum Subsidence (ft) | Problems/Damages/Concerns |
|---|---|---|---|
| 1 | Area bounded by 50th and 60th Streets east and Avenues G and H (T7N-R11W-S3) | 3-4 | • Development of cracks and fissures |
| 2 | Northwest portion of Lancaster | 4-5 | • Development of cracks and fissures in the following areas of concern:<br>• In the vicinity of KAVL and KBVM radio towers near the proposed site for High Desert Hospital complex<br>• East of a residential project at the southeast corner of 30th St. West and Ave. "I"<br>• In the vicinity of LA County Detention Facility south of Ave. "I"<br>• The "H" Street Bridge over Amargosa Creek where up to 4" of lateral separation is present across the central expansion joint[a]. |

| Location | Description | Maximum Subsidence (ft) | Problems/Damages/Concerns |
|---|---|---|---|
| 3 | Edwards AFB | 3.3 | • Failure of several well casings.<br>• Increase in area subject to flooding.<br>• Structural damage to wastewater treatment plant building.<br>• Wells protruding above the ground.<br>• Development of cracks, fissures, sinkholes and softspots on Rogers Lakebed, affecting use of the lakebed as a runway for planes and space shuttles. |

Note: (a) Geolabs reports that the separation may be due to differential settlement or, may be related to the same mechanism which is causing the fissuring in the area.

#### 3.1.9.6 Effects of Global Warming

In the recent update of DWR's Water Plan (2005c), an assessment of the impacts of global warming on the State's water supply was conducted using a series of computer models that incorporated decades of scientific research. Model results indicate increased temperatures, a reduction in Sierra Nevada mountain snow depth, early snow melt, and a rise in sea level. These changing hydrological conditions could affect future planning efforts, which are typically based on historic conditions. Difficulties that may arise include:

- Hydrological conditions, variability, and extremes that are different than current water systems were designed to manage;
- Changes occurring too rapidly to allow sufficient time and information to permit managers to respond appropriately; and
- Requiring special efforts or plans to protect against surprises and uncertainties.

DWR will continue to provide updated results from these models as further research is conducted.

In July 2006, DWR issued "Progress on Incorporating Climate Change into Management of California's Water Resources," as required by Executive Order S-3-05, which instituted biennial reports on potential climate change effects on several areas, including water resources. This IRWM Plan describes the progress made in incorporating current climate change data and information into existing water resources planning and management tools and methodologies. The report, whose purpose is to demonstrate how various analytical tools currently used by DWR could be used to address issues related to climate change, focuses on assessment methodologies and preliminary study results from four climate change scenarios.

Potential impacts of climate change are presented for the SWP and for the Sacramento-San Joaquin Delta, both of which are related to the Antelope Valley Region's imported water supplies. Since the Antelope Valley Region is reliant on imported SWP supplies as part of its overall supply mix, any reduction or change in the timing of availability of those supplies could have negative impacts on the water supply of the Antelope Valley Region. Reductions in the quantity of SWP water available would force the Antelope Valley Region to rely more heavily on local groundwater and local surface flows, or other sources of imported water. It is possible that local surface flows could also be reduced by changes in snow pack altitude levels and/or quantity of snow pack in the San Gabriel Mountains from global warming, which would reduce natural recharge, thus exacerbating groundwater availability problems.

The SWP analysis presents potential impacts on SWP operations, including reservoir inflows, delivery reliability, and average annual carryover storage, as well as many other operational parameters. The analysis assumes forecast levels of climate change in year 2050, with 2020 land use levels. Some of the main impacts include changes to south of Delta Table A Amount deliveries (from an increase of about 1 percent in a wetter scenario to about a 10 percent reduction for a drier climate change scenario), increased winter runoff and lower Table A allocations in the three driest climate change scenarios, lower carryover storage in drier scenarios, and higher carryover storage in a wetter scenario.

The Sacramento-San Joaquin Delta analysis of the four climate change scenarios included the operational impacts to the SWP and other water delivery systems, as well as meeting Delta water quality standards. The analysis indicated that meeting these water quality standards will be a "larger challenge" due to climate change. Using assumed climate change scenarios and a sea level increase of one foot, the ability to meet chloride standards for M&I uses would be more difficult and may cause water supply impacts which DWR could not quantify at this time.

In addition, the report presents potential impacts of climate change that could cause increases in ETo rates and crop water use statewide. The analysis of potential impacts of climate change on ETo and crop water use showed that with a rise of 3 degrees Celsius (°C) in air temperature, increases in ETo for a reference crop ranged from 3 to 6 percent. While a small percentage, this volume of water, when summed statewide, would be substantial. DWR assumes that other crops would show similar responses. DWR is developing modeling tools to use in future analyses of crops and other plant species to determine the potential impacts to agriculture. The Antelope Valley Region, while experiencing rapid urbanization, remains an active agricultural area. Global warming may impact water supply availability, but it also increases crop (and residential landscaping) ETo rates. Actual water demand of various crops in the Antelope Valley Region could rise just at a time when water supplies are becoming less available or reliable.

Future studies will include DWR working with other agencies to incorporate climate change information into the management of the state's water resources. Additional climate change scenarios will be developed and analyzed, with the goal of providing them to water resource planners to utilize in making water operations and management decisions. DWR states that the preliminary results in this current report are not sufficient by themselves to make policy decisions regarding water resources.

### Assembly Bill 32: Global Warming Solutions Act

A recent legislative development in California is the passing of Assembly Bill (AB) 32, Global Warming Solutions Act. The Global Warming Solutions Act of 2006 has committed California to reducing the state's greenhouse gas emissions to 2000 levels by 2010 (approximately 11percent below business as usual), to 1990 levels by 2020 (approximately 25 percent below business as usual), and to 80 percent below 1990 levels by 2050. The California Air Resources Board (CARB) is charged with developing the appropriate regulations and reporting system to effectively implement the caps on emissions. AB 32 requires that CARB use the following principles to implement the caps: distribute benefits and costs equitably; ensure that there are no direct, indirect, or cumulative increases in air pollution in local communities; protect entities that have reduced their emissions through actions prior to this mandate; and allow for coordination with other states and countries to reduce emissions.

Counties, cities, water agencies, water purveyors, and water consumers can all expect to be affected by this legislation. As heavily documented by the media in recent months, climate change has large consequences for California's water supply and environment, including reduced snow pack in the Sierra Nevada Mountains, sea level rise, flash floods, drought, reduced supply from the Colorado River, etc. To curb these devastating effects, actions ranging from assessments of one's carbon footprint and carbon trading, to use of alternative energies, to reduction of emissions through direct conservation of both water and energy, for example, will likely be expected of many organizations and even individuals dealing directly and indirectly with water throughout the state.

## 3.2 Water Quality Management Assessment

Given the Antelope Valley Region's dependence on its groundwater source, it is vital that the quality of the groundwater be protected. With the increase of groundwater recharge projects, which are essential to ensuring the availability of groundwater and preventing land subsidence, it is crucial to monitor the quality of the injected water and its impacts to the groundwater basin.

Water quality management in the Antelope Valley Region is therefore focused on maintaining and improving existing water quality and preventing future contamination. Recycled water activities have also been included in this discussion since the recharge of the recycled water may impact water quality.

### 3.2.1 Local Groundwater Quality

Groundwater quality in the Antelope Valley Region is excellent within the principal aquifer but degrades toward the northern portion of the dry lakes areas. The groundwater is typically calcium bicarbonate in character near the surrounding mountains and is sodium bicarbonate or sodium sulfate character in the central part of the basin (Duell 1987 as cited in DWR 2004). Considered to be generally suitable for domestic, agricultural, and industrial uses, the water in the principal aquifer has a total dissolved solids (TDS) concentration ranging from 200 to 800 mg/L. The deep aquifer typically has a higher TDS level. Hardness ranges from 50 to 200 mg/L and high fluoride, boron, and nitrates are a problem in some areas of the basin. The groundwater in the basin is used for both agricultural and M&I purposes.

An emerging contaminant of concern is arsenic. Arsenic is a naturally occurring inorganic contaminant often found in groundwater and occasionally found in surface water. Anthropogenic sources of arsenic include agricultural, industrial and mining activities. In California, there are 763 sources in 404 water systems in 45 counties that show arsenic levels greater than the new federal drinking water standard of 10 parts per billion[6] (ppb) (DHS 2005). Arsenic can be toxic in high concentrations, and is considered a chronic carcinogen when accounting for lifetime exposures.

Arsenic levels above the current MCL of 10 ppb have been observed in the Antelope Valley Region. Approximately 20 LACWWD 40 wells have tested above the Maximum Contaminant Level (MCL), and as a result six (6) wells have been placed on inactive status. Five (5) active wells with high arsenic levels are undergoing a partial abandonment process that would restrict flow from areas containing arsenic and allow pumping in arsenic free zones. PWD has arsenic levels below 2 ppb. QHWD has also observed levels above the MCL in a number of wells, however, it has the ability to blend the water to acceptable levels. Similarly, RCSD has observed levels of arsenic in the range of 11 to 14 ppb in three (3) of its wells. RCSD is utilizing similar methods to LACWWD 40 to manage arsenic levels so that delivered water meets the arsenic MCL. It is not anticipated that the existing arsenic problem will lead to future loss of groundwater as a supply for the Antelope Valley Region.

In addition to arsenic issues, there have also been concerns with nitrate levels above the current MCL of 10 ppb in portions of the Basin. Agricultural fertilization practices and discharge of wastewater with high total nitrogen concentration has likely contributed to the elevated levels.

### 3.2.2 Imported Water Quality

DWR regulates the water quality of the SWP through the *Department of Water Resources Water Quality Criteria for Acceptance (Acceptance Criteria) of Non-Project Water into the State Water Project* and the *Implementation Procedures for the Review of Water Quality from Non-Project Water Introduced into the State Water Project (Implementation Procedures).* DWR has provided draft criteria that are still undergoing revision. In the interim, between the time of when the criteria were established and the current proposed criteria, new or modified regulations for some additional constituents of concern have been developed.

As of January 2006, the Federal arsenic MCL was revised to 10 micrograms per liter (µg/L) (down from 50 µg/L), which will have significant impacts on water utilities in California that will need to install or modify treatment to remove arsenic. Additionally, this lowering of the standard likely will affect what DWR will establish as the appropriate criteria for arsenic in the SWP system, which is currently set at 4 µg/L.

Another constituent of concern is chromium VI. There is currently no proposed or existing drinking water standard for chromium VI. There are, however, federal and state standards for total chromium in drinking water. The California standard is 50 µg/L (half the federal standard, which is 100 µg/L). According to SB 351 (Ortiz), the California Department of Public Health (DPH) was required to set a drinking water standard specific to chromium VI by January 1, 2004. However, this deadline has been missed due to delays in developing the Public Health Goal. The Office of Environmental Health Hazard Assessment (OEHHA) is currently working on the Public Health Goal (PHG) for chromium VI, which will be used by DPH in setting the standard. There is a PHG for total chromium, which is 2.5 µg/L.

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6 The State of California is in the process of developing its own regulation for arsenic in drinking water, which could include a revised, lowered MCL. While by statute, the regulation should have been proposed by 30 June 2004, DPH is still continuing to work on the regulatory process.

The current water quality criteria for the SWP are compared to current water quality conditions in the California Aqueduct (data taken from Station KA017226, Check 21 near Kettleman City) and to the current federal primary and secondary drinking water standards, and provided in Table 3-26. It is important to note that not all constituents currently in the draft *Acceptance Criteria* are sampled for by DWR. It is also important to note that while some constituents do not have SWP pumpback criteria and/or an MCL (bromide, total organic carbon, TDS, and chloride) high levels of these constituents can be of concern, especially with regard to potential treatment costs to downstream users.

**TABLE 3-26**
**COMPARISON OF SWP WATER QUALITY CRITERIA (2004) TO SWP ACTUAL DATA (All values in ug/L unless otherwise noted)**

| Constituent | SWP Pumpback Criteria (Max) | SWP Water Quality Data (Sta. KA017226)[(a)(b)] | | | Current Drinking Water Standards (2006) |
|---|---|---|---|---|---|
| | | Max. | Min. | Avg. | |
| Aluminum | 527 | | | | 50-200 [2] |
| Antimony | 5 | 1 | 1 | 1 | 6 |
| Arsenic | 4 | 3 | 1 | 2 | 10 |
| Barium | 680 | | | | 2,000 |
| Beryllium | 1 | 1 | 1 | 1 | 4 |
| ***Bromide*** | 540 | 400 | 70 | 180 | No standard |
| Cadmium | 5 | | | | 5 |
| Chromium | 110 | 3 | 1 | 1.8 | 100 |
| Copper | 280 | 3 | 1 | 1.9 | 1,300 |
| Fluoride | 550 | <100 | <100 | <100 | 4,000 |
| Iron | 416 | 40 | 8 | 19 | 300 [2] |
| Manganese | 60 | 5 | 5 | 5 | 50 [2] |
| Mercury | 1 | | | | 2 |
| Nickel | 4 | | | | No standard |
| Nitrate as N (mg/L) | 9.6 | 1.5 | .31 | .78 | 10 |
| Selenium | 2 | 2 | 1 | 1.3 | 50 |
| Silver | 5 | | | | 100 [2] |
| Sulfate (mg/L) | 99 | 72 | 20 | 38.2 | 250 [2] |
| ***Total Organic Carbon (mg/L)*** | 9.3 | 6.9 | 2.6 | 4.14 | No standard |
| Zinc | 210 | 5 | 5 | 5 | 5,000[2] |
| ***TDS (mg/L)*** | No criteria | 368 | 124 | 232.9 | 500[2] |
| Specific Conductance (uS/cm) | No criteria | 620 | 218 | 407.6 | No standard |
| ***Chloride (mg/L)*** | No criteria | 124 | 24 | 60.1 l | 250 [2] |

Notes:
(2) Denotes secondary standard.
(a) SWP Water Quality data collected by DWR between 2/01/05 and 2/01/06.
(b) SWP Water Quality data not shown was not sampled by DWR.

#### 3.2.2.1 Imported Water Quality Infrastructure

SWP water is treated by PWD's treatment plant for use by PWD and LCID, and by the four AVEK facilities (Quartz Hill WTP, Eastside WTP, Rosamond WTP, and Acton WTP) prior to delivery to the other water purveyors.

PWD's water treatment plant is a conventional design plant using chlorine as the disinfectant, and has a permitted capacity of 28 mgd. Screening and metering are provided at the outlet of Palmdale Lake and head of the plant, followed by treatment chemical addition, flash mixing, three-stage tapered energy flocculation, clarification utilizing plate settlers and sediment removal systems, multi-media filters, and disinfection. Treated water is stored in a 6 million-gallon reservoir, which supplies water into the distribution system. Decanted water from the solids removal process is returned to Palmdale Lake. The plant is currently undergoing a second phase of improvements designed to meet Stage II Disinfection-by-Products regulations. Improvements include additional filters and adding Granulated Activated Carbon contactors to the processes. This will allow the continued use of chlorine as the disinfectant and increase the capacity to 35 mgd.

The Quartz Hill WTP was the first plant built by AVEK. The treatment plant receives water by gravity flow from the California Aqueduct. Screening and metering are provided at the head of the plant, followed by treatment chemical addition, flash mixing, tapered energy flocculation, clarification utilizing traveling bridges for sediment removal, dual media filters, and disinfection. Treated water is stored in a 9.2 million-gallon reservoir which supplies water by gravity into the distribution system. Decanted water from the solids removal process is returned to the plant influent. After the completion of a second expansion in 1989, the Quartz Hill WTP became capable of producing 65 mgd, enough to serve the needs of 280,000 consumers. The Quartz Hill WTP is planning a conversion of its disinfection system from chlorine to ozone/chloramines. This conversion will significantly reduce the levels of trihalomethanes (THMs) from the treated water, which was previously limiting LACWWD 40 from implementing their ASR program.

Expansion of the Eastside WTP located between Littlerock and Pearblossom to 10 mgd was completed in late 1988. It now serves the needs of about 44,000 consumers.

The 14 mgd Rosamond WTP was established to support the needs of consumers in southeastern Kern County, an area that includes Rosamond, Mojave, California City, Edwards AFB and Boron. Rosamond WTP is capable of providing water for 60,000 consumers.

The 4 mgd Acton WTP was completed in 1989. Water is pumped from the plant site near Barrell Springs Road, on Sierra Highway, to Vincent Hill Summit. From there it is pumped into a Los Angeles County Waterworks pipeline for transport to the Acton area. The plant's capacity is sufficient to supply the needs of 17,000 consumers. The treated water from these facilities is generally considered to be excellent quality.

### 3.2.3 Wastewater and Recycled Water Quality

Once the Palmdale and Lancaster WRPs, and the RCSD WWTP are upgraded, as outlined in the Antelope Valley Facilities Planning Report (LACWWD 40 2006), the tertiary treated effluent will be of sufficient quality to meet unrestricted use requirements. It may then be used for irrigating the landscapes of freeways, parks, schools, senior complexes and new home developments. The effluent will also meet all Waste Discharge Requirements (WDRs). Revised WDRs for the Lancaster WRP were issued in spring 2007 and are expected near the end of 2007 for the Palmdale WRP.

### 3.2.4 Local Surface Water and Stormwater Runoff Quality

Littlerock Reservoir, jointly owned by PWD and LCID, is the only developed surface water source in the Antelope Valley Region. This reservoir collects runoff from the San Gabriel Mountains, and has a storage capacity of 3,500 AF (PWD 2001). The reservoir discharges to Lake Palmdale and the water is ultimately treated by PWD's WTP. The quality of the water in Lake Palmdale is considered good.

### 3.2.5 Regional Water Quality Issues, Needs, Challenges, and Priorities

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to water quality include the following, which are discussed in greater detail below:

- Concern for meeting water quality regulations for groundwater recharge;
- Closed basin with no outfall for discharge;
- Must provide wastewater treatment for growing population;
- Meeting evolving regulations; and
- Handling emerging contaminants.

#### 3.2.5.1 Concern for Meeting Water Quality Regulations for Groundwater Recharge

There are a variety of source waters that could be available for recharge into the groundwater of the Antelope Valley Region. They include, but are not limited to:

- State Water Project:
  - Treated potable water or
  - Untreated raw water direct from the California Aqueduct.
- Reclaimed Water (for spreading only or blending):
  - Secondary or
  - Tertiary treated.
- Additional water from outside of the basin (such as imported desalinated water) with water quality such that its use would not compromise the water quality within the basin.

The water quality of the recharged water depends on which supply is used. There are restrictions to the quality of the water recharged as outlined in the Lahontan Regional Water Quality Control Board (RWQCB) Basin Plan. Recharge source water would need to meet these requirements before recharge could occur. Additionally, requirements are stricter for water that is injected versus water that is infiltrated.

The current waiver prevents injection of water that has THM levels greater than 40 ppb. AVEK's current treatment process does not consistently produce water that meets this requirement. However, their planned conversion of disinfection facilities to the use of a combination of ozone and chloramines will achieve the THM levels required for injection. The conversion is currently underway. However, LACWWD 40 continues injection as long as the average THM levels are under 40 ppb for the injection cycle.

#### 3.2.5.2 Closed Basin with No Outfall for Discharge

As described in Section 2, the Antelope Valley Groundwater Basin is a closed topographic basin with no outlet to the ocean. Therefore, any treated effluent (recycled water) generated in the Antelope Valley Region must be percolated, reused, evaporated, or transpired by plants. This places great responsibility on the wastewater treatment providers in the Antelope Valley Region to provide alternative effluent management methods while still being compliant with their WDRs.

#### 3.2.5.3 Must Provide Wastewater Treatment for Growing Population

Population increases in the Antelope Valley Region will result in higher wastewater flow rates and the need to provide additional wastewater treatment and effluent management capacity. As mentioned above, the groundwater basin is a closed basin, so all treated effluent must be managed (e.g., reuse, evaporation, and percolation) and cannot simply be discharged to an ocean outlet. The ability to meet increased wastewater demands is a great concern.

The Lancaster WRP has a current design capacity of 16.0 mgd; it is projected that its wastewater flow rate will be 26.0 mgd in the year 2020 (LACSD 2004). As the volume of wastewater treated at the Lancaster WRP has increased, the effluent volume has exceeded the capacity of the Lancaster WRP's effluent management sites, which results in overflows onto Rosamond Dry Lake, located on Edwards AFB, for up to nine months of the year (LACSD 2004).

The Palmdale WRP is also planning for increased demand, since the current 15.0 mgd capacity of the WRP is projected to be reached by 2013 (LACSD 2005). The Palmdale WRP has a planned capacity of 22.4 mgd by 2025. In the past, Palmdale WRP handled its effluent in three ways: land application, agricultural irrigation above agronomic rates, and agricultural reuse (LACSD 2005). Revised WDRs for the Palmdale WRP in 2000 phased out land application and agricultural irrigation above agronomic rates as effluent management methods caused the WRP to provide for alternative effluent management methods in its 2025 Plan (LACSD 2005).

#### 3.2.5.4 Meeting Evolving Regulations

In response to groundwater quality concerns, the RWQCB Lahontan Region is revising the WDRs for WRPs in the Antelope Valley Region. The ability to comply with these evolving regulations is expected to be both economically and technologically challenging.

#### 3.2.5.5 Emerging Contaminants

Emerging contaminants of concern such as arsenic and nitrate will require water suppliers, WRPs, and WTPs to conduct routine monitoring and sampling of their systems and could impact their treatment methods. The ability to remove these emerging contaminants also has a positive economic impact on the agricultural community since it reduces the damage to crops. It also benefits the WRPs and WTPs striving for compliance with more stringent WDRs.

Additionally, the following AB 3030 elements relate to water quality management within the Antelope Valley Region. A discussion of how these elements are addressed in this IRWM Plan is provided below.

**The Control of Saline Water Intrusion.** Seawater intrusion is a natural process that occurs in nearly all coastal aquifers, and is a condition of salt water flowing in to freshwater aquifers. Seawater intrusion becomes a problem when excessive pumping of freshwater from an aquifer reduces the water pressure and draws seawater into new areas, degrading the water quality of those new areas. Since the Antelope Valley Region is not a coastal community, this AB 3030 plan element is not applicable. Furthermore, existing evidence suggests that the possibility of saline intrusion from other nearby aquifers is not likely because the basin is a closed basin.

**Identification and Management of Wellhead Protection Areas and Recharge Areas.** Identification and management of wellhead protection areas and recharge areas are important to both the quality of groundwater within the Antelope Valley Region, and for providing storage of available supplies in underground aquifers. Several groundwater recharge projects are being considered and evaluated as part of this IRWM Plan. The Antelope Valley State Water Contractors Association's (AVSWCA) "Study of Potential Recharge Areas in the Antelope Valley" (2002) evaluated, identified, and ranked potential recharge sites within the Antelope Valley Region. Additionally, AVEK is considering an agricultural in-lieu recharge program, and Lancaster, Palmdale, and PWD are all proposing recharge projects or feasibility studies as part of this IRWM Plan. Each of these projects is discussed in detail in Section 5, Water Management Strategies.

Identification of wellhead protection areas will also be examined in this IRWM Plan.

**Regulation of the Migration of Contaminated Groundwater.** Groundwater quality within the Antelope Valley Groundwater Basin is excellent within the principal aquifer but degrades toward the north. The main emerging contaminant of concern in the Antelope Valley Region is arsenic. LACWWD 40's Arsenic Mitigation Project, part of this IRWM Plan, is one project under design to mitigate recent arsenic contamination. Other projects proposed to address this management component include recycled water projects that call for the regulation of the discharge of treated effluent into the local groundwater basins.

**Administration of a Well Abandonment and Well Destruction Program.** The purpose of a well abandonment and well destruction program is to regulate such activities for water, agricultural, or other wells (i.e., industrial, monitoring, observation, etc.) so that groundwater in the Antelope Valley Region will not be contaminated or polluted, and water obtained from wells will be suitable for beneficial use and will not jeopardize the health, safety or welfare of the people of the Antelope Valley Region. Administration of such a program could, for example, come through issuance of a countywide well destruction ordinance. This groundwater management component is considered as a potential management action within Section 6.

**Identification of Well Construction Policies.** Similar to the program purpose discussed above, a well construction policy is intended to regulate the construction, reconstruction, or modification of water, agricultural, or other wells (i.e., industrial, monitoring, observation, etc.) so that groundwater in the Antelope Valley Region will not be contaminated or polluted, and water obtained from wells will be suitable for beneficial use and will not jeopardize the health, safety or welfare of the people of the Antelope Valley Region. Administration of such a policy could, for example, come through issuance of a countywide well construction ordinance. This groundwater management component is considered as a potential management action within Section 6.

**Construction and Operation by Local Agency of Groundwater Contamination Cleanup, Recharge, Storage, Conservation, Water Recycling, and Extraction Projects.** This IRWM Plan includes an assessment of potential groundwater contamination clean-up (i.e., Arsenic Mitigation Project), recharge, storage, conservation, and expansion of existing water recycling projects. The potential projects are discussed in Section 5, "Water Management Strategies."

## 3.3 Flood Management Assessment

The Antelope Valley Groundwater Basin is a closed basin without a natural outlet for storm runoff (LADPW 1987). Numerous streams originating in the mountains surrounding the Antelope Valley Region carry highly erodible soils onto the Antelope Valley Region floor, forming large alluvial river washes. Streams then meander across the alluvial fans in ill-defined paths subject to change. Precipitation ranges on average less than 10 inches per year on the Antelope Valley Region floor, to more than 12 inches in the surrounding mountains (Rantz, 1969 as cited in USGS 1995). Portions of the Antelope Valley Region floor are subject to flooding due to uncontrolled runoff from these nearby foothills (City of Lancaster 1997), and this situation is aggravated by lack of proper drainage facilities and defined flood channels in the Antelope Valley Region. Heavy discharge and flooding is also prevalent along Big Rock Creek, Little Rock Creek, Amargosa Creek, and Anaverde Creek. Heavy rainfall and summer thunderstorms increase the potential for flash floods.

Stormwater runoff that does not percolate into the ground eventually ponds and evaporates in the impermeable dry lake beds at Edwards AFB near the Los Angeles/Kern County line (LADPW 1987). This 60 square mile playa is generally dry but is likely to be flooded following prolonged precipitation. Fine sediments carried by the stormwater inhibit percolation as does the impermeable nature of the playa soils (LADPW 1987). Surface water can remain on the playa for up to five months, until the water evaporates (LADPW 2006).

Examples of existing flood control facilities include the engineered channels and retention basins on Amargosa Creek. Storms of a 20-year frequency or greater can, however, overflow these facilities (LACSD 2005). There is also a flood retention basin along Anaverde Creek; when this basin is overtopped flooding occurs in the vicinity of 20$^{th}$ Street East, 30$^{th}$ Street East, and Amargosa Creek.

Following severe flooding in the Antelope Valley Region in 1980, 1983, and 1987, the LADPW prepared the "Antelope Valley Comprehensive Plan of Flood Control and Water Conservation." This plan proposed flood plain management in the hillside areas, structural improvements in the urbanizing areas, and non-structural management approaches in the rural areas. In the hillside areas the plan recommended restricting development to areas outside of entrenched watercourses. In the Antelope Valley Region area, much of which is flood-prone, the plan recommended improvements such as open channel conveyance facilities and storm drains through communities, as well as detention and retention basins located at the mouths of the large canyons (LADPW 1987). Both the City of Palmdale and the City of Lancaster have incorporated major elements of the Los Angeles County "Comprehensive Plan of Flood Control and Water Conservation" into their own planning efforts. However, there are no identified funding mechanisms or schedule for major improvements except in the established areas of Palmdale, Lancaster, and along Amargosa Creek (City of Lancaster 1997, LADPW 2004). Cities have annexed portions of Los Angeles County, and this, coupled with a gradual decrease in housing construction since the early 1990s has limited County revenue from developer fees necessary to fund the construction of facilities in the unincorporated areas of Antelope Valley Region.

In 1991, LADPW teamed with the cities and unincorporated communities on a ballot measure whereby the entire Antelope Valley Region would be included within the Los Angeles County Flood Control District or a new Antelope Valley Flood Control District would be formed (LADPW 2004). That measure failed, as did a similar measure in Kern County, and new measures proposed regionally in 2006. The lack of coordinated flood control is problematic and will worsen as urban development and associated impervious surfaces increase the potential amount of runoff and local flooding.

### 3.3.1 Regional Flood Management Issues, Needs, Challenges, and Priorities

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to flood management include the following, which are discussed in greater detail below:

- Lack of coordination throughout Antelope Valley Region;
- Poor water quality of runoff;
- Nuisance water and dry weather runoff;
- Difficulty providing flood control without interfering with groundwater recharge; and,
- Desire of Edwards AFB to receive sediments into the dry lakes to maintain operations area.

#### 3.3.1.1 Flood Management Efforts are not Well Coordinated throughout Antelope Valley Region

Flood management efforts are currently performed by local jurisdictions within their particular area (e.g., City of Palmdale undertakes flood control within its boundaries), but there is not a regional entity that coordinates flood control for the entire Antelope Valley Region. In the past, Los Angeles County prepared a regional plan for flood control, but its implementation has been hindered by a lack of funds. Ballot measures that would result in the creation of regional flood control districts have failed in the Antelope Valley Region.

#### 3.3.1.2 Poor Water Quality of Runoff

Stormwater flow from the mountain areas to the Antelope Valley Region traverse highly erodible soils, which results in significant transport of sediments. On the Antelope Valley Region floor natural drainage channels are poorly defined and runoff is almost entirely sheet flow. This sheet flow intermixes with the urban environment and picks up contaminants (pesticides, plastics, oil, gasoline, radiator fluid, and animal wastes). The end result is that toxic pollutants are found in stormwater runoff including lead, zinc, copper, arsenic, chromium, cadmium, nickel, cyanide, and asbestos (Lahontan RWQCB 1994). In mountainous areas, runoff containing salt and other de-icing chemicals used on roads and parking lots during the winter is of concern. Stormwater quality also varies with time. During dry periods pollutants accumulate on pavement and then are flushed into surface waters in high concentrations by the first significant rainstorm. Runoff from later storms may have lower pollutant concentrations. Desert flash floods and summer thunderstorms can result in high pollutant loads in stormwater.

Runoff from urban areas is increasing as the Antelope Valley Region develops. The heavy sediment content and urban runoff contaminants make this storm water flow undesirable for many uses. Poorly planned urban development further upsets the natural interactions within a watershed and degrades water quality through the following types of primary impacts: direct impacts, such as filling and excavation of wetlands, riparian areas, drainages, and other waters; generation of pollutants during and after construction; alteration of flow regimes and groundwater recharge by impervious surfaces and stormwater collector systems; and disruption of watershed-level aquatic functions, including pollutant removal, flood water retention, and habitat connectivity. These impacts typically degrade water quality, increase peak flows and flooding, and destabilize stream channels, resulting in engineered solutions to the disrupted flow patterns, and ultimately, near-total loss of natural functions and values in the affected basins. Impacts must be minimized through municipal stormwater programs that require use of Best Management Practices (BMPs) and conditions to be placed on new development proposals.

#### 3.3.1.3 Nuisance Water and Dry Weather Runoff

Stagnant or nuisance water is standing water that ponds and fails to infiltrate even after prolonged periods. In the Antelope Valley Region there are several areas with impervious soils (including the dry lakes at Edwards AFB) and perched clay layers prone to supporting nuisance water.

Dry-weather runoff is defined as urban runoff water that enters the drainage system due to human activities (e.g., car washing, lawn irrigation). Dry-weather runoff can also result from illicit connections to the storm water or sewer systems. Dry-weather runoff concentrates contaminants in urban runoff and can negatively affect the water quality of receiving waters (e.g., groundwater).

#### 3.3.1.4 Difficulty in Providing Flood Management without Interfering with Groundwater Recharge

The Antelope Valley Region is underlain by groundwater, which is a major source of water supply in the area. An aggressive flood management program could slow, limit, or direct groundwater recharge to unfavorable areas. In addition, groundwater recharge focused on recharge of stormwater flows could introduce urban runoff contaminants into the groundwater aquifer. Ideally, excess stormwater could be properly treated and directed to areas that allow recharge of groundwater.

#### 3.3.1.5 Desire of Edwards AFB to Receive Sediments into the Dry Lakes to Maintain Operations Area

Sediment carried by storm flows on Little Rock and Big Rock creeks eventually end up in the dry lake beds at Edwards AFB. Edwards AFB has established runways on these lake beds. Flood waters and the resulting siltation act to "resurface" and naturally restore the elevation of the dry lake beds. It is a challenge to design storm flow facilities that will both control flood flows while maintaining sedimentation at the dry lakes. In 1983, stormwater flows were too great and took the runways out of operation (LADPW 1987).

## 3.4 Environmental Resource Management Assessment

The Antelope Valley Region is part of a subbasin within the Mohave Desert. The climate and physical environment is typical of the high desert with the exception of the southern edge of the Antelope Valley Region which includes a cooler upland area. The area has many unique environmental features and several plant and animal species are endemic to this desert area.

**General Habitat Types.** The Antelope Valley Region is generally flat and sparsely vegetated, but is interspersed with buttes, mountain ranges, and dry lakes (Bureau of Land Management [BLM] 2005). Rogers Lake is the largest and flattest playa in the world (BLM 2005). Freezing temperatures are limited to a few winter days but in the summer temperatures often exceed 100 degrees Fahrenheit. The Antelope Valley Region is characterized by creosote bush and saltbush plant communities which make up approximately 75 percent of the natural lands in the Western Mojave Desert. A small percentage of natural lands in the area can be characterized as Mojave mixed woody scrub community. A very small percentage of the Antelope Valley Region could be characterized as freshwater or alkali wetlands (BLM 2005). A comprehensive delineation of wetlands in the Antelope Valley Region has not been conducted. However, the Antelope Valley Region is home to numerous desert washes (Little Rock Creek, Big Rock Creek), as well as man-made lakes (Little Rock Creek Reservoir, Lake Palmdale), sag ponds (an enclosed depression formed where active or recent fault movement results in impounded drainage), and areas of rising groundwater. Freshwater marsh and alkaline meadow habitat is found in the vicinity of Piute Ponds. While wetland and riparian areas are limited in the Antelope Valley Region, these areas are important resources to birds migrating along the Pacific Flyway (LACSD 2004).

The unique habitat of Antelope Valley Region means the Antelope Valley Region is also home to several special status species, including plants, reptiles, birds, and mammals. Several regulatory protections and practices for these special status species are in place in the Antelope Valley Region, such as Significant Ecological Area (SEA) designations by Los Angeles County, Desert Wildlife Management Area (DWMA) designations by U.S. Fish and Wildlife Service (USFWS), and development of a Habitat Conservation Plan (HCP) by the (BLM).

**Significant Ecological Areas.** SEAs are defined by Los Angeles County and generally encompass ecologically important or fragile areas that are valuable as plant or animal communities and often important to the preservation of threatened or endangered species. Preservation of biological diversity is the main objective of the SEA designation. SEAs are neither preserves nor conservation areas, but areas where Los Angeles County requires development to be designed around the existing biological resources (Los Angeles County 2006). Design criteria in SEAs include maintaining watercourses and wildlife corridors in a natural state, set-asides of undisturbed areas, and retaining natural vegetation and open space (Los Angeles County 1986).

Significant Ecological Areas in the Antelope Valley Region include:

- *Edwards AFB (SEA No. 47).* This area contains botanical features unique and limited in distribution, including the Mojave spineflower and the only healthy stands of mesquite in Los Angeles County (Los Angeles County 1986). The Edwards AFB SEA also has an alkali sink community, a plant community adapted to salty soils (Los Angeles County 1986).
- *Big Rock Wash (SEA No. 48) and Little Rock Wash (SEA No. 49).* These areas have been designated as SEAs because desert washes act as wildlife movement corridors, possess a greater diversity than surrounding areas, and are important to the stability of the desert ecosystem. Little Rock wash is the largest wash habitat in Los Angeles County. Scrub habitats and desert riparian plant communities are found within these wash areas. The comparatively dense plant growth found in Big Rock Wash and Little Rock Wash provides nesting habitat for many bird species. The wash banks provide habitat for burrowing mammal species (Los Angeles County 1986).
- *Rosamond Lake (SEA No. 50).* Rosamond Lake is home to both shadescale scrub communities and the Great Basin kangaroo rat; both species are rare in southern California. Rosamond Lake also supports an alkali sink biotic community. The Piute Ponds, which are within this SEA, provide over 300 acres of wetlands and act as important wintering grounds for waterfowl and open water for birds traveling along the Pacific Flyway (Los Angeles County 1986, LACSD 2004).
- *Saddleback Butte State Park (SEA No. 51), Alpine Butte (SEA No. 52), Lovejoy Butte (SEA No. 53), and Piute Butte (SEA No. 54).* Desert butte habitat has increased biological diversity relative to surrounding areas. The steep slopes of buttes act as refuges for many biological resources. Desert buttes provide roosting and nesting areas for birds, as well as den sites for mammals. The butte SEAs include desert wildflower habitat and Joshua tree woodland areas. Saddleback Butte has a desert wash area. The Mojave ground squirrel (listed as “Threatened” under the California Endangered Species Act and “Special Concern” by the federal Endangered Species Act) is known to

exist at Saddleback Butte State Park, and suitable habitat for the species is also found at Alpine Butte, Lovejoy Butte, and Piute SEAs.

- *Desert-Montane Transect (SEA No. 55).* The Desert-Montane transect is representative of the transition between the Mojave Desert and the northern slopes of the San Gabriel Mountains. The combination of desert and montane habitats makes this one of the most diverse areas in the County. Beside creosote bush scrub, sagebrush scrub, and Joshua tree woodland found in the desert floor, this area also includes pinyon-juniper woodland, desert chaparral, and mixed conifer forest habitat. While some of these are considered common habitats, the area is valuable because this SEA is the only site where these communities are found in an uninterrupted band (Los Angeles County 1986).
- *Fairmont and Antelope Buttes (SEA No. 57).* These buttes have benefits similar to those described above. However, as these are the westernmost buttes in the Antelope Valley Region, they have a different species composition than other buttes in the Antelope Valley Region (Los Angeles County 1986).

In addition to the existing SEAs, Los Angeles County has proposed an Antelope Valley Region SEA. This proposed SEA would encompass or consolidate many of the existing SEAs in the Antelope Valley Region and as proposed extends from the area south of Palmdale to the area north of Edwards AFB (LACSD 2004).

Ritter Ridge and Portal Ridge/Liebre Mountain SEAs are also described in the Antelope Valley Region Areawide Plan. However, they reside in the Sierra Pelona foothills, which is outside of this IRWM Plan boundary.

**West Mojave Plan.** The West Mojave Plan is an HCP developed by the BLM with collaboration from multiple other jurisdictions and agencies, including the City of Palmdale, City of Lancaster, Los Angeles County, the California Department of Fish and Game, and the US Fish and Wildlife Service (USFWS). The West Mojave Plan also acts to amend the California Desert Conservation Area Plan. The Planning Area for the West Mohave HCP includes the entire Antelope Valley Region. The objective of the West Mojave HCP is to develop a comprehensive strategy to preserve and protect the desert tortoise, the Mohave ground squirrel, and over 100 other sensitive plants, animals and habitats. The West Mohave HCP would establish additional conservation areas for the desert tortoise and Mohave ground squirrel and alter allowable motorized vehicle routes on BLM managed lands. Jurisdictions that have adopted the West Mojave HCP must follow the selected conservation strategies, but benefit from a streamlined process when permitting activities that may affect endangered species covered by the plan (BLM 2005).

**Open Space Areas.** The open space and rural character of the Antelope Valley Region is treasured by many of its residents. During a poll conducted as part of its General Plan Update, the City of Lancaster found that “open space,” “views,” and “desert environment” were commonly cited as key to the area’s quality (City of Lancaster 2006). Typical population densities in southern California suburban areas generally range from roughly 2,500 persons per square mile and increase to more than 7,500 persons per square mile in urbanized areas. By comparison, the high desert area (Mohave Desert in general) only averages about 680 persons per square mile (BLM 2005). The Census Bureau utilizes a minimum threshold of

1,000 persons per square mile to denote an urbanized setting. The Antelope Valley Region is characteristic of a large rural environment.

### 3.4.1 Important Ecological Processes

The ecological integrity of the Antelope Valley Region includes a critical range of variability in its overall biodiversity, important ecological processes and structures, regional and historical context, and sustainable cultural practices. The ability to maintain biodiversity and ecosystem health while accommodating new growth is a challenge in the Antelope Valley Region, which is home to a variety of unique and sensitive species endemic to the area. An overriding consideration becoming more prevalent with the implementation of the West Mojave Plan is the promotion of ecosystem processes that sustain a healthy desert ecosystem. Knowledge to support management decisions will require improved understanding of desert ecology.

We need to understand processes that change ecosystem dynamics because they are the most effective tools available to land managers who are asked to maintain or restore the health of the natural environment. Important ecological processes in the Antelope Valley Region include competition (for nutrients, water, and light), fire, animal damage, nutrient cycling, carbon accumulation and release, and ecological genetics.

Understanding genetic structure is basic knowledge for implementing biologically sound programs dealing with breeding, restoration, or conservation biology, all of which is at the basis of the West Mojave Plan for endangered species in the Region (e.g., desert tortoise and Mohave ground squirrel). Genetic structure also determines responses to changing conditions regardless of whether change is induced by management, lack of management, fluctuating climatic gradients, or global warming.

### 3.4.2 Regional Environmental Resource Issues, Needs, Challenges, and Priorities

The following is a list of the key issues, needs, challenges, and priorities for environmental management within the Antelope Valley Region, as determined by the stakeholders:

- Conflict between industry, growth, and preserving open space;
- Desire to preserve open space;
- Protecting endangered species (desert tortoise, Mojave ground squirrel, burrowing owl); and
- Removing invasive non-native species from sensitive ecosystems.

#### 3.4.2.1 Conflict between Industry, Growth and Open Space/Desire to Preserve Open Space

As described earlier, because of its proximity to the Los Angeles Area, the Antelope Valley Region is subject to increasing demand for community development, recreation, and resource utilization. As described in Section 2.6, population in the Antelope Valley Region is expected to increase by 121 percent between 2005 and year 2020. Some of this growth will result in conversion of agricultural land but some of this growth will occur in areas that are currently natural areas. Loss of both agricultural acreage and natural areas decreases the amount of open space in the Antelope Valley Region.

#### 3.4.2.2 Threatened and Endangered Species

Pressures for growth and recreational activities in the Antelope Valley Region have been linked to significant declines in desert species. Growth of urban areas results in loss of available or suitable habitat for sensitive species. Studies of the desert tortoise have shown a significant downward decline in the population from 1975 to 2000 (USFWS 2006). Besides loss of habitat, proximity to human development can be harmful to sensitive species. Human development introduces roadway traffic, pesticides, urban runoff, and non-native species, which degrade habitat and food sources for sensitive species. Land use practices, such as cattle and sheep grazing and mining are also considered harmful to many species. Recreational uses, such as off-highway vehicle use are known to conflict with sensitive species habitat. For example, a vehicle traveling over a tortoise burrow could cause a desert tortoise to be trapped inside the burrow or make the burrow unusable when they are needed to escape predation or extreme weather conditions (USFWS 2006). In recreational areas sensitive wildlife may seek shelter in the shade of vehicles and be crushed when those vehicles are subsequently moved. Improper disposal of food wastes and trash by recreational users often attracts predators of the sensitive species, such as common ravens. Dogs brought onto public lands by recreational visitors can also disturb, injure, or kill sensitive species.

#### 3.4.2.3 Non-native Species

Non-native species (such as arundo and tamarisk) are listed as ‘A-1’ invaders (the most invasive and widespread wildland pest plants) by the California Invasive Plant Council and as noxious weeds by the California Department of Food and Agriculture (CDFA). While the degree and specifics of problems associated with these species vary, general negative effects associated with the establishment of tamarisk within the Antelope Valley Region include the following:

- Water Quality: Reduction in the shading of surface water, thereby resulting in reduction of bank-edge river habitats, higher water temperature, lower dissolved-oxygen content, elevated pH, and conversion of ammonia to toxic unionized ammonia. Tamarisk also increases salinity by depositing its highsalt leaves.
- Water Supply: Loss of surface and groundwater through heavy consumption and rapid transpiration.
- Flooding: Obstruction of flood flows with associated damage to public facilities, including bridges and culverts, and to private property, such as farmland.
- Erosion: Increased erosion of streambanks, associated damage to habitats and farmlands due to channel obstructions, and decreased bank stability associated with shallow-rooted arundo.
- Fire Hazards: Substantially increased danger of wildfire occurrences, intensity, and frequency, and a decrease in the value that riparian areas provide as firebreaks or buffers when infested with arundo.

- Native Habitats: Displacement of critical riparian habitat through monopolization of soil moisture by dense monocultures of arundo and tamarisk.
- Native Wildlife: Reduction in diversity and abundance of riparian-dependent wildlife due to decreased habitat quality, loss of food and cover, and increased water temperatures.
- Threatened and Endangered Species: Substantial reductions in suitable habitat available for state and federally listed species such as the least Bell's vireo.

In particular, tamarisk is a growing concern in the area near Piute Ponds.

## 3.5 Land Use Management Assessment

Cities and counties (for unincorporated areas) are the regulatory agencies responsible for land use planning within the State of California. Land use regulations and policies such as general plans, zoning ordinances, California Environmental Quality Act (CEQA) compliance, and permit conditions can be valuable policy and implementation tools for effective water management. The California Government Code establishes requirements for the development of General Plans to guide land use decisions, of which water resources play an important role. Water resources is typically not an 'element' of a General Plan, but is discussed within the context of the General Plans required 'elements'; land use, circulation, housing, conservation, open space, noise, and safety.

Land uses within the Antelope Valley Region are provided for in local and regional policies and regulations, including the Los Angeles County General Plan (adopted in 1980), the Antelope Valley Areawide General Plan (adopted December 1986), Kern County General Plan (approved June 2004), the City of Palmdale General Plan (last updated 1993) and the City of Lancaster General Plan (last updated 1997). The Los Angeles County General Plan has not been comprehensively updated since its adoption in 1980; the County is currently involved in a multi-year planning effort to update its General Plan.

Recent legislation has also addressed the gap between land use planning and water resource management. In 2001, two water supply planning bills, Senate Bill 610 (SB 610) and Senate Bill 221 (SB 221), were enacted that require greater coordination and more extensive data to be shared between water suppliers and local land use agencies for large development projects and plans. SB 610, codified as Water Code sections 10910 and 10911, requires the public water system that may supply water to a proposed residential development project of more than 500 dwelling units (or a development project with similar water use), to prepare a water supply assessment for use by the lead planning agency in its compliance with the CEQA. Such a water supply assessment (WSA) is performed in conjunction with the land use approval process associated with the project and must include an evaluation of the sufficiency of the water supplies available to the water supplier to meet existing and anticipated future demands. SB 221 requires projects which include tentative tract maps for over 500 dwelling units to obtain verification from the water system operator that will supply the project with water, that it has a sufficient water supply to serve the proposed project and all other existing and planned future uses, including agricultural and industrial uses, in its area over a 20-year period, even in multiple dry years. SB 221 is intended as a "fail safe" mechanism to ensure that collaboration on finding the needed water supplies to serve a new large subdivision occurs before construction begins.

As growth in the Antelope Valley Region is rapidly increasing, and larger development projects are being proposed, the preparation of WSAs or written verifications pursuant to these Bills is becoming increasingly more common, forcing water purveyors in the area to question their ability to provide service to these developments. If water supplies are deemed not available, developers in the Antelope Valley Region will be required to find water outside the Antelope Valley Region in sufficient quantities to serve their projects.

### 3.5.1 Recreation

The Antelope Valley Region offers many recreational opportunities. The Antelope Valley Region has over 410 acres of developed park land including 21 parks, 18 lighted softball fields, two baseball fields, 15 soccer fields and 17 tennis courts. In addition there are over 3,000 acres of natural park land. Antelope Valley Region is also home to the 1,700 acre California Poppy Reserve and the Arthur B. Ripley Desert Woodland State Park. A portion of the Sierra Highway between Avenue H and the Kern County line is designated as a bikeway in the Antelope Valley Areawide Plan. Many recreational activities take place in the eastern, less populated areas of the Antelope Valley Region. BLM has identified the following types of recreational activities in the high desert: motorcycle activities, four wheel drive exploring, sight seeing, target shooting, hunting, experimental vehicles/aircraft, model rocketry, dry land wind sailing, endurance equestrian rides, hiking, mountain biking, bird watching, botany, rockhounding, camping, and picnicking.

### 3.5.2 Regional Land Use Issues, Needs, Challenges, and Priorities

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to land use management include the following, which are discussed in greater detail below:

- Growing public demand for recreational opportunities;
- Tremendous pressure for growth in the Antelope Valley Region; and
- Loss of local culture and values.

#### 3.5.2.1 Growing Public Demand for Recreational Opportunities

The Antelope Valley Region is located only 90 miles from downtown Los Angeles; the proximity allows residents to utilize the Antelope Valley Region as their “recreational backyard.” The high desert Antelope Valley Region has attracted nearly 2 million visitor-trips a year for off-highway vehicle recreation and nearly 1.5 million visitors to State and National Parks in the area (BLM 2005). BLM estimates that 85 percent of recreational visitors to the high desert are from the urban areas of Southern California. Demand for recreational resources in the Antelope Valley Region is particularly acute due to the lack of other similar resources near these urban areas and due to a decrease in recreational opportunities elsewhere. For example, since 1980 the number of acres of off-highway vehicle recreation areas has decreased by 48 percent in California. In the same time period off-highway vehicle registrations in California increased by 108 percent (BLM 2005). As population increases in Southern California and the Antelope Valley Region, there will be increasing pressure to maintain and expand the Antelope Valley Region’s recreational opportunities.

### 3.5.2.2 Tremendous Pressure for Growth in the Antelope Valley Region

Historically, land uses within the Antelope Valley Region have focused primarily on agriculture. This is partly dependent on the types of soils found in the area, the majority of which have been classified by the U.S. Soil Conservation Service as prime soils, which are best for agricultural production. Coupled with lower water costs and favorable climactic conditions, productivity has been maintained throughout the years, although pressures for developable land have also increased (Los Angeles County 1993). Approximately 73,000 acres of land in the Antelope Valley Region was in agricultural production in the early 1950s (USGS 1995). There was a surge in irrigated acreage when AVEK introduced SWP water to the western Antelope Valley Region in 1972 at prices competitive with the costs of pumping ground water (LADPW 1989). However, the overall trend for agricultural land use continued to decrease through the 1980s and 1990s. DWR predicts that agricultural land use will continue to decrease to approximately 900 acres in 2020 (DWR as cited in USGS 1995). This prediction does not however, account for the approximately 5,500 acres for carrot production that was developed in the Antelope Valley Region between 1995 and 2000. During the late 1980s, carrot farmers in the San Joaquin Valley undertook marketing efforts to assess the acceptability of a potential new product, "baby carrots," to the public. Response was so positive that within only a few years, an entirely new market was created. Demand for these new, smaller carrots was so high, and they were so profitable, that farmers expanded into the Antelope Valley Region and other desert regions in search of additional planting acreage. The profit margin of this crop is such that cost of water is not a limiting factor for carrot farmers.

Currently, land uses within the Antelope Valley Region are in transition as the predominant land use is shifting from agriculture, to residential and industrial. The increase in residential land use is evident from the population growth in the Antelope Valley Region. As presented in Section 2.5, growth in the Antelope Valley Region was slow until 1985, but increased rapidly (approximately 1,000 percent of the average growth rate between the years 1956 to 1985) as these land uses shifted. Population projections for the Antelope Valley Region indicate that approximately 1.26 million people will reside in the Antelope Valley Region by the year 2035, an increase of approximately 149 percent from the 2005 population (refer to Section 2.6.2 for population projections analysis). The two most populous cities in the Valley Region are Lancaster and Palmdale. As residential development continues to grow within the middle of the Antelope Valley Region, the agricultural operations are now found farther to the west and east than in previous decades.

The large migration of people to the Antelope Valley Region is primarily based on economics. With significantly lower home prices than in other portions of Los Angeles County, the Antelope Valley Region has become an attractive and affordable alternative to living in the congested and expensive Los Angeles area. Additionally, it was recognized that the Antelope Valley Region is the last large available open space “opportunity” for development, including residential, commercial/industrial, retail, and agricultural. According to the Antelope Valley Building Industry Association (BIA) (2006), the Antelope Valley Region is expected to continue to grow in population and sustained “residential growth is necessary for a strong, vibrant economy” (BIA 2006).

### 3.5.2.3 Local Culture and Values Could be Lost

The Stakeholders of this IRWM Plan have expressed concerns about the changing land use trends in the Antelope Valley Region, and feel that with the tremendous pressure for growth in the Antelope Valley Region, local culture and values could ultimately be lost.

Currently, industrial land use in the Antelope Valley Region consists primarily of manufacturing for the aerospace industry and mining. Edwards AFB and the U.S. Air Force Flight Production Center (Plant 42) provide a strong aviation and military presence in the Antelope Valley Region. Reductions or realignments in the defense industry could adversely affect this presence. Mining operations also contribute to the Antelope Valley Region's industrial land uses. However, gold is no longer mined at Tropico in the Rosamond Hills, and the mining area is now operated as a tourist attraction. Borax is actively mined near Kramer. Rock and gravel quarrying is conducted in the southeastern part of the Antelope Valley Region along the mountain front. Clay used for drilling mud formerly was mined from Rosamond and Rogers Dry Lakes.

Land use shifts increase the demand for water supply and higher quality water, thereby increasing the competition for available water supplies. This change in land use and increase in supply competition affects the dependence on imported SWP and groundwater supply, affects fluctuations in groundwater levels, and heightens concerns over the potential for contamination and reliability of these sources. The ability to continue to meet the water demands of the Antelope Valley Region, while not losing focus of the local culture and values, will be a challenge for the Antelope Valley Region.

Increasing development pressures in the 1980's were in part driven by the continuing appeal of the Antelope Valley Region's high desert climate, land values lower than those in the Los Angeles metropolitan area. As the Los Angeles population rapidly expanded into the Antelope Valley Region, bringing with it the desire for more cultural amenities and new skills and resources, the Antelope Valley Region became more metropolitan in character. The increase in population and development of tract housing, retail centers and business parks has altered the formerly low density, rural and agrarian character of many local communities.

Today, competing demands are placed on limited available resources. Many of these competing demands stem from the range of local cultural values that characterize the Antelope Valley Region. Decisions regarding future land use and the dedication of water resources will need to weigh varying agricultural, metropolitan, and industrial needs as they continue to develop and as the balance between these interests continues to change.

Stakeholders commonly expressed the need to develop a balance of resources, while preserving the area's natural environment and rural history. Despite the need to ensure economic vitality and longevity by bringing new industry and employment opportunities to the Antelope Valley Region, residents of the Antelope Valley Region believe preserving a hometown feel and developing a strong sense of neighborhood stability are critical to strengthening the identity of the community and, in turn, that of the Antelope Valley Region. The preservation of existing natural open space, achieved in part through a development strategy focused on infill and parcel redevelopment combined with environmental conservation, are key components of preserving the Antelope Valley Region's rural character and strengthening the health, vitality and security of growing urban areas.

Additionally, the following AB 3030 elements also concern land use planning within the Antelope Valley Region. A discussion of how these elements are addressed in this IRWM Plan is provided below.

**Development of Relationships with State and Federal Regulatory Agencies.** As discussed in Section 1.2.1, several State regulatory agencies have participated in the development of this IRWM Plan and thus a relationship with these agencies has been established.

**Review of Land Use Plans and Coordination with Land Use Planning Agencies to Assess Activities which Create a Reasonable Risk of Groundwater Contamination.** As discussed in Section 1.2.1, several land use planning departments and agencies have participated in the development of this IRWM Plan and thus a level of coordination has been established. Additionally, as part of this IRWM Plan, projects selected for implementation are assessed for water quality and land-use impacts and integration, as well as for consistency with local and regional General Plan documents.

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# Section 4: Objectives

The following section presents the Integrated Regional Water Management (IRWM) Plan objectives and establishes planning targets for the Antelope Valley Region that can be used to gauge success in meeting these objectives. Objectives refer to the general intent for planning within the Antelope Valley Region, whereas the targets refer to specific measurable goals intended to meet the objectives.

## 4.1 Objectives Development

As stated in Section 1, the primary focus of this IRWM Plan is to develop a broadly supported water resource management plan that defines a meaningful course of action to meet the expected demands for water and related resources within the entire Antelope Valley Region between now and 2035. Goals to meet this primary focus include developing a plan that will address:

- How municipal and industrial (M&I) purveyors can reliably provide the quantity and quality of water that will be demanded by a growing population;
- Options to satisfy agricultural users' demand for reliable irrigation water supplies at reasonable cost; and
- Opportunities to protect and enhance current water resources (including groundwater) and the other environmental resources within the Antelope Valley Region.

Early in the development of the IRWM Plan, the Stakeholder group was asked to brainstorm preliminary objectives for the issues and needs of concern for the Antelope Valley Region to meet these broad goals. This list was revised and a draft list of objectives presented to the Stakeholder group in December 2006. At the January 2007 Stakeholder meeting, a draft list of objectives was discussed amongst the entire group and new stakeholder comments were reviewed and incorporated into the objectives, as appropriate. The list was then finalized and incorporated into the IRWM Plan. By accomplishing these objectives, significant benefits to the Antelope Valley Region can be achieved.

To establish quantified benchmarks for implementation of the IRWM Plan, planning targets have been identified to amplify the objectives and provide more definition to the Antelope Valley Region's major water resource needs over the planning horizon. Although the IRWM Plan is intended to address the Antelope Valley Region's water resource management needs, this document also identifies several open space, recreation, and habitat targets, as the implementation of water supply, flood management, and water quality projects have the potential to contribute towards these other Regional needs. In addition, habitat and open space projects have the potential to generate additional water supply and water quality benefits.

The objectives and planning targets are presented below (and summarized in Table 4-1) and are presented under this IRWM Plan element to which they most closely correspond.

**TABLE 4-1**
**ANTELOPE VALLEY REGION OBJECTIVES AND PLANNING TARGETS**

| Objectives | Planning Targets |
|---|---|
| *Water Supply Management* | |
| Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035. | Reduce (68,400 to 189,100 AFY) mismatch of expected supply and demand in average years by providing new water supply and reducing demand, starting 2009. |
| | Provide adequate reserves (50,700 to 60,500 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009[7]. |
| | Provide adequate reserves (0 to 62,400 AF/ 4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009[8]. |
| Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP water deliveries. | Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer, by June 2010. |
| Stabilize groundwater levels at current conditions. | Manage groundwater levels throughout the basin such that a 10-year moving average of change in observed groundwater levels is greater than or equal to 0, starting January 2010. |
| *Water Quality Management* | |
| Provide drinking water that meets customer expectations. | Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period. |
| Protect aquifer from contamination. | Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period. |
| | Map contaminated sites and monitor contaminant movement, by December 2008. |
| | Identify contaminated portions of aquifer and prevent migration of contaminants, by June 2009. |
| Protect natural streams and recharge areas from contamination. | Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period. |

[7] Dry year reserves determined by taking the dry year mismatch and adding the average year supplement. Assumes that the average year supplement equals the average year mismatch for any given year. Range determined from the maximum and minimum reserves.

[8] As with single-dry year, multi-dry year reserves determined by summing the 4-year dry year mismatch and adding the 4-year average year supplement. Assumes that the average year supplement equals the average year mismatch for any given year. Range determined from the maximum and minimum reserves.

| Objectives | Planning Targets |
|---|---|
| Maximize beneficial use of recycled water. | Increase infrastructure and establish policies to use 33% of recycled water by 2015, 66% by 2025, and 100% by 2035. |
| *Flood Management* | |
| Reduce negative impacts of stormwater, urban runoff, and nuisance water. | Coordinate a regional flood management plan and policy mechanism by the year 2010. |
| *Environmental Resource Management* | |
| Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region. | Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface water and groundwater management by 2015. |
| *Land Use Planning/Management* | |
| Maintain agricultural land use within the Antelope Valley Region. | Preserve 100,000 acres of farmland in rotation[9] through 2035. |
| Meet growing demand for recreational space. | Contribute to local and regional General Planning documents to provide 5,000[10] acres of recreational space by 2035. |
| Improve integrated land use planning to support water management. | Coordinate a regional land use management plan by the year 2010. |

## 4.2 Water Supply Management Objectives and Targets

Water supply management objectives and targets are directly related to addressing the key issues and needs identified in the water supply assessment in Section 3, including water supply and groundwater management issues.

**Objective: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035.**

Reliability is defined herein as "how much one can count on a certain amount of water being delivered to a specific place at a specific time," and depends on the availability of water from the source, availability of the means of conveyance, and the level and pattern of water demand at the place of delivery.

Reliability criteria identify the maximum acceptable level of supply shortage an agency is willing to sustain during a drought. For this study, a reliability criterion has been used to evaluate water supply plans. This criterion requires water supply to be sufficient to meet projected demands 95 percent of the time. In the remaining 5 percent of the time, it is assumed that the maximum

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[9] The phrase "in-rotation" means that not all 100,000 acres will be in agricultural production at one time rather the land will be rotated in cycles to make most efficient use of the land.

[10] The City of Palmdale and City of Lancaster's General Plans provide a standard of 5 acres of parkland per 1,000 City residents. The Kern County General Plan provides a standard of 2.5 acres per 1,000 residents. The other local and regional General Plans do not provide a standard for "recreation or parkland" preservation. This planning target assumes a 2035 population of 1.0 million residents in the Antelope Valley Region.

allowable supply shortage will be 5 percent of the demand.  This level is chosen because a 5 percent water demand reduction is anticipated to be readily attainable by voluntary conservation.  Typically when a shortage occurs, water customers increase their awareness of water usage and voluntarily reduce water demands, avoiding water rationing.

As discussed in Section 3, the Antelope Valley Region's expected demand between 2010 and 2035 is approximately 269,000 and 400,000 acre-feet per year (AFY) for an average water year. However, the planned water supply for an average water year is approximately 200,600 to 210,900 AFY, resulting in a mismatch of approximately 68,400 to 189,100 AFY.  Assuming average year supplemental water is equivalent to the average year mismatch, there is an additional mismatch of 50,700 to 60,500 AF for a single dry water year and 0 to 62,400 AF/4-yrs for a 4-year multi-dry year condition.  This additional mismatch (or reserve) was determined by taking the drought year mismatch and adding the average year supplement.  The range of the reserve is the maximum and minimum reserves.  In order to assure a reliable water supply, the following three planning targets have been identified.  The targets are based on the assumption of a regional population growth rate of 4.2 percent as determined by the Southern California Association of Governments (SCAG), existing water use rates, and an increase in agricultural demand for dry year conditions.  However, if actual growth is less than 4.2 percent or if average annual water use per capita decreases due to conservation efforts, then the overall demand for the Antelope Valley Region would decrease as well.  Any reduction in demand would reduce the mismatch. Similarly, this target assumes the supply from only currently planned sources presented in Section 3 and that groundwater extractions are limited to groundwater recharge. Thus, any changes or limitations to the groundwater supply resulting from the pending adjudication could significantly alter the mismatch as well.

> *Target:  Reduce (68,400 to 189,100 AFY) mismatch of expected supply and demand in average years by providing new water supply and reducing demand, starting 2009.*

> *Target:  Provide adequate reserves (50,700 to 60,500 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.*

> *Target:  Provide adequate reserves (0 to 62,400 AFY) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.*

**Objective:  Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP water deliveries.**

Given the Antelope Valley Region's dependence on State Water Project (SWP) water, as discussed in Section 3, all elements of its reliability should be considered.  Fluctuations in SWP deliveries due to climatic changes have already been incorporated in the supply and demand comparisons for average, single-dry, and multi-dry year conditions, as provided in Section 3. However, impacts to the Antelope Valley Region in the event of an outage or disruption of SWP water due to emergency situations (e.g., a flood, earthquake, power outage, or other disaster) also need to be considered and a response planned.  In the event of a temporary loss of SWP for 6 months over the summer, the Antelope Valley Region would be short approximately 37,150 AFY from the normal supply (assumes lost of half of average year 2035 expected SWP supply.)  The Antelope Valley Region needs to address and identify necessary actions to accommodate for such a loss and to ensure imported water supply; therefore, the following target has been identified.

*Target: Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer, by June 2010.*

**Objective: Stabilize groundwater levels at current conditions.**

As previously mentioned, a decrease in groundwater levels has led to incidences of land subsidence within the Antelope Valley Region, which may result in the loss of groundwater storage as well as a possible degradation of groundwater quality. Accordingly, maintaining groundwater levels is a key component to managing the groundwater basin and ensuring its reliability by preventing future land subsidence.

Addressing the following AB 3030 elements for stabilizing groundwater would also assist the Region in achieving this objective and planning target: (a) mitigation of conditions of overdraft; (b) replenishment of groundwater extracted by water producers; and (c) monitoring of groundwater levels and storage. To track and prevent future land subsidence and ensure the reliability of the Region's groundwater supply, the planning target below would monitor and identify changes in groundwater levels to demonstrate that management actions are having a positive impact to the groundwater basin.

It is recognized and acknowledged that the on-going adjudication of the Antelope Valley Ground Water Basin and the Physical Solution that may be adopted by the Court may require the target set forth below to be modified.

*Target: Manage groundwater levels throughout the basin such that a 10 year moving average of change in observed groundwater levels is greater than or equal to 0, starting in January 2010.*

## 4.3 Water Quality Management Objectives and Targets

Addressing the following AB 3030 elements for improving and maintaining water quality would assist the Antelope Valley Region in achieving the water quality objectives and planning targets discussed below: identification and management of wellhead protection areas and recharge areas; regulation of the migration of contaminated groundwater; construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects; development of relationships with State and Federal regulatory agencies; and review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

**Objective: Provide drinking water that meets customer expectations.**

As discussed in Section 3.2, water quality is generally good Valley-wide except for the northeast part of the Antelope Valley Region, the borders of the Lancaster subunit, and some shallow wells in north Edwards Air Force Base (AFB) and Boron. Poorer water quality appears to be associated with areas containing hard-rock outcrops and areas underlain by the shallow playa deposits where evaporation has concentrated solutes. In general, the water quality over time has remained relatively unchanged across the entire Antelope Valley Region and generally meets Maximum Contaminant Levels (MCLs). The exceptions to the good groundwater quality are some high concentrations of boron associated with naturally-occurring boron deposits, high nitrates associated with fertilizer use and poultry farming near the areas of Little Rock and Quartz Hill, and high arsenic levels due to recent changes (lowering) of the MCL.

However, in addition to meeting the Federal and State standards for water quality, other secondary standards (such as taste, color, and odor) may also affect a customer's overall satisfaction with the water. Although these constituents do not result in any health effects to the customer, they do impact the customer's desire to drink and use the water. Thus the following planning target has been identified.

> *Target: Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetic throughout the planning period.*

**Objective: Protect aquifer from contamination.**

Groundwater is a main component of the Antelope Valley Region's water supply. Any loss of supply due to water quality degradation[11] would significantly hinder the Antelope Valley Region's ability to meet anticipated demands. As the Antelope Valley Region begins to reduce its dependence on imported water, utilize more recycled water, and implement recharge and storage projects, protecting the aquifer will become increasingly more important. All of these non-groundwater sources can potentially cause degradation to the existing groundwater supply during recharge. Thus the following planning target has been identified, which will involve monitoring these recharge sources to ensure they have negligible impacts to the groundwater supply.

> *Target: Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.*

Identifying sources of contaminants and taking appropriate measures to reduce or eliminate the potential for contamination is crucial to ensuring a reliable water supply. Where contamination has occurred, programs and projects must be implemented to treat the contaminated groundwater and prevent its migration to other areas of the Basin. An area of the Basin that has been identified as contaminated is the portion of the aquifer near the Los Angeles World Airport where the spreading of wastewater effluent has resulted in a decline in water quality. Other sources of potential contamination are from wells no longer in service that that have not been properly abandoned. These wells are suspected of drawing on water of a lesser quality from the deep aquifer to intermix with the water of the upper aquifer, degrading its quality. These areas and others not yet identified should be identified, mapped, and monitored to prevent any future migration. Accordingly, the following planning targets have been identified.

> *Target: Map contaminated sites and monitor contaminant movement, by December 2008.*

> *Target: Identify contaminated portions of the aquifer and prevent migration of contaminants, by June 2009.*

**Objective: Protect natural streams and recharge areas from contamination.**

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[11] For the purposes of this IRWM Plan, any increase in constituent levels over naturally occurring levels is considered degradation; any increase in constituent levels over the State or Federal standards is considered contamination.

In addition to protecting the aquifer, it is also important to protect the surface water areas of the Antelope Valley Region from contamination. Natural streams feed the Littlerock Creek Reservoir as well as recharge areas in the Antelope Valley Region. Thus, any degradation in water quality in the streams could result in the loss of this surface water supply as well as degradation in the recharge areas. Thus the following planning target has been identified.

*Target: Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period.*

**Objective: Maximize beneficial use of recycled water.**

As discussed in Section 3, approximately 65,000 AFY of recycled water will be available for use by 2035, assuming treatment plant upgrades and distribution system development occur as planned. However, currently only 16,700 AFY are planned to be utilized by 2035 for M&I users, through the planned projects. Use of the remaining 48,300 AFY would require additional infrastructure to treat and deliver the recycled water, as well as development of policies to encourage or require recycled water use for irrigation. The Los Angeles County and Antelope Valley Areawide General Plans currently identify general goals and policies to promote water conservation and protection of water quality through encouraging groundwater recharge, reuse of storm and reclaimed water, and development of water conservation programs. The development of this infrastructure and time to implement such policies is likely to occur in phases as resources are made available. Therefore, the following planning target has been identified.

*Target: Increase infrastructure and establish policies to use 33 percent of recycled water by 2015, 66 percent by 2025, and 100 percent by 2035.*

## 4.4 Flood Management Objectives and Targets

**Objective: Reduce negative impacts of stormwater, urban runoff, and nuisance water.**

As described in Section 3.3, the Antelope Valley is prone to flash flooding, and this situation is aggravated by the lack of a coordinated and comprehensive drainage infrastructure system for managing stormwater and urban runoff. Stormwater tends to be of poor quality and high in sediment, and is further degraded by urban runoff. In some areas of the Valley, underlying impervious soils will cause stormwater to pool and become nuisance water until it eventually evaporates.

Extensive growth in the Antelope Valley has occurred in both cities as well as unincorporated County areas. This growth both increases the amount of impervious surfaces in the Valley and the number of homes and businesses subject to the negative impacts of flooding and in need of flood protection. Natural communities and wildlife habitat may also suffer as a result of flooding. Conversely, flood waters can also have positive impacts. For example, flood waters can result in siltation that acts to “resurface” and naturally restore the elevation of the dry lake beds.

To adequately address any desires to maintain flood effects, and to limit flood damage in a cost-effective manner, flood management efforts should take place on a regional scale and should be coordinated across jurisdictions. This scope and level coordination would also provide some consistency both in costs associated with flood prevention and mitigation and in permitting requirements for Antelope Valley residents, businesses and developers. With the Antelope Valley Region having a great water need there is the added incentive for the flood management systems to convey waters of suitable quality to rechargeable systems for the benefit of multiple communities.

Furthermore, urban development and revitalization efforts implemented on a regional scale that can protect natural and man-made amenities, while avoiding severe hazard areas such as flood prone areas, would be consistent with the goals and policies of the Los Angeles County and the Antelope Valley Areawide General Plans. New development is currently encouraged to protect drainage courses in as natural a state as possible, while minimizing modification of the natural carrying capacity or production of excessive siltation.

Flood Plain Management Areas are identified within the Antelope Valley Areawide General Plan, and include areas that are subject to a high risk flooding during storm events such as Amargosa Creek, Anaverde Creek, Big Rock Creek, Little Rock Creek, the frontal canyons on the north slope of the San Gabriel Mountains, drainages from the north face of Portal Ridge, and the upper reaches of the Santa Clara River through Acton. Development is regulated within these areas by either not permitting (due to extreme hazard) or limiting new development to adhere to special performance requirements in the flood fringe areas adjacent to a waterway, to ensure the hazard of inundation can be mitigated without increasing the hazard to adjacent properties.

The Antelope Valley is in need of both short- and long-term solutions to the various flood management needs presented in Section 3.3. Such solutions can best be designed and implemented through coordination of a regional flood management plan, which has been identified as a planning target for integrated regional water management. Important goals under the plan include reducing flood damage, maximizing groundwater recharge, controlling stormwater runoff and curbing nuisance water runoff (for example by educating residents or installing proper sprinkler heads and timers), and managing sediment transport by 2010.

In addition to these goals, a regional plan that provides a multi-objective management approach would aim towards ecosystem restoration and the protection of farmland and natural habitat. The flood management plan and its resulting projects should be flexible enough to adjust to future changes in the Antelope Valley Region, including changes in population and resource needs, as well as changes in the climate and landscape.

A flood management plan for the Antelope Valley should include a comprehensive set of strategies that seek both to preventively reduce flood hazards and to respond effectively to direct and indirect threats associated with flooding. First, it should outline a strategic plan to improve and update mapping and technology necessary to meet planning objectives. Since many flood maps used by public agencies and the public do not reflect the most accurate information available, land use decisions in California are in some cases based on poor or outdated information regarding the seriousness of the flood threat. This leads to much of the State's new development occurring in areas that are especially prone to flooding.

Most water quality impacts of urban development are best avoided by directing the location, pattern, and design of the development rather than through traditional regulation of discharges. A flood mitigation plan that addresses the level of risk associated with flood-prone areas within the Antelope Valley Region should be a central component of the flood management plan. Such a plan should prompt investigation of the feasibility of mitigation activities such as the relocation, redevelopment or modification of structures existing within areas especially at risk; an assessment of existing and needed flood management infrastructure to redirect stormwater and control flooding; and zoning and other regulatory measures that address the need for regulation of development patterns and improved site design and building practices. The plan should promote the establishment of land use ordinances that restrict development within hazardous floodplain areas and establish buffers to allow the natural hydrologic function within remaining natural or restored floodplains to occur.

In addition to spurring formal changes in land use policy, the plan should contain regional design guidelines and best management practices for flood prevention and on-site stormwater management, and a public outreach and education program related to stormwater quality and urban runoff. The plan should also include regional and local contingency plans and communication plans, prepared so that regional and local authorities have the means to coordinate responses to different flood events.

The local and regional General Plan policies pertaining to flood management within the Antelope Valley Region can be found in Table 8-2 in Section 8.

*Target: Coordinate a regional flood management plan and policy mechanism by the year 2010.*

## 4.5 Environmental Resource Management Objectives and Targets

**Objective: Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region.**

As described earlier, due to its proximity to the Los Angeles Area, the Antelope Valley is subject to increasing demand for community development, recreation, and resource utilization. Population in the Antelope Valley is expected to increase by 121 percent between 2005 and year 2020. Some of this growth will result in the conversion of agricultural land, while some of this growth will occur in areas that are currently natural and undeveloped areas. Loss of both agricultural acreage and natural areas decreases the amount of open space in the Valley. Open space can mean natural open space, passive and active recreation which may or may not be compatible with natural habitats or natural open space preservation. As an example, open space can mean soccer fields, playgrounds, etc and should not be considered as natural habitat. This growth and the associated loss of open space could adversely affect local water resources through the loss of wetland areas and the watershed functions these areas provide (filtration of surface water, stormwater detention), and the loss of groundwater recharge areas.

Also of concern is the negative effect of urban growth on the unique biological resources of the Antelope Valley. Besides a direct loss of habitat, increasing proximity to urban development is harmful to the sensitive desert species, several of which are found only in the Antelope Valley Region.

Thus, the following planning target has been identified to preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region.

*Target: Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface and groundwater management by 2015.*

This planning target needs to be consistent with local planning objectives such as those identified in the Antelope Valley Areawide General Plan, the Kern County General Plan, and other management plans approved for the Antelope Valley Region, some of which are discussed below.

Policies within the Antelope Valley Areawide General Plan implement Los Angeles County's General Plan (anticipated completion summer 2008), and further specify objectives and goals specific to that Antelope Valley Region. The Antelope Valley Areawide General Plan identified several priority areas for habitat acquisition and preservation including the Santa Clara River, Fairmount/Antelope Buttes, steeper butte areas in the eastern Antelope Valley, and riparian areas within Little-rock Wash, Big Rock Wash, Portal Ridge-Liebre Mountain and Tehachapi Foothills and other Significant Ecological Areas (SEAs). Educational, observational, and light recreational uses could be allowed in these preserves and the preserves would also act as open space areas, enhancing the rural character of the Antelope Valley.

Through the identification and designation of SEAs within the Los Angeles County General Plan and the Antelope Valley Areawide General Plan, new urban growth or encroaching uses and activities would be conditioned to ensure protection of ecological resources and habitat areas by regulating and establishing compatible land uses, and requiring design and performance criteria to be met. Although SEAs are neither preserves nor conservation areas, requiring development to be designed around the existing biological resources (Los Angeles County 2006) would help to ensure protection of sensitive species and their habitats.

The Kern County General Plan does not identify specific open space or habitat areas to be preserved (Kern County 2004). The Kern County General Plan does, however, state that “The County will seek cooperative efforts with local, state, and federal agencies to protect listed threatened and endangered plant and wildlife species through the use of conservation plans and other methods promoting management and conservation of habitat lands.”

The West Mojave Plan covers 9.3 million acres in the western portion of the Mojave Desert, including portions of Los Angeles and Kern counties. This habitat conservation plan and federal land use plan amendment presents a comprehensive strategy to conserve and protect the desert tortoise, the Mohave ground squirrel and over 100 other sensitive plants and animals and the natural communities of which they are a part. The Plan accomplishes such by: designating 14 new Areas of Critical Environmental Concern (ACEC), adjusting four existing ACEC boundaries, and establishing other special management areas specifically designed to promote species conservation; designating allowed routes of travel on public lands to reduce species mortality from off-road vehicles; and, establishing other management prescriptions to guide grazing, mineral exploration and development, recreation, and other public land uses (BLM 2006). The West Mojave Plan is consistent with the existing conservation plans in the area, and would further the preservation of important species and their habitats that protect and enhance the Antelope Valley Region’s watershed.

Conservation and protection of the desert tortoise, the Mohave ground squirrel and over 100 other sensitive plants and animals and the natural communities of which they are a part, as described within the West Mojave Plan, would help the area meet this planning target (BLM 2006). The Plan is consistent with conservation plans and local policies for furthering habitat protection by prescribing appropriate uses within protected ACEC areas that limit human and non-native animal interaction with sensitive species to reduce mortality and habitat degradation.

Preservation lands in other areas could also be targeted, based on qualities that maintain and enhance the watershed and aquifer.

## 4.6 Land Use Management Objectives and Targets

**Objective: Maintain agricultural land use within the Antelope Valley Region.**

As discussed in Section 3, there is an estimated 24,700 acres of irrigated crop land in the Antelope Valley Region. Agriculture is an important industry for the Antelope Valley area. In addition to direct production of food and fiber, secondary employment is created by the agricultural production, including transportation and food manufacturing. In Kern County it is estimated that one out of every four jobs is tied to the agricultural industry (Kern County Agricultural Commissioner 2007). In addition, agriculture plays an important role in community identity. The types of crops grown in an area may be unique to that place. Community festivals are often planned around the commodities unique to a place, or for which a community is known. The physical landscape of a place can be defined by its agriculture as the crops create a distinct color mosaic and pattern. Residents also can take advantage of the open space and views allowed by nearby agriculture. In addition, some agricultural crops may provide wildlife habitat (nesting, temporary foraging).

As described in earlier sections of this IRWM Plan, demand for urban development is resulting in a conversion of agricultural land, and is introducing conflicts between agricultural and residential development. As a result, agricultural land is increasingly found only on the urban fringes. There is a desire to preserve agriculture as an industry and as a cultural asset. Both Los Angeles County and Kern County have adopted policies intended to preserve agricultural resources. These policies include right-to-farm ordinances, reduced property tax programs for farm businesses, and policies discouraging provision of urban services in agricultural areas. The Los Angeles County General Plan and the Antelope Valley Areawide Plan have designated "Agricultural Opportunity Areas," or prime agricultural land that has been identified for preservation and protection from the intrusion of incompatible uses that would conflict with or preclude viable agricultural activity. This is intended to be accomplished through use of incentives that establish a voluntary agricultural preserve. To encourage the retention and expansion of agricultural use both within and outside a potential agricultural preserve, the policies promote compatible land use arrangements and offer technical assistance in support of farming interests. In addition, expansion of agricultural into underutilized lands, such as utility rights-of-way and flood prone areas is encouraged. The following planning target, which furthers these existing goals and policies, has been identified to maintain agricultural land use within in the Antelope Valley Region.

*Target: Preserve 100,000 acres of farmland in rotation[12] through 2035.*

**Objective: Meet growing demand for recreational space.**

Demands for recreational space are similar to the demands for biological habitat and agricultural land. These demands for land uses are competing with one another due to an increasing population. Growth in the Antelope Valley threatens recreational lands and increases demands for recreational opportunities. However, population increases in Southern California as a whole also add to the pressure to maintain and expand the Antelope Valley Region's recreational opportunities, particularly since recreational resources found in the Antelope Valley, such as off-highway vehicle (OHV) use areas, are not found anywhere else in near proximity to Southern California population centers. Optimally, recreational resources could be preserved in a way that does not conflict with other land uses or resource protection.

Currently, recreation resources in the Antelope Valley are provided by multiple jurisdictions. Often recreational facilities are dedicated as part of a specific local development project or fees are paid in-lieu of providing recreational facilities. However, most local jurisdictions have policies in place that would encourage cooperation to develop, expand, or enhance regional recreation facilities. For example, several goals and policies within Los Angeles County's General Plan identify the need for development of community parks and recreational amenities within areas deficient in such resources, and suggest such could be accomplished through preserving large natural and scenic areas while focusing new urban growth into areas with suitable land. To achieve such a balance between increased intensity of development and the capacity of needed facilities to serve the population, the General Plan encourages use of open space easements and dedications, or recycling of "brownfield" sites (e.g., abandoned mineral extraction sites, remediated industrial or commercial areas, etc.) as a means of achieving recreational, open space and scenic needs.

Development of new regulatory controls, similar to those in place for SEAs to ensure compatibility of development adjacent to or within major public open space and recreational areas, including the Angeles and Los Padres National Forests are also encouraged.

Thus the following planning target has been identified to meet the growing demand for recreational resources in the Antelope Valley Region.

*Target: Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2035.*

**Objective: Improve integrated land use planning to support water management.**

Coordination between land use planning agencies and water management agencies is crucial to implementation of a successful IRWM Plan. A regional land use management plan to guide the Antelope Valley Region's physical development would be a key step towards improving coordination and identifying future water needs throughout the Antelope Valley Region. Growth management, the protection of various land uses and the efficient use of natural resources such as land, water and energy are three of the principal goals of regional land use planning. A

[12] The phrase "in-rotation" means that not all 100,000 acres will be in agricultural production at one time rather the land will be rotated in cycles to make most efficient use of the land.

regional land use management plan that directs the Antelope Valley Region's growth towards existing centers will not only encourage natural resource efficiency and the preservation of surrounding agricultural land uses and recreational open space, but it will also improve the efficient use of economic resources dedicated towards utilities infrastructure improvements and expansions.

A regional land use management plan would identify the actions necessary in order to gauge success on meeting the land use management objectives. Ideally, a regional land use plan would serve as a master plan for the Antelope Valley Region's physical development. As such, it could provide the opportunity to conduct design studies to test the physical capacity of the Antelope Valley Region's urban areas and centers of development. Such a focus on physical design can help regional agencies to understand and visualize the impact of new structures on the natural and built environment, and thus to better understand the consequences of planning policy. Consideration of building codes, zoning laws, and other regulations affecting development should also be a central component of the regional land use plan. The plan should provide for the periodic review of its major elements, in order to remain a useful tool as the Antelope Valley Region undergoes various changes.

Accordingly, the following planning target has been identified.

*Target: Coordinate a regional land use management plan by the year 2010.*

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