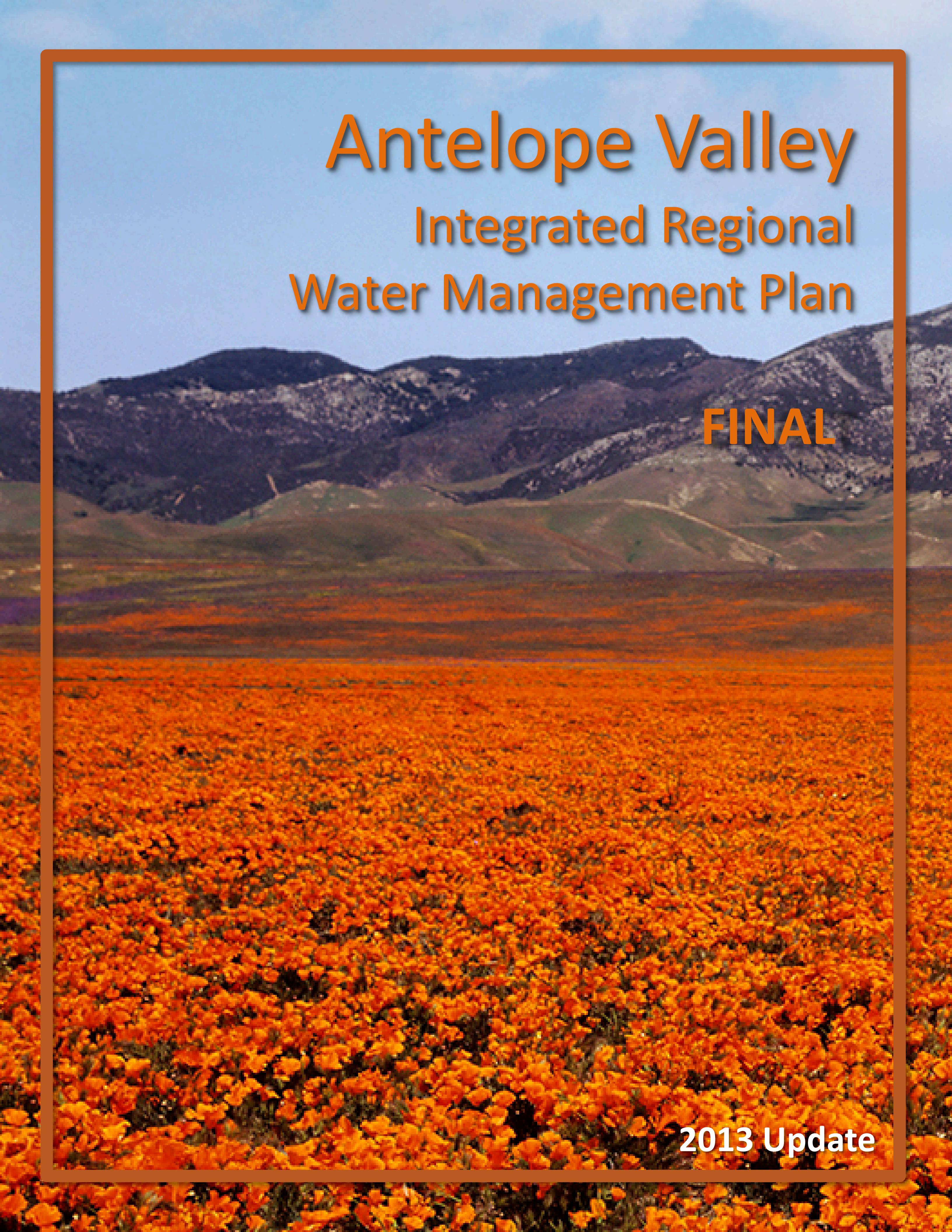
Antelope Valley

Integrated Regional Water Management Plan

FINAL



2013 Update

2013 Update

Antelope Valley Integrated Regional Water Management Plan

Table of Contents

List of Appendices

List of Tables

List of Figures

Executive Summary

Antelope Valley Integrated Regional Water Management Plan Overview

This document is the 2013 Antelope Valley Integrated Regional Water Management (IRWM) Plan Update (2013 Plan Update). It includes new information as required by the California Department of Water Resources' (DWR) 2012 Integrated Regional Water Management Proposition 84 Guidelines as well as updates to previous information from the 2007 Antelope Valley IRWM Plan.

IRWM is a collaborative effort to manage all aspects of water resources in a region. 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. The State's IRWM program was developed beginning with Senate Bill 1672 which created the Integrated Regional Water Mangement Act to encourage local agencies to work cooperatively to manage local and imported water supplies to improve water quality, quantity and reliability.

Funding programs for IRWM planning were created when voters passed Proposition 50 in November 2002 and Proposition 84 in November 2006. These propositions set aside funds for IRWM planning and project implementation to be administered by the State. These grant programs state that IRWM Plans should include specific aspects, or "standards", as outlined in Table ES-1. This table also indicates where each standard may be located in the 2013 Plan Update. A more detailed cross-reference table showing IRWMP standards and their locations in both the 2007 IRWMP and the 2013 IRWMP Update may be found in Appendix L.

Table ES-1: IRWM Plan Standards and Locations in AV IRWM Plan

IRWM Plan Standard	Location in Antelope Valley IRWM Plan
Governance	Section 1, Section 8
Region Description	Section 2
Objectives	Section 4
Resource Management Strategies	Section 5
Integration	Section 6
Project Review Process	Section 7
Data Management	Section 8
Finance	Section 8
Technical Analysis	Section 3, Section 8
Relation to Local Water Planning	Section 8
Relation to Local Land Use Planning	Section 8
Stakeholder Involvement	Section 1, Section 8
Coordination	Section 1, Section 8
Climate Change	Sections 2, 3, 4, 5, 6, 7, 8

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 (LACWD 40), Palmdale Water District (PWD), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD). These 11 public agencies 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. 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 the 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 AV IRWM Plan consistent with the State sponsored Integrated Regional Water Management Program that makes grant funds available to support sound regional water management. In 2012, the RWMG began development of this IRWM Plan Update to incorporate changes to the Region's water resources that have occurred since 2007. This IRWM Plan contains information to help take action to meet shared objectives for long-term water management for the entire Region.

Region Description (Section 2)

The Antelope Valley Region of California is home to over 390,000 people living in many different communities. Residents within this Region have experienced tremendous changes over the past generation due to rapid population growth in 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 may be impacted.

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, North Edwards, 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 recycled water), 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 280 percent between 1970 and 2010, growing from 103,000 people in 1970 to 390,000 people in 2010. Forecasters expect the population to continue to increase, potentially reaching 547,000 residents by the year 2035. As the number of people living and working in the Antelope Valley Region increases, the competition for water supply intensifies, and the challenge of maintaining good water quality and managing the interconnected water cycle becomes more challenging.

Creation of a proactive, "SMART[1]" approach 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

[1] A SMART approach includes objectives that are Specific, Measurable, Attainable, Relevant, and Time-Based.

issues and needs in the following categories. Section 3 of the Plan describes these issues and needs in detail.

Supplies are Variable and Uncertain

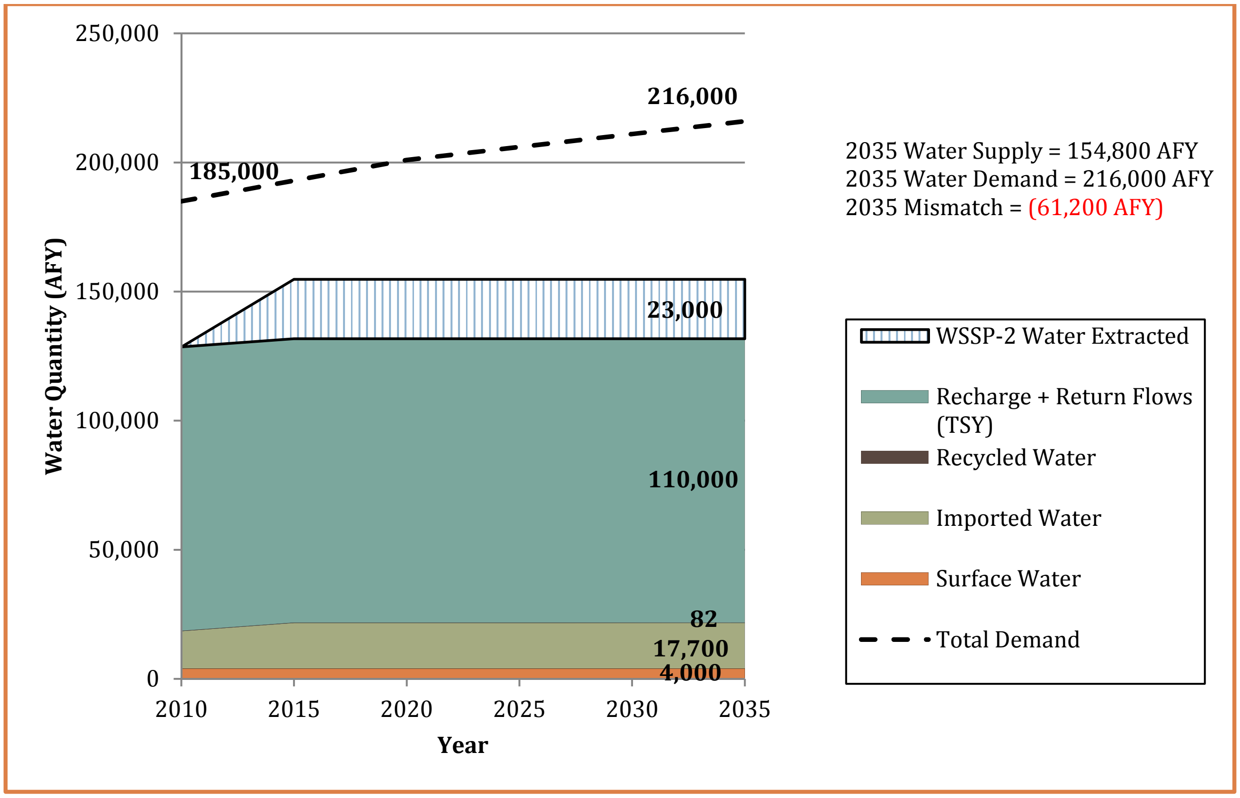
Determining the amount of water available for use at any given time (now or in the future) is challenging. All water supplies within the Antelope Valley Region come from two sources: (1) local rain and snowmelt that percolate into the groundwater aquifers or are captured in Littlerock Reservoir, or (2) imports of water from outside the Antelope Valley Region via the State Water Project. The amount of water supply available varies considerably due to changes in weather, rain and snow, and other conditions.

Demand is Greater than Supply in Dry Years

One fundamental challenge in the Antelope Valley Region is that demand for water exceeds available supplies in dry years. In future single dry years, the supply demand mismatch is estimated to be 61,200 AFY, as shown in the figure below, while in future multi-dry year periods the mismatch is estimated at 164,800 AF over four years. If communities do not implement projects to account for these mismatches, such as conservation, recycled water, stormwater capture, and water banking projects, the Region will not be able to meet its demands during dry periods. The Region also recognizes the need for other actions to reduce the mismatch in dry years, such as reducing reliance on imported water and improving conveyance facilities.

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 urban runoff. More residents will also lead to higher demand for water-based recreation.

Figure ES-1: Water Supply Summary for a Single-Dry Water Year



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.

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. The adjudication process seeks to create and abide by a plan to stabilize groundwater levels and prevent further damage that can result from declining groundwater levels.[2]

Water Quality and Flood Management

The groundwater basin within the Antelope Valley Region is an un-drained, closed basin, meaning there is no outlet for water to flow to the ocean. When water enters a closed basin, any minerals or

[2] The number for total sustainable yield used in this 2013 IRWM Plan Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.

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, total dissolved solids, and nitrate concentrations. Arsenic is another emerging contaminant of concern in the Antelope Valley Region and has been observed in LACWD 40, PWD, Boron, and QHWD wells. Research conducted by the LACWD 40 and the United States Geological Survey has shown the problem to reside primarily in the deep aquifer, therefore it is not anticipated that the existing arsenic concentrations will lead to future loss of groundwater as a water supply resource for the Antelope Valley. In addition, a salt and nutrient management plan is being developed that will help to monitor and maintain water quality conditions in the Antelope Valley groundwater basin.

Much of the Antelope Valley Region is subject to flooding from natural runoff through alluvial fans in the nearby foothills. Some of these flood waters eventually move into developed areas, many of which lack sufficient drainage capacity, causing impacts to infrastructure and other improvements. Runoff flowing across impervious surfaces can also become contaminated with constituents such as petroleum products. At the same time, the Region recognizes the downstream benefits of flood waters, including habitat preservation, dust control, and other uses. The need for regional coordination of flood control efforts with natural habitat protection and water supply is critical as urban development and the accompanying paved surfaces increase throughout the Region.

Environmental Resources

The Antelope Valley Region has many unique environmental features that are dependent on natural surface flows, such as the dry lakebeds (Rosamond, Buckhorn, Rogers), Piute Ponds, mesquite bosques, alkali mariposa lily, Joshua tree woodlands, desert tortoise, Le Contes thrasher, tricolored blackbirds, and others. Part of the Antelope Valley wash areas are incorporated into a Significant Ecological Area designated by Los Angeles County intended to provide added protection to sensitive natural resources. As the pressure for growth expands into undeveloped or agricultural lands, the need to balance industry and growth against the protection of endangered species and sensitive ecosystems requires a careful consideration of trade-offs, many involving water resources in the Region. The actions identified in the AV IRWM Plan can help to preserve open space and natural habitats in the Antelope Valley Region while maximizing the effective use of water resources.

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 meeting the objectives presented in the Plan to balance the growing demand for development while preserving recreational opportunities and avoiding major impacts to natural resources, agriculture, and the loss of local culture and values.

Climate Change

The Antelope Valley Region's Stakeholders identified and prioritized a number of climate change vulnerability issues facing the Region's water resources based on the expected effects of climate change, including water demand, water supply, flooding, ecosystem and habitat, and water quality. The identified and prioritized vulnerabilities are discussed in Section 3.

Objectives (Section 4)

The Stakeholders worked together to identify clear objectives and planning targets they wish to accomplish by implementing the AV IRWM Plan (see Table ES-2). 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 developed.

These objectives and planning targets represent the most important needs and issues the Stakeholders hope to address 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 successfully the Plan is being implemented.

Table ES-2: 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; and adapt to climate change.	Maintain adequate supply and demand in average years.
	Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
	Provide adequate reserves (164,800 AF/ 4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.
	Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.
Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries.	Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer by 2017
Stabilize groundwater levels.	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 regulatory requirements and 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 and maintain aquifers.	Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.
	Map contaminated sites and monitor contaminant movement, by 2017.
	Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017.

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 to help meet expected demand 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 2017 and incorporate adaptive management strategies for climate change.
Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses.	
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 2017.
Land Use Planning/Management	
Maintain agricultural land use within the Antelope Valley Region.	Preserve 100,000 acres of farmland in rotation[3] through 2035.
Meet growing demand for recreational space.	Contribute to local and regional General Planning documents to provide 5,000 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 2017 and incorporate adaptive management strategies for climate change.
Climate Change Mitigation	
Mitigate against climate change	Implement "no regret" mitigation strategies,[4] when possible, that decrease greenhouse gases (GHGs) or are GHG neutral

Resource Management Strategies (Section 5)

The State of California, through the 2009 California Water Plan, has identified 33 different Resource Management Strategies (RMS) to improve regional water resource management. In order to determine what regional water management strategies should be included in the IRWM Plan, the Stakeholders considered the RMS listed and defined in Section 5 of the IRWM Plan. The relationship of these strategies (Table ES-3) to the Region's objectives (Table ES-2) was discussed for those strategies included in the IRWM Plan.

[3] 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.
[4] No regret projects are projects that would still be considered beneficial even if climate change weren't happening.

Table ES-3: RMS included in the IRWM Plan

Reduce Water Demand	Improve Operational Efficiency and Transfers
• Agricultural Water Use Efficiency • Urban Water Use Efficiency	• Conveyance – Regional/Local • System Reoperation • Water Transfers
Increase Water Supply	**Flood Management**
• Conjunctive Management and Groundwater • Recycled Municipal Water • Surface Storage – Regional/Local	• Flood Risk Management
Water Quality Management	**Practice Resources Stewardship**
• Drinking Water Treatment and Distribution • Groundwater and Aquifer Remediation • Matching Water Quality to Use • Pollution Prevention • Salt and Salinity Management • Urban Runoff Management	• Agricultural Lands Stewardship • Economic Incentives • Ecosystem Restoration • Forest Management • Land Use Planning and Management • Recharge Areas Protection • Water-dependent Recreation • Watershed Management

IRWM Project 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-4 lists the projects and actions that the Stakeholders believe will help meet the Regional objectives. In total, over 70 projects were submitted for inclusion in the IRWM Plan, and include implementation projects, plans and studies, and conceptual projects. All projects included in the IRWM Plan will help the Region to meet its goals and objectives. Implementation projects are programs or construction projects that have had some planning completed, such as facilities planning or cost analyses, and could potentially be implemented in the near future. Plans and studies may also be considered "implementation projects" because they are eligible under certain grant funding opportunities. Finally, conceptual projects are those projects identified by stakeholders that *could* contribute to meeting the Region's IRWM objectives but may not yet be developed enough to include in the IRWM Plan as an implementation project.

Implementing the IRWM projects will require focused effort, broad community support, political resolve, and funding. The Stakeholders are actively pursuing financial assistance through several grant programs designed to help leverage local investments. The RWMG is also working to establish a secure and long-lasting approach to coordinate resources to meet the growing needs of the entire Antelope Valley Region.

The projects proposed by Stakeholders are primarily expected to help the Region meet the water supply management objectives, some of the water quality management objectives, and the climate change objective described in Section 4. For the flood management, environmental resource management, land use planning/management, and climate change objectives, additional projects need to be developed and proposed to ensure progress in those management areas.

Table ES-4: Stakeholder Implementation Projects

Sponsor	Project Name	Project Type
City of Palmdale	Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	Implementation
Palmdale Water District	Littlerock Creek Groundwater Recharge and Recovery Project	Implementation
Palmdale Water District	Littlerock Dam Sediment Removal	Implementation
Antelope Valley Resource Conservation District	Antelope Valley Regional Conservation Project	Implementation
AVEK	Water Supply Stabilization Project (WSSP) – Westside Expansion	Implementation
AVEK	Eastside Banking & Blending Project	Implementation
AVEK	AVEK Strategic Plan	Study/Report
Palmdale Recycled Water Authority	Palmdale Recycled Water Authority – Phase 2 Distribution System	Implementation
AVEK	South Antelope Valley Intertie Project	Implementation
City of Lancaster	Antelope Valley Recycled Water Master Plan	Study/Report
Boron CSD	BCSD Arsenic Management Feasibility Study and Well Design	Study/Report
City of Lancaster	Whit Carter Park Recycled Water Conversion	Implementation
City of Lancaster	Division Street and Avenue H-8 Recycled Water Tank	Implementation
City of Lancaster	Pierre Bain Park Recycled Water Conversion	Implementation
City of Lancaster	Lancaster National Soccer Center Recycled Water Conversion	Implementation
Rosamond CSD	RCSD Arsenic Consolidation Project	Implementation
City of Palmdale	Palmdale Power Plant Project	Implementation

In terms of supply, the implementation and conceptual projects proposed will allow the Region to maintain adequate supply and demand in average years. The IRWM projects identify approximately 30,000 AFY of new supply, while also identifying up to approximately 600,000 AFY of water bank storage capacity. These projects, if implemented, would help the Region to meet demands during single-dry years and multi-dry year periods, as well as during a plausible six month disruption of State Water Project deliveries.

A number of projects were proposed that would help the Region to meet its water quality targets, including improving drinking water quality, protecting and maintaining aquifers, protecting natural streams and recharge areas from contamination, and maximizing beneficial use of recycled water. As water quality issues are further studied and plans such as the Salt and Nutrient Management Plan are implemented, it is expected that additional projects will be identified to target specific water quality issues.

Additional projects may be necessary to help address the Region's flood management issues, particularly since a majority of the projects proposed to help improve flooding are conceptual and require further development. Section 6 lists a number of suggestions for improving flood management in the Region, including beneficial use identification, existing flood hazard mapping, development of policy actions, and flood mitigation.

The environmental resource management objective will also require more projects. Proposed projects that would help the Region to meet its environmental resource management targets are mainly multi-benefit projects that would provide water supply, water quality and/or flood improvements in additional to providing open space and habitat. Section 6 suggests development of a habitat conservation plan for the Region, and promotion of land conservation projects that enhance flood control, aquifer recharge and watershed and open space preservation to further identify projects to meet this objective.

Similarly, additional projects may be necessary to meet the Region's targets that include preserving farmland, increasing recreational space and coordinating a regional land use plan. Many of the projects identified would indirectly support these targets by providing water to irrigate farm and recreational lands, but few projects would directly support these targets.

A majority of the projects proposed would support the Region's climate change objective. For example, projects that increase local supply production are expected to reduce the embedded energy required to supply imported water. Projects that would increase habitat would allow for the sequestration of carbon through the increase in vegetation. Further planning and study would be necessary to numerically assess GHG reductions in the Region.

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 Plan. The Region will continue with its current governance structure and continue its efforts to encourage stakeholder involvement in the IRWM program. An ongoing management process is proposed for evaluating, updating and maintaining the Plan, and a funding and financing plan has been established to implement the Plan. The stakeholders decided to continue using the current approach of facilitated broad agreement to implement and update the AV IRWM Plan.

Implementation of the priority projects in the IRWM Plan is currently the responsibility of individual lead agencies with the jurisdictional authority to approve projects. The Stakeholders and RWMG have chosen these projects because they directly address the objectives and planning targets for the most pressing issues and constitute the most well-developed projects to improve management of water resources within the Region. Furthermore, implementing the projects in an integrated fashion is understood to achieve greater benefits to the Region.

The collection, management, distribution and use of data collected as part of this IRWM Planning effort, and through implementation of the Plan, 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/findings, and successful integration with other important regional, statewide, and federal programs.

This IRWM Plan also identifies performance measures that will be used to evaluate 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 objectives and 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 implemented.

Finally, the Region evaluated the funding and financing that would be necessary to implement this IRWM Plan. To meet the resource needs identified above, the Region will need to secure funding as both in-kind services and monetary resources. Given that local revenue sources will not be sufficient to fully fund all aspects of the IRWM Program's financing needs over the 20-year planning horizon, the Region intends to fund its activities using a combination of local, state and federal funds.

This IRWM Plan is a Stakeholder-driven planning process. 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.

For additional information on this IRWM Plan and the Antelope Valley Region, please visit www.avwaterplan.org.

Section 1 | Introduction

This Integrated Regional Water Management Plan (IRWM Plan)[1] defines a clear vision and direction for the sustainable management of water resources in the Antelope Valley Region (Region) through 2035. This version of the Plan includes 2013 updates to the 2007 version, and it complies with all requirements of the 2012 IRWM Grant Program Guidelines-IRWM Plan Standards.

Although the Antelope Valley 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 the Antelope Valley Region, this Plan is a planning and feasibility study only and no implementation or any project is being approved or required through its adoption. Implementation of this IRWM Plan will require further discretionary approvals either individually or jointly by the stakeholder group members. 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 also documents an extensive collaborative process that led to the selection of a robust combination of actions that may be implemented cooperatively by the stakeholders in the Antelope Valley Region.

[1] All references to “IRWM Plan” in this document indicate the 2013 updated version.

Before the original IRWM Plan was adopted in 2007, individual water purveyors and users had been actively studying the effects of accelerated development of the Antelope Valley Region and were attempting to identify appropriate actions to address the increased need for water services. At the time, the acceleration of industrial and residential activity had stimulated demand for both more water supply and higher quality water. Attempts by individual agencies to meet the growing challenges had been frequently criticized and the atmosphere was not conducive to collaborative partnerships. 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.

These entities 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.

The Stakeholders discuss funding opportunities from the California Department of Water Resources.

Acknowledging the need for a more comprehensive view, proactive stakeholders in the Antelope Valley Region (including agencies with an interest in water and other resource management) began meeting in May 2006 to improve communication and explore opportunities to leverage their resources. As a result, eleven public agencies signed a memorandum of understanding (MOU) to form the Antelope Valley Regional Water Management Group (RWMG). The MOU was amended in April 2009 to establish the organization and responsibilities of the IRWM governance structure, including the RWMG, the Advisory Team, and the Stakeholder Group. Copies of these two documents are included in Appendix A and may be found on the www.avwaterplan.org website.

During the early (pre-2007) 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, flood management, environmental resource management including habitat improvement, and increased recreational park space and open space. These topics were re-examined during the 2013 Plan Updates, and climate change impacts were added to the discussion.

This planning process acknowledges that a separate process called adjudication, related to groundwater management, is underway. The members of the RWMG have agreed that since the IRWM Plan and the adjudication are focused on different (but related) aspects of water management, they can and should proceed in parallel. This IRWM Plan contains information to help take action to meet shared objectives for long-term water management for the entire Region. The results of the adjudication (which are still pending at the time of the 2013 Plan update) will help provide important clarity and certainty for groundwater users about how the groundwater resources will be utilized and managed. At the same time, other important water management actions can and should be taken without waiting for a final adjudicated solution. Members of the RWMG agree

A variety of flora may be found in the Antelope Valley climate.

that no information developed for the purposes of the IRWM Plan should be interpreted to interfere in any way with the adjudication process. The data provided in this report are not prepared in a manner suitable to answer the questions being addressed in the adjudication.

This IRWM Plan creates opportunities for new partnerships and collaboration and documents a collective vision to meet water resource needs and improve the ecological health of the Antelope Valley Region. The quantitative planning targets provide interested stakeholders the means to measure progress and account for tangible community benefits. This updated 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.

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 it 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 (EAFB), Lancaster, Mojave, Palmdale and Rosamond.

On November 23, 2009, the Antelope Valley Region successfully completed the Region Acceptance Process (RAP) with the Department of Water Resources (DWR). The RAP was the first step in becoming eligible for Proposition 84 grant funding and helps to define certain aspects of the Region. Specifically, the RAP provides documentation of contact information, governing structure, RWMG composition, stakeholder participation, disadvantaged communities (DAC) participation, outreach, stakeholder decision-making, geographical boundaries and other features, water management issues, water-related components, and relationships with adjacent Regions. The Region boundary shown in Figure 1-1 was determined during the RAP.

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 165,000 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 and is widely regarded to have decreased in recent years. Surface water stored at the Littlerock Reservoir, which has a storage capacity of 3,325 acre-feet (AF), is used directly for agricultural uses and for M&I purposes following treatment.

The State Water Project delivers imported water to the Antelope Valley.

The Antelope Valley Groundwater Basin is 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 supplied to both agricultural and M&I uses.

Recycled water and stormwater are secondary sources of water supply. A portion of the recycled water from the Antelope Valley Region's two large water reclamation plants, Los Angeles County Sanitation Districts' (LACSD) plants in Palmdale and Lancaster, are used for maintenance of Piute Ponds wetlands, agricultural irrigation, landscape irrigation, and a recreational lake at Apollo Park. The expansion of recycled water use continues in the Region.

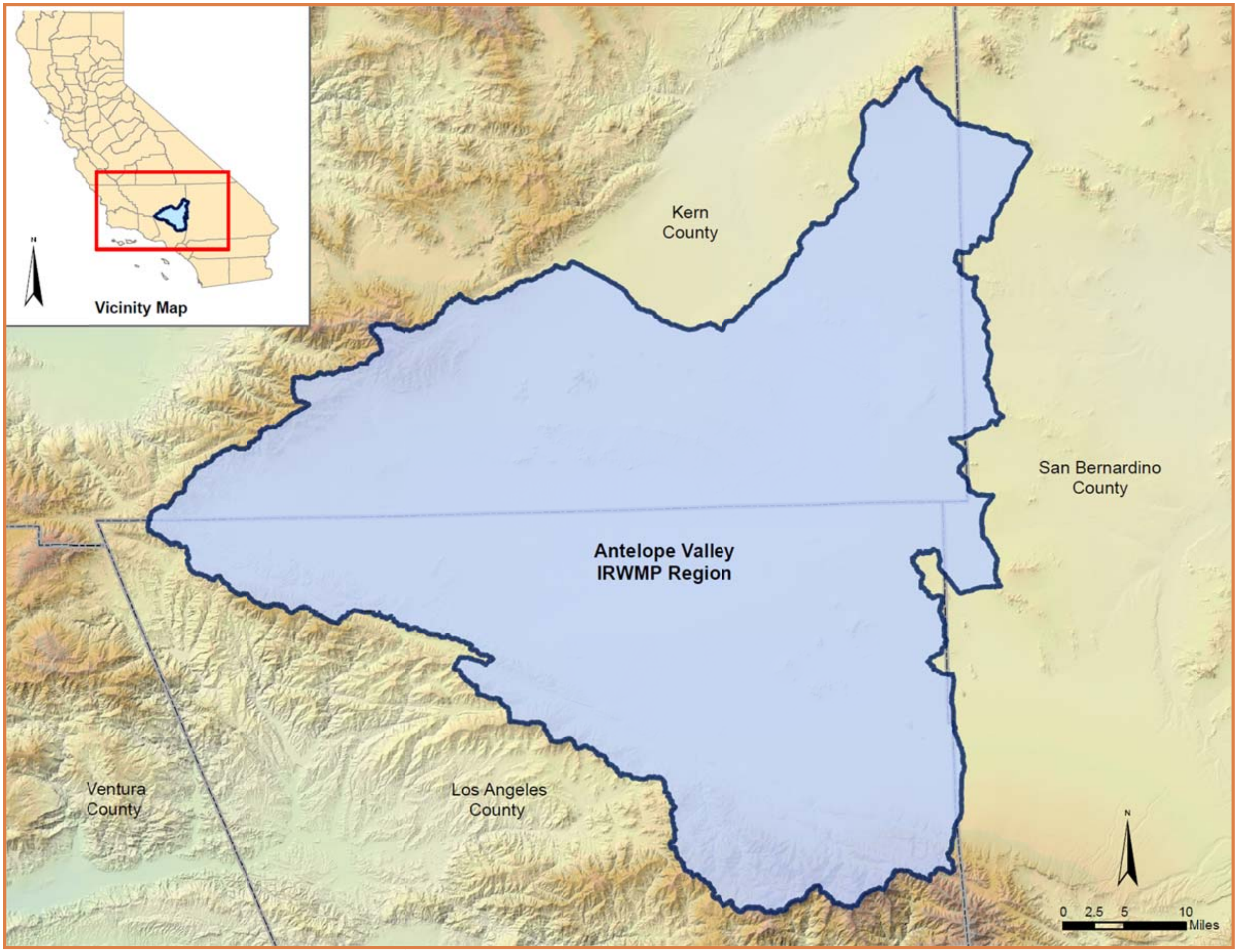
Surface flows (i.e., storm water runoff) from the surrounding San Gabriel Mountains, Tehachapi Mountains, and hills cross alluvial fans and flow through deeply excised washes. The flows make their way from the wash headwaters, filling vernal pool clay pan depressions and wetlands such as Piute Ponds, before either percolating into sand dune areas where water is sequestered for summer use or flowing to the lowest points in the Valley at Rosamond, Buckhorn, and Rogers dry lakebeds. As the surface flow makes its way to the lakebeds it allows the larger sediments to settle out first and transports smaller silty clay further into the Valley interior. The surface flow and silty clay helps to fill in and re-establish the soil surface structure, which protects the lakebed areas from wind erosion, sustains the surficial strength of the lakes (important to the operational mission of EAFB), and sustains local habitats. Some surface flows ultimately evaporate. .

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 nearly 550,000 people will reside in the Antelope Valley Region by the year 2035, an increase of 140 percent.

The expected continuation of growth in the Antelope Valley Region will affect water demand and increase the need for management of additional imported water, recycled water and urban runoff. More residents will also lead to higher demand for water-based recreation. Increasing demands coupled with periodic curtailments of SWP deliveries have intensified the competition for available water supplies. This competition has often limited the water available for natural habitats within the Antelope Valley. In addition, growth in the Valley will likely be influenced by climate change.

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

Figure 1-1: Antelope Valley IRWM Region



1.2 Stakeholder Participation


The Stakeholder process was started during the original formation of the Antelope Valley RWMG.

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 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 good quality, reliable water while maintaining the quality of life in the Antelope Valley Region.

The 2007 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 the 2007 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. Through participation in stakeholder meetings stakeholders were exposed to a variety of opportunities for discovering and establishing mutually beneficial partnerships.

The 2013 updates to the Plan also benefited from extensive stakeholder participation. A total of 12 stakeholder meetings were held between February 2012 and December 2013. In addition, numerous special committee meetings were held to address specific topics (e.g., Advisory Team, integrated flood management, DAC outreach, climate change, salt and nutrient management). The 2013 updates continued to support the collaboration and partnerships that originated during the 2007 Plan development.

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 in 2007 through an MOU (Appendix A). By signing the MOU, the agencies agreed to contribute funds to help develop the original 2007 IRWM Plan, provide and share information, review and comment on drafts of the IRWM Plan, adopt the final 2007 IRWM Plan, and assist in future grant applications for the priority projects selected.

The MOU was amended in April 2009 to establish the organization and responsibilities of the IRWM governance structure, including the RWMG, the Advisory Team, and the Stakeholder Group.

The RWMG included AVEK, the Antelope Valley State Water Contractors Association (AVSWCA), the City of Lancaster (Lancaster), the City of Palmdale (Palmdale), Littlerock Creek Irrigation District (LCID), LACSDs 14 and 20, Los Angeles County Waterworks District No. 40 (LACWD 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 in the Antelope Valley Region. AVEK estimates that it currently provides water to a population of approximately 285,000 people through seventeen retail water agencies and water companies. Currently, AVEK customers utilize approximately 75,000 AFY of the Table A Amount.

AVEK does not have production groundwater wells and does not provide recycled water. The agency does operate a water bank, the Water Supply Stabilization Project No.2 (WSSP-2), that started operations in 2010. AVEK provides a small amount of SWP water to areas outside of the Antelope Valley. The agency is also a partner in the Joint Powers Authority (JPA) for the AVSWCA.

1.2.1.2

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 Principles 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.

The WSSP-2, operated by AVEK, is one of the groundwater basin banking projects that was selected for implementation during the 2007 IRWMP development. The WSSP-2 utilizes SWP water delivered to the Antelope Valley Region's Westside for groundwater recharge and supplemental supply for the Antelope Valley Region during summer peaking demands and anticipated dry years. The recharge percolation rate is expected to be an average of half a foot per day on 400 acres of the 1,400 acre site. The project will deliver raw water to the recharge site through three existing turnouts and currently has a withdrawal capacity of approximately 20 mgd (23,000 AFY).

1.2.1.3 City of Lancaster

The City of Lancaster is a highly acclaimed, award-winning municipality with a thriving community of nearly 157,000. Located approximately one hour north of Los Angeles, Lancaster's clean air, attainable housing, wide open spaces, and close-knit community make it the ideal place for families. The City serves as a commercial, cultural and educational center for the Antelope Valley, as well as for northern Los Angeles County.

Lancaster's potential for growth, along with a strong commitment to business from local leaders, earned Lancaster the "Most Business-Friendly" Eddy Award from the Los Angeles Economic Development Corporation in 2007. Additionally, Lancaster has received nineteen League of California Cities Helen Putnam Awards of Excellence; sixteen 3CMA Awards; numerous awards for its accomplishments in the areas of parks, recreation & arts, financial reporting, economic development, public works, and public safety. The City's most recent accolade hailed from the National Energy Globe Award committee, which recognized Lancaster's advancements in the solar energy arena.

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 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 thirteen City parks with more than 500 acres, including athletic fields, swimming pools, playgrounds and walking trails.

Lancaster is a Charter City, incorporated in 1977, and operates under a 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 City of Lancaster and 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 2010, the population is estimated at 152,750, 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.

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 LACWD 40; sewer service is provided by 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 the agency 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 (5) 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

LACSD is 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 (i.e., Apollo Lakes), wildlife habitat maintenance (i.e., Piute Ponds), and groundwater replenishment. Expansion of recycled water use in the Antelope Valley continues.

1.2.1.7 Los Angeles County Waterworks District No. 40

LACWD 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. LACWD 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 LACWD 40's facilities.

LACWD 40 provides water service to approximately 174,000 residents with water that is imported to the Antelope Valley through the State Water Project and then treated at AVEK's Quartz Hill Water Treatment plant and Eastside Water Treatment Plant. This supply is supplemented by groundwater pumped from the Antelope Valley Groundwater Basin by 54 wells owned and operated by the LACWD 40. LACWD 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.

In an effort to ensure supply reliability, LACWD 40 is undertaking projects to store excess imported water in the ground during wet years so that it can be extracted and used during dry years. LACWD 40 has implemented an aquifer storage and recovery program (ASR) and equipped many of its groundwater wells so that excess treated imported water in the LACWD 40 distribution system can be injected through the wells and stored until a future time when it is needed. LACWD 40 is also working with AVEK to store water at their Water Supply Stabilization Project No. 2 water bank.

LACWD 40 also has an agreement with LACSD to purchase up to 13,500 acre-feet of tertiary treated recycled water produced at their Palmdale and Lancaster Water Reclamation Plants. The City of Lancaster and City of Palmdale are currently working with LACSD on separate purchase agreements and LACWD 40 will subsequently modify their existing agreement. The recycled water will be made available through ongoing construction of the North Los Angeles County Regional Recycled Water Project which will be a completely separate distribution system for irrigation and other non-potable uses. This project will decrease the Region's reliance on imported water and local groundwater supplies.

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 46 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 3,325 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 1954, 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 the Cities of Lancaster and Palmdale as well as unincorporated County land. 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 2009, QHWD imported approximately 3,146 AF of water from AVEK, and pumped approximately 2,431 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 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 2010, RCSD imported approximately 261 AF of water from AVEK, and pumped approximately 2,752 AF of groundwater for distribution in its service area.

Table 1-1: Participating Entities

Agency	Roles and Responsibility
AVEK	Wholesaler of imported water to the Antelope Valley Region, water banking
AVSWCA	Members provide imported water to the 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 the Antelope Valley Region in 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 the Antelope Valley
RCSD	Supplies water to portions of unincorporated Kern County

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.

1.2.2 Stakeholder Group

In addition to the RWMG, this IRWM Plan has received the input of many other interested agencies and organizations. Membership in the stakeholder group has been broadly extended to a number of entities and membership continues to grow. Neither a financial contribution nor agency status are required to be part of the collaborative IRWM planning 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 other outreach in their communities.

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

The Stakeholders are given a tour of the Rosamond Dry Lake bed by EAFB staff.

Region. This subsection lists all current stakeholders grouped into several categories and describes their roles in the planning process. The broad array of participants includes 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.

During the preparation of the 2013 IRWM Plan updates, Stakeholder group meetings were held regularly 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 agendas, minutes, and presentations 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 the 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. A majority of these agencies are members of the RWMG and were described in Section 1.2.1. These agencies include LACWD 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 valuable input in meetings, ensures accurate and consistent land-use planning information, and helps to incorporate 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, participated in the stakeholder meetings.

1.2.2.4 Federal Agencies

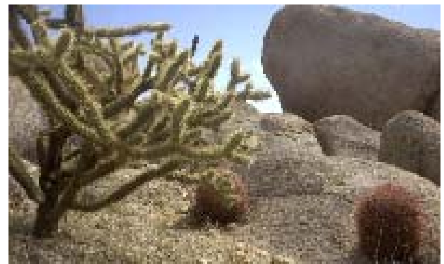
Several federal agencies have been involved in the development and implementation of the objectives and projects for the IRWM Plan. Coordination with federal regulatory agencies is essential to the development and implementation of all recommended projects due to the need for regulatory and environmental approval prior to implementation. The federal agencies involved include: the United States Department of Agriculture, Natural Resources Conservation District, United States Geological Survey, and EAFB. The role of EAFB is to ensure that their natural resource management and other mission goals are incorporated into the 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. Furthermore, these agencies have had the chance to address items of concern on these projects at the regularly scheduled 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: DWR, the Lahontan RWQCB, the California Department of Public Health, the California State Parks, and the California State Department of Fish and Game. DWR specifically provided support during outreach calls with other Lahontan Regions.

1.2.2.6 Environmental/Conservation Community

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



Natural resources conservation is a priority for the Region.

1.2.2.7 Building Industry

The Building Industry Association of Southern California – Los Angeles/Ventura Chapter (BIA LA/V) 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 South Eastern Kern County Chapter.

The agricultural industry is integral to the Region's economy.

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 management for the Antelope Valley is provided by LACSD Nos. 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, 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 attend RWMG stakeholder meetings and informed their readership of the goals and objectives of this IRWM Plan. Progress was reported on in these two major area newspapers as well as other local newsletters.

1.2.2.12 Others

Other agencies involved in the planning process include the Antelope Valley Board of Trade, Boron Community Services District (Boron CSD), 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. Other groups promote commercial activity in the Region. 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 has been implemented. The process centers on regular stakeholder meetings open to the public where attendees are invited to participate in several ways. During the preparation of the 2013 IRWM Plan updates, attendees were asked to participate in facilitated discussions of major items of interest, to review draft Plan chapters and other prepared documents, 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:

- Notification of Intent (NOI): An NOI to prepare an update to the 2007 IRWM Plan was published in three local newspapers on July 15, 2013 and on July 22, 2013. A copy of the notice is provided in Appendix C. The published NOI contained the following language:

  > "The Antelope Valley Integrated Regional Water Management (IRWM) Program is preparing an update to the Antelope Valley IRWM Plan adopted in 2007. IRWM Plans are regional plans designed to improve collaboration in water resources management. The first IRWM Plan for Antelope Valley was published in 2007, following a multi-year effort among water retailers, wastewater agencies, storm water and flood managers, watershed groups, the business community, agriculture representatives, and non-profit stakeholders to improve water resources planning in the Antelope Valley IRWM Region.
  >
  > In response to changes in the State's integrated planning requirements, the Antelope Valley IRWM Program is preparing an update to the 2007 IRWM Plan. This update is an opportunity to incorporate additional stakeholder interests into the IRWM Plan, and revisit the Plan in light of changes that have occurred since 2007.
  >
  > The 2007 IRWM Plan and information concerning the update may be viewed online at http://avwaterplan.org.
  >
  > Questions regarding the AV IRWM update should be directed to: Aracely Jaramillo at AJaramillo@dpw.lacounty.gov
  >
  > This public notice is being published in accordance with section 10543 of the California Water Code."

- Review of Plan Sections: This IRWM Plan synthesizes and extends a significant body of work related to water supply, water quality, flood management, environmental resources, and open space for the Antelope Valley Region. The original sections of the 2007 IRWM Plan were updated and Stakeholders were also provided the opportunity to review the draft 2013 IRWM Plan updates and the material was adopted only after the stakeholders reached facilitated broad agreement on the material. The subjects of the sections include: introduction, Region description, issues and needs, objectives, resource management strategy development, project integration and objectives assessment, Plan and project evaluation and prioritization, and framework for implementation. These sections incorporate and integrate stakeholder-generated information and aggregate this information from across the entire Antelope Valley Region.
- 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 revision of this IRWM Plan, including the prioritization and selection of projects for IRWM grant funding.
- 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 can submit or review projects or project concepts. 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 notices 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 allowed the residents of the Antelope Valley Region to be informed. Sample email notifications are provided in Appendix C.

1.2.4 Community Outreach

Community outreach within the Antelope Valley Region has been a key component to a successful IRWM Plan. Simply stated, a regional plan should have regional input, and should incorporate the widest variety of stakeholders possible. Initial outreach efforts began in 2007 and were targeted at improving overall stakeholder participation through increased agency and organized committee involvement, including disadvantaged, underserved, and smaller communities in the Region. A DAC Outreach Subcommittee had been formed to assist in outreach efforts. More information about these early efforts may be found in the 2007 IRWM Plan, Section 1.2.4.

Public Outreach Subcommittee members meet to discuss various opportunities to involve more Antelope Valley communities, including DACs.

For the 2013 IRWM Plan updates, outreach was focused on DAC areas but also extended to underserved and other rural communities. Efforts included presentations to the Antelope Valley Board of Trade and Quartz Hill Chamber of Commerce, as well as booths at the Thursday Night on the Square event and the Antelope Valley Fair and Alfalfa Festival. Outreach materials for these events can be found in Appendix C.

While DAC outreach efforts were underway, additional steps to better identify environmental justice problems, underrepresented, and rural populations within the Region were taken.

1.2.4.1. Disadvantaged Communities

For the 2013 IRWM Plan updates, A DAC Outreach committee was formed to assist with data collection, outreach efforts, and project solicitation in DAC areas. The committee was composed of volunteer members representing a diverse cross section of the active Antelope Valley IRWM Plan stakeholders including DACs, DWR, and mutual water companies. The members soon developed and implemented a multifaceted outreach campaign to support the IRWM Plan that would more actively address the needs of DACs. Overall, the two main goals of the committee were to:

- Encourage participation by DACs and solicit input into Antelope Valley IRWM Plan updates, and
- Educate target audiences in DAC areas about the purpose and benefits of the Antelope Valley IRWM Plan.

After DAC areas were identified using mean household income (MHI) data from the DWR website, a coordination effort to speak at DAC community meetings was initiated. Initial contact was made with representatives from Lake Los Angeles, Mojave Public Utility, Boron Community Services District, North Edwards Water District, Edgemont Acres Mutual Water Company, California City, and others. Subsequent presentations at local community meetings were also arranged. In addition to PowerPoint presentations, handouts were provided at each meeting that included detailed schedules, project eligibility criteria, IRWM Plan goals, plan objectives, and technical assistance listings with contact information. Table 1-2 contains a list of the DAC outreach meetings scheduled for the 2013 IRWM Plan updates.

Table 1-2: DAC Outreach Meetings

Meeting/Event	Meeting Date
DAC Committee Meeting No. 1	April 18, 2012
Boron CSD	July 24, 2012
Mojave Public Utility District	August 14, 2012
North Edwards/Desert Lake CSD	August 14, 2012
Lake Los Angeles Town Council	August 28, 2012
DAC Committee Meeting No. 2	March 20, 2013
DAC Committee Meeting No. 3	May 15, 2013
Quartz Hill Chamber of Commerce	June 5, 2013
Littlerock Creek Irrigation District	June 12, 2013
Rosamond CSD	June 13, 2013
Lake Los Angeles conference call	August 7, 2013
Littlerock Creek Irrigation District	August 7, 2013

As defined by the 2012 IRWM Grant Program Guidelines-IRWM Plan Standards, DACs are defined as having an annual MHI that is less than 80 percent of the statewide annual median household income, which is $48,706 using Census 2010 data. To confirm DAC areas in the Antelope Valley Region, committee members conducted an initial assessment of the Antelope Valley Region using

DWR's online DAC map for census "places", "tracts", and "blocks". This identified a number of DAC areas in the Region, as listed below.

Boron, Unincorporated Los Angeles County

- Concerns regarding high arsenic levels in groundwater – would like to implement groundwater projects that reduce the concentration of arsenic.

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 xeriscaping 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 DAC Outreach Subcommittee put the School District in contact with Mojave Utilities District and Environmental Justice Coalition for Water (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.

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 areas are represented in the IRWM process by stakeholders from each of the two cities.

Refer to Appendix D of the IRWM Plan for larger DAC Census Block and Residential Area Maps and Census data printouts. In addition, two technical memoranda were prepared to characterize DACs and to define issues related to DAC areas. These documents are included in Appendix D:

- DAC Water Supply, Quality and Flooding Data Final Draft TM
- DAC Monitoring Plan Final Draft TM

1.2.4.2 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 committee agreed that these communities would also be incorporated into our IRWM Plan outreach efforts as a result of this isolation.

Outreach efforts were 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 1-2):

- Boron
- Lake Los Angeles
- Leona Valley
- Mojave
- Quartz Hill
- Sun Village
- The Lakes Community
- Three Points

Rural communities frequently face economic constraints that make it difficult to implement projects and programs.

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 are eager to participate in a Regional group that promotes a 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.

1.2.4.3 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. No organized tribes were identified through this outreach process. Previous efforts at outreach had determined that some Native American individuals within the Antelope Valley Region had been reached but reported that their lineage groups were not land holders and, therefore, not recognized as tribes or nations.

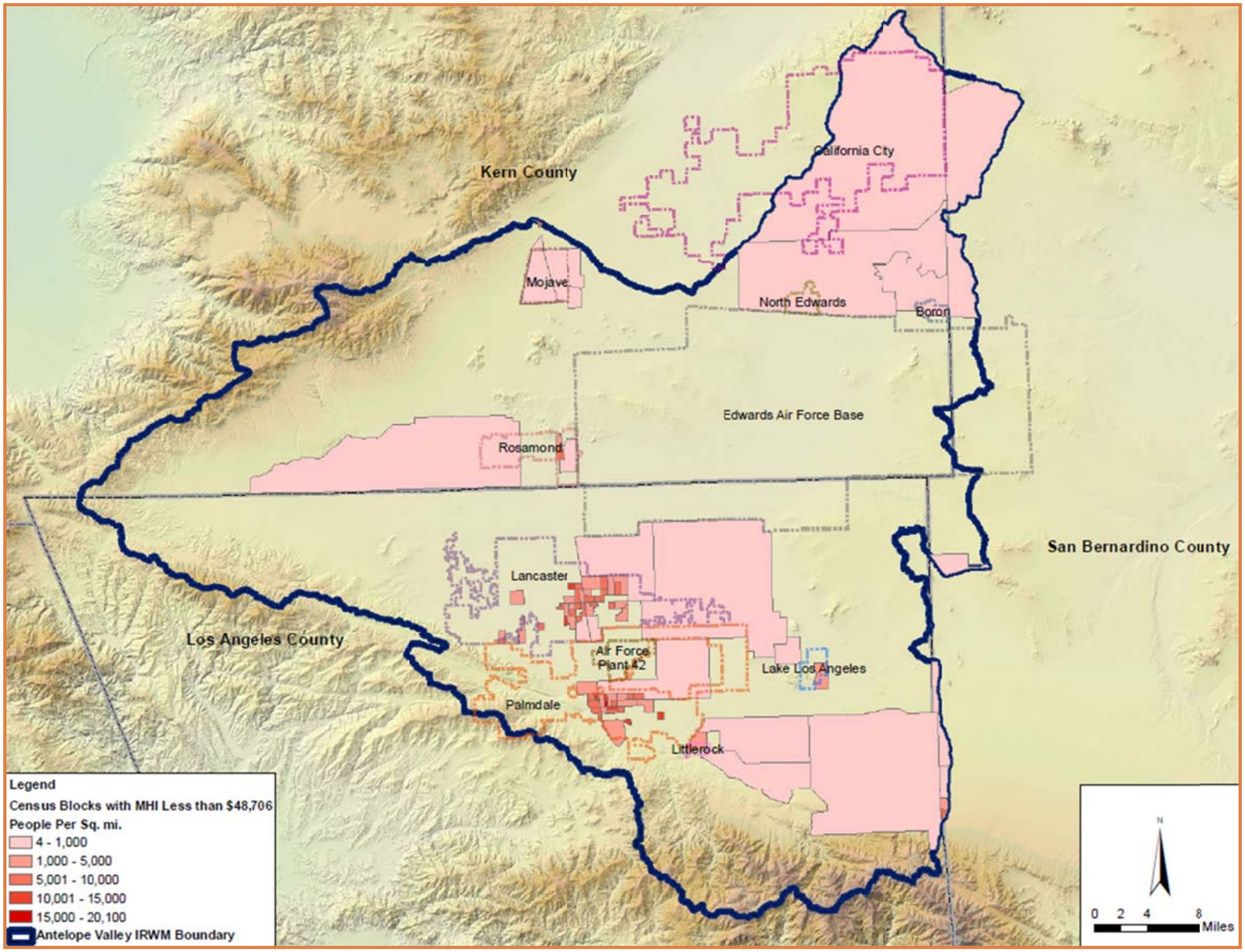
The Antelope Valley Indian Museum further reports that during the late 19th and early 20th centuries, most American Indian residents remaining in the Antelope Valley integrated with the ever-expanding European culture in Southern California, and the binding group ties of earlier times began to be erode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

1.2.4.4 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 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 committee used the EPA EnviroMapper maps found on www.city-data.com to locate 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. Guidelines for incorporating DACs into the IRWM Plan that help prevent environmental justice issues from developing are detailed in the 2007 IRWM Plan and are repeated here.

Figure 1-2: Antelope Valley IRWM Disadvantaged Communities as Defined by Census Blocks and Population Densities



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 a mechanism for Environmental Justice communities to participate in the evaluation of the plan over time.

Each of these suggestions are incorporated into the overall outreach strategy for the IRWM Plan except for the second bullet. There is no governing body representative for environmental justice.

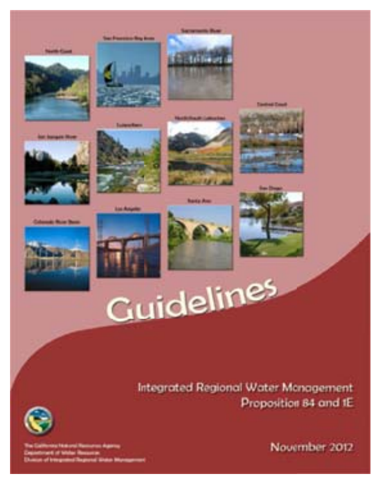
As the Antelope Valley communities expand and evolve, the IRWM Plan Stakeholder group will continue to assess environmental justice concerns throughout implementation of the Plan.

1.2.4.5 Media Coverage of Plan Preparation

Progress of the 2013 IRWM Plan updates was also covered by reporters who attended stakeholder meetings representing the Antelope Valley Press and the Mojave Desert News. Committee members found that many residents were already aware of this IRWM Plan because of the coverage by these newspapers. Their exposure has greatly helped keep members of the general public and DACs informed about the IRWM Plan updates.

1.3 Plan Updates

This subsection provides a brief overview of the planning process utilized to update the IRWM Plan to comply with the 2012 IRWM Grant Program Guidelines-IRWM Plan Standards.



1.3.1 Region Goals and Planning Objectives

The primary reason for 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. Region goals were originally developed in 2007 and were updated during the 2013 IRWM Plan updates. This IRWM Plan will address:

- How to 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, enhance, and manage current water resources and the environmental resources for human and natural benefit within the Antelope Valley Region.

In order to achieve these goals, a list of planning objectives for the IRWM Plan was developed back in 2007. This list is reproduced below. The 2013 IRWM Plan updates were completed in a fashion that preserves the original intent of these planning objectives.[2]

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;

[2] These planning objectives should not be confused with the Region Objectives in Section 4. Planning objectives apply to the IRWM Plan document itself. Region Objectives apply to the Antelope Valley.

   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.

Many of these objectives were reached by the end of 2007. Others are ongoing in nature and apply to the 2013 IRWM Plan updates. Again, it is the intent of these 2013 IRWM Plan updates to preserve the intent of the planning objectives.

1.3.2 Process for 2013 Updates

This planning process recognized the importance of three key elements to any successful public policy planning exercise: people, information, and action. It was designed to provide a forum for safe and effective dialogue among the various stakeholders. During the development of the 2007 IRWM Plan, the group agreed to the following steps for interaction through a professionally facilitated process. These steps were also implemented during the 2013 IRWM Plan updates:

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

The planning process was also designed to provide useful, broadly accepted information that supports clear action. The information gathering and generation portion of this process is summarized in Figure 1-3, Antelope Valley IRWM Plan Planning Process. It includes the following key steps that were repeated during the 2013 IRWM Plan updates:

- <u>Identify the Antelope Valley Region's issues and needs</u>: 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 drive the Stakeholders into taking action, and are discussed in Section 3. The Region issues and needs were revised with more current information during the 2013 IRWM Plan updates.
- <u>Identify clear plan objectives</u>: 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. The Region Objectives and Planning Targets were revised during stakeholder meetings for the 2013 IRWM Plan updates.
- <u>Resource Management Strategy Development</u>: Involves reviewing existing documents to identify projects within the following resource management strategies (RMS) that could satisfy these IRWM Plan Region Objectives: water supply, water quality, flood management, environmental management, land use management, and climate change. Resource Management Strategy development is discussed in more detail in Section 5 and was revised during the 2013 IRWM Plan updates.
- <u>Integration</u>: Includes intra- and inter- resource management strategy integration between projects. Integration is discussed in more detail in Section 6, and the integration process was revised during the 2013 IRWM Plan updates.

- 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. Project evaluation and prioritization was revisited during the 2013 IRWM Plan updates.
- Plan for Implementation: Finally, 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 process for updating the Plan in the future.

Throughout the development of the 2007 IRWM Plan and the 2013 Plan updates, public comments as well as Stakeholder comments have been reviewed, evaluated, discussed amongst the Stakeholder group as necessary, and incorporated into the document as appropriate.

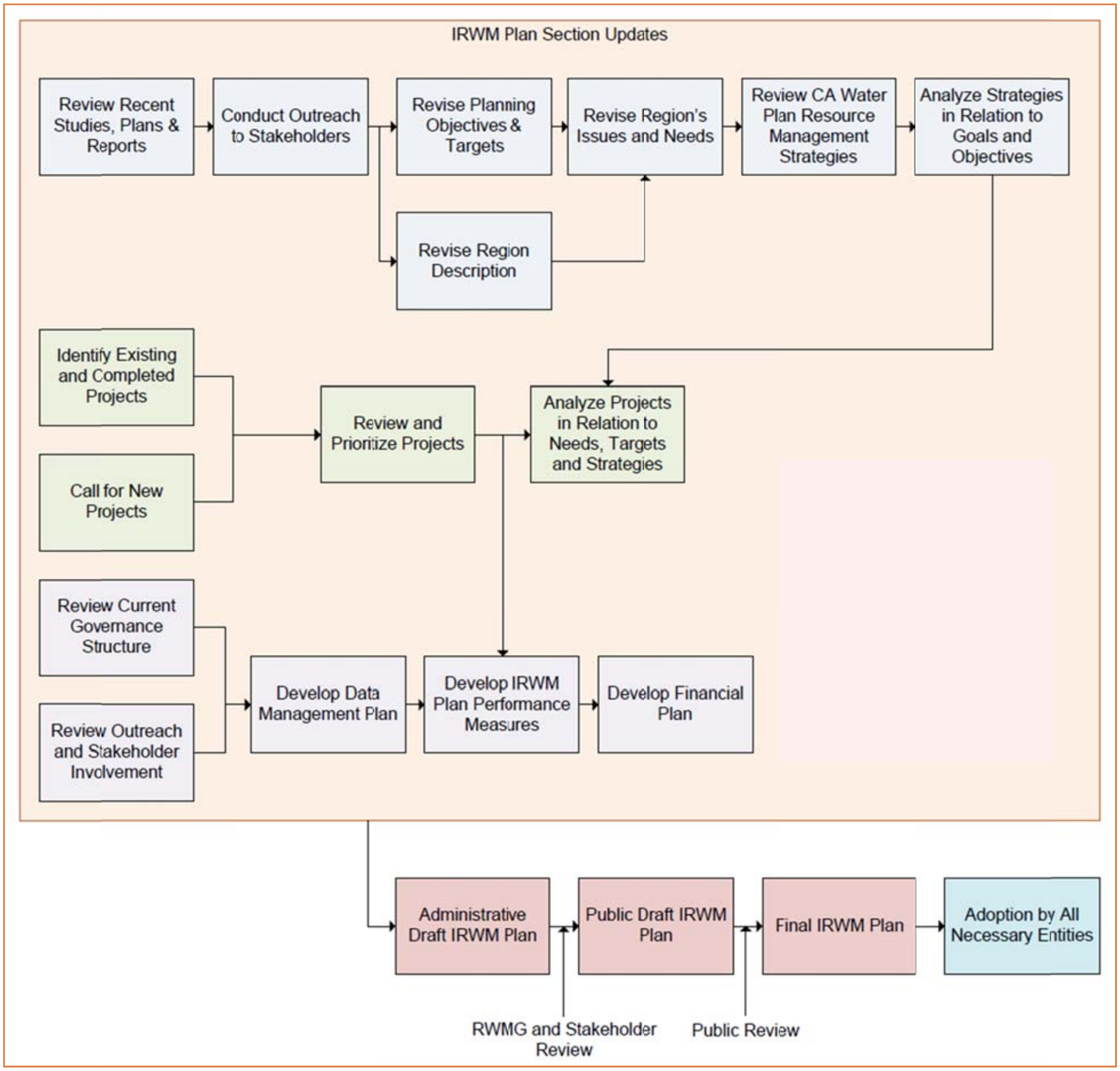
The 2013 Plan Updates were presented for public review in draft form from November 12th through December 10th, 2013. Comments received on the draft Plan were incorporated into a Final Plan that was completed by December 31st, 2013. The comments for the Draft 2013 Plan updates have been summarized into a comment response matrix and can be found in Appendix E. After the Final IRWM Plan is submitted to DWR and is approved, members of the RWMG plan to present the document (with 2013 updates) to their boards in the first quarter of 2014 for adoption during public meetings.[3]

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 estimates 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 estimates as well as the objectives and planning targets, which may delay implementation of the IRWM Plan. Additionally, the adjudication may place limitations not considered on the groundwater banking and recharge projects included for implementation.[4] However, the IRWM Plan is meant to be a dynamic planning document and as such will be updated at a minimum of every five years with the project priority list being kept up-to-date as discussed in Section 7.4.2.

[3] Some other agencies/stakeholders that are not RWMG members may also adopt the 2013 IRWMP Update.
[4] The number for total sustainable yield used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process (see Section 3 – Issues and Needs).

Figure 1-3: Antelope Valley Integrated Regional Water Management Planning Process



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. The 2007 IRWM Plan was designed to 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 or interfere with 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.

1.3.5 Integrated Flood Management Planning

Integrated flood management (IFM) is an approach that varies from traditional flood protection by maximizing the efficient use of a floodplain while promoting public safety. IFM is a process that promotes an integrated, rather than fragmented, approach to flood management; and it recognizes the connection between flood management and water resources management, land use planning, environmental stewardship, and sustainability. Flood risk management balances current needs with future sustainability to enhance the performance of a watershed system as a whole.

The Region developed a set of comprehensive integrated flood management guidelines that identify the AV IRWM Region's flood protection needs. The guidelines prioritize opportunities to capture and utilize stormwater recharge in addition to mitigating flood impacts. The guidelines were developed in coordination with the Flood Management Committee formed from the AV IRWMP Stakeholder Group and AV RWMG. This group assisted with the technical development of the guidelines and provided recommendations for future flood management governance and funding strategies. Findings from this needs evaluation were then used to consider strategies for managing flood issues in the Region, and consider how flood management projects should be evaluated. A set of recommended actions for flood management in the Region was developed, including the recommendation that the Region take part in the National Flood Insurance Program (NIFP) Community Rating System (CRS) to better map the Region's flood plains, and become eligible for flood insurance discounts. Finally, an assessment of existing and potential flood protection activities versus water quality enhancement activities was completed in order to make recommendations for more integrated flood management. The findings of these tasks culminated in the development of the Integrated Flood Management Summary Document.

The Integrated Flood Management Summary Document is included with this Plan in Appendix F.

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)	Section 1.2.3
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 2 and 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 8-4
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 2-3, Figure 2-4, Figure 2-10

1.3.6 Climate Change

As part of the update of this IRWM Plan, the Region incorporated climate change considerations into various chapters, as shown below in Figure 1-4.

Figure 1-4: Incorporation of Climate Change into the Antelope Valley IRWM Plan

Chapter 2: Region Description
- Climate change effects and impacts

Chapter 3: Issues and Needs
- Climate change vulnerabilities

Chapter 4: Objectives
- Climate change related objective

Chapter 5: Resource Mangement Strategies
- Strategies to adapt to and mitigate against climate change

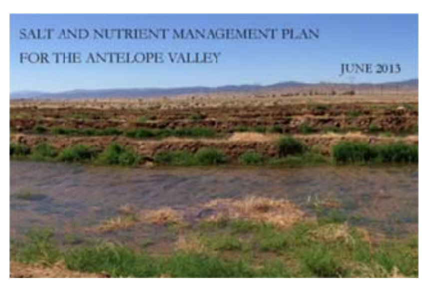
Chapter 6: Project Integration and Objectives Assessment
- Evaluation of how proposed projects will meet the Region's climate change related objective

Chapter 7: Project Submittal, Review, and Prioritization
- Climate change adaptation and mitigation included as part of prioritization

Chapter 8: Implementation
- Plan for further data gathering and analysis of vulnerabilities

A climate change committee was established in order to provide input on the Region's vulnerabilities and strategies for responding to climate change. Three meetings were conducted between September 2012 and November 2012 to vet climate change impacts, determine and prioritize vulnerabilities of the Region's water resources to climate change, assess strategies for responding to climate change and mitigating greenhouse gases (GHGs), incorporate climate change considerations into objectives and targets, and incorporate climate change adaptation and mitigation into the project prioritization process. Meeting agendas, notes, and presentation materials are available on the project website (www.avwaterplan.org).

1.3.7 Salt and Nutrient Management Plan



The AV IRWM Region is developing a regional Salt/Nutrient Management Plan (SNMP) to manage salts and nutrients from all sources within the basin to maintain regional water quality objectives and support beneficial uses. The SNMP was developed under the guidance of the SNMP committee who are active participants in the IRWM stakeholder group. A copy of the draft SNMP can be located in Appendix G, and is available on the www.avwaterplan.org website.

Section 2 | Region Description

This section presents a regional description for the Antelope Valley Region, including location, climate, hydrologic features, land uses, water quality, population and demographic information, regional growth projections, and climate change information. The Antelope Valley Region Description emphasizes the combination of increasing population growth, the lack of adequate water-related infrastructure, the need to maintain existing water levels in the groundwater basin, and the opportunity to create a proactive growth strategy for the developing Antelope Valley Region. This description sets the stage for the issues and needs discussed subsequently in Section 3.

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. Figure 2-1 provides an overview of the Antelope Valley Region. For the purposes of this IRWM Plan, the 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 (or watershed) was originally chosen as the boundary for the 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.

On November 23, 2009, the Antelope Valley Region successfully completed the Region Acceptance Process (RAP) with DWR. The RAP was the first step in becoming eligible for Prop. 84 grant funding and the process helped to further define certain aspects of the Region. Specifically, the RAP provides documentation of contact information, governing structure, RWMG composition, stakeholder participation, DAC participation, outreach, stakeholder decision-making, geographical boundaries and other features, water management issues, water-related components, and relationships with adjacent Regions. The Region boundary shown in Figure 2-1 was determined during the RAP and represents the Antelope Valley watershed. Water demands within the Antelope Valley Region are supplied by a variety of water purveyors, including large wholesale agencies, irrigation districts, special districts providing water primarily for M&I uses, investor-owned water companies, mutual water companies, and private well owners. Water supply for the Antelope Valley Region comes from five sources: the SWP, local surface water runoff that is stored in Little Rock Reservoir, the Antelope Valley Groundwater Basin, recycled water, and captured stormwater. Development demands on water availability and quality, coupled with the potential curtailments of SWP deliveries due to prolonged drought periods and other factors, have intensified the competition for available water supplies. Consensus is needed to maintain 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 needs of agricultural users to have adequate supplies of reasonably-priced irrigation water.

Highway 14 connects Los Angeles to the expanding communities of the Antelope Valley.

2.2 Location

As discussed above, the Antelope Valley Region encompasses most of the northern portion of Los Angeles County and the southern region of Kern County. The Region is located within the Lahontan DWR Funding Area. Bordered by 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: California City, EAFB, Lancaster, Mojave, Palmdale, and Rosamond. Smaller communities include Boron, Lake Los Angeles, North Edwards, Littlerock and Quartz Hill. The communities are predominantly located in the eastern portions of the Antelope Valley Region.

The Lahontan Funding Area is bordered by the Tulare/Kern, Los Angeles-Ventura, Santa Ana, and Colorado River Funding Areas. Other Regions within the Lahontan Funding Area and adjacent Funding Areas are currently represented by, or are in the process of developing, IRWM Plans. These consist of the Mojave Water Agency IRWM Plan in the Lahontan Funding Area; the Fremont Basin IRWM Plan in the Lahontan Funding Area; the Upper Santa Clara River IRWM Plan in the Los Angeles-Ventura Funding Area; the Los Angeles IRWM Plan in the Los Angeles-Ventura Funding Area; 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-Ventura Funding Area. These areas are shown in Figure 2-1 and Figure 2-2. "Funding areas" are large areas across the State that are designated by DWR; they are made up of smaller self-defined "Regions".

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 the Region boundary. Additionally the AVRWMG submitted a letter of agreement which acknowledges both the AV IRWM and Kern IRWM regional boundary overlap and the respective RWMG's for the IRWM regions will work collaboratively to address any issues of common interest in this area. Letters of Support and Agreement may be found at the www.avwaterplan.org website (under "Grants"). These IRWM Regions nearly surround the Antelope Valley Region, which means that the Antelope Valley IRWM Plan will play an integral role in completing watershed analyses for the Lahontan Funding Area and provide an important link to the neighboring Los Angeles-Ventura Funding Area. The collective efforts of these interconnected IRWM Plans will not only benefit their respective regions, but the watersheds of Southern California as a whole.

Figure 2-1: Neighboring IRWM Regions

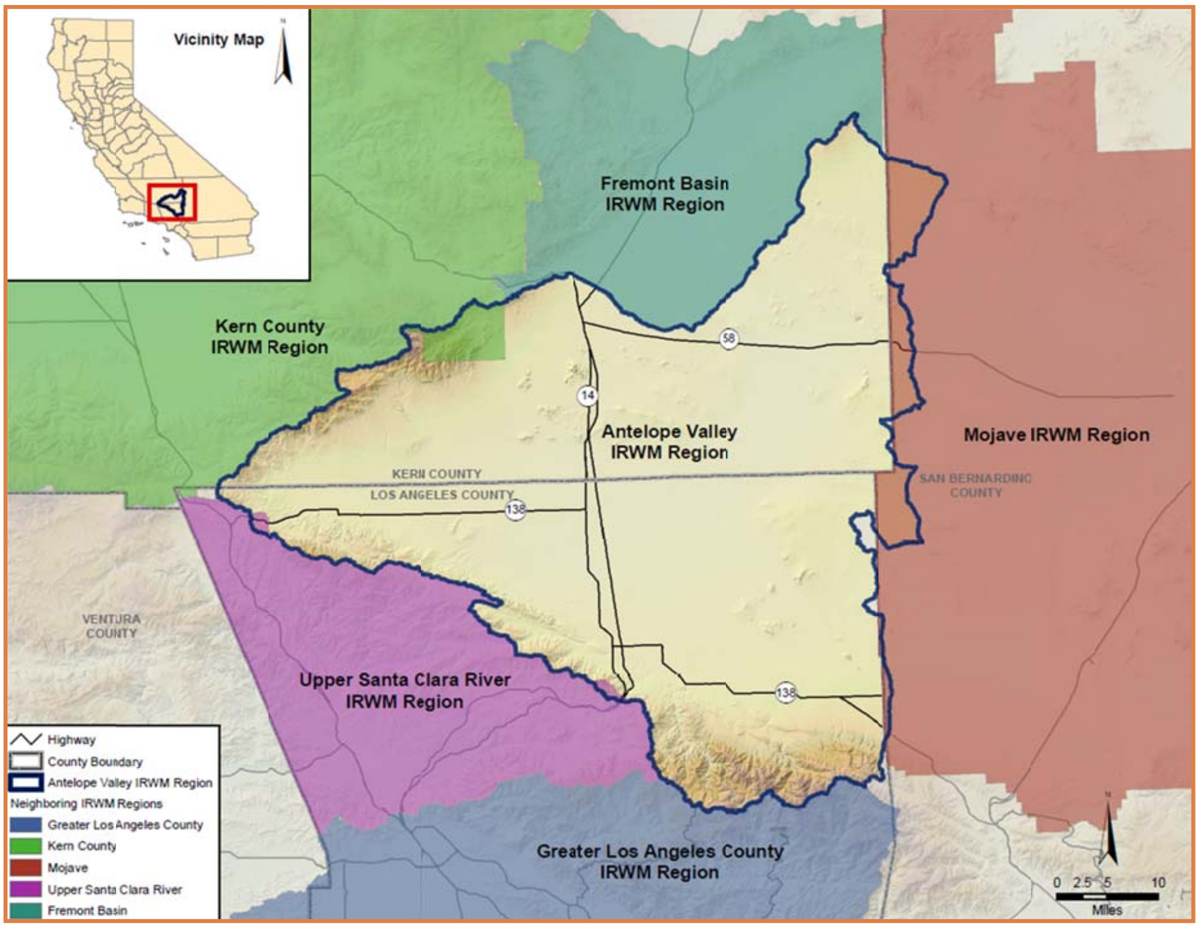
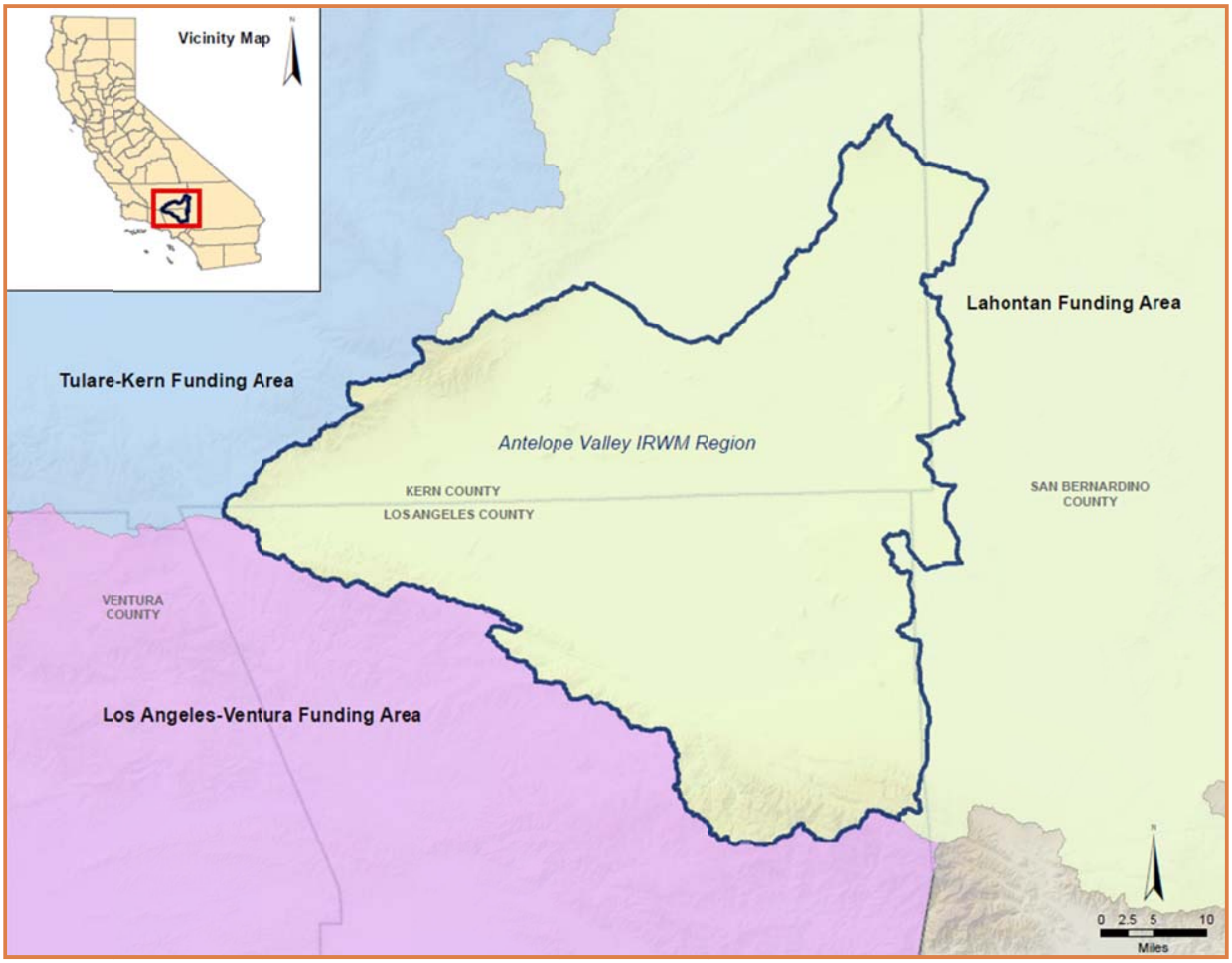


Figure 2-2: DWR IRWM Funding Areas



Four major roadways traverse the Antelope Valley Region. The Antelope Valley Freeway (State Route 14) and 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. Figure 2-3 shows the main Antelope Valley Service Districts, including counties, AVEK, EAFB, LACWD 40, LCID, PWD, Boron CSD, Mojave Public Utilities District, North Edwards Water District, West Valley County Water District, QHWD, RCSD, and mutual water companies. Figure 2-4 shows the Antelope Valley city boundaries, towns, flood control districts and sanitation districts. Both figures include the locations of the major roads, county lines, city lines, and Antelope Valley Region boundary.

2.3 Climate Statistics

Located in 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 is typical of the high desert and includes 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 (◦F) to 93◦F, and mean daily winter temperatures range from 34◦F to 57◦F. The growing season is primarily from April to October, though vegetation may begin to grow as early as January as the ground temperature increases.

Native vegetation includes the regal joshua tree.

Precipitation ranges from less than 4 inches on the valley floor to 20 inches in the mountains, running off the surrounding mountains through a number of canyons and watersheds. Most rainfall occurs between October and April, with little to no precipitation falling in summer months, meaning cultivated crops and non-native plants must rely heavily on irrigation. Annual variations in precipitation are important to the annual variations in applied water required for crop production and landscape maintenance. Rainfall records indicate that some runoff may be available for artificial groundwater recharge use (USGS 1995).

Figure 2-5, Annual Precipitation, summarizes the historical annual precipitation for the Antelope Valley Region, based on the data from EAFB. 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 1903 to 2012. Figure 2-6 and Figure 2-7 present the average maximum and minimum temperature and the average rainfall and monthly evapotranspiration (ETo) in the Antelope Valley Region, while Figure 2-4 presents average rainfall throughout the valley.

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)]	1.46	1.53	1.24	0.48	0.14	0.03
Average Max Temperature(ºF)[(b)]	58.5	62.1	67.4	74.0	81.9	90.2
Average Min Temperature (ºF)[(b)]	32.4	35.6	39.2	44.0	51.0	58.0

	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	0.15	0.19	0.33	0.67	1.36	7.62
Average Max Temperature(ºF)[(b)]	97.6	96.9	91.4	80.2	67.3	58.7	77.2
Average Min Temperature (ºF)[(b)]	65.3	63.9	57.6	48.1	38.1	32.7	47.2

Sources:
(a) CIMIS Data for Palmdale No. 197 Station since April 2005.
(b) Western Regional Climate Center, Palmdale Station (046624) for the Years 1903 to 2012.

Page Intentionally Left Blank

Figure 2-3: Antelope Valley Service Districts

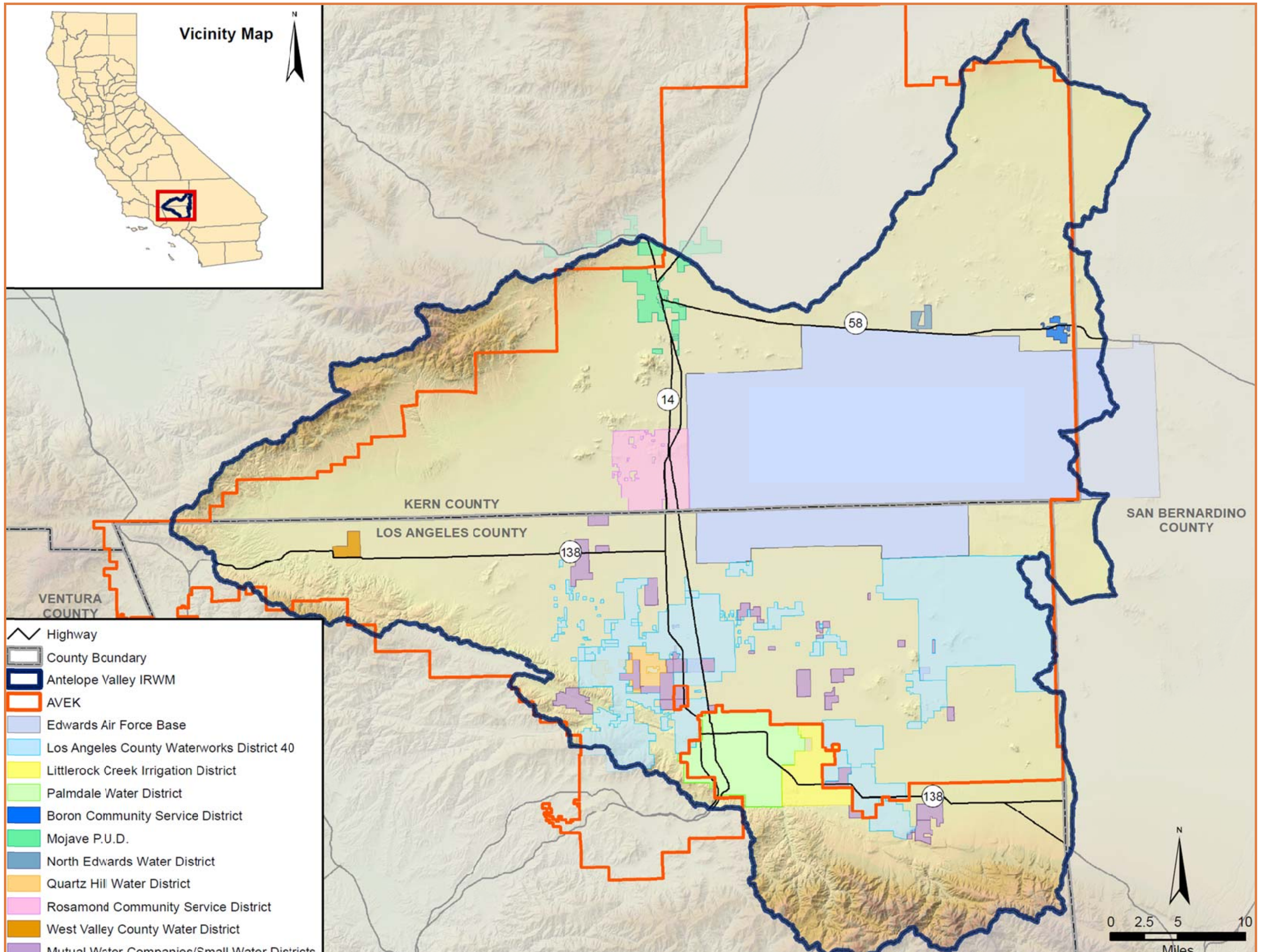


Figure 2-4: Antelope Valley City Boundaries and Special Districts

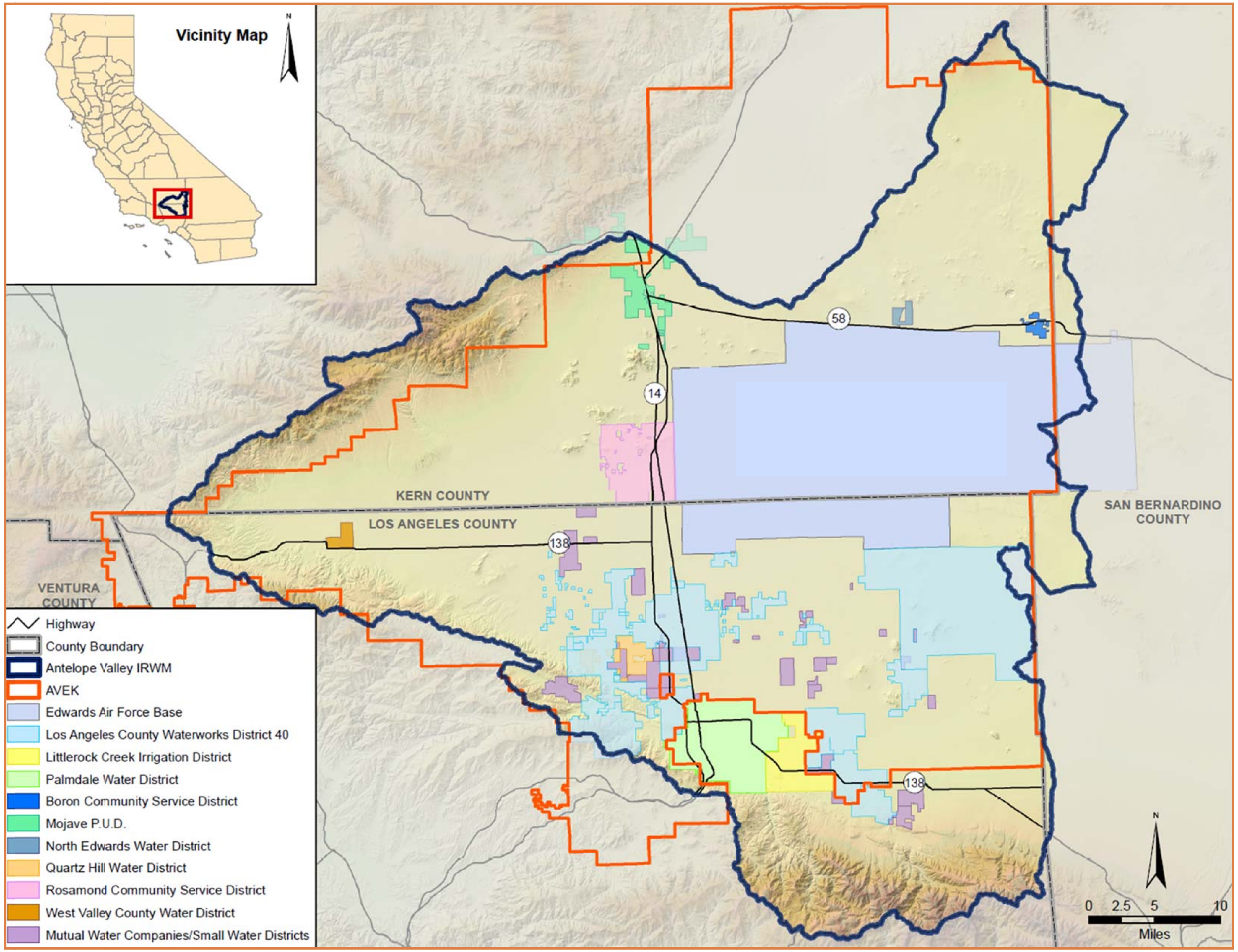
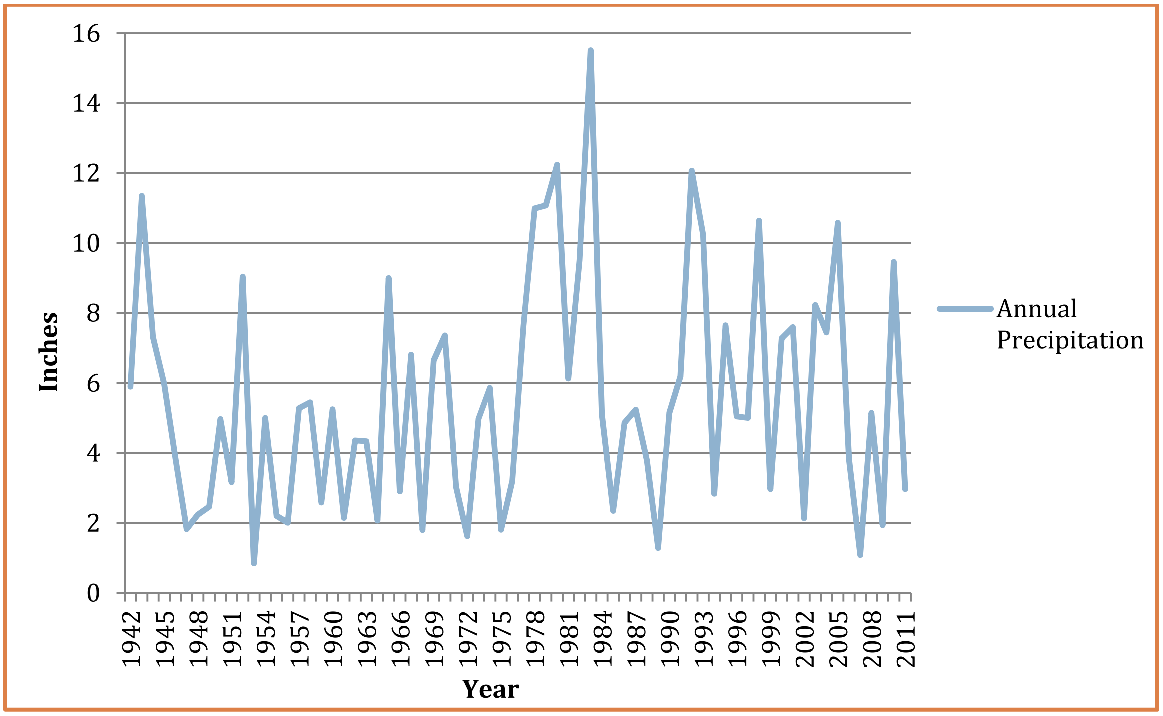
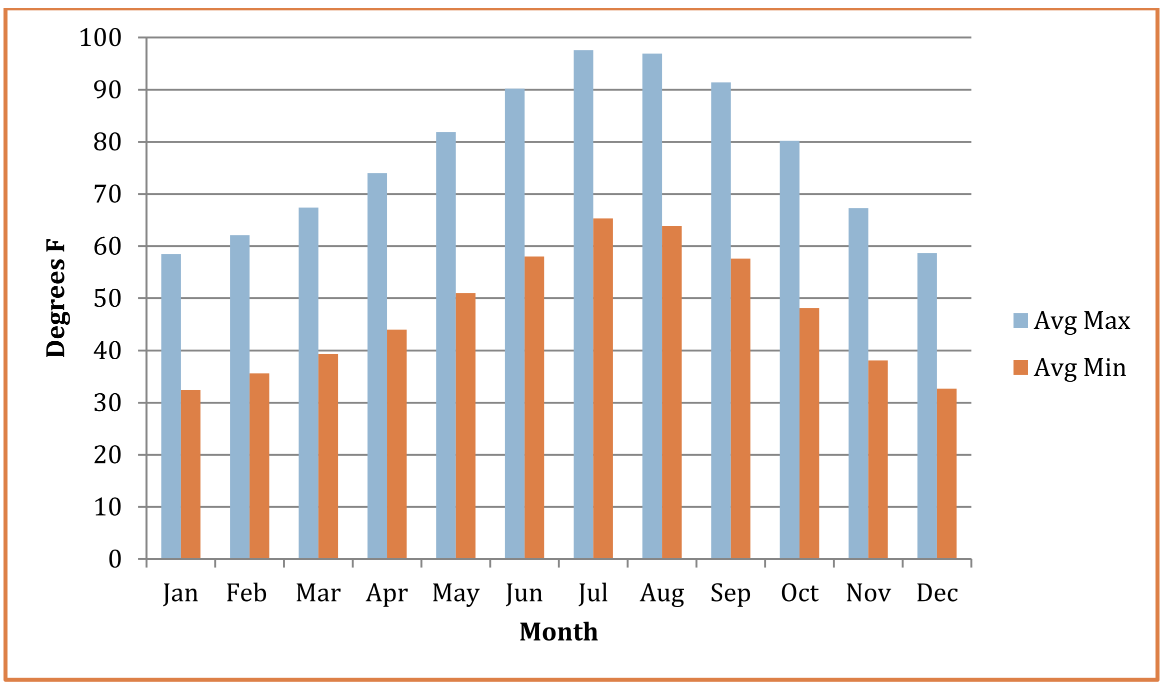


Figure 2-5: Annual Precipitation



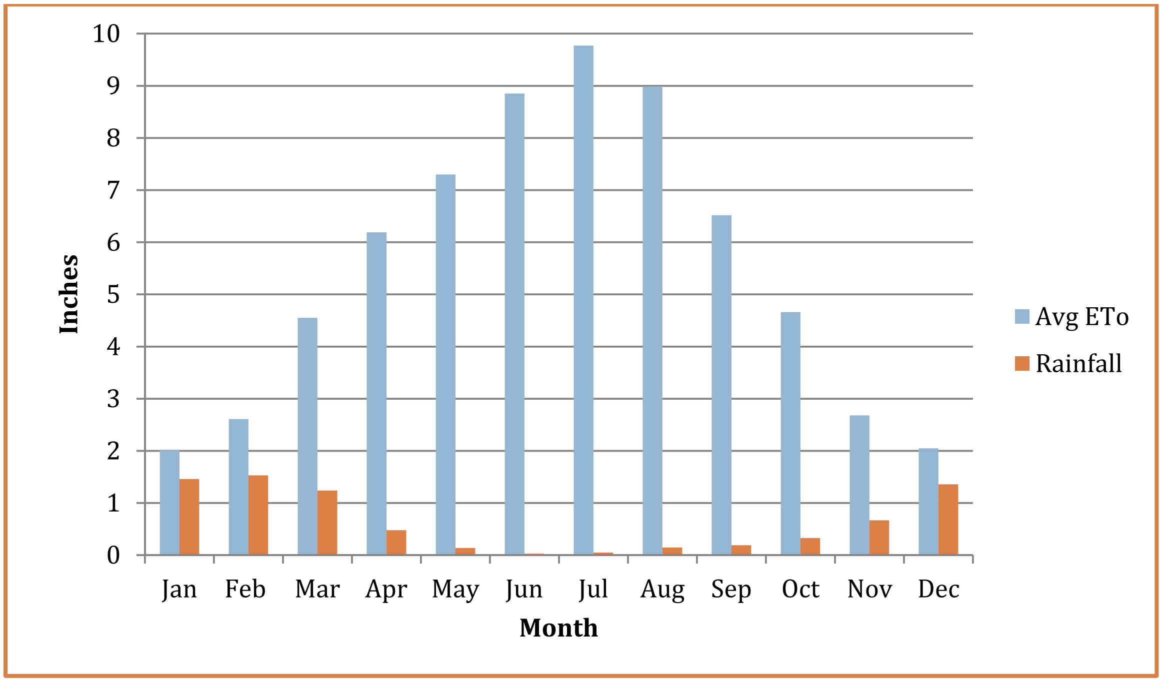
Source: 1942-2011 EAFB

Figure 2-6: Average Maximum and Minimum Temperature in the Antelope Valley Region



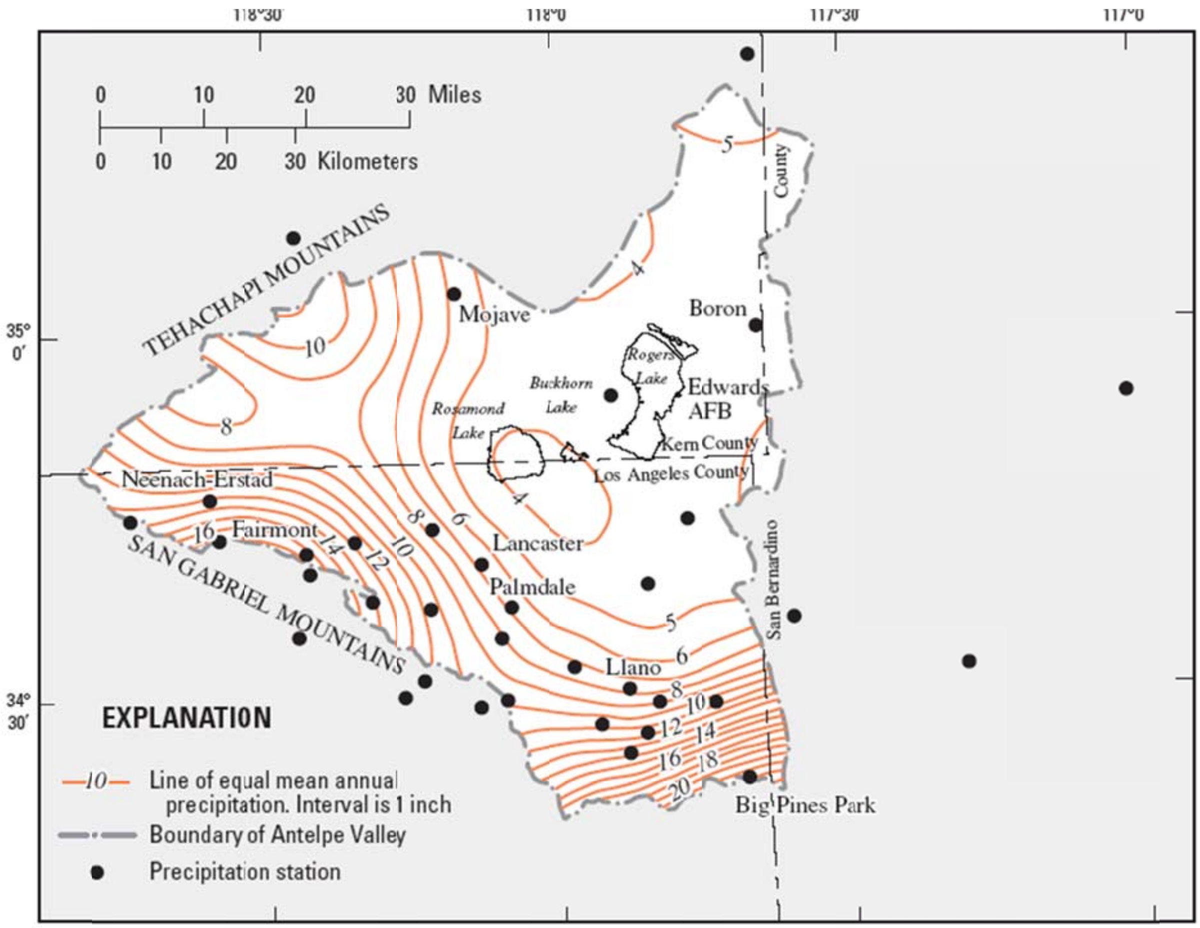
Source: Western Regional Climate Center, Palmdale Station (046624) for the Years 1903 to 2012.

Figure 2-7: Average Rainfall and Monthly Evapotranspiration (ETo) in the Antelope Valley Region



Source: CIMIS Data for Palmdale No. 197 Station since April 2005 and Western Regional Climate Center, Palmdale Station (046624) for the Years 1903 to 2012.

Figure 2-8: 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 EAFB: 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 some groundwater features of the Antelope Valley Region are discussed in more detail below and are depicted in Figure 2-9.

Page Intentionally Left Blank

Figure 2-9: Antelope Valley Hydrologic Features

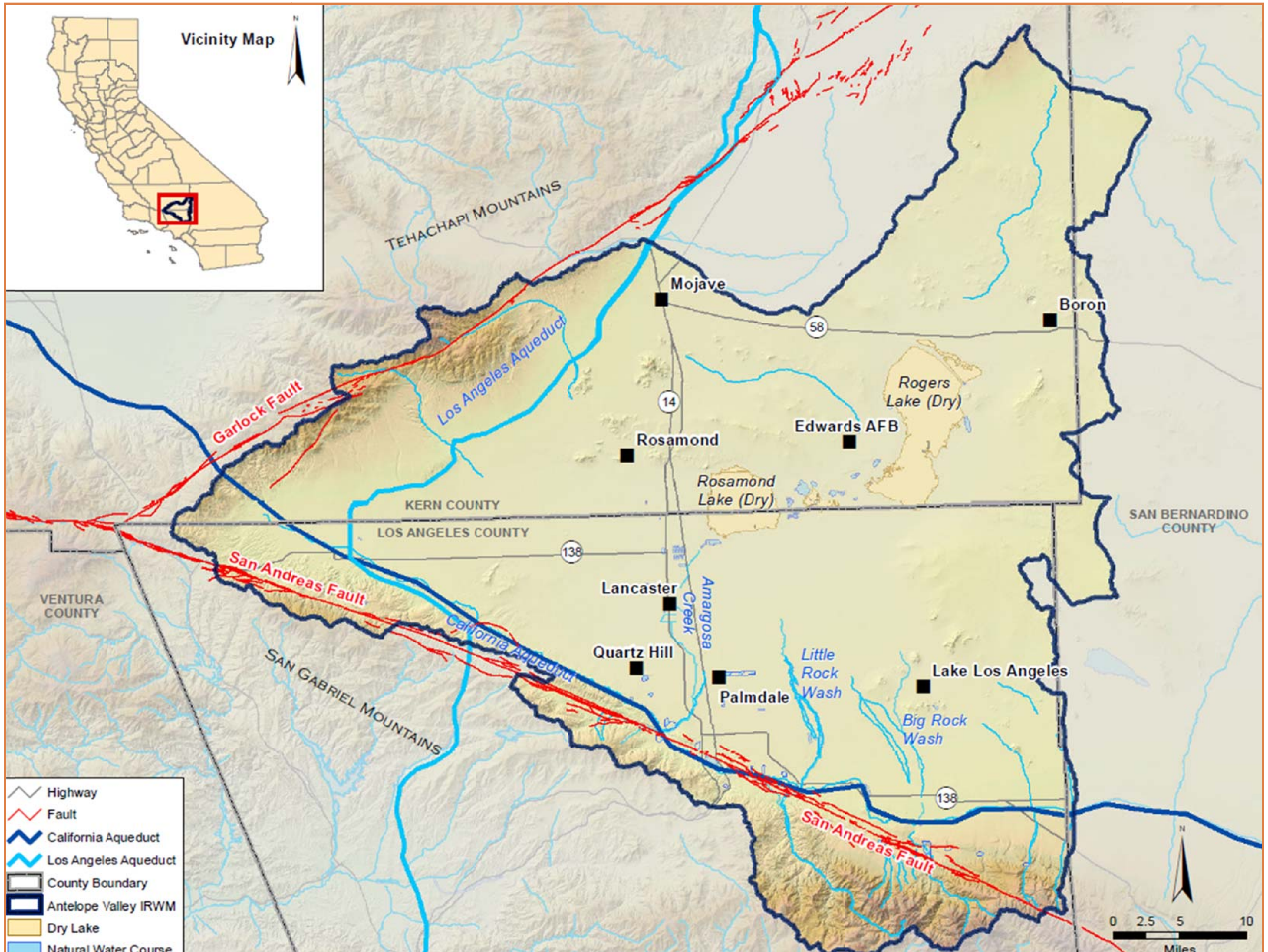
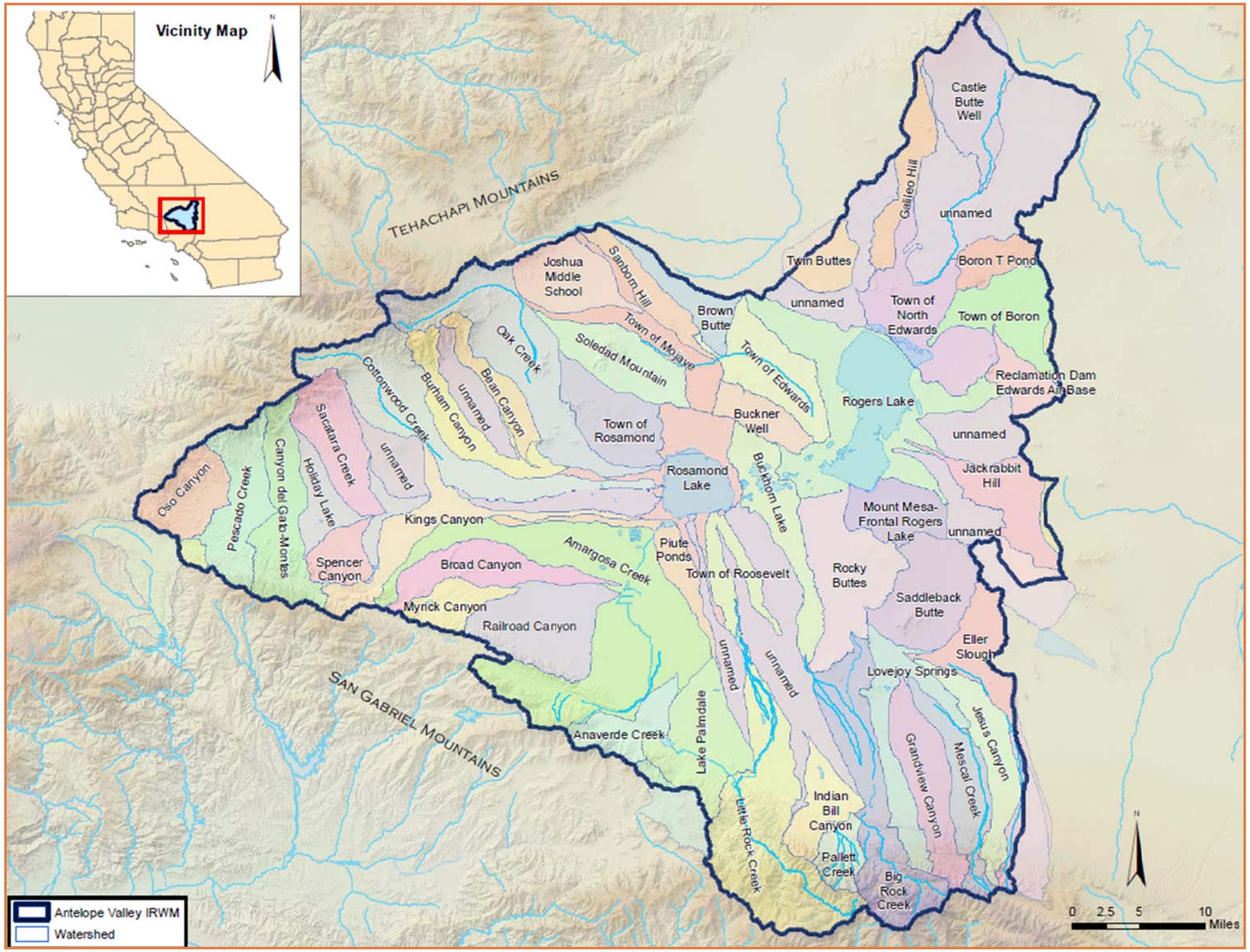


Figure 2-10: Antelope Valley Watersheds



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 Big Rock Creek, Little Rock Creek and Amargosa Creek from the San Gabriel Mountains; and Oak Creek and Cottonwood Creek from the Tehachapi Mountains. In addition, the fault lines surrounding the Valley form the Region's groundwater basin. These hydrologic features are shown on Figure 2-9.

2.4.1.1 Watersheds

The Antelope Valley's watersheds feed numerous ephemeral streams that originate in the surrounding mountains and meander across the alluvial fans that make up the valley floor. Stormwater runoff that doesn't percolate into the ground eventually ponds and evaporates in the dry lake beds on the Valley floor. There are a number of canyons and watersheds in the Valley, including Osos Canyon, Pescado Creek, Canyon del Gato-Montes, Sacatara Creek, Spencer Canyon, Kings Canyon, Cottonwood Creek, Burham Canyon, Bean Canyon, Oak Creek, Amargosa Creek, Railroad Canyon, Anaverde Creek, Little Rock Creek, Indian Bill Canyon, Pallett Creek, Big Rock Creek, Grandview Canyon, Mescal Creek, and Jesus Canyon. The most significant streams in the Valley begin in the San Gabriel Mountains on the southwestern edge of the Valley, and include Big Rock Creek, Little Rock Creek, and Amargosa Creek. Together, these streams drain an area of approximately 330 square miles. Surface water flows in Little Rock Creek are captured at Little Rock Reservoir, which is discussed further below. Big Rock Creek and Amargosa Creek are not diverted for supply at this time. The two major watersheds that begin in the Tehachapi Mountains, Oak Creek and Cottonwood Creek, drain an area of about 160 square miles. The Valley's watersheds are shown in Figure 2-10 and collectively drain the entire 2,400 square miles of the Region.

2.4.1.2 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 PWD and LCID, collects runoff from the San Gabriel Mountains. As of 2005, the reservoir's useable storage capacity was estimated at 3,500 AF of water, reduced from its original design capacity of 4,300 AF due to the deposition of sediment. It is assumed that on average, 54,000 cubic yards of sediment are deposited in the reservoir per year (Aspen Environmental Group, 2005.) One of the priority projects in the 2013 IRWM Plan proposes to remove accumulated sediment from behind the dam (see Section 7).

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. PWD and LCID jointly hold long-standing water rights to divert 5,500 AFY from Littlerock Creek flows per an agreement between the two districts. LCID has not exercised its right to surface water diversions since 1994 and has made those rights available to PWD by agreement for a 50-year period.[1]

2.4.1.3 Dry Lakes and Percolation

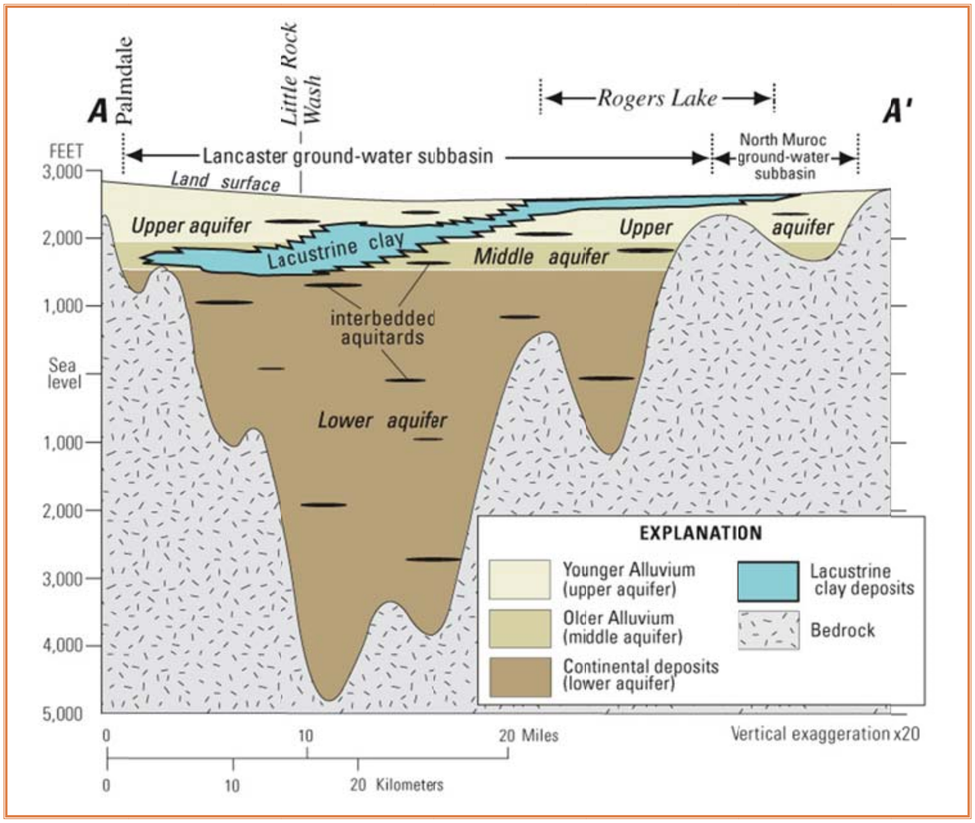
Surface water from the surrounding hills and from the Antelope Valley Region floor flows primarily toward the three dry lakes on EAFB. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley Region from the surrounding mountains, quickly percolates into the stream bed, and recharges the groundwater basin. Surface water flows that reach the dry lakes are either used by the natural vegetation on the lake beds, or are lost to evaporation. It

[1] *2010 Urban Water Management Plan,* PWD, June 2011.

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, though further investigations would be necessary to confirm the locations of impermeable areas. See Figure 2-11 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.

Previous USGS estimates indicate that approximately 5 percent of the precipitation that falls in the Antelope-Fremont Valley each year percolates to the groundwater basins, while the remaining water is lost to evaporation (USGS, 1987).

Figure 2-11: Cross Sectional View of the Clay Layer Between the Upper and Lower Aquifers in the Antelope Valley Region



Source: USGS 2000b

2.4.1.4 Geology and Soils

The Antelope Valley represents a large topographic area 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. These elevations represent the surface areas overlying the groundwater basin only and do not include the larger area overlying the entire watershed (i.e., Region). In other words, the watershed has a larger "footprint" than the groundwater basin. The 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).

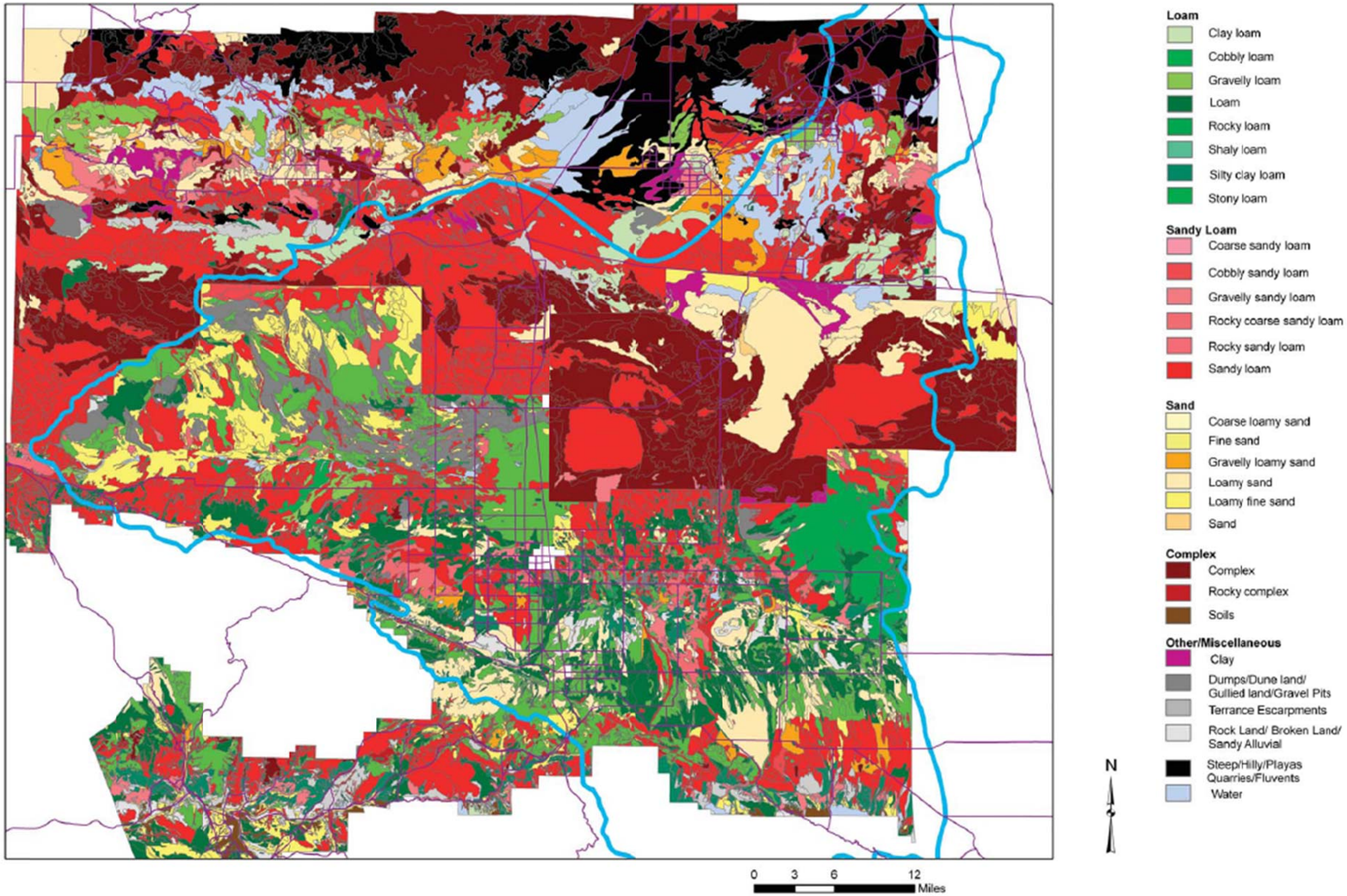
Alluvium and interbedded lacustrine deposits of Quaternary age are the important aquifers within the closed basin and have accumulated to a thickness of as much as 1,600 feet. The alluvium is unconsolidated to moderately consolidated, poorly sorted gravel, sand, silt, and clay. Older units of the alluvium 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). Figure 2-12 provides a soil map of the Antelope Valley Region.

Page Intentionally Left Blank

Figure 2-12: Antelope Valley Soils Map



This Page Intentionally Left Blank

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 EAFB.

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 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 is underway. There are no existing restrictions on groundwater pumping, but pumping may be altered or reduced as part of the adjudication process. The adjudication process is discussed in more detail in Section 3 of this IRWM Plan.

2.4.2.1 Groundwater Subunits

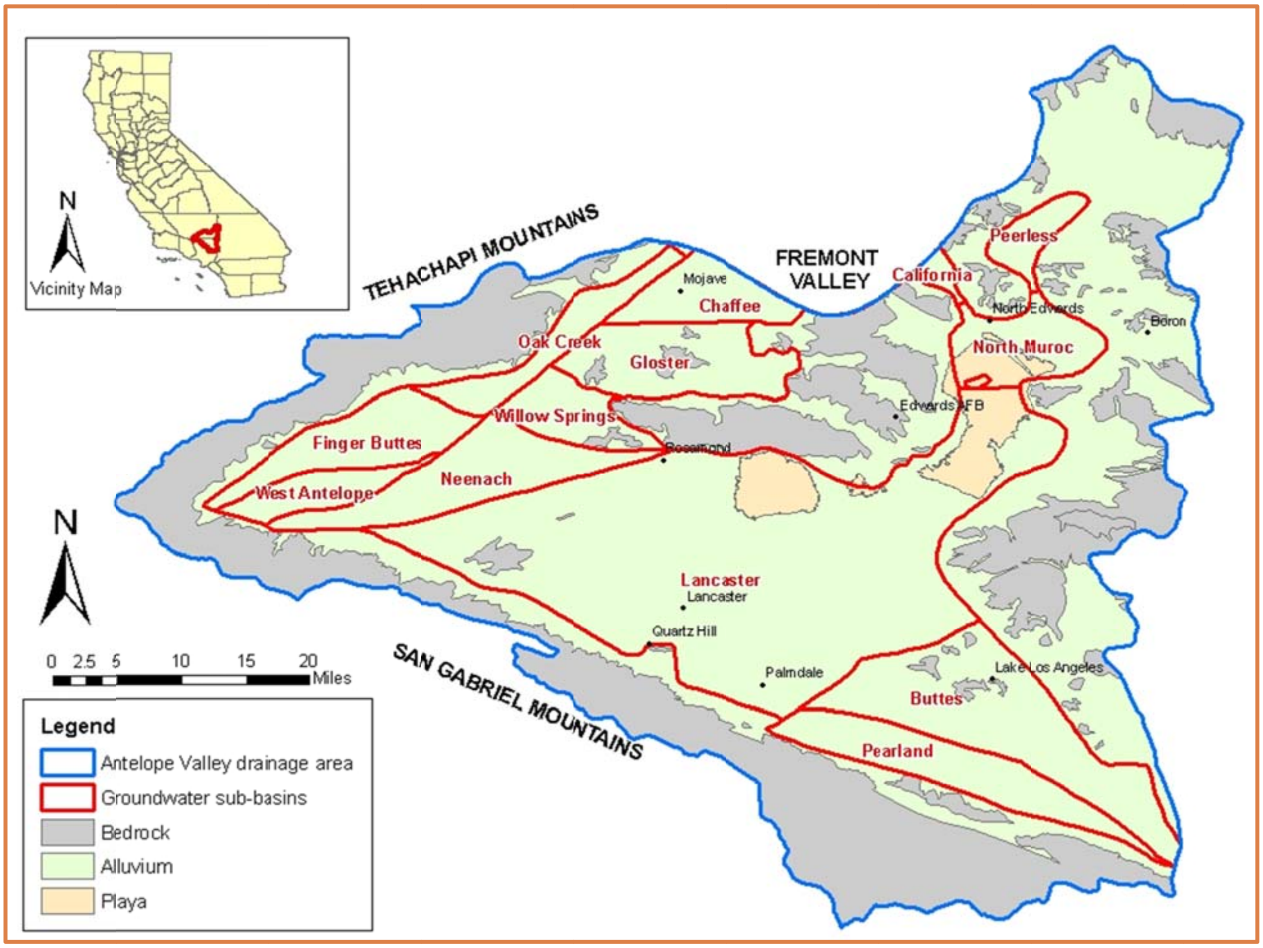
The complex Antelope Valley Groundwater Basin is divided by the USGS into twelve subunits as shown on Figure 2-13. Groundwater basins are generally divided based upon differential groundflow patterns, recharge characteristics, and geographic location, as well as controlling geologic structures. The Antelope 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 EAFB 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.

Figure 2-13: Antelope Valley Groundwater Sub-Basin Boundary Map



Source: Draft Salt and Nutrient Management Plan for the Antelope Valley June 2013

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. Identification and characterization of salts and nutrients is necessary for assessing constituent loads and analyzing impacts on groundwater quality. Sources of salts and nutrients in the basin include imported water, recycled water, and several others. The following provides a brief description of some of the significant salts and nutrients in the Antelope Valley Watershed. Refer to Appendix G for a more detailed description of the constituents in the Antelope Valley Salt and Nutrient Plan.

Total Dissolved Solids: Salts in groundwater are typically measured by TDS, which is the overall mineral content. Most TDS sources are anthropogenic in nature and include agricultural runoff, point source water pollution, and industrial and sewage discharge. Inorganic sources include minerals commonly found in nature through the weathering and dissolution of rocks and organic material from decaying organisms, plants, and animals.

There are no known health effects associated with the ingestion of TDS in drinking water. However, high TDS concentrations can negatively impact sensitive crops and cause corrosion and scaling in pipes.

Chlorides: Chlorides are widely distributed in nature as salts of sodium (NaCl), potassium (KCl), and calcium ($CaCl_2$). Chlorides in groundwater are naturally occurring from weathering of rocks, negligible atmospheric deposition, and as result of human use and wastes. Sources of chloride from human use include food condiments and preservatives, potash fertilizers, animal feed additives, production of industrial chemicals, dissolution of de-icing salts, and treatment of drinking water and wastewater. Release of brines from industry processes, leaching from landfills and fertilized soils, discharge of wastewater from treatment facilities or septic systems affect chloride in groundwater.

As with TDS, there are no known health effects associated with the ingestion of chloride in drinking water. Chloride concentrations in excess of approximately 250 mg/L can affect taste. Also, elevated chloride concentrations have substantial negative impacts on sensitive crops and cause corrosion in pipes.

Nitrogen: Nitrogen is ubiquitous in the environment and an essential nutrient for crops. Nitrate is the primary form of nitrogen found in groundwater and is a principal by-product of fertilizers. Other sources of nitrate include land use activities such as irrigation farming of crops, high density animal operations, wastewater treatment, food processing facilities and septic tank systems.

Nitrogen in the nitrate/nitrite form poses health hazards for infants and pregnant women. High nitrate levels in drinking water can result in methemoglobinemia, commonly known as "blue baby syndrome" which is a condition characterized by a reduced ability of the blood to carry oxygen to organs and tissue.

Arsenic: Arsenic is an odorless and tasteless semi-metal element that occurs naturally in rocks and soil, water, air, and plants and animals. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices. Higher levels of arsenic tend to be found more in groundwater sources than in surface water sources. The demand on groundwater from municipal systems and private drinking water wells may cause water levels to drop and release arsenic from rock formations.

Arsenic is a concern in the Antelope Valley Region and has been observed in LACWD 40, PWD, and QHWD wells. Research conducted by the LACWD 40 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.

Arsenic has been linked to cancer of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate. Non-cancer effects of arsenic can include thickening and discoloration of the skin, stomach pain, nausea, vomiting; diarrhea; numbness in hands and feet; partial paralysis; and blindness.

Chromium: Chromium is an odorless and tasteless metallic element found naturally in rocks, plants, soil and volcanic dust, and animals. The most common forms of chromium that occur in natural waters in the environment are trivalent chromium (chromium-3) and hexavalent chromium (chromium-6).

Chromium-3 is an essential human dietary element and is found in many vegetables, fruits, meats, grains and yeast. Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits, and it can also be produced by industrial processes. There are demonstrated instances of chromium being released to the environment by leakage, poor storage or inadequate industrial waste disposal practices.

Drinking water standards have been set to protect consumers served by public water systems from the effects of exposure to chromium. On August 23, 2013, the California Department of Public Health (CDPH) proposed a maximum contaminant level (MCL) for chromium-6 of 10 ug/L (parts per billion). Completion of the rulemaking process may take up to 12 months after the proposal.

Fluoride: Fluoride compounds are salts that form when the element, fluorine, combines with minerals in soil or rocks. Some fluoride compounds, such as sodium fluoride and fluorosilicates, dissolve easily into ground water as it moves through gaps and pore spaces between rocks. Most water supplies contain some naturally occurring fluoride. Fluoride also enters drinking water in discharge from fertilizer or aluminum factories. Also, many communities add fluoride to their drinking water to promote dental health.

Exposure to excessive consumption of fluoride over a lifetime may lead to increased likelihood of bone fractures in adults, and may result in effects on bone leading to pain and tenderness. Children aged 8 years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects to teeth.

Boron: Naturally-occurring boron is usually found in sediments and sedimentary rock formations and rarely exists in elemental form. Other forms of boron include boric acid, borax, borax pentahydrate, anhydrous borax, and boron oxide. The principal uses for boron compounds in the United States include glass and ceramics, soaps and detergents, algicides in water treatment, fertilizers, pesticides, flame retardants, and reagents for production of other boron compounds. The major sources of free boron in the environment are exposed minerals containing boron, boric acid volatilization from seawater, and volcanic material. Anthropogenic inputs of boron to the environment are considered smaller than inputs from natural processes and may include: agriculture, waste and wood burning, power generation using coal and oil, glass product manufacture, use of borates/perborates in the home and industry, borate mining/processing, leaching of treated wood, and sewage/sludge disposal. Contamination of water can come directly from industrial wastewater and municipal sewage, as well as indirectly from air deposition and soil runoff. Borates in detergents, soaps, and personal care products can also contribute to the presence of boron in water.

The available data for boron support its ubiquitous presence in the ambient environment. Based on the concentrations of boron in the groundwater compared to the health risk level, boron does not present a health risk (US EPA 2008).

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 2-13 for a depiction of groundwater basin boundaries). 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 on the Valley floor 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. As part of the current adjudication proceedings, the total sustainable yield (TSY) of the basin has been determined to be

110,000 AFY (i.e., natural recharge and return flows). A list of documents that reference estimates for TSY, natural recharge, and return flows are included in Appendix I. [2]

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).

Though general trends exist, USGS data compiled by the City of Lancaster indicate that changes in groundwater levels have varied in different parts of the Antelope Valley between 1975 and 2011, with some areas experiencing decreases of over 30 feet and other areas experiencing increases of over 30 feet (Lancaster, 2011; USGS, 2013).

2.4.2.4 Groundwater Extraction

According to the USGS (2003), groundwater extractions have exceeded the estimated natural recharge of the basin during some periods 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). The Statement of Decisions for Phase Three Trial for the adjudication process has also determined that the groundwater basin is in overdraft and that overall, current extractions exceed recharge, though it also acknowledges that groundwater levels are increasing in some areas (Antelope Valley Groundwater Litigation (Consolidated Cases), Los Angeles Superior Court, Lead Case No. BC 325 201 (2011)).

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 EAFB 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 adjudication process indicate that extractions are between 130,000 and 150,000 AFY based on the period between 1951 and 2005 (Antelope Valley Groundwater Litigation (Consolidated Cases), Los Angeles Superior Court, Lead Case No. BC 325 201 (2011)).

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] The number for total sustainable yield (a portion of which is natural recharge) used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.

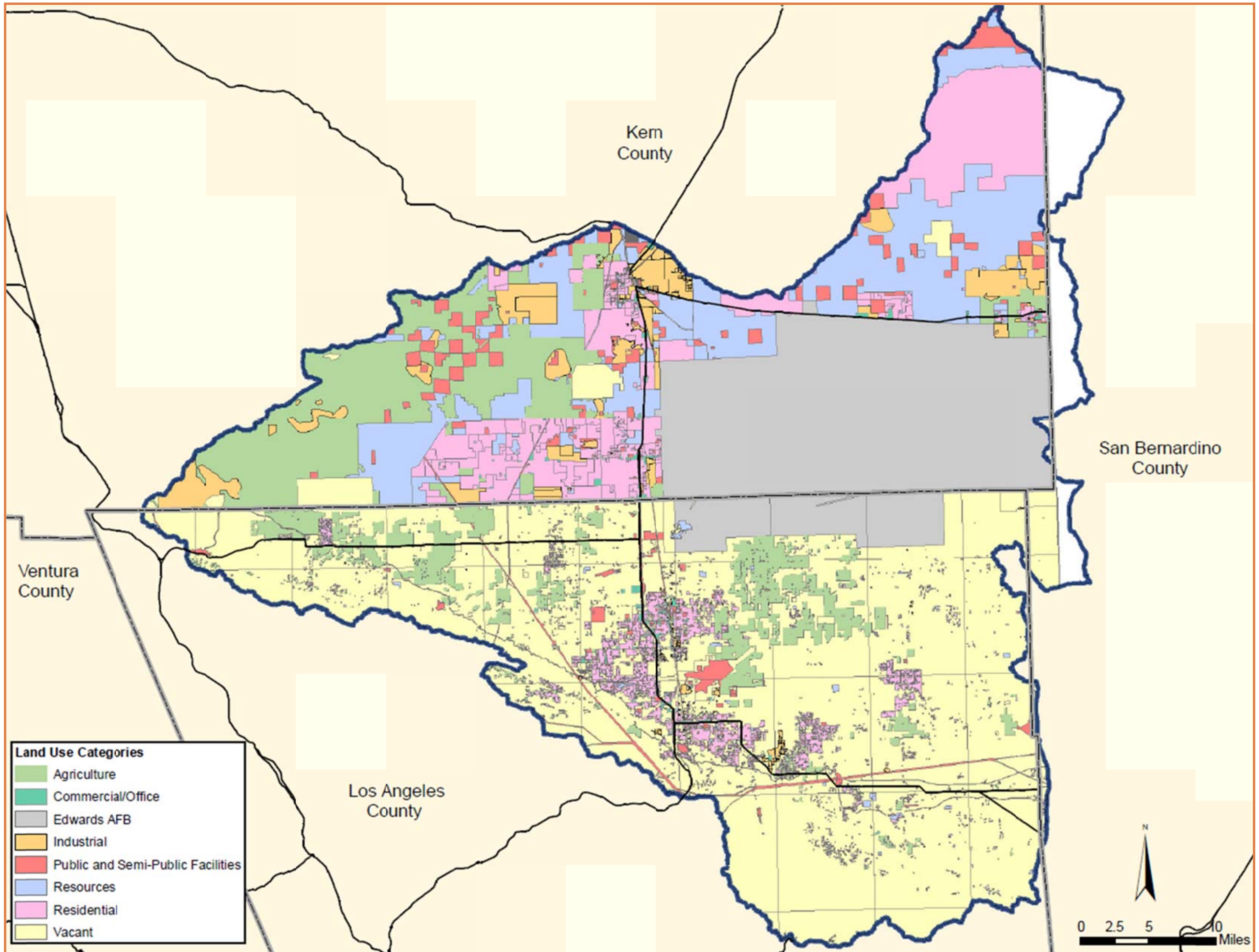
2.5 Land Use

Figure 2-14 presents a map of major existing land use categories within the Antelope Valley Region, characterized and grouped together according to broad water use sectors. Land use is determined by the Region's counties and cities. The map was created with Los Angeles County and Kern County Planning Department Geographic Information System (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.
- 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.

This Page Intentionally Left Blank

Figure 2-14: Current Land Use Designations for the Antelope Valley Region



This Page Intentionally Left Blank

2.6 Flood Control

Flood control in the Region is managed at both the county level by Los Angeles County and Kern County, and at the municipal level by the cities. It should be noted that the Los Angeles County Flood Control District Boundary only extends as far north as Avenue S, as shown in Figure 2-4. Regional flood control facilities are limited and generally located in urban areas. The valley floor is essentially an alluvial fan, making much of it subject to inundation and shallow flooding with unpredictable flow paths. Additionally, "flashy" storms tend to occur in the area, leading to high stream flow volumes over short periods of time. Urban drainage facilities have limited hydraulic capacity which at times causes localized flooding problems. Urban drainage facilities generally consist of local detention basins, street drainage inlets, underground storm drain pipes, and culverts. There are no regional flood management facilities maintained in the Antelope Valley; however, a number of flood studies have been performed to assess the need for a more integrated, regional approach:

- Hydrologic Investigation for Feasibility Studies of the Los Angeles County Department of Public Works Master Drainage Plan, USACE, 1986.
- Antelope Valley Final Report on the Comprehensive Plan of Flood Control and Water Conservation, LACDPW, 1987.
- City of Palmdale General Plan, City of Palmdale, 1993.
- Flood Assessment for Rosamond Dry Lake, EAFB, 2004.
- Engineer's Report Relative to the Revised Master Plan of Drainage, City of Lancaster, 2005.
- Antelope Valley Integrated Regional Water Management Plan, AVSWCA, 2007.
- City of Lancaster General Plan 2030, City of Lancaster, 2009.
- General Plan Kern County, Kern County, 2009.
- Flood Assessment for Rosamond Dry Lake (Revision), EAFB, 2009.
- Surface Flow Study, Pre-Acquisition Report, EAFB, 2010.
- Quartz Hill Infrastructure Improvements Drain Alignment, LACDPW, 2011.
- Surface Flow Study, Technical Report, EAFB, 2012.
- Los Angeles County Revised Draft General Plan 2035, LACDPW, 2012.

Looking forward, flood management in the Region should incorporate urban needs as well as habitat needs and dry lake bed management needs to remain consistent with IRWM Objectives. For example, Amargosa Creek does not drain directly to Rosamond Dry Lake, but flows through Piute Ponds. Piute Ponds stores a portion of the runoff volume if capacity is available and traps a portion of the sediment delivered. The wetlands also provide habitat for a number of species. EAFB relies on stormwater reaching the Valley's dry

The Piute Ponds provide over 300 acres of wetlands and provide habitat for waterfowl.

lake beds to maintain the surface of the lakes for operational and emergency landing use, to maintain habitat, and to provide dust mitigation. An Integrated Flood Management Summary Document was developed during the 2013 IRWMP Updates and is included in Appendix F.

2.7 Wastewater and Recycled Water

Wastewater and recycled water in the southern portion of the Valley is managed primarily by LACSD, while in the northern portion of the valley wastewater and recycled water systems are managed by various local agencies including the RCSD. Wastewater service is primarily limited to urban areas, while rural areas of the Valley rely on septic systems.

The LACSD owns and operates the Lancaster WRP and Palmdale WRP which collect wastewater from the Cities of Palmdale and Lancaster, treating to tertiary levels that are suitable for non-potable uses and groundwater recharge. The RCSD treats wastewater at its Rosamond Community Services District Wastewater Treatment Facility, and also produces tertiary-treated water.

2.8 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.

2.8.1 Agriculture

Historically, agriculture was the predominant land use in the Antelope Valley.

Historically, agriculture was the Antelope Valley Region's predominant land use, characterized by dry wheat farming in the west, alfalfa on the Antelope Valley 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. Agriculture remains a significant industry in the Valley with approximately 19,000 acres actively farmed in the Region.

2.8.2 U.S. Military

In 1933, the U.S. Department of Defense established EAFB, (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 EAFB's dry lake beds, it was the original site of NASA space shuttle 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 EAFB 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, and Northrop Grumman, among other significant aeronautical companies.

2.8.3 Housing Development

Increases in population and development bring more demand for cultural amenities.

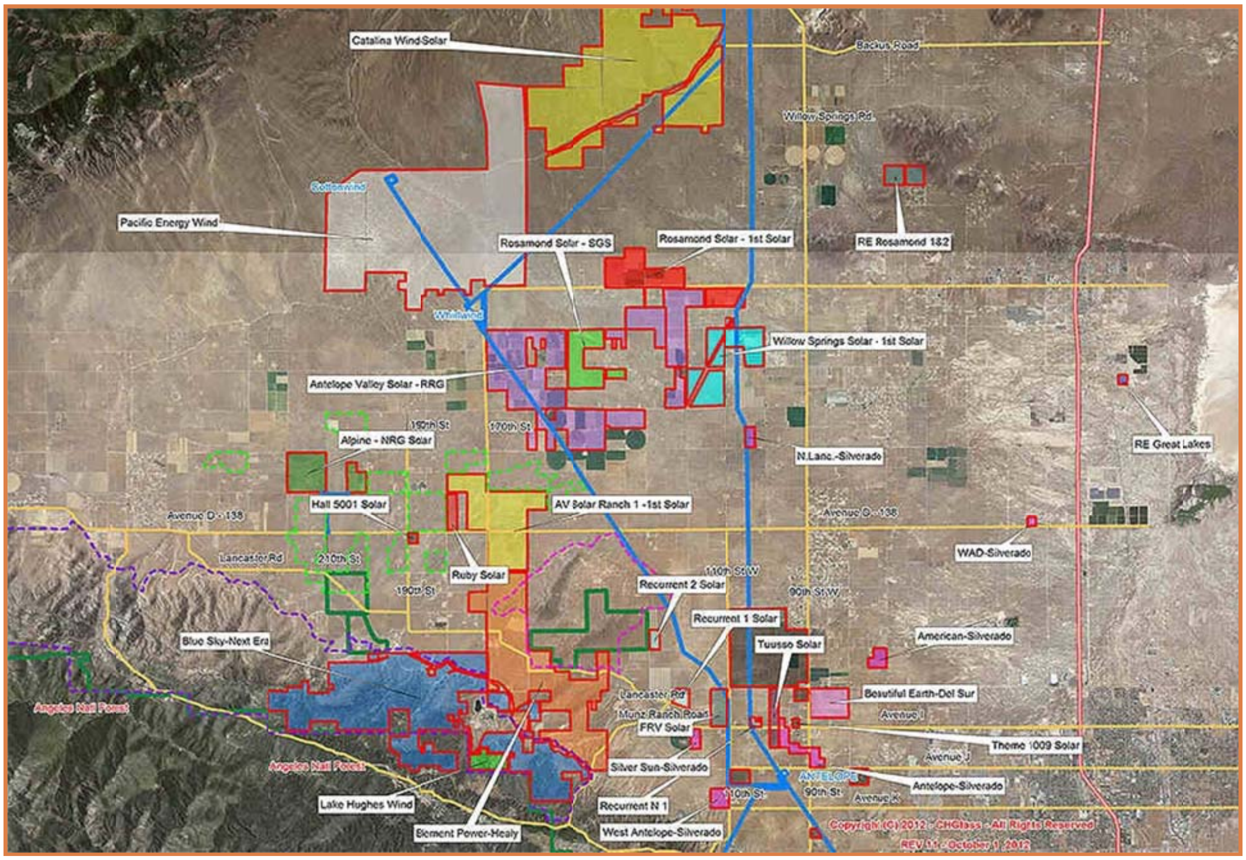
Increasing development pressures in the 1980's were in part driven by the continuing appeal of the Antelope Valley Region's high desert climate as well as land values lower than those in the Los Angeles metropolitan area. As the Los Angeles population rapidly expanded into the Antelope Valley Region, 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.

2.8.4 Alternative Energy

One growing industry in the Region is alternative energy production. Wind and solar power generation facilities can be found throughout the Valley, as shown in Figure 2-15. Cities and towns such as Lancaster, Palmdale and Rosamond have set goals to promote alternative energy sources while protecting natural resources. Encouraging the growth of alternative energy production helps to meet the common goal of protecting resources by promoting alternative energy use within the Valley.

Figure 2-15: Solar and Wind Generation Facilities in the Antelope Valley Region



Source: www.avhidesert.com/A/WestAVRenewRev11.jpg

2.8.5 Visioning Document

The Lancaster Community Visioning Report (2006) helps to shed light on the current interplay of these interests and how they may influence the direction of future planning and growth in the 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

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.

2.9 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.

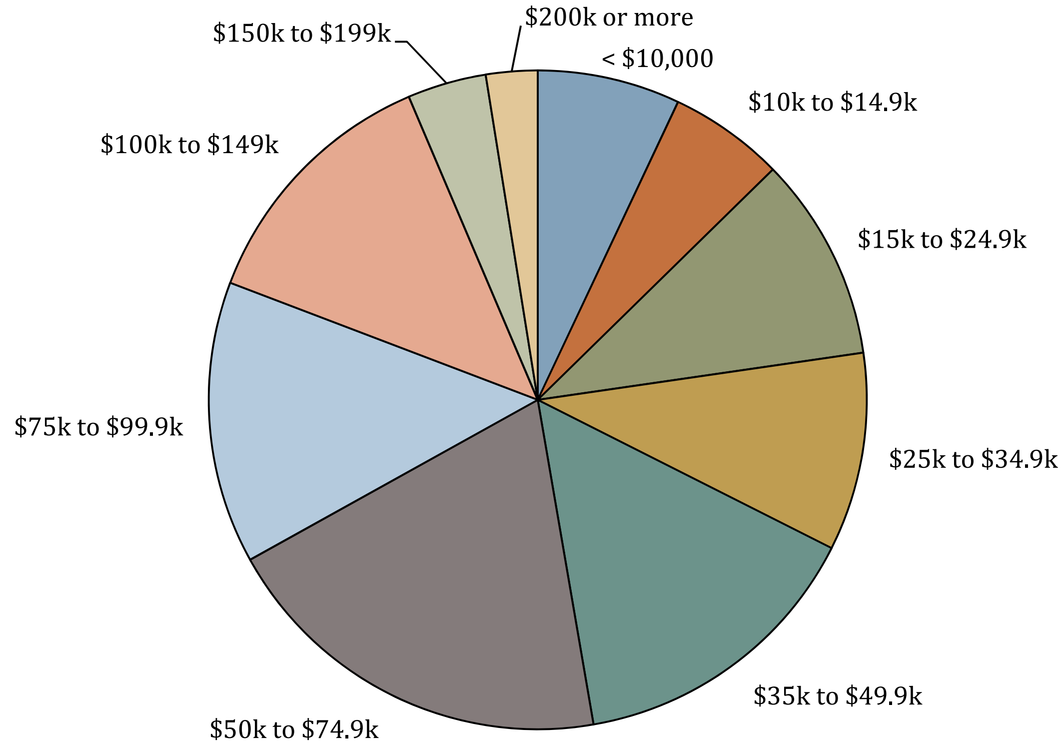
The increase in residential land use and its impact on the economy is evident from the population growth in the Antelope Valley Region, which is discussed in Section 2.7. With significantly lower home prices than in other portions of Los Angeles County, the Antelope Valley Region housing market has seen an increase as people choose to commute to the Los Angeles area. 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. This is supported by the Southern California Association of Governments (SCAG) 2012 Integrated Growth Forecast, which estimates that the number of households in Palmdale and Lancaster will increase between 27% and 40% from 2008 to 2035. The same forecast projects that employment will increase between 10% and 44% from 2008 to 2035.

Industry in the Antelope Valley Region consists primarily of manufacturing for the aerospace industry and mining. EAFB 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. Alternative energy is an emerging industry in the Region.

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 2-16, approximately 47 percent of the Antelope Valley Region's population has a household income of less than $50,000, approximately 20 percent of the population has a household income between $50,000 and $74,999, and approximately 33 percent has a household income of $75,000 or higher.

Figure 2-16: Income Levels for the Antelope Valley Region



2.10 Population

This subsection provides demographic information from the 2010 Census as well as the 2006-2010 American Community Survey and regional growth projections.

2.10.1 Demographics

Table 2-2 provides a summary of the human demographics for the Antelope Valley Region as determined by 2010 U.S. Census Bureau data and 2006-2010 5-year American Community Survey (ACS) data. Regional data was estimated from the data for the census tracts within the regional boundaries. Figure 1-2 shows several DACs throughout the Antelope Valley. DACs were defined as having a MHI less than $48,706 (80% of the statewide MHI according to 2006-2010 5-year ACS data). As stated in Section 2.13, 47 percent of the Antelope Valley Region's population has a household income of less than $50,000, indicating that a large portion of the Region meets the criteria for DACs. Two technical memoranda were prepared to characterize DACs and to define issues related to DAC areas. These documents are included in Appendix D:

- DAC Water Supply, Quality and Flooding Data Final Draft TM
- DAC Monitoring Plan Final Draft TM

Figure 2-16 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	Lake Los Angeles	Lancaster	Littlerock	Palmdale	Quartz Hill	Sun Village	Unincorp. LA County	North Edwards	Boron	Mojave	Rosamond	Edwards AFB	Unincorp. Kern County	Antelope Valley Region
Age Structure (by %)														
under 5	6.5	8.3	1.1	8	7.4	5.4	5.1	7.8	11.4	12.1	9.1	2.2	5.3	7.8
5-9	7.8	8.2	5.0	9.8	7.4	5.9	5.8	7.9	4.4	3.1	8.5	7.0	5.5	8.4
10-14	11.8	9.6	16.7	10.3	8.8	10.6	9.3	11.7	3.0	7.6	7.5	3.5	6.4	9.7
15-19	13.1	8.5	7.0	10.2	8.9	12.1	9.3	8.2	10.1	6.2	8.6	4.7	5.9	9.4
20-24	5.9	6.8	9.4	7.2	6.3	4.2	4.7	4.5	5.5	7.6	7.7	20.1	8.6	6.9
25-34	10.2	13.9	10.2	12	10.6	11.8	12.1	9.1	14.3	13.4	11.8	34.3	16.5	12.9
35-44	11.9	13.6	12.0	14.3	12.8	14.6	12.5	15.1	8.8	12.4	14.6	23.5	15.1	13.9
45-54	15.3	14.2	27.5	13.9	17.6	17.4	18.8	11.2	13.1	12.6	16.2	3.4	16.7	14.6
55-59	5.2	4.7	4.0	4.8	5.7	6.1	6.2	7.2	4.3	6.4	5.1	0.4	4.6	4.9
60-64	4.2	3.4	2.8	3.4	3.8	5.2	6	9.3	13.9	7.8	2.9	0	4.2	3.7
65-74	4.1	4.6	3.2	3.7	6.6	4.6	6.2	4.8	4.6	3.2	4.9	0.3	7.1	4.4
75-85	3.3	3	0.0	2.1	2.9	1.4	3.1	1.1	5.7	6.5	2.6	0.6	2.8	2.6
85 and over	0.8	1.1	1.0	0.5	1.4	0.6	1.1	2	0.9	1	0.7	0	1.2	0.8
MHI	$45,917	$51,192	$58,833	$55,696	$57,294	$50,482	$55,858	$42,375	$37,411	$26,492	$51,946	$62,895	$58,364	--
Income Levels (by %)														
< $10,000	6.7	9.0	0	5.1	7.2	4.2	4.9	13.2	14.4	19.1	9.7	0	4.0	7.02
$10k to $14.9k	4	6.5	3.4	4.8	0.8	6.2	5.5	6.6	7.6	14.8	8.9	0	5.1	5.66
$15k to $24.9k	9.8	10.6	13.5	9.6	12.4	10.8	10	15.1	7.8	14.7	8.6	2.3	4.5	10.04
$25k to $34.9k	8.7	8.2	12.1	10.9	9	11.2	10.9	10.7	13.5	9	9.6	12.8	13.3	9.72
$35k to $49.9k	26.7	14.4	15.4	14.4	14.7	17.2	15.5	15.8	16.6	13.7	12.3	14.7	13.6	14.86
$50k to $74.9k	21	19.9	23.6	20.3	20	18	16.5	20.3	12.2	14.5	16.1	29	19.8	19.65
$75k to $99.9k	11.5	12.6	14	13.9	16.4	21.6	16.7	8.4	11.9	5.6	15.4	20.6	16.4	13.86
$100k to $149k	7.9	12.6	15.4	13.5	12.3	7.4	13.8	6.6	14.5	6.1	14.4	18.9	16.6	12.81
$150k to $199k	1.2	3.7	2.5	4.7	2.9	2.6	4	3.2	0	1.6	3.5	0	4.6	3.88
$200k or more	2.4	2.5	0	2.9	4.4	0.9	2.2	0	1.4	0.8	1.3	1.7	2.1	2.53

Area	Lake Los Angeles	Lancaster	Littlerock	Palmdale	Quartz Hill	Sun Village	Unincorp. LA County	North Edwards	Boron	Mojave	Rosamond	Edwards AFB	Unincorp. Kern County	Antelope Valley Region
Population Density(persons per sq. mile)	1,276	1,584	531	1,379	2,736	999	25	87	148	62	326	209	3	215
Languages spoken at home (by %)														
English	64	73	60	54%	84%	52%	66%	95%	85%	67%	73%	85%	86%	65%
Spanish	36	22	37	41%	13%	47%	31%	4%	15%	33%	25%	10%	11%	31%
Other Indo-European languages	<1	2	1	2%	1.4	0	2%	0%	0%	0	<1%	<1%	<1%	2%
Asian and Pacific Island Languages	<1	3	2	3%	1%	1%	1%	1%	0%	<1%	1%	5%	3%	3%
Other	0	<1	0	<1	1%	<1%	<1%	0%	0%	0%	<1%	0%	0%	0%

Source: 2006-2010 5-Year American Community Survey Data

2.10.2 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 use 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 up to the year 1980 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. Populations in the years 1990, 2000 and 2010 are based on census data for those years, and adjusted according to the percentage of area within the Region, rounded to the nearest thousand.

Projections for the Cities of Lancaster and Palmdale were derived from SCAG estimates. Population projections for the rest of the Antelope Valley Region assume the an annual growth rate similar to the City of Lancaster, estimated as approximately 1.7 percent per year up to 2020, then 1.0 percent per year up to 2035 from SCAG projections. Projections indicate that approximately 530,000 people will reside in the Antelope Valley Region by the year 2035. This represents an increase of approximately 153 percent from the 2010 population. Figures 2-17 and 2-18 below graphically depict these population projections.

Table 2-3: Population Projections

	1970[(a)]	1980[(a)]	1990[(b)]	2000[(c)]	2010[(d)]	2020[(e)]	2035[(e)]
Boron	3,000	3,000	3,000	2,000	2,000	2,000	3,000
California City[(f)]	0	0	0	0	0	0	0
Edwards AFB	10,000	9,000	7,000	7,000	4,000	5,000	5,000
Mojave	4,000	5,000	4,000	4,000	4,000	5,000	5,000
North Edwards	n/a	n/a	n/a	1,000	1,000	1,000	1,000
Rosamond	4,000	5,000	7,000	14,000	17,000	20,000	23,000
Uninc. Kern County	1,000	2,000	6,000	2,000	3,000	3,000	4,000
Lake Los Angeles	n/a	n/a	8,000	12,000	12,000	14,000	16,000
Lancaster	41,000	51,000	97,000	119,000	150,000	175,000	201,000
Littlerock	n/a	n/a	n/a	1,000	1,000	1,000	1,000
Palmdale	17,000	22,000	68,000	117,000	146,000	179,000	206,000
Quartz Hill	5,000	7,000	10,000	10,000	11,000	13,000	15,000
Sun Village	n/a	n/a	n/a	n/a	12,000	14,000	16,000
Uninc. Los Angeles County	15,000	22,000	46,000	33,000[(g)]	25,000	29,000	34,000
Region	**103,000**	**128,000**	**275,000**	**346,000**	**390,000**	**465,000**	**547,000**

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 1990 Census data, and normalized by percentage of area of Census Block Group or Census Place in the Region.
(c) Based on 2000 Census data, and normalized by percentage of area of Census Block Group or Census Place in the Region.
(d) Based on 2010 Census data, and normalized by percentage of area of Census Block Group or Census Place in the Region.
(e) Projections for Palmdale and Lancaster from the SCAG *Adopted 2012 RTP Growth Forecast*. For remaining areas, it is assumed the Antelope Valley Region would have a similar annual growth rate as the City of Lancaster, estimated as approximately 1.7 percent per year up to 2020, then 1.0% per year up to 2035.
(f) The portion of California City within the Antelope Valley Region has a population of less than 500 people, and therefore is rounded down to 0.
(g) Decrease in population in unincorporated Los Angeles County likely due to addition of Census Designated Places to the census County that had previously been counted as unincorporated area.

Figure 2-17: Population Projections

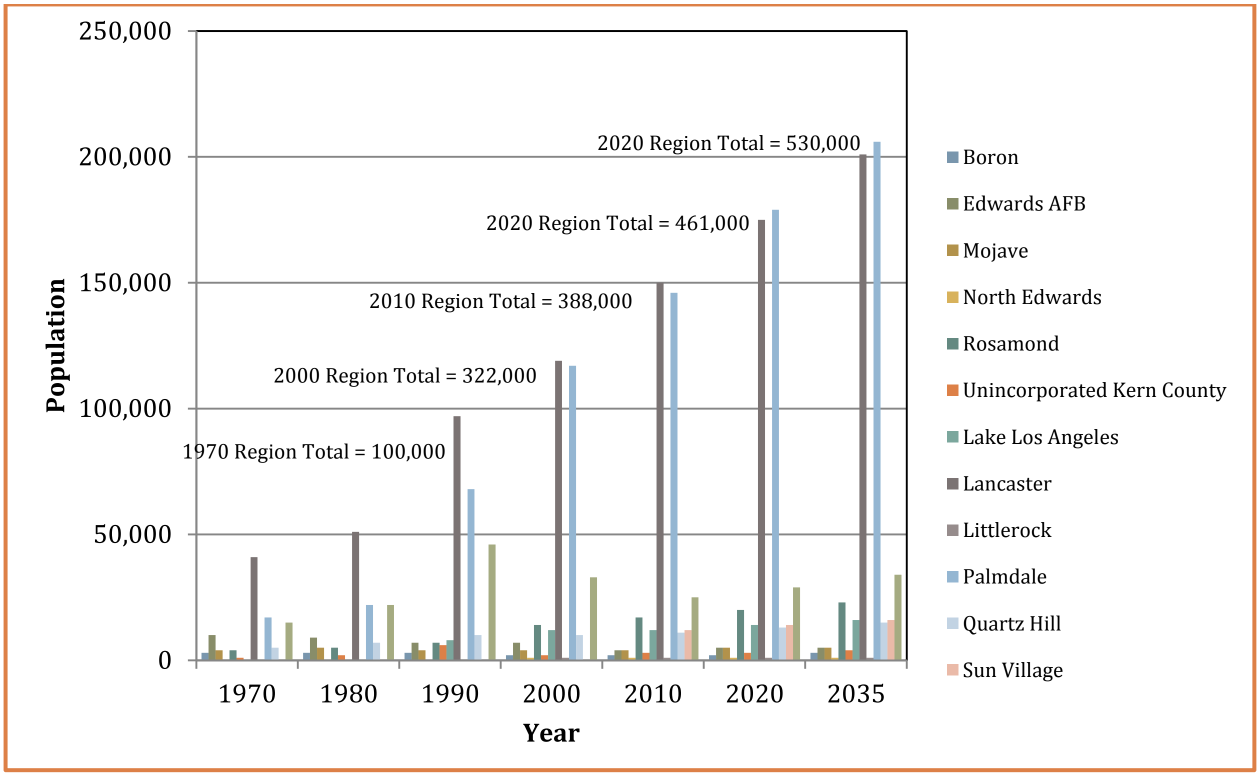
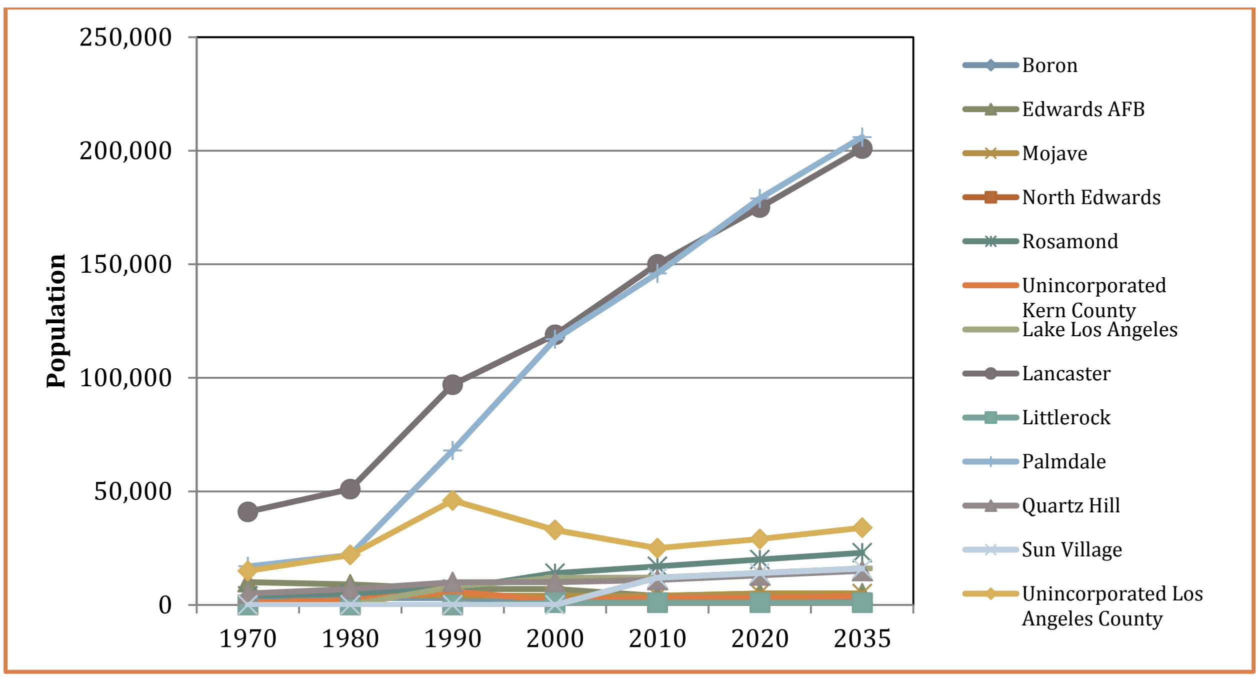


Figure 2-18: Antelope Valley Region Population



2.11 Climate Change

Climate change projections have shown that California's water resources will likely be impacted by changes to temperature, precipitation, and sea level rise. Even in the year 2013, California is beginning to experience these impacts. Water resource planners already face challenges interpreting new climate change information and determining which response methods and approaches will be most appropriate for their planning needs. However, in order for the Region to adapt to, or protect against, climate change, it must first identify the impacts. Knowing these changes will help to identify potential vulnerabilities in water resource systems, which can identify and inform planning measures. Future projects in the Region can be evaluated based on their ability to adapt to the anticipated climate change impacts and mitigate GHGs. These strategies will help the Region to be more robust in the face of a changing environment.

The following state-wide impacts are expected to impact local water resources in the Region (DWR, 2011):

- Temperature increases:
    - More winter precipitation falling as rain rather than snow (this includes precipitation for local and imported water sources), leading to reduced snowpack water storage, reduced long term soil humidity, reduced groundwater and downstream flows, and reduced imported water deliveries
    - Higher irrigation demands as temperatures alter evapotranspiration rates, and growing seasons become longer
    - Exacerbated water quality issues associated with dissolved oxygen levels, increased algal blooms, and increased concentrations of salinity and other constituents from higher evaporation rates
    - Impacted habitats for temperature-sensitive fish and other life forms, and increased susceptibility of aquatic habitats to eutrophication

- Precipitation pattern changes:
    - Increased flooding caused by more intense storms
    - Changes to growth and life cycle patterns caused by shifting weather patterns
    - Threats to soil permeability, adding to increased flood threat and decreased water availability
    - Reduced water supply caused by the inability to capture precipitation from more intense storms, and a projected progressive reduction in average annual runoff (though some models suggest that there may be some offset from tropical moisture patterns increasingly moving northward)
    - Increased turbidity caused by more extreme storm events, leading to increased water treatment needs and impacts to habitat
    - Increased wildfires with less frequent, but more intense rainfall, and possibly differently timed rainfall through the year, potentially resulting in vegetation cover changes
    - Reduction in hydropower generation potential

Although the extent of these changes is uncertain, scientists agree that some level of change is inevitable; therefore, it will be necessary to implement flexible adaptation measures that will allow natural and human systems to respond to these climate change impacts in timely and effective ways. In addition to adapting to climate change, the Region has the opportunity to mitigate against climate change by minimizing GHGs associated with provision of water and wastewater services. The following is a discussion of likely climate change impacts on the Region, as determined from a vulnerability assessment that was completed with a group of local stakeholders. Specific opportunities for adapting to and mitigating against climate change will be discussed in later chapters of this Plan.

2.11.1 Effects and Impacts of Climate Change on the Region

Estimating the impacts of climate change at a regional level is challenging due to the coarse spatial scale of the global models that project climate change impacts of temperature and rainfall. These global models also project estimates for the year 2100, which is well beyond typical planning horizons of 20 to 30 years. To incorporate climate change into water resources management, downscaled temperature and precipitation projections are input into hydrologic and water resources system models to project impacts to water supplies, water demand, snow pack, sea level rise, and wildfires.

Climate change impacts and effects are based on different climate change assumptions and analysis approaches. Table 2-4 summarizes the impacts and effects of climate change on the Region by 2100 (unless otherwise indicated), which are typically based on an average of various climate change analyses.

Table 2-4: Projected Climate Change Effects on the Region
(By the year 2100, unless otherwise noted)

Effect	Ranges
Temperature change	• Winter: Projected increases of 5°F to 6°F • Summer: Projected increases of 6°F to 10°F
Precipitation	• 3 to 5 inch decrease in average rainfall at low elevations • 8 to10 inch decrease in average rainfall at higher elevations
Snowpack	• March snowpack in San Gabriel Mountains decrease from 0.7 inches to zero
Wildfire Risk	• Little change is projected in lower elevations • Slight increases expected in mountainous areas
Demand	• *Increases expected, but not quantified*
Supply	• SWP delivery decrease of 7-10% by 2050, and 21-25% by 2100 • *Changes to local supply not quantified, but could be reduced based on precipitation effects described above*

For the Antelope Valley Region, climate change is expected to increase average temperature by at least 5 degrees Fahrenheit by 2100. Precipitation is expected to decrease by 3 to 5 inches in low elevations, and decrease by 8-10 inches at higher elevations which could reduce local supplies availability. Snowpack in the San Gabriel Mountains is expected to reduce slightly, while wildfire risk is expected to increase slightly in mountainous areas. Imported water supplies feeding the Region are also anticipating delivery decreases as a result of climate change.

2.11.2 Climate Change Reporting and Registry Coordination

Individual agencies within the Region may individually decide whether to participate in the California Adaptation Strategy Process as part of further integrating the information derived from the local climate change studies being conducted and described above. Agencies that are part of the IRWM effort may consider joining the Climate Registry (Registry), http://www.theclimateregistry.org. The Climate Registry serves as a voluntary GHG emissions registry that has developed tools and consistent reporting formats which may aid agencies in understanding their GHG emissions and understanding ways to promote early actions to reduce GHG emissions. Both the State and the federal government require reporting of emissions for regulated entities of electricity and fuel use. These programs have reporting, certifying and verifying requirements that are separate from those under the voluntary programs.

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. The section will assess the current and projected water demands of the Antelope Valley Region, which include agricultural and M&I demands on groundwater, imported water, and recycled water as well as an analysis of the current and projected supplies[1] 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 issues affect the water supply and demand requirements within the Antelope Valley Region. Finally, the issues and needs resulting from climate change are discussed.

3.1 Water Supply Management Assessment

As development has increased the demand for both quantity and quality water in the Antelope Valley Region, the competition for available water supplies has also increased. Development of new water supplies and protection of existing water supplies, provision of proper infrastructure, and the need to maintain the groundwater levels are 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 was developed. Figure 3-1 presents a schematic of the water budget elements and their relationships. The main components of the water budget include demands, water entering, surface storage, groundwater storage, direct deliveries, recycle/reuse, and water leaving. Each of these components is discussed in more detail below.

[1] The analyses provided in the IRWM Plan are strictly for long-term planning purposes and have not been conducted to answer the questions being addressed within the adjudication.

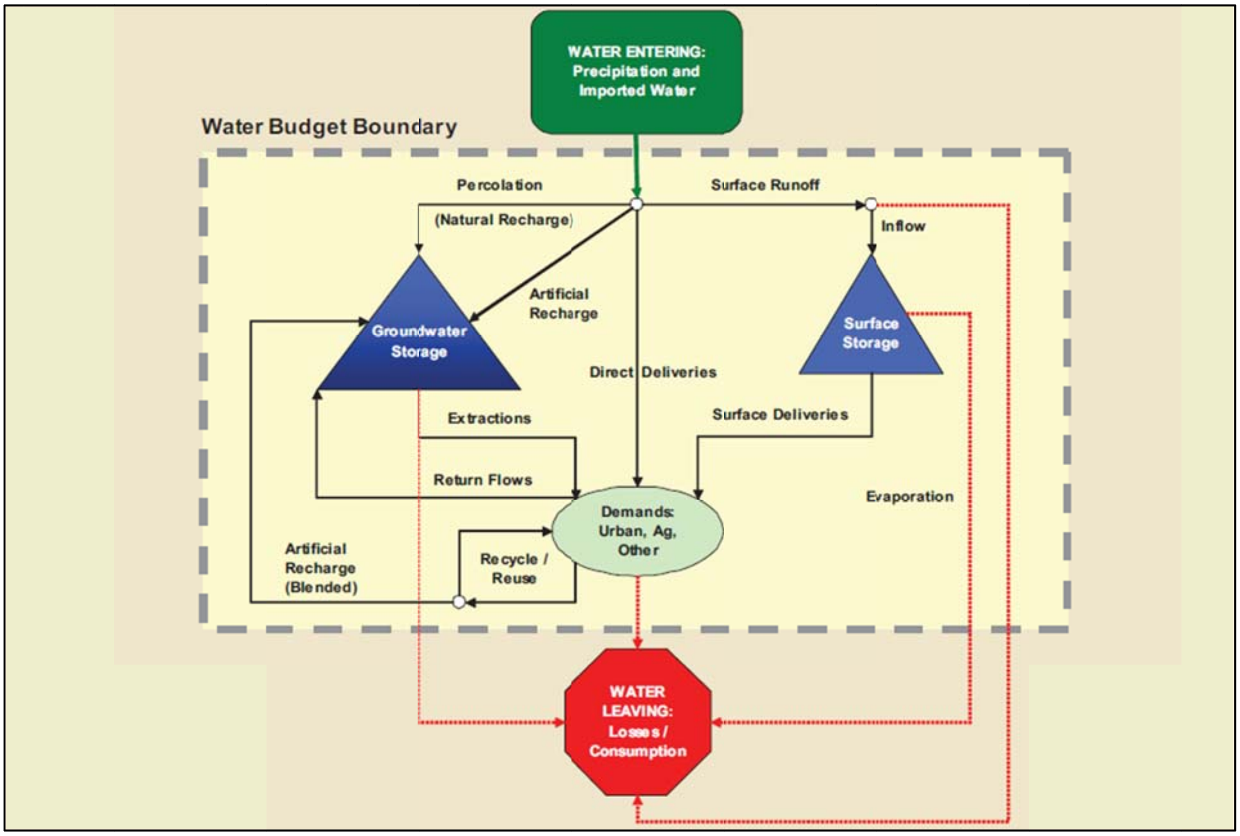
3.1.1 Water Entering

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 7.5 inches per year. Precipitation entering the Antelope Valley Region is lost to evaporation (see Section 3.1.7), percolated to groundwater storage as natural recharge (see Section 3.1.6), or carried as runoff to surface storage (see Section 3.1.5).

Figure 3-1: Water Budget Schematic



Note: Some surface runoff provides water for environmental demands, including wetlands, clay pan/vernal pools, sand dune water sequestering, and dry lake bed resurfacing.

3.1.1.2 Imported Water

Imported water entering the Antelope Valley Region could come from a number of sources including the SWP, desalination, or transfers/exchanges with outside agencies. Currently, the only source of imported water to the Antelope Valley Region is SWP water. SWP water is used in the Antelope Valley Region for direct deliveries (see Section 3.1.2) or for artificial recharge to groundwater storage (see Section 3.1.6).

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 by local SWP Contractors is then treated before distribution to customers.

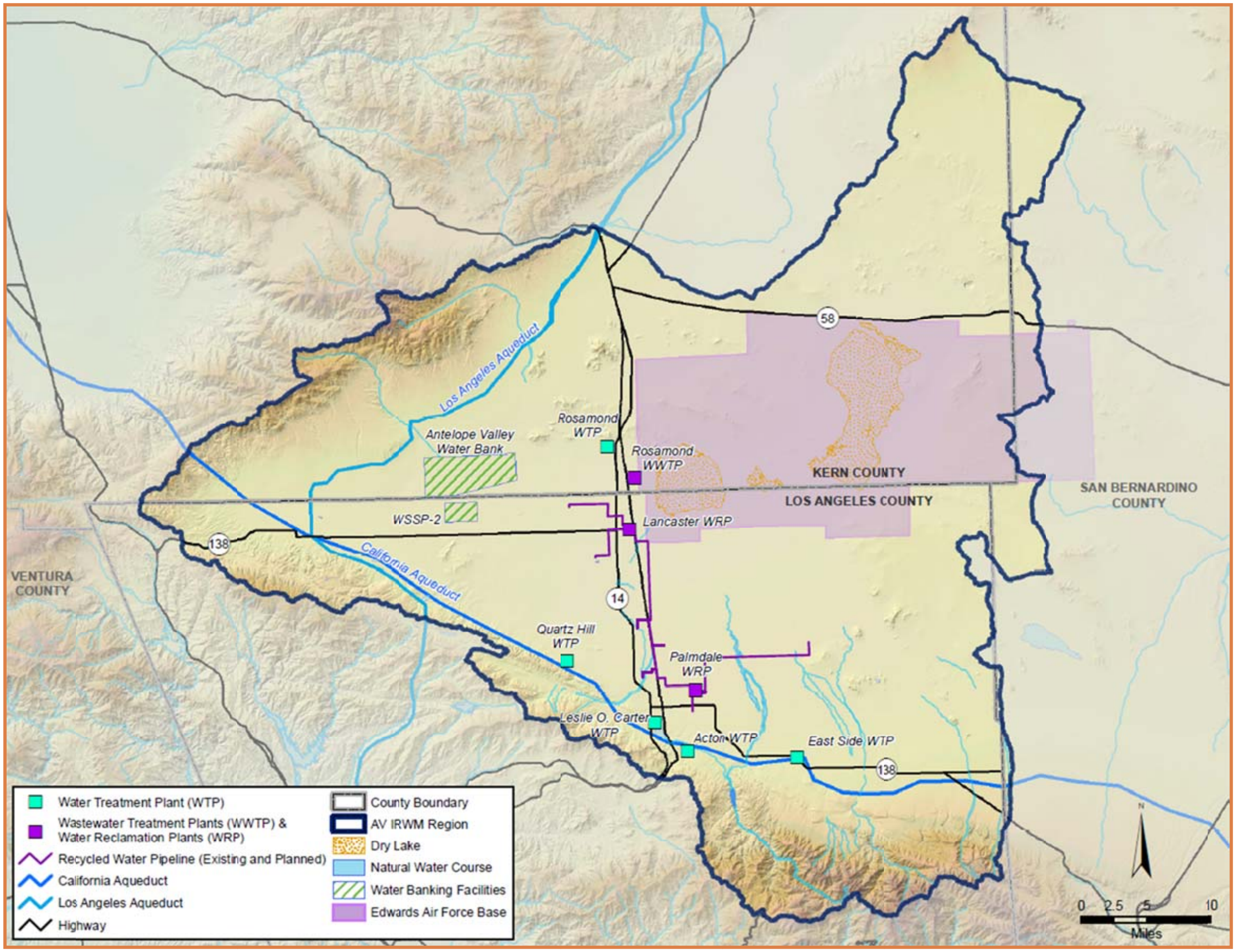
AVEK currently treats SWP water with four Water Treatment Plants (WTPs) that are capable of treating approximately 132,280 AFY of imported water. The main WTP, Quartz Hill WTP, is rated for 90 million gallons per day (mgd) (100,890 AFY). The Eastside WTP, expanded in 1988, provides a treatment capacity 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. LACWD 40, QHWD, and RCSD all receive treated water from AVEK.

PWD's water treatment plant capacity is 35 mgd (39,235 AFY), but it is limited to treating 28 mgd (31,390 AFY) in accordance with the CDPH requirements to keep one filter offline in reserve (PWD 2001). Planned improvements at the plant will increase its treated output to 35 mgd. PWD is also in the preliminary design stage for a new water treatment plant with an initial capacity of 10 mgd.

LCID has an agreement with PWD to provide treatment for LCID's raw SWP water.

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

Figure 3-2: Major Infrastructure



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 contractors. The variability of SWP deliveries is described in the California DWR "Final 2011 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 82 years of hydrology. 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 effects of climate change were factored into the modeled future conditions.

The Reliability Report shows that existing SWP facilities will on average receive 61 percent of their full Table A Amount for current demand conditions and 60 percent of their full Table A Amount for 2031 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 60 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 35 percent of total Table A Amounts and could possibly be as low as 9 percent during an unusually dry single year (the driest in 82 years of historical hydrology) according to DWR's 2011 modeling results. (DWR 2012b).

On August 31, 2007, a U.S. District Judge ruled that the SWP was in violation of the federal Endangered Species Act because it threatened the existence of the Delta smelt, a fish species living in the Sacramento Delta. To help protect the species, the Judge ordered water imports from the north to be cut by up to 35 percent from the SWP and the Central Valley Project, until the Biological Opinion for the species could be prepared. The U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (BO) on the Long-Term Operational Criteria and Plan for the SWP and Central Valley Project on December 15, 2008, determining that the two water projects would likely jeopardize the continued existence of the species. The findings of this BO called for adaptively managed flow restrictions and have continued to influence pumping in the Delta despite ongoing debate and litigation. In 2009, the National Marine Fisheries Service (NMFS) issued a BO for winter-run and spring-run Chinook salmon and steelhead that put similar limits on pumping through part of the year and restrictions on total Delta exports during the months of April and May.

The SWP supply estimates in this IRWM Plan rely on the projections made in DWR's 2011 Reliability Report for future supply. DWR's projected supply estimates incorporate the restrictions set by both the USFWS and NMFS BOs, while acknowledging the challenge of accurately determining future water reliability as a result of adaptive management techniques and the potential for future changes in court rulings.

3.1.2 Direct Deliveries

Direct deliveries to the Antelope Valley Region consist of the SWP water contracted through 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 deliveries have historically been supplied to AVEK customers outside of the Antelope Valley IRWMP Region boundary, leaving a maximum of about 137,150 AFY available for AVEK customers inside the IRWMP Region boundary.

By October 1st of every year, each contractor provides DWR a request for water delivery up to their full Table A Amount for the next year. 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 3-1. The table illustrates the Antelope Valley Region's increasing dependence on SWP water.

Table 3-1: Summary of Historical Wholesale (Imported) Supply (AFY) in the 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
2005	59,831	141,400	11,712	21,300	0	2,300	71,543	165,000
2010	57,713	141,400	10,969	21,300	0	2,300	68,682	165,000

Source: DWR 2012b

Future availability of the SWP water was estimated by DWR in its 2011 Reliability Report (2012b). For an average water year, it is anticipated that 61 percent of the Table A Amount in 2011 and 60 percent in year 2031 would be available for delivery to contractors. For a single dry water year, delivery of Table A water decreases to 9 percent for 2011 and 11 percent in year 2031. For a multi-dry water year, delivery of Table A water is estimated at 35 percent for 2011 and 34 percent in year 2031. For the purposes of this IRWM Plan, 2015 through 2035 deliveries were estimated at the 2031 delivery percentages. Maximum Table A water that could be available for the Region includes 137,150 AFY from AVEK (inside the IRWMP Region), 21,300 AFY from PWD, and 2,300 AFY from LCID.

In addition to SWP reliability constraints, 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 is caused by the variability of demand during winter and summer and the limitations on existing infrastructure to receive, store, and deliver water to users. AVEK currently provides most of their water through direct deliveries to meet current demand (i.e., without storage). When demand is high during summer months, the aqueduct bringing water to AVEK has a conveyance capacity below the demand for water. Conversely, during the winter months, demand is much lower than aqueduct capacity. To accommodate the need to store water during the winter months for use in the dry summer months, AVEK has planned to use water banking projects to increase their ability to fully use the SWP allotment. AVEK and various partners recently completed the WSSP-2 that allows them to store up to 150,000 AF of water in the ground (as of late 2013, 35,000 AF is the total amount stored for all of the parties). Currently, the maximum withdrawal capacity in any one year is 20 mgd (approximately 23,000 AFY) and plans are underway to increase that annual withdrawal capacity to 50 mgd (approximately 56,000 AFY). Excess SWP water may be placed in the water bank during winter months when M&I demands are low (AVEK 2013).

To determine the most reasonable amount of available SWP water for AVEK, this analysis assumes that SWP reliability is limiting (i.e., not conveyance capacity). Without the WSSP-2 water bank, the conveyance capacity limitation would only allow AVEK to deliver 81,750 AFY. This estimate is based on 400 AF/day SWP deliveries from June 15 to September 30 that are limited by conveyance capacity and 150 AF/day SWP deliveries for the rest of the year that are limited by customer demands. This value is lower than 83,700 AFY, which is the value obtained by multiplying the SWP reliability factor of 61% to the available Table A amount of 137,150 AFY for AVEK customers inside the IRWMP Region. However, since these values are close (83,700 – 81,750 = 1,950), and since the WSSP-2 water bank is operational, this analysis assumes that the water bank can be used each year to supplement AVEK imported supplies in summer months to 61% of their Table A amount in 2010 and to 60% of their Table A amount in years 2015 through 2035.

Table 3-2 provides a summary of projected SWP availability to the Antelope Valley Region based on these assumptions.

Table 3-2: Summary of Projected Wholesale (Imported) Supply (AFY) in the Antelope Valley Region

	2010	2015	2020	2025	2030	2035
Maximum Table A	160,750	160,750	160,750	160,750	160,750	160,750
Average Year(a)	98,100	96,500	96,500	96,500	96,500	96,500
Reliability(b)	61%	60%	60%	60%	60%	60%
Single Dry Year(c)	14,500	17,700	17,700	17,700	17,700	17,700
Reliability(b)	9%	11%	11%	11%	11%	11%
Multi-Dry Year(c)	56,300	54,700	54,700	54,700	54,700	54,700
Reliability(b)	35%	34%	34%	34%	34%	34%

Notes: Numbers rounded to nearest 100 AFY.

(a) Assumes supply equivalent to the Antelope Valley Region's maximum Table A Amount (160,750 AFY) multiplied by the SWP reliability. This assumption relies on another assumption that conveyance constraints can be overcome by using the WSSP-2 water bank to supplement small amounts of water during an average year up to Table A amounts.

(b) Determined from DWR's Final 2011 "State Water Project Reliability Report" (DWR 2012b).

(c) Assumes supply equivalent to the Antelope Valley Region's maximum Table A Amount (160,750 AFY) multiplied by the SWP reliability. This assumption relies on another assumption that conveyance constraints can be overcome by using the WSSP-2 water bank to supplement small amounts of water during single dry year and multi-dry year periods.

3.1.3 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). Rainfall in the Region during average years typically reduces agricultural demands on imported supplies, therefore dry year agricultural demands are higher than average years. Projected water demands for the Antelope Valley Region are presented in Table 3-3 and graphically presented in Figure 3-3 and Figure 3-4. Later in this Section, water budgets are developed for the Region that compare average water years, dry water years, and multi-dry water years.

Table 3-3: Water Demand Projections (AF) for the Antelope Valley Region

	2010	2015	2020	2025	2030	2035
Urban Demand						
Boron	400	400	400	1,000	1,000	1,000
California City[(a)]	0	0	0	0	0	0
Edwards AFB	1,000	1,000	1,000	1,000	1,000	1,000
Mojave	1,000	1,000	1,000	1,000	1,000	1,000
North Edwards	200	200	200	200	200	200
Rosamond	4,000	4,000	4,000	5,000	5,000	5,000
Unincorporated Kern County	1,000	1,000	1,000	1,000	1,000	1,000
Lake Los Angeles	3,000	3,000	3,000	3,000	3,000	4,000
Lancaster	33,000	36,000	39,000	41,000	43,000	45,000
Littlerock	200	200	200	200	200	200
Palmdale	33,000	36,000	40,000	42,000	44,000	46,000
Quartz Hill	2,000	3,000	3,000	3,000	3,000	3,000
Sun Village	3,000	3,000	3,000	3,000	3,000	4,000
Unincorporated LA County	6,000	6,000	6,000	7,000	7,000	8,000
Total Urban Demand	87,000	95,000	103,000	108,000	113,000	118,000
Agricultural Demand						
Agricultural Demand Average Year	92,000	92,000	92,000	92,000	92,000	92,000
Agricultural Demand Dry Year	98,000	98,000	98,000	98,000	98,000	98,000
Total Region Average Year Demand	**179,000**	**187,000**	**195,000**	**200,000**	**205,000**	**210,000**
Total Region Dry Year Demand	**185,000**	**193,000**	**201,000**	**206,000**	**211,000**	**216,000**

Notes: All numbers rounded to nearest 1,000 AF (values below 500 AF were rounded to the nearest 100).
(a) California City has a population center outside the Region and only minimal population inside the Region.

Figure 3-3: Regional Average Year Water Demand

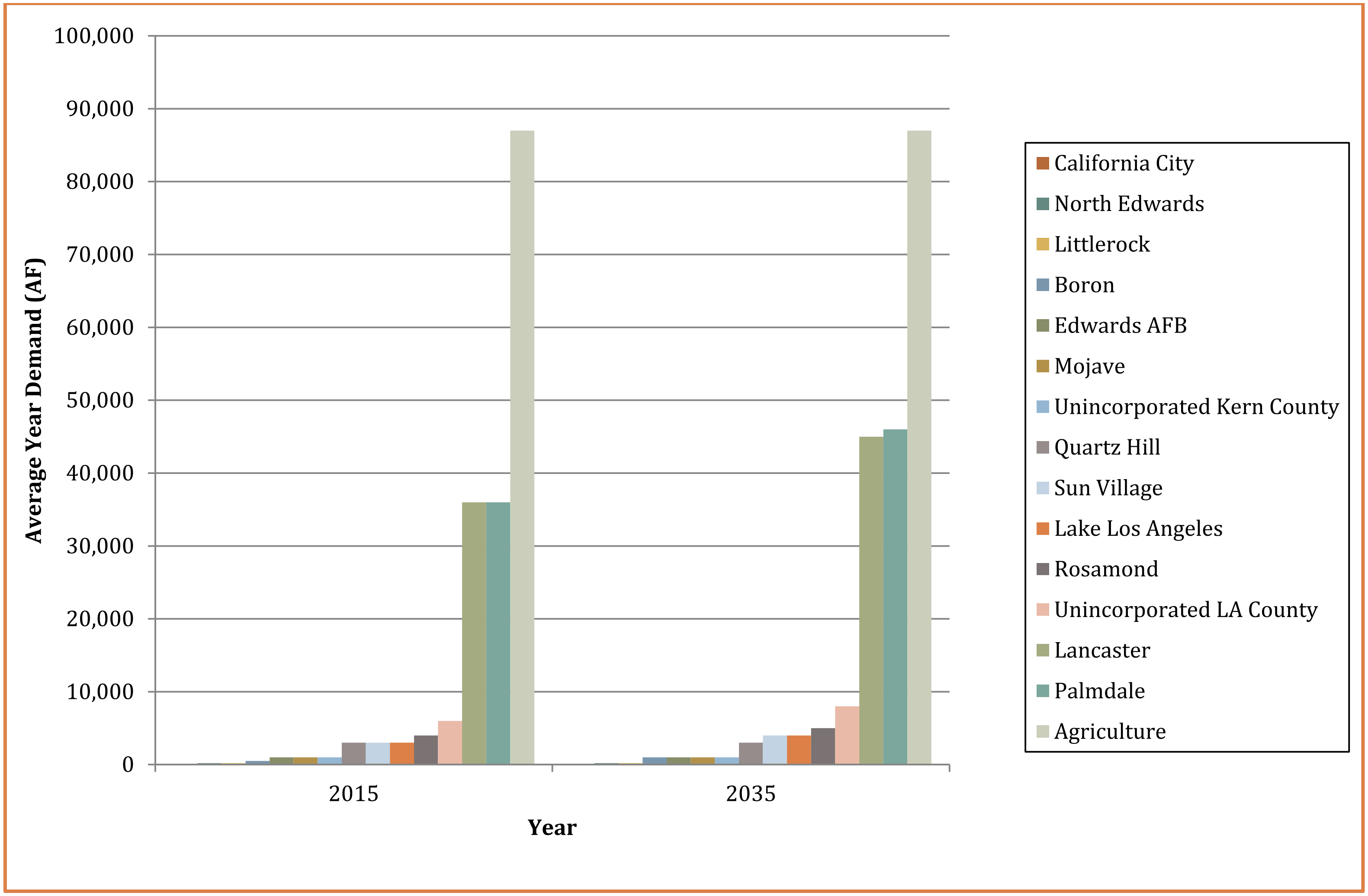
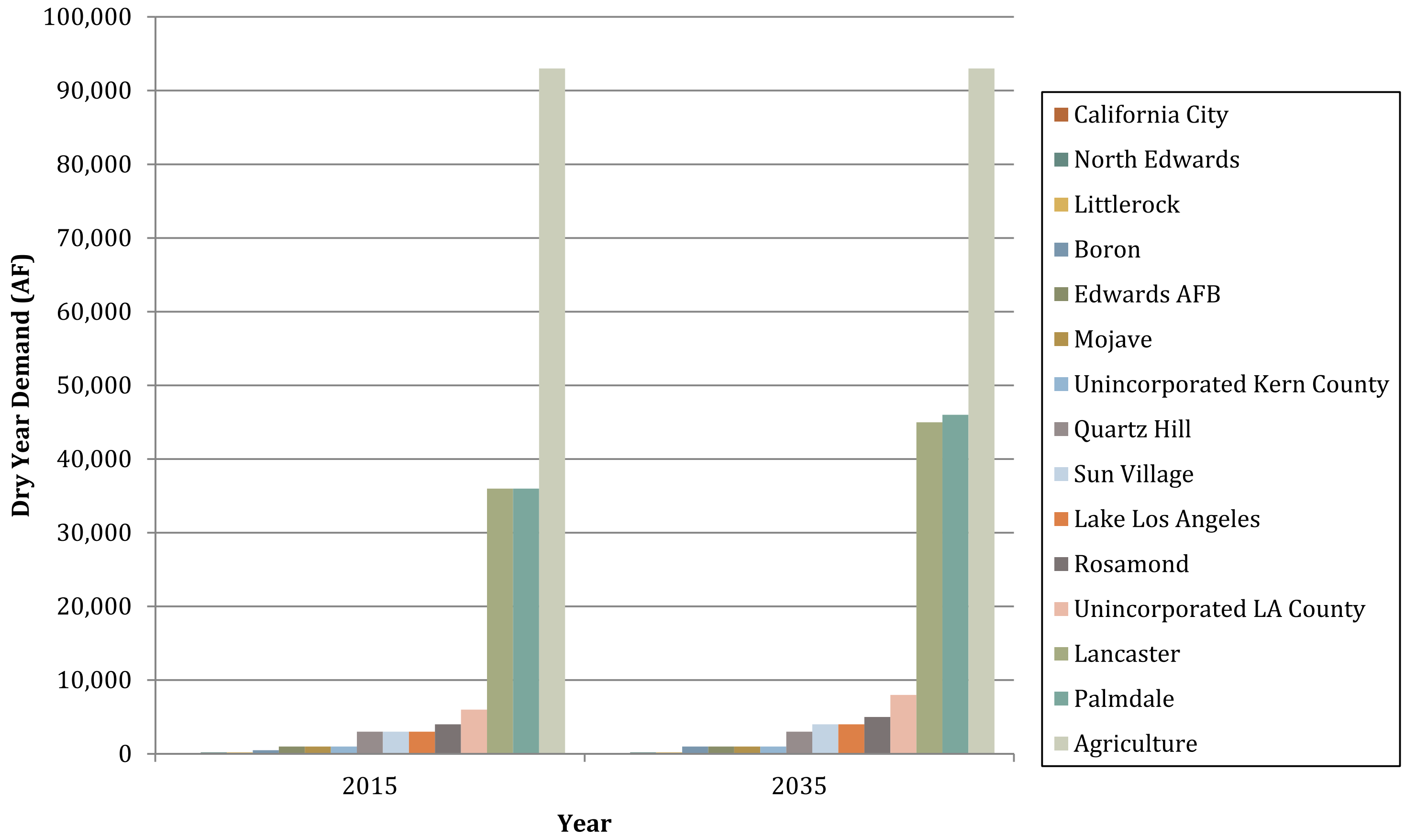


Figure 3-4: Regional Dry Year Water Demand



3.1.3.1 Urban (Municipal and Industrial) Demand

Urban water demands for 2010 were developed from the population projections presented in Table 2-3 (in Section 2) and utilize a regional water use per capita estimate of 199 gallons per day (gpd) per person (or 0.223 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 in Table 3-4. 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 rates of water use in areas that receive water from sources other than those included in Table 3-4 were assumed to have minimal impact on the average per capita rate and therefore were not included in the calculations to determine the average for the Region.

The per capita water use values could be reduced in the future with the implementation of more robust demand management measures. With the implementation of Senate Bill x7-7 in 2009, water suppliers have been required to reduce their average per capita daily water use rate by 20 percent from a baseline value by December 31, 2020. Each water purveyor may calculate their baseline per capita water use rate a number of ways. Whether an agency meets targets or not, they are required to design and implement water conservation programs to further reduce per capita consumption. With the implementation of these programs, it is expected that the average per capita water use in the Region will decrease. Once the next round of Urban Water Management Plans (UWMPs) are developed in 2015, the Region will have a better understanding of at the progress made on reducing per capita water demand.

Table 3-4: Per Capita Urban Water Use in the Antelope Valley Region

	2010 Population	2010 Urban Water Demand (AF)	Average per Capita Water Use (AFY/person)
AVEK (excluding purveyors)[(a)]	84,000	15,000	0.181
LCID[(b)]	3,000	1000	0.310
LACWD 40[(c)]	172,000	46,000	0.265
PWD[(d)]	109,000	20,000	0.181
QHWD[(d)]	18,000	6,000	0.314
RCSD[(d)]	18,000	3,000	0.170
Total	**403,000**	**90,000**	
Regional Average Per Capita Water Use (AFY/person)			**0.223**

Notes: All numbers rounded to the nearest 1,000. Numbers do not include private well owners. It is assumed that the demand and population numbers reported in the UWMPs provide an approximate per capita estimate for the Region.
(a) As determined from data in the AVEK's 2010 UWMP. Values exclude population and demand numbers for LCID, LACWD 40, PWD, QHWD, and RCSD that fall inside the AVEK service area.
(b) Values exclude LCID agricultural demand. Demand verified by personal communication with Brad Bones at LCID on August 21, 2013. Population sizes from the Annual CDPH Drinking Water Program Report.
(c) Population size from the Annual CDPH Drinking Water Program Report. Water demand based values from the Antelope Valley 2010 Integrated UWMP, based on land use.
(d) Based on values provided in the 2010 UWMPs and 2009 actual water use.
(e) Antelope Valley Region per capita water use was determined by dividing total water demand by total population. These numbers do not include private well owners.

3.1.3.2 Private Pumping/Small Mutual Water Demand

Water demands from private pumping and from small mutual water companies in the Antelope Valley Region are difficult to quantify as accurate data is not readily available. These demands were accounted for in Table 3-3 since people served by private wells and by small mutual water companies were included in the population projections. The Antelope Valley Region average per capita water use that was estimated in Table 3-4 was assumed to represent these populations.

3.1.3.3 Agricultural Water Demand

Historical total applied agricultural water demand (1999 to 2012) for the Antelope Valley Region is summarized in Table 3-5. 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. 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. For the 2007 IRWMP, it had 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. For the 2013 IRWMP Update, recent data from the Kern County Farm Bureau were used in the calculations in lieu of the 18 percent estimate.

Table 3-5: 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.

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.

The first step in determining the crop water requirements involves determining the evapotranspiration 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 Palmdale, 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 it is independent of the location. Crop coefficients were adapted from a variety of published reports. The crop coefficients are presented in Table 3-6.

Table 3-6: Crop Coefficient (Kc) Estimates

Date	Pasture	Alfalfa[(a)]	Sudan[(b)]	Sod	Onions	Deciduous Fruit Trees[(c)]	Carrots	Potatoes
1-Jan	1.0	0.40		1.0				
15-Jan	1.0	0.40		1.0				
1-Feb	1.0	1.00		1.0			0.31	
15-Feb	1.0	1.15		1.0			0.31	
1-Mar	1.0	1.15		1.0	0.30	0.25	0.31	0.55
15-Mar	1.0	1.05		1.0	0.30	0.54	0.55	0.61
1-Apr	1.0	1.05		1.0	0.30	0.60	0.82	0.88
15-Apr	1.0	1.05		1.0	0.53	0.66	1.03	1.16
1-May	1.0	1.05		1.0	0.83	0.72	1.11	1.21
15-May	1.0	1.05		1.0	1.14	0.79	1.13	1.19
1-Jun	1.0	1.05		1.0	1.14	0.84	1.05	0.87
15-Jun	1.0	1.05	0.3	1.0	1.14	0.86	1.00	0.55
1-Jul	1.0	1.05	0.85	1.0	1.04	0.92		
15-Jul	1.0	1.05	1.10	1.0	0.92	0.94		
1-Aug	1.0	1.05	0.85	1.0	0.80	0.94		
15-Aug	1.0	1.05	1.10	1.0	0.68	0.94		
1-Sep	1.0	1.05	0.85	1.0		0.94		
15-Sep	1.0	1.05	1.00	1.0		0.91		
1-Oct	1.0	1.05	1.10	1.0		0.85		
15-Oct	1.0	1.05	1.10	1.0		0.79		
1-Nov	1.0	1.05		1.0		0.70		
15-Nov	1.0	0.40		1.0				
1-Dec	1.0	0.40		1.0				
15-Dec	1.0	0.40		1.0				

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 3-7 provides the ETc estimates for the Antelope Valley Region. 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

Table 3-7: Crop Evapotranspiration (ETc) Estimates for the Antelope Valley Region

Date	Pasture/Sod ETo[(a)]	Alfalfa	Sudan	Sod	Onions	Deciduous Fruit Trees	Carrots	Potatoes
1-Jan	0.84	0.34	0.00	0.84	0.00	0.00	0.00	0.00
15-Jan	0.98	0.39	0.00	0.98	0.00	0.00	0.00	0.00
1-Feb	1.24	1.24	0.00	1.24	0.00	0.00	0.38	0.00
15-Feb	1.65	1.90	0.00	1.65	0.00	0.00	0.51	0.00
1-Mar	2.21	2.54	0.00	2.21	0.66	0.55	0.69	1.22
15-Mar	2.86	3.00	0.00	2.86	0.86	1.54	1.57	1.74
1-Apr	3.10	3.26	0.00	3.10	0.93	1.86	2.54	2.73
15-Apr	3.35	3.52	0.00	3.35	1.78	2.21	3.45	3.89
1-May	3.56	3.74	0.00	3.56	2.95	2.56	3.95	4.31
15-May	4.23	4.44	0.00	4.23	4.82	3.34	4.78	5.03
1-Jun	4.42	4.64	0.00	4.42	5.04	3.71	4.64	3.85
15-Jun	4.63	4.86	1.39	4.63	5.28	3.98	4.63	2.55
1-Jul	4.69	4.92	3.99	4.69	4.88	4.31	0.00	0.00
15-Jul	4.89	5.13	5.38	4.89	4.50	4.60	0.00	0.00
1-Aug	4.30	4.52	3.66	4.30	3.44	4.04	0.00	0.00
15-Aug	4.00	4.20	4.40	4.00	2.72	3.76	0.00	0.00
1-Sep	3.21	3.37	2.73	3.21	0.00	3.02	0.00	0.00
15-Sep	2.68	2.81	2.68	2.68	0.00	2.44	0.00	0.00
1-Oct	2.21	2.32	2.43	2.21	0.00	1.88	0.00	0.00
15-Oct	1.83	1.92	2.01	1.83	0.00	1.45	0.00	0.00
1-Nov	1.43	1.50	0.00	1.43	0.00	1.00	0.00	0.00
15-Nov	1.10	0.44	0.00	1.10	0.00	0.00	0.00	0.00
1-Dec	0.98	0.39	0.00	0.98	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
TOTAL (inches)	65.29	65.76	28.66	65.29	37.86	46.26	27.15	25.31

Note:
(a) Pasture ETo from the California Irrigation Management Information System (CIMIS), Palmdale Station 197 from January to December 2012.

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. Greater controls are utilized by agricultural operations that use recycled water that justify higher irrigation efficiencies (discussed later in this document).

A summary of the crop water requirements is presented in Table 3-8. 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 demand 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 3-8: Crop Water Requirements for the Antelope Valley Region

Water Requirements	Pasture	Alfalfa	Sudan	Sod	Onions	Deciduous Fruit Trees	Carrots	Potatoes
Net ETo	65.29	65.76	28.66	65.29	37.86	46.26	27.15	25.31
Net Soil					3.54		4.46	
Net Non-Growing	0	2.00[a]	4	4	6.00[b]	0	6.50[b]	4
Total Net Dry Years (in.)	65.29	67.76	32.66	69.29	47.40	46.26	38.11	29.31
Total Net Average Years[c] (in.)	62.29	64.76	29.66	66.29	44.40	43.26	35.11	26.31
Irrigation Efficiency (%)	75	75	75	75	75	75	75	75
Total Gross for Dry Years (in.)	87.05	90.34	43.55	92.39	63.20	61.68	50.81	39.08
Total Gross for Dry Years (AF/acre)	7.25	7.53	3.63	7.70	5.27	5.14	4.23	3.26
Total Gross for Avg. Years (in.)	83.05	86.34	39.55	88.39	59.20	57.68	46.81	35.08
Total Gross for Average Years (AF/acre)	6.92	7.20	3.30	7.37	4.93	4.81	3.90	2.92

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.
(c) It is assumed that approximately 3 inches of net water demand would be met by rainfall for average water years and thus average year water requirements include a reduction in the total net water requirements.

Crop Acreages

Data regarding crop acreages in the Antelope Valley Region was available from the Los Angeles County and Kern County Commissioner Crop Reports. Table 3-9 provides a comparison of historical crop acreages in the Antelope Valley Region.

Table 3-9: Comparison of the Historical Crop Acreages

	1999	2000	2001	2002	2003	2004	2005	2010
Ag Commissioner[a]								
Field Crops	NA	NA	11,592	11,234	11,305	10,624	11,975	13,080
Vegetable/Root Crops	NA	NA	12,282	15,804	14,763	13,312	10,760	4,906
Fruits/Nut/Grapes Crops	NA	NA	2,866	1,947	1,955	1,920	2,117	603
Misc Nursery	NA	NA	621	617	599	608	675	450
Antelope Valley Region Total	---	---	**27,361**	**29,602**	**28,622**	**26,464**	**25,526**	**19,040**

Notes:
(a) Acreages for Kern County were estimated using the ratios of LA County Ag to Kern County Ag from the Inspection Reports (from 2007 IRWMP).

Projected Agricultural Demand

Projected water year agricultural demand is summarized in Table 3-10. Projections assume that crop acreages will remain approximately the same as in 2012 with the understanding that some shifting of acreages between crops may occur. Table 3-10 provides the estimates of agricultural water use for average and dry water years.

Table 3-10: 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	5,370	7.20	38,700	7.53	40,400
Grain Hay	7,160	3.30	23,600	3.63	26,000
Sudan Hay	300	3.30	1,000	3.63	1,100
Irrigated Pasture	250	6.92	1,700	7.25	1,800
Other Crops					
Onions	1,142	4.93	5,600	5.27	6,000
Fruits/Nuts/Grapes	603	4.81	2,900	5.14	3,100
Root Crops	3,764	3.90	14,700	4.23	15,900
Misc. Nursery (mostly sod)	450	7.37	3,300	7.70	3,500
Total Projected Ag Demand (AFY)	**19,000**		**92,000**		**98,000**

Notes: Totals rounded to the nearest 1,000 AF.
(a) Data from Los Angeles and Kern County Commissioner Reports. Acreage does not include land cultivated for recycled water purposes.
(b) From Farm Advisor gross crop water requirements specific to Antelope Valley Region.
(c) Acreage multiplied by crop water requirements.

3.1.4 Recycle/Reuse

3.1.4.1 Recycled Water Sources

Recycled water in the Antelope Valley is available from three primary sources: (1) the Lancaster WRP, (2) the Palmdale WRP, and (3) the Rosamond Wastewater Treatment Plant (WWTP). All three plants treat wastewater to a tertiary level. Since the RWMG prioritized the need to maximize beneficial use of water supplies within the Antelope Valley Region, proposed recycled water users served by these WRPs have been included below for discussion purposes, but only existing recycled water users are included in the Water Budget estimates for this Plan. Significant investments have been made to expand and upgrade the treatment plants to develop these recycled water supplies. Figure 3-5 shows the locations of the facilities and proposed infrastructure necessary to provide the recycled water quantities shown in Table 3-11.

EAFB has two treatment plants that distribute recycled water to the base. These include the EAFB Air Force Research Laboratory Treatment Plant which is a secondary wastewater treatment plant that discharges all its effluent to the evaporation ponds at the base.

The second plant is the EAFB Main Base WWTP which produces tertiary treated effluent for landscape irrigation at the base golf course with excess effluent discharged to the evaporation ponds when irrigation demand is low. Recycled water from these plants is not included in supply and demand calculations since all water is used on the base.

Table 3-11 provides a summary of the projected availability of the recycled water to the Antelope Valley Region through 2035.

Table 3-11: Potential Availability of Recycled Water (AFY) to the Antelope Valley Region

	2012	2015	2020	2025	2030	2035
Lancaster WRP[(a)(b)]	10,000	11,000	13,000	14,000	16,000	17,000
Palmdale WRP[(a)]	10,000	11,000	12,000	12,000	13,000	13,000
Rosamond WWTP[(c)]	---	1,000	1,000	1,000	1,000	1,000
Total Study Area	20,000	23,000	26,000	27,000	30,000	31,000

Notes: Totals rounded to the nearest 1,000 AF.
(a) Source: LACSD communication in December 2013.
(b) LWRP water availability excludes water used for environmental maintenance.
(c) Source: Rosamond 2010 UWMP, Table 6-3.

Recycled Water Infrastructure

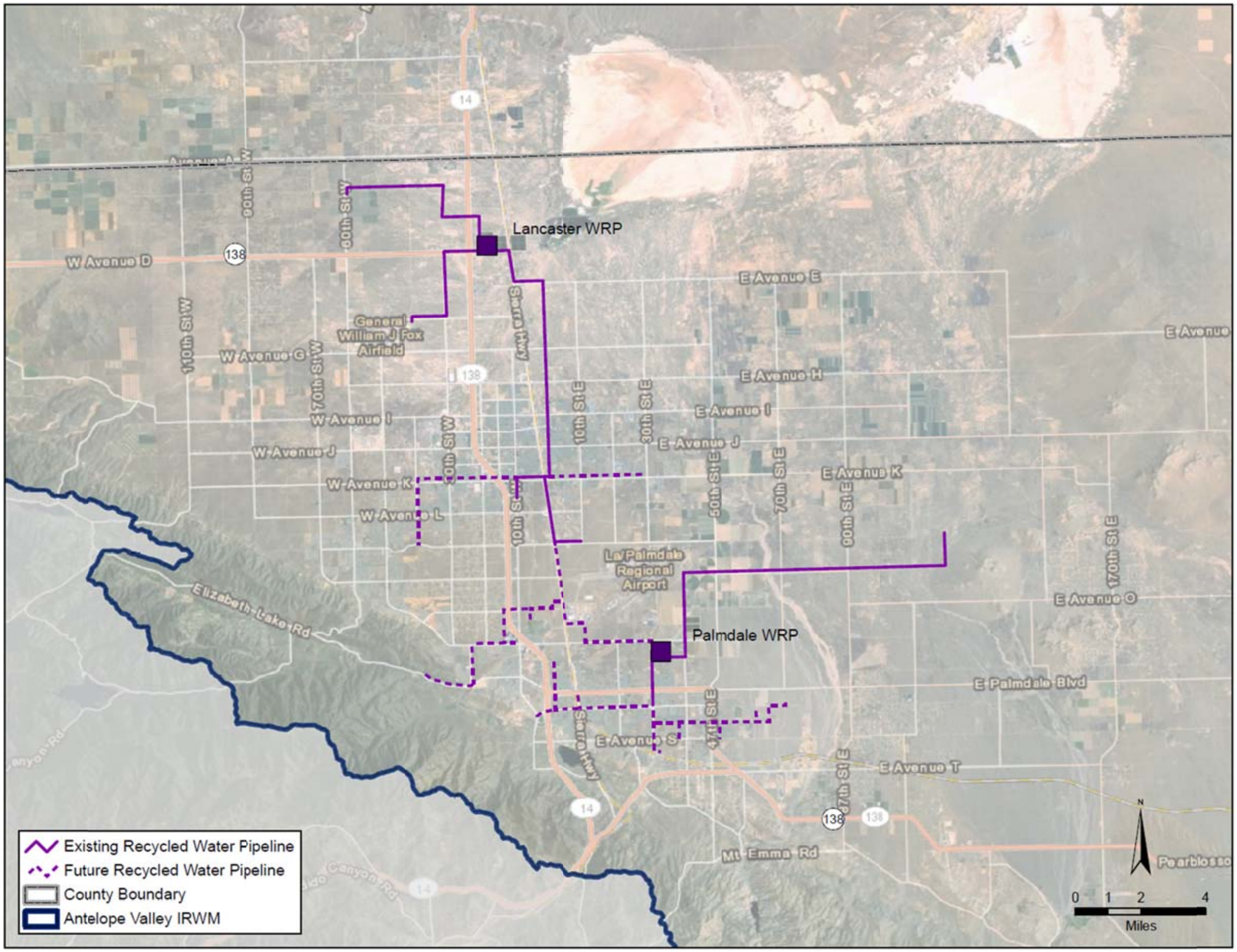
Distribution Pipeline: As shown in Figure 3-5, the recycled water distribution system in Lancaster, which serves sites such as Apollo Lakes, has been expanded for urban reuse as part of the Division Street Corridor Project. Figure 3-5 also shows the LACWD 40 Recycled Water Backbone distribution pipeline which is intended to further expand urban reuse in the Antelope Valley Region. This expansion throughout the Antelope Valley Region is a direct result of the substantial coordination and cooperation between Kern and Los Angeles Counties.

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. The Lancaster WRP, which has a permitted capacity of 18.0 mgd, treated an average flow of 14.1 mgd in 2012 to tertiary standards for agricultural and landscape irrigation, municipal and industrial (M&I) reuse, wildlife habitat, maintenance, and recreation. Recycled water produced at the Lancaster WRP and accounted for in the environmental maintenance and recreation reuse at Apollo Community Regional Park and Piute Ponds is not included in the potential availability (Table 3-11), since these flows will not likely be available for other M&I use in the Region.

Palmdale WRP: The 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 12.0 mgd. The plant treated an average flow of 9.04 mgd in 2012 to tertiary standards. All tertiary treated water is used for agricultural and M&I reuse.

Rosamond WWTP: The Rosamond WWTP, located in the City of Rosamond, is owned, operated, and maintained by the RCSD. Rosamond WWTP, currently has a permitted capacity of 2.0 mgd. RCSD has recently increased the capacity to 2.5 mgd. The expansion will help supplement the existing tertiary treatment and disposal facility. The expanded plant is expected to be permitted in the fall of 2013 at which time it will be fully operational. The tertiary treated recycled water will be provided for landscape irrigation at median strips, parks, schools, senior complexes and new home developments.

Figure 3-5: Proposed Recycled Water Infrastructure



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. Use 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.

3.1.4.2 Recycled Water Demand

Table 3-12 summarizes the existing and projected recycled water demand as listed in the 2014 SNMP for the Antelope Valley (Appendix G). While expanded recycled water use in the Antelope Valley Region is highly likely, only current recycled water uses are included in this IRWM Plan's supply and demand calculations to show the need for increased end use of recycled water supply. Recycled water used for environmental and recreational area maintenance at Piute Ponds and Apollo Community Regional Park is not included in demands since it was excluded from the recycled water availability in Table 3-11. Current M&I recycled water use for both the Lancaster and Palmdale WRPs is approximately 82 AFY. Approximately 3 AFY was used in 2010.

Current demands for recycled water include those for the North LA/Kern County Regional Recycled Water Project. To date, only a portion of the recycled water backbone project has been built. The Division Street Corridor uses an average of 2 AFY (personal communication with Aracely Jaramillo, LACWD 40) with approximately 3 AFY used in 2010. The Palmdale Regional Recycled Water Authority's water line to McAdam Park in Palmdale uses about 80 AFY (personal communication with Gordon Phair, City of Palmdale), but the Palmdale water line was not built until after 2010.

Although there is the potential to provide 31,000 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, while Table 3-12 provides the anticipated future recycled water demand to be served by the backbone system, those supplies not currently in use are not included in the Plan's supply and demand calculations.

Other future users of recycled water in the Region include the eSolar Power Plant and the Palmdale Hybrid Power Plant. Recycled water demand estimates for these projects are included in Table 3-12. The eSolar Sierra Sun Tower Power Plant is a solar thermal pilot project in the City of Lancaster that would potentially convert to using recycled water instead of potable water in the future. The Palmdale Hybrid Power Plant Project involves the construction of a 570 mega-watt (MW) natural gas and solar thermal electricity generating facility that would use recycled water for its cooling water demands. It should be noted that both the Palmdale Hybrid Power Plant and the eSolar Power Plant constitute new uses of water, meaning that supplying these facilities with recycled water would not offset potable water that is currently being used.

Table 3-12: Summary of Current and Projected Recycled Water Use Demands (AFY) in the Antelope Valley Region

	2010	2015	2020	2025	2030	2035
North LA/Kern County Regional Recycled Water Project	3	7,121	8,673	10,225	11,777	13,330
RCSD WTP Recycled Water Use	---	---	100	100	100	100
eSolar Power Plant	---	80	80	80	80	80
Palmdale Hybrid Power Plant	---	3,400	3,400	3,400	3,400	3,400
PWD Groundwater Recharge Project	---	---	---	---	5,000	5,000
Total Recycled Water Demand	**3**	**10,601**	**12,253**	**13,805**	**20,357**	**21,910**

Note: Demands do not include recycled water use for environmental maintenance.
Source: Draft Salt and Nutrient Management Plan for the Antelope Valley, Table 3-5 (portion). AFY values for the PWD Groundwater Recharge Project are adjusted for recent information obtained during IRWM project solicitation.

3.1.5 Surface Storage

3.1.5.1 Runoff

Surface water supplies in the Antelope Valley Region generally consist of 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.

PWD is currently undergoing actions to increase the yield at Littlerock Reservoir. PWD's Littlerock Creek Sediment Removal Project proposes to restore the reservoir capacity to 3,325 AF through the removal of 900,000 cubic yards of sediment from behind the dam.

3.1.5.2 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 is effective 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.

Table 3-13 provides a summary of the historical surface deliveries from Littlerock Reservoir.

Table 3-13: Historical Surface Deliveries from Littlerock Reservoir (AFY)

Year	PWD Diversions	LCID Diversions	Total Diversions
1975[(a)]	1,586	1,513	3,099
1980[(a)]	913	1,950	2,863
1985[(a)]	1,460	1,375	2,835
1990[(a)]	110	200	310
1995[(a)]	3,771	0	3,771
2000[(a)]	6,500	0	6,500
2005[(a)]	6,900	0	6,900
2010[(b)]	1,861	0	1,861

Notes:
(a) PWD 2001.
(b) PWD 2010 UWMP.

Surface Water Infrastructure

The surface water storage facilities in the Antelope Valley Region include Littlerock Reservoir and Lake Palmdale. Littlerock Reservoir has an average seasonal inflow of approximately 3,500 AFY but an estimated storage capacity of only 2,765 AF due to sediment accumulation behind the dam.

Littlerock Reservoir discharges into Lake Palmdale, which has a capacity of approximately 4,250 AF. 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.

Reliability

In the PWD 2010 UWMP, historical data were used to determine how the reliability of the Littlerock Dam and Reservoir surface water supplies would be affected for average, single-dry, and multi-dry water years. PWD expects to use 4,000 AFY of its diversion rights in average, dry, and multi-dry water years. This was calculated as 50% of the average available yield from the Reservoir of 8,000 AF.

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 County Department of Public Works (LACDPW). This analysis estimated surface water ranging from a minimum of 1,178 to a maximum of 15,900 AFY (PWD 2001).

3.1.5.3 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.

3.1.6 Groundwater Storage

3.1.6.1 Overview of Groundwater Storage

Groundwater Infrastructure

LCID has four (4) groundwater wells that supplied approximately 1,800 AFY of water in 2012 with half the supply going to agriculture. The wells have a maximum pumping capacity of 4,800 gpm (personal communication with Brad Bones, LCID, August 21, 2013)

LACWD 40 has 54 active wells. The combined groundwater extraction capacity is estimated at 38,000 AFY (33.6 mgd), yet this estimate does not necessarily reflect the maximum pumping capacity of LACWD 40.

PWD has twenty-five (25) active groundwater wells throughout the Lancaster and Pearland groundwater subunits, and the San Andreas Rift Zone. The total instantaneous capacity for all PWD wells operating is 16,093 gpm (25,958 AFY). PWD's total groundwater pumping in 2010 was 8,000 AFY and they project to consistently be able to pump 12,000 AFY for average, dry and multi-dry years (PWD 2011).

QHWD currently operates eleven (11) wells for a total maximum pumping capacity of 9,165 AFY (5,681 gpm) (LACWD 40 & QHWD 2011).

RCSD has three (3) wells with a combined maximum pumping capacity of 2,825 gpm (4,557 AFY). One new well is anticipated to come online in the near future with another 800 to 1,000 gpm capacity.

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 changes in the anticipated demand. The return flow estimates are meant to indicate a sense of the impact of return flows to the groundwater basin.

3.1.6.2 Percolation

For purposes of this IRWM Plan, direct percolation from precipitation on the Antelope Valley Region floor is assumed to be negligible. However, indirect percolation from irrigation return flows on the Antelope Valley Region floor does occur. 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.

3.1.6.3 Total Sustainable Yield

TSY is composed of natural recharge, supplemental recharge from imported water, and associated return flows. 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). An alternative method used a groundwater model, and found a natural recharge estimate of 30,300 AFY achieved a balance within the model (USGS 2003). Estimates for return flows are typically calculated using a percentage of applied water used for M&I irrigation, agricultural irrigation, and agricultural irrigation with recycled water. These estimates are added to recharge to get TSY. As part of the current adjudication proceedings, the TSY has been determined to be 110,000 AFY (i.e., recharge and return flows). A list of documents that reference estimates for TSY, natural recharge, and return flows is included in Appendix I.

For the purposes of this IRWM Plan, the adjudication finding for TSY (110,000 AFY) is utilized to determine the amount of water that may be sustainably pumped from the basin and represents the combination of natural recharge and return flows from M&I, agricultural, and agricultural reuse. Therefore, these components of TSY are not calculated separately. This Plan acknowledges that other estimates have been developed for TSY in the Valley as mentioned above.

For the purposes of this Plan, as determined by the Stakeholder Group at the October 16, 2013 stakeholder meeting, the discussions that follow in Sections 3 and 6 will utilize the 110,000 AFY for TSY for water balance and projection purposes[2]. Although unlikely, it is important to note that the value for TSY may be revisited by the Court after a period of monitoring and documentation. If a motion is filed with the Court to revise the TSY, the IRWMP will be updated to reflect the subsequent discussion.

3.1.6.4 Artificial Recharge

One typical source of artificial recharge is water banking through spreading basins that allow the water to infiltrate into the ground. Several water banking projects have been proposed in the Region and are discussed in later Sections of this Plan. AVEK's WSSP-2 project was completed in 2010 and can store up to 150,000 AFY. This project is a collaboration between several agencies. The partners can currently withdraw up to 20 mgd (approximately 23,000 AFY).

Another type of artificial recharge is through 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 source of ASR water available to the Antelope Valley Region is SWP water, but blended and non-blended recycled water are potential future sources. Although the Region plans to develop groundwater recharge projects with blended recycled water in the future, currently only SWP water is utilized for ASR in the Antelope Valley to a very limited extent.

LACWD 40 is the only agency within the Antelope Valley Region that has attempted to utilize 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. LACWD 40's ASR program operated under a Conditional Waiver of Waste Discharge Requirements, for a period of 5 years with groundwater monitoring requirements stipulated in the waiver. The 2004 waiver stipulated that LACWD 40 could 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. As a condition of the waiver, LACWD 40 could only inject up to 6,843 AFY. For the first few years of the project, LACWD was only able to inject approximately 1,500 AFY. In 2010, another five-year Conditional Waiver was approved.

As of December 2010, all injection activities were halted as a result of operational and financial restraints. No future injection is being projected.

For the purposes of this Plan, ASR extraction of banked water will be considered to be negligible since injection has been discontinued.

[2] The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process

3.1.6.5 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. Figure 3-6 to Figure 3-10 provide a set of contour maps of the groundwater levels for the Antelope Valley Region from 1915 to 2006.

3.1.6.6 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 closed basin, losses from subsurface flow are assumed to be negligible for the purposes of this IRWM Plan.

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. However, further investigation and study are needed to more accurately determine the water losses in the Antelope Valley Region.

Figure 3-6: 1915 Groundwater Level Contour Map of the Antelope Valley Region

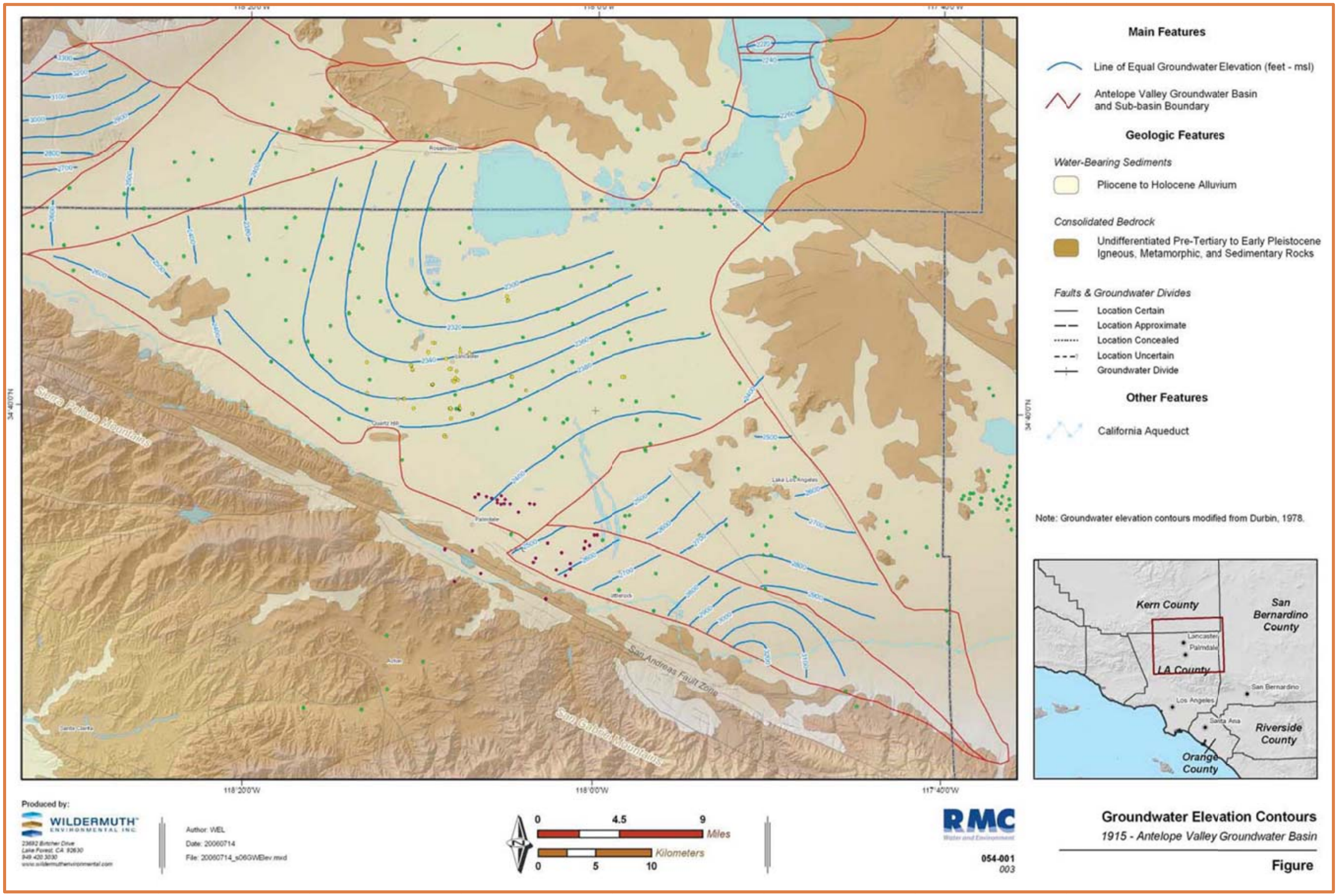


Figure 3-7: 1961 Groundwater Level Contour Map of the Antelope Valley Region

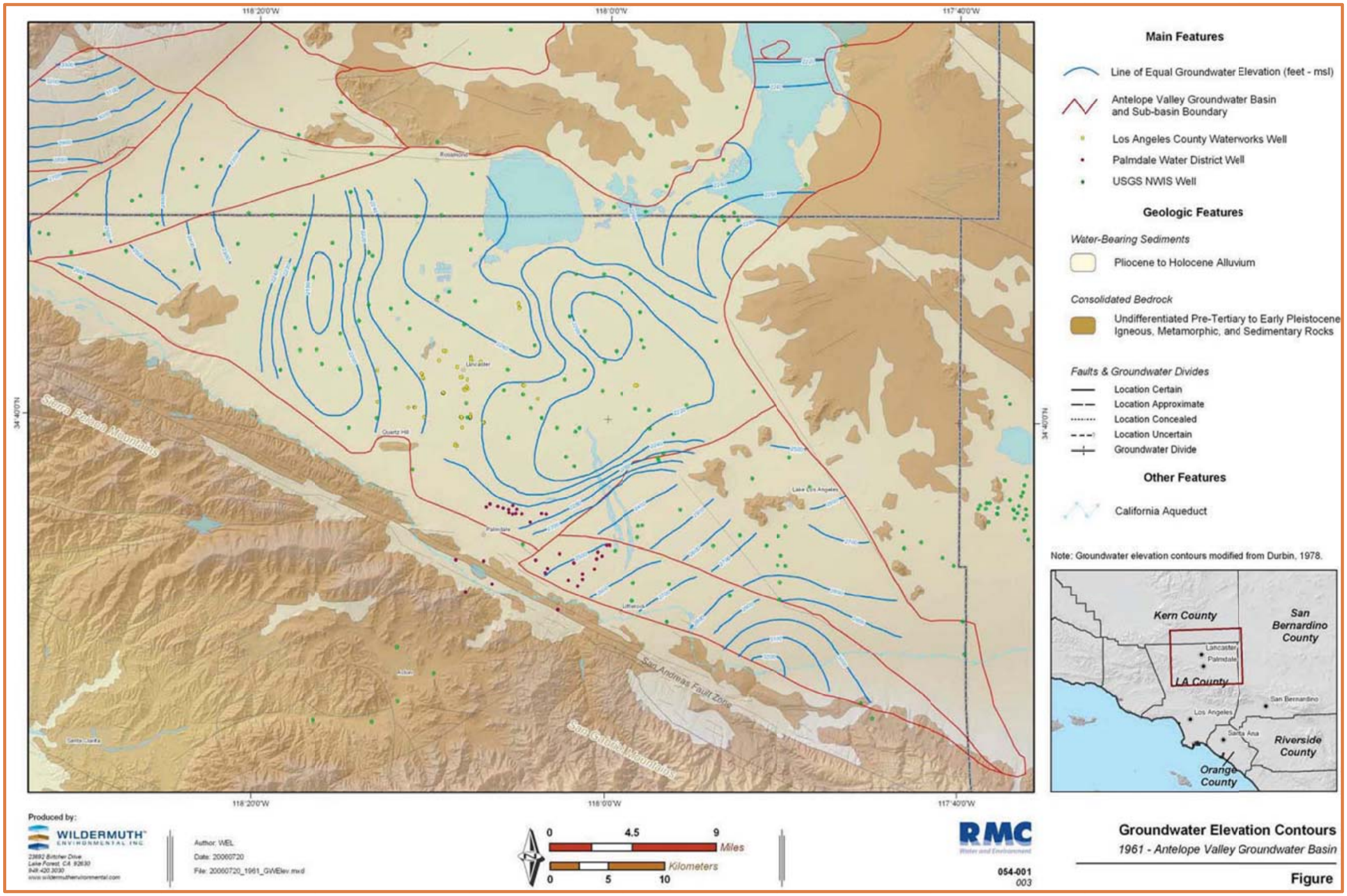


Figure 3-8: 1979 Groundwater Level Contour Map of the Antelope Valley Region

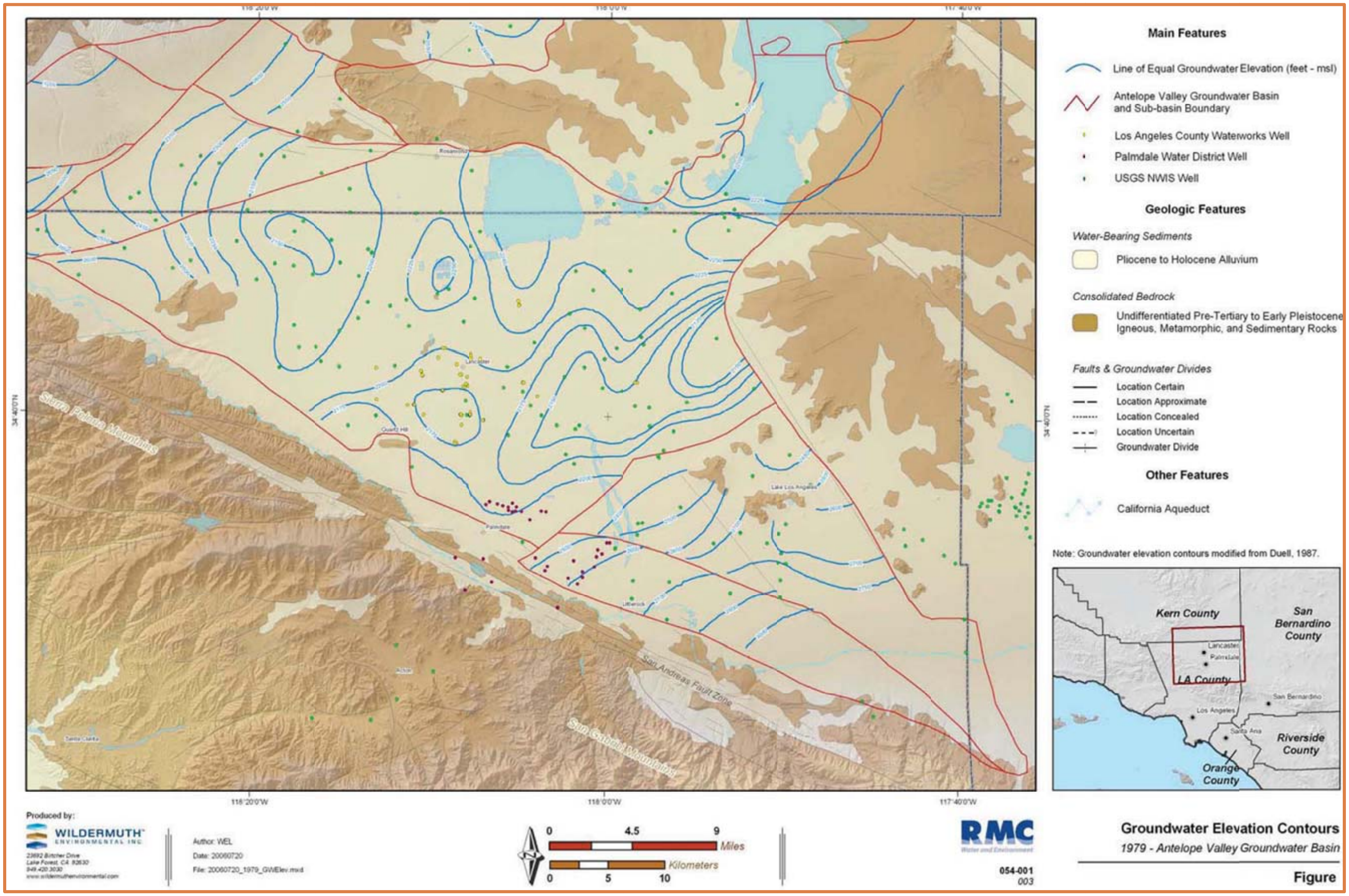


Figure 3-9: 1988 Groundwater Level Contour Map of the Antelope Valley Region

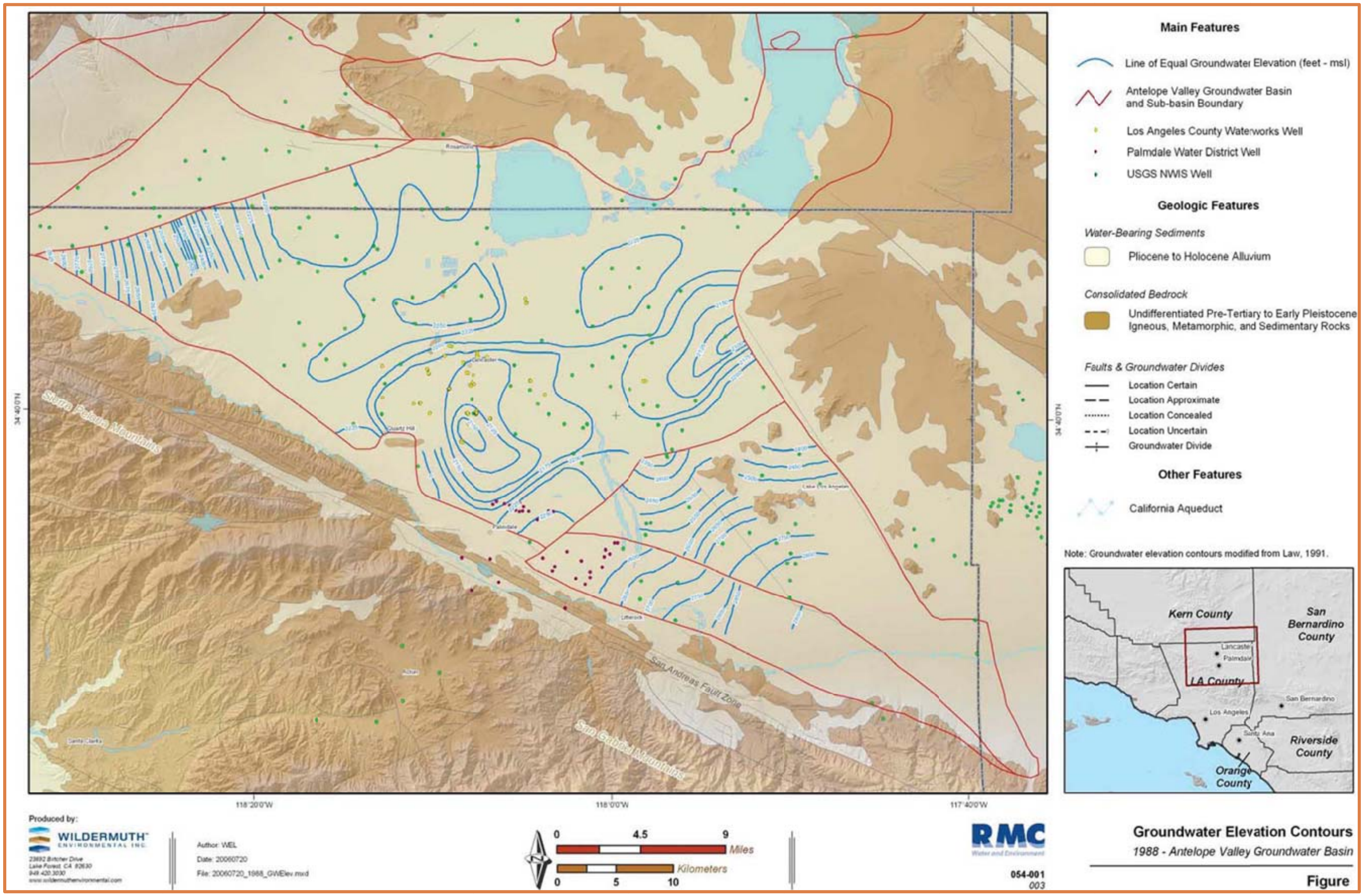
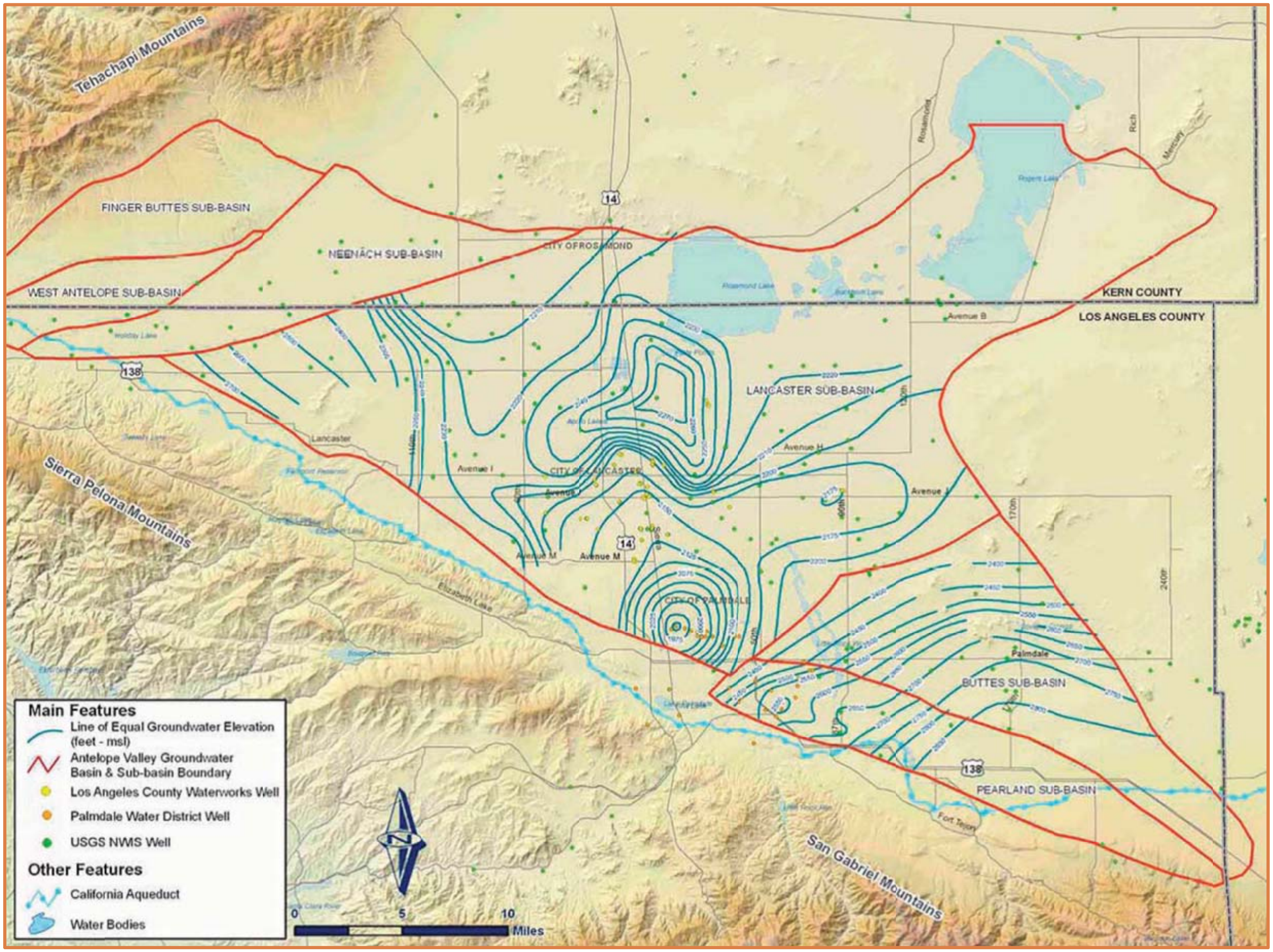


Figure 3-10: 2006 Groundwater Level Contour Map of the Antelope Valley Region



3.1.8 Water Budget Comparisons

3.1.8.1 Average Water Year

Figure 3-11 and Table 3-14 provide a comparison of the supply and demand for the Antelope Valley Region for an average water year. It is assumed that an average year requires reserves equal to the average year mismatch (if demand exceeds supply). A range for the required reserves was determined from the maximum and minimum of the individual year reserves between 2010 and 2035. For an average water year supplies are projected to exceed demands. Because of the uncertainty in several supply and demand estimates including SWP deliveries and projected demand, there is still potential for a deficit to occur. Additional projects and management actions to remedy any potential supply deficits are discussed in Section 5, Resource Management Strategies, and Section 6, Project Integration and Objectives Assessment.

3.1.8.2 Single-Dry Water Year

Figure 3-12 and Table 3-15 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. For a single dry water year the range of mismatch between supply and demand is 56,400 AFY to 61,200 AFY. This Plan assumes that AVEK's WSSP-2 water bank will be in operation during the planning horizon and that a sufficient amount of wet years or water transfers will have occurred between dry year periods to keep the bank at full capacity prior to a single-dry year. The maximum withdrawal in any one year is currently 23,000 AFY (20 mgd); therefore it is assumed that this amount would be available in a single-dry year. It is possible that banked water will not be available during dry years, in which case the mismatch would be more severe (up to 84,200 AFY). Figure 3-12 assumes 23,000 AFY of water bank supply. Additional projects and management actions to remedy these supply deficits are discussed in Section 5, Resource Management Strategies, and Section 6, Project Integration and Objectives Assessment. The WSSP-2 project partners plan to increase the withdrawal capacity from 20 mgd (23,000 AFY) to 50 mgd (56,000 AFY) within the 2035 planning horizon, but this is not reflected in Figure 3-12 since the expansion is a planned project (i.e., not operational now). These findings for a single dry year indicate the need to secure additional water supplies for the Region.

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. Table 3-16 provides a comparison of the supply and demand for the Antelope Valley Region for a multi-dry water year. Each year shown is assumed to be the first of a 4-year dry period. As shown by the comparison, future demand exceeds the existing and planned water supplies through 2035. For multi-dry water years the range of mismatch between supply and demand is 14,600 AFY to 41,200 AFY. This Plan assumes that AVEK's WSSP-2 water bank will be in operation during the planning horizon and that a sufficient amount of wet years or water transfers will have occurred between dry year periods to keep the bank at full capacity prior to a four-year dry period. The maximum withdrawal in any one year is currently 23,000 AFY (20 mgd); therefore it is assumed that approximately ¼ of this amount would be used each year of the 4-year dry period (about 6,000 AFY). It is possible that banked water will not be available during a multi-dry year, in which case the mismatch would be more severe (up to 47,200 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. The WSSP-2 project partners plan to increase the withdrawal capacity from 20 mgd (23,000 AFY) to 50 mgd (56,000 AFY) within the 2035 planning horizon, but this is not reflected in Figure 3-13 since the expansion is a planned project (i.e., not operational now). These findings for a multi-dry year period indicate the need to secure additional water supplies for the Region.

Figure 3-11: Water Supply Summary for an Average Water Year

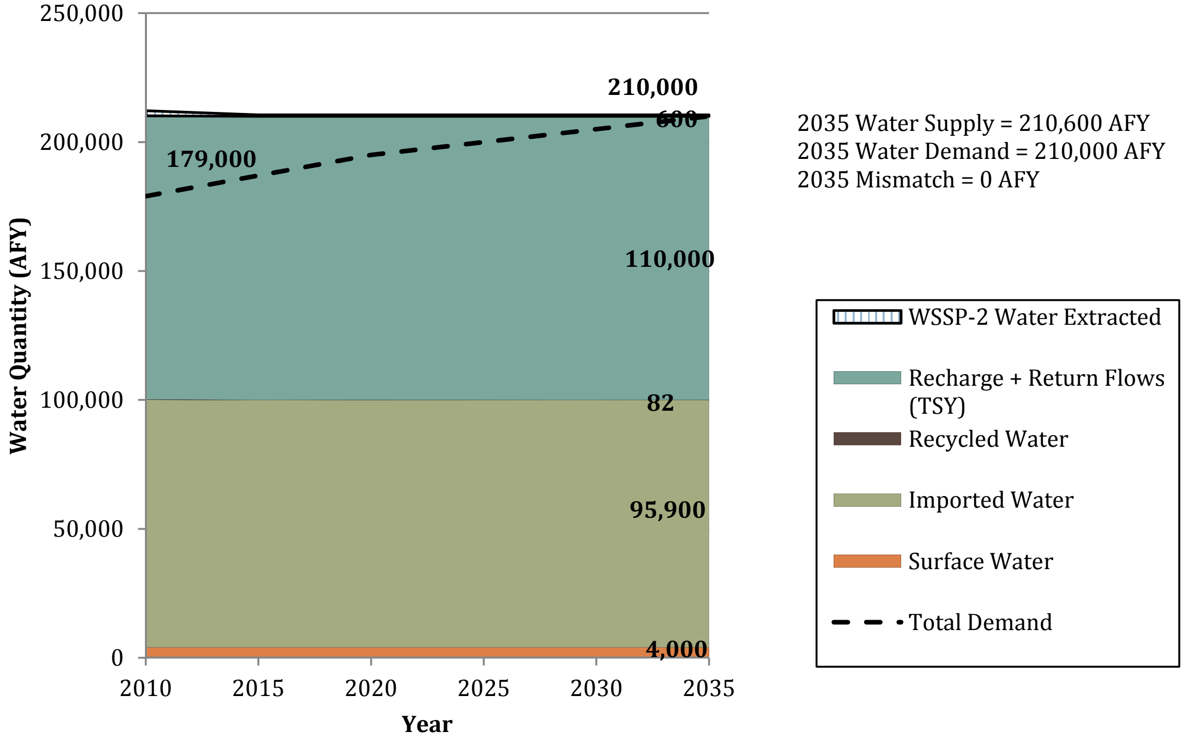


Table 3-14: Water Budget Comparison for an Average Water Year

	2010	2015	2020	2025	2030	2035
Groundwater Storage						
Recharge + Return Flows (TSY)	110,000	110,000	110,000	110,000	110,000	110,000
WSSP-2 Water Extracted[a]	2,000	600	600	600	600	600
Subsurface Flow Loss	0	0	0	0	0	0
Direct Deliveries	96,100	95,900	95,900	95,900	95,900	95,900
Recycle/Reuse[b]	82	82	82	82	82	82
Surface Storage						
Surface Deliveries	4,000	4,000	4,000	4,000	4,000	4,000
Total Supply	**212,200**	**210,600**	**210,600**	**210,600**	**210,600**	**210,600**
Demands[c]						
Urban Demand	87,000	95,000	103,000	108,000	113,000	118,000
Ag Demand	92,000	92,000	92,000	92,000	92,000	92,000
Total Demand	**179,000**	**187,000**	**195,000**	**200,000**	**205,000**	**210,000**
Supply and Demand Mismatch	**33,200**	**23,600**	**15,600**	**10,600**	**5,600**	**600**

Notes: Values are rounded to the nearest 100.
(a) Assumes small withdrawals from WSSP-2 will occur to overcome conveyance constraints and enable utilization of 60-61% of AVEK Table A (SWP reliability estimate). See explanation in Section 3.1.2.
(b) Recycled water demands for 2010-2035 reflect existing 2013 M&I demands (i.e., Division Street Corridor and McAdam Park).
(c) Demand includes groundwater extractions.

Figure 3-12: Water Supply Summary for a Single-Dry Water Year

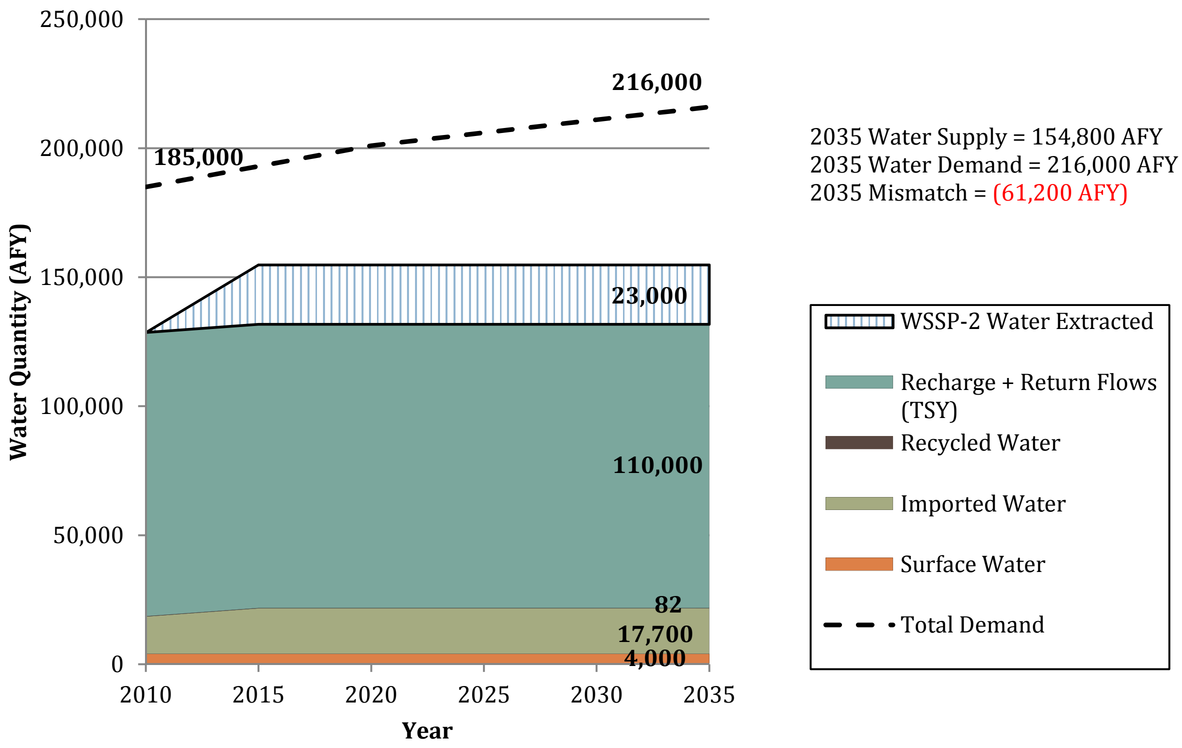


Table 3-15: Water Budget Comparison for a Single-Dry Water Year

	2010	2015	2020	2025	2030	2035
Groundwater Storage						
Recharge + Return Flows (TSY)	110,000	110,000	110,000	110,000	110,000	110,000
WSSP-2 water Extracted[(a)]	0	23,000	23,000	23,000	23,000	23,000
Subsurface Flow Loss	0	0	0	0	0	0
Direct Deliveries	14,500	17,700	17,700	17,700	17,700	17,700
Recycle/Reuse[(b)]	82	82	82	82	82	82
Surface Storage						
Surface Deliveries	4,000	4,000	4,000	4,000	4,000	4,000
Total Supply	**128,600**	**154,800**	**154,800**	**154,800**	**154,800**	**154,800**
Demands[(c)]						
Urban Demand	87,000	95,000	103,000	108,000	113,000	118,000
Ag Demand	98,000	98,000	98,000	98,000	98,000	98,000
Total Demand	**185,000**	**193,000**	**201,000**	**206,000**	**211,000**	**216,000**
Supply and Demand Mismatch	**(56,400)**	**(38,200)**	**(46,200)**	**(51,200)**	**(56,200)**	**(61,200)**

Notes: Values are rounded to the nearest 100.
(a) Assumes periodic wet years have occurred to allow quantities of SWP deliveries above AVEK demands to fill the water bank.
(b) Recycled water demands for 2010-2035 reflect existing 2013 M&I demands (i.e., Division Street Corridor and McAdam Park).
(c) Demand includes groundwater extractions.

Figure 3-13: Water Supply Summary for a Multi-Dry Water Year

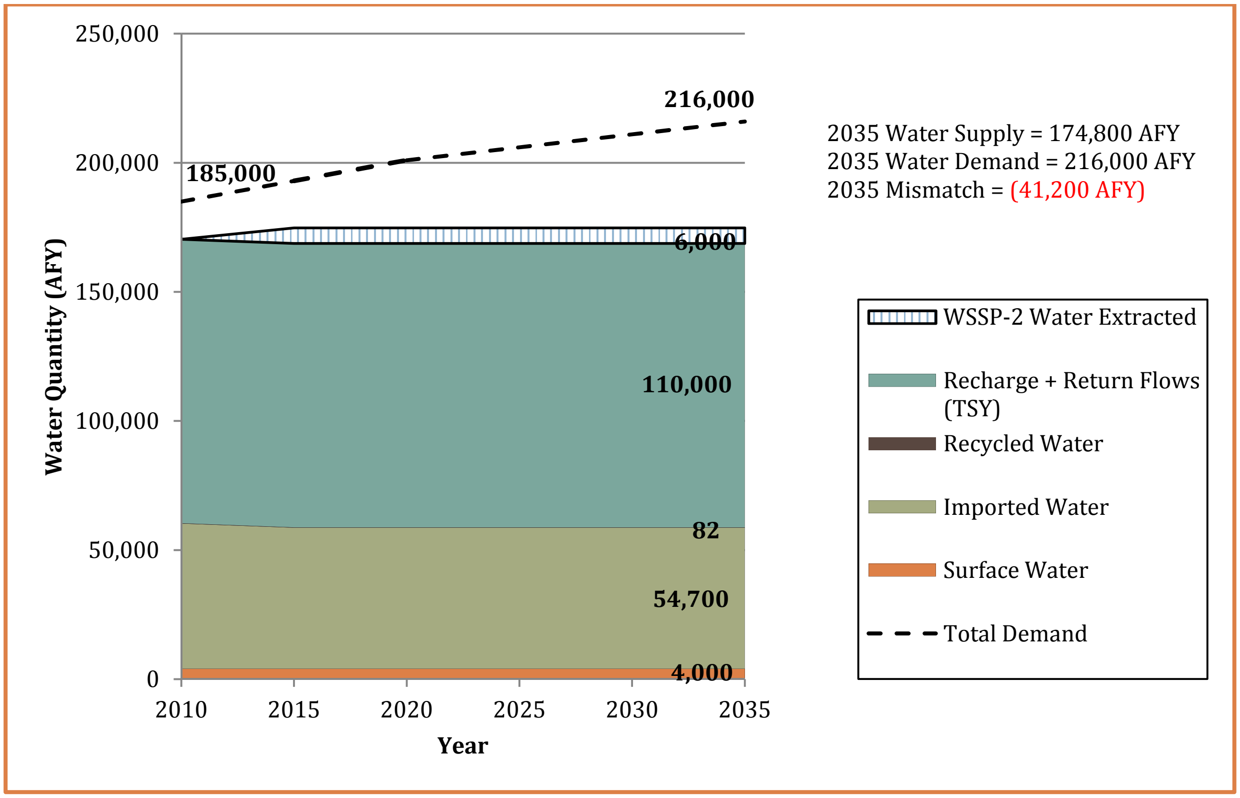


Table 3-16: Water Budget Comparison for a Multi-Dry Water Year

	2010	2015	2020	2025	2030	2035
Groundwater Storage						
Recharge + Return Flows (TSY)	110,000	110,000	110,000	110,000	110,000	110,000
WSSP-2 Water Extracted[(a)]	0	6,000	6,000	6,000	6,000	6,000
Subsurface Flow Loss	0	0	0	0	0	0
Direct Deliveries	56,300	54,700	54,700	54,700	54,700	54,700
Recycle/Reuse[(b)]	82	82	82	82	82	82
Surface Storage						
Surface Deliveries	4,000	4,000	4,000	4,000	4,000	4,000
Total Supply	**170,400**	**174,800**	**174,800**	**174,800**	**174,800**	**174,800**
Demands[(c)]						
Urban Demand	87,000	95,000	103,000	108,000	113,000	118,000
Ag Demand	98,000	98,000	98,000	98,000	98,000	98,000
Total Demand	**185,000**	**193,000**	**201,000**	**206,000**	**211,000**	**216,000**
Supply and Demand Mismatch	**(14,600)**	**(18,200)**	**(26,200)**	**(31,200)**	**(36,200)**	**(41,200)**

Notes: Values assume 4-year dry period begins in the year shown and are rounded to the nearest 100.
(a) Assumes periodic wet years have occurred to allow quantities of SWP deliveries above AVEK demands to fill the water bank. Full bank storage is evenly distributed over the 4-year dry period, rounding to about 6,000 AFY each year.
(b) Recycled water demands for 2010-2035 reflect existing 2013 M&I demands (i.e., Division Street Corridor and McAdam Park).
(c) Demand includes groundwater extractions.

3.1.9 Regional Water Supply Issues and Needs

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;
- Mismatch between supplies and demands
- Existing facility limitations; and
- Land subsidence effects

3.1.9.1 Reliance on Imported Water

As shown from the supply and demand comparisons, the Antelope Valley Region relies on SWP for approximately 46 percent of its total supply in an average year, approximately 31 percent of its total supply in a multi-dry year, and approximately 11 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 (2012) anticipates a minimum delivery of 9 percent of full Table A Amounts for 2011 demand conditions and 11 percent of full Table A Amounts for 2031 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.

3.1.9.3 Mismatch between Supplies and Demands

The population in the Antelope Valley is expected to increase through the planning horizon resulting in an increase in water demand. Decreases in estimated population growth have reduced the mismatch between supply and demand since the 2007 IRWM Plan. Yet, even with less population growth, water supply is still a limiting factor during dry periods. In order to maintain supplies and meet the growing needs of the region, agencies will need to diversify the Region's water supply portfolio with additional imported sources, additional water conservation, additional recycled water, and groundwater recharge and recovery projects.

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 vulnerability to short-term variances in 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 un-managed groundwater pumping 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 in many years since the early 1920s (USGS 2003). This approach to groundwater pumping will change in the future as the adjudication process for establishing groundwater rights is completed.

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 for dry and multi-dry year periods 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 and storage capacity for new supply.

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 in some years. It may also be possible for some AVEK customers to regulate their water supply deliveries such that more could be taken during winter months when demands are typically low.

LACWD 40's facilities improvements will include well efficiency and rehabilitation projects, reservoirs and pipelines throughout its system to meet current and projected water supply requirements. LACWD 40 is pursuing the use of recycled water as an alternative source for irrigation and recharge purposes.

PWD's plan for improvements and expansion of its existing infrastructure was recently developed in its 2010 Strategic Water Resources Plan. According to the Plan, PWD is identifying additional water sources by investigating the potential to increase the storage capacity of Littlerock Reservoir, establishing groundwater recharge and water banking facilities, maximizing the use of recycled water (tertiary treated recycled water for irrigation and industrial/commercial uses), creating and maintaining future imported water opportunities, and implementing water conservation programs. PWD's 2010 Recycled Water Facilities Plan details construction alternatives for expanding recycled water as a water supply option.

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.

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 and groundwater recharge projects. 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 2003). 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 3-14). Conversations held with various agencies and companies indicate that within the Antelope Valley Region, the Lancaster and EAFB areas are currently experiencing problems or damages that appear to be related to land subsidence (see Figure 3-15). EAFB has been actively involved in projects aimed at preventing future land subsidence. The adjudication process has as one of its primary goals the permanent stabilization of groundwater levels and prevention of overdraft.

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.
- Legal actions.
- Increased pumping costs.

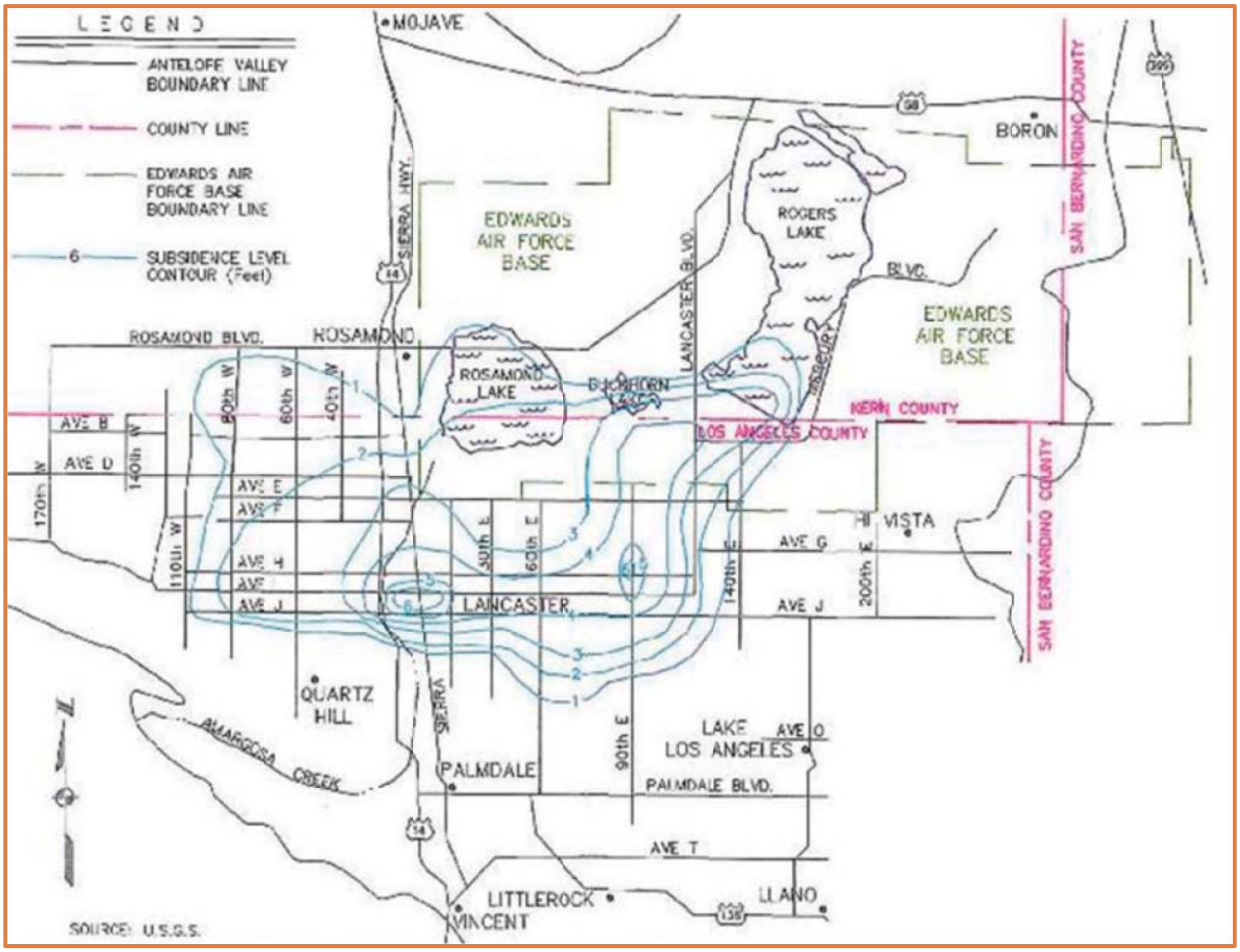
Table 3-17 lists land subsidence problems identified in Antelope Valley Region.

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

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 3-15). 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 3-17.

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 EAFB. 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

Figure 3-14: Subsidence Levels in the Antelope Valley Region



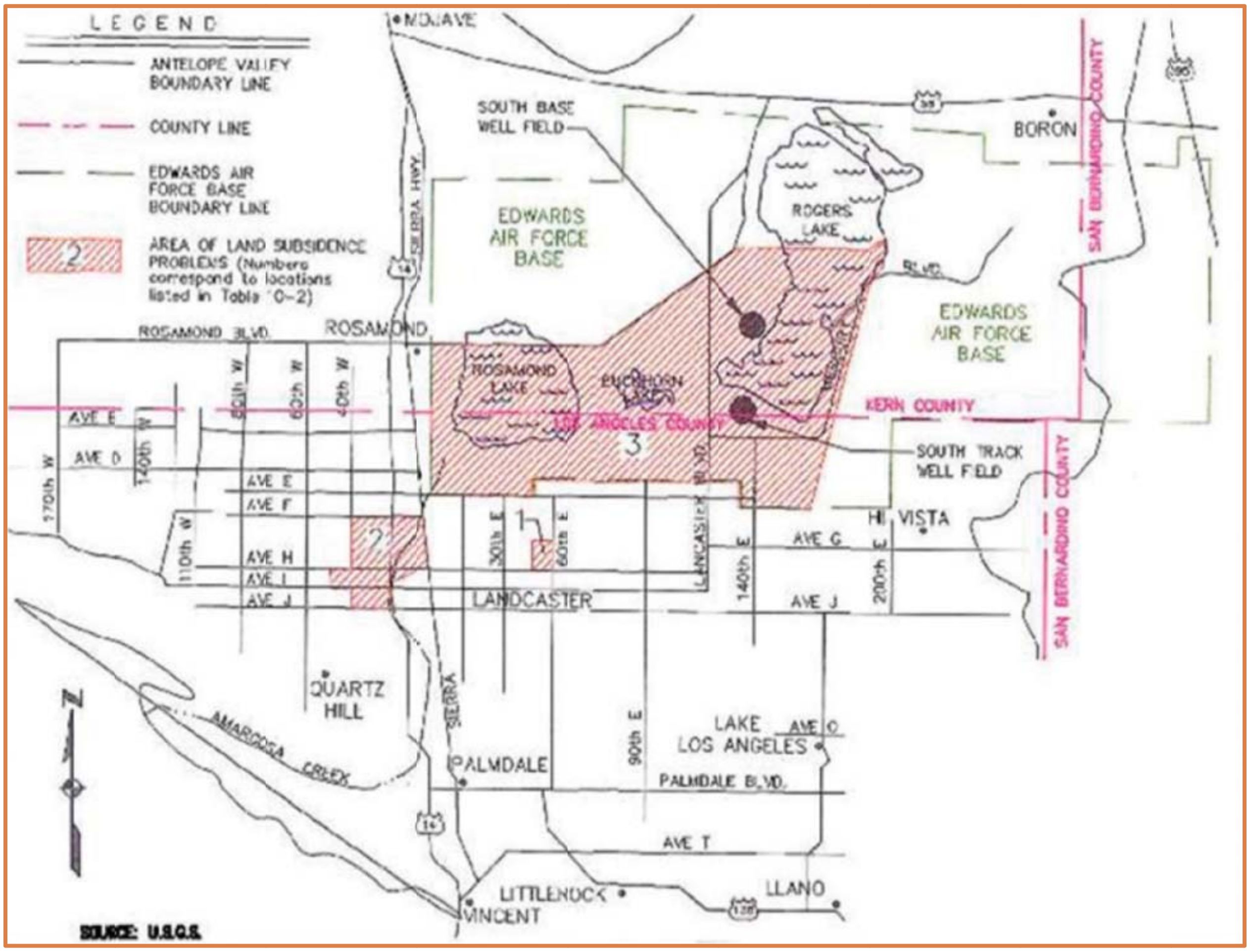
was potential contamination of the water table through fissures which can provide direct access for toxic materials.

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 5.57×10^{-2} feet was measured at the Holly site near the South Track well field (see Location 3 on Figure 3-15).

USGS 1994 Draft Report. USGS (1994) revealed that land subsidence throughout Antelope Valley Region has reached nearly 7 feet. As shown on Figure 3-15, 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.

Figure 3-15: Areas of Potential Land Subsidence in the Antelope Valley Region



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
- EAFB
- 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

Table 3-17: 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: • In the vicinity of KAVL and KBVM radio towers near the proposed site for High Desert Hospital complex • East of a residential project at the southeast corner of 30th St. West and Ave. "I" • In the vicinity of LA County Detention Facility south of Ave. "I" • The "H" Street Bridge over Amargosa Creek where up to 4" of lateral separation is present across the central expansion joint[(a)].
3	EAFB	3.3	• Failure of several well casings. • Increase in area subject to flooding. • Structural damage to wastewater treatment plant building. • Wells protruding above the ground. • 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.

Other than the damages identified in the reports summarized above, structural damage to the wastewater treatment plant building on EAFB 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 the 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.

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.

3.1.10 AB 3030 Water Supply Considerations

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 final stages. Although there are no existing restrictions on pumping, water rights are likely to be assigned as part of the adjudication process. The groundwater adjudication process is a management action discussed 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. Some have been implemented or are in the process of being implemented. Additionally, EAFB has been actively involved in projects aimed at refilling the depleted aquifers. 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 RMS (provided in Section 5) discussion 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 described in more detail in Section 5. Conjunctive use opportunities with native water are 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 and on the ability to supplement with recycled water.

3.2 Water Quality

Water quality is a major concern in the Antelope Valley Region. The Region's dependence on its groundwater source makes it 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 recharged imported, local surface and recycled water. Water quality management in the Antelope Valley Region is therefore focused on maintaining and improving existing water quality and preventing future contamination.

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 characterized by calcium bicarbonate near the surrounding mountains and is characterized by sodium bicarbonate or sodium sulfate in the central part of the basin (Duell 1987 as cited in DWR 2004). In the eastern part of the basin, the upper aquifer has sodium-calcium bicarbonate type water and the lower aquifer has sodium bicarbonate type water (Bader 1969 as cited in DWR 2004). Considered to be generally suitable for domestic, agricultural, and industrial uses, the water in the principal aquifer has a 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, nitrates, chromium and antimony are a problem in some areas of the basin. The groundwater in the basin is used for both agricultural and M&I purposes.

Arsenic is closely monitored in the Region. It 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. Arsenic can be toxic in high concentrations, and is linked to increased risk of cancer when consumed for a lifetime at or above the regulated MCL. Arsenic levels above the MCL of 10 ppb have been observed in the Antelope Valley Region. Ten LACWD 40 wells have tested above the MCL. Of the ten wells, one is not in use and the remaining are blended, with lower arsenic concentrated groundwater or surface water, to concentrations below 8 ppb or 80% of the MCL. QHWD has also observed levels above the MCL in a number of wells and utilizes the same blending method to manage arsenic 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 LACWD 40 to manage arsenic levels so that delivered water meets the arsenic MCL. PWD has arsenic levels below 2 ppb or at Non-Detect (ND) concentrations. It is not anticipated that the existing arsenic problem will lead to future loss of groundwater as a supply for the Antelope Valley Region. Arsenic is also an issue in some DAC areas such as Boron.

An emerging contaminant of concern is hexavalent chromium or chromium-6. Chromium-6 can occur naturally in the environment from the erosion of natural chromium deposits, but can also be produced by industrial processes where it is used for chrome plating, dyes and pigments, and leather and wood preservation. This element has been known to cause cancer when inhaled and has also been linked to cancer when ingested. Though there is a total chromium MCL of 50 ppb in California, there is not currently a chromium-6 MCL at either the federal or state level. California has set a public health goal (PHG) of 0.02 ppb for chromium-6, and as of August 23, 2013 has proposed an MCL of 10 ppb. Twelve wells belonging to various agencies within the southern portion of the Region have tested in excess of this proposed MCL within the last ten years, and will therefore need to be monitored as the state moves forward with the adoption of this MCL (SWRCB 2013).

In addition to arsenic and chromium-6 issues, there have also been concerns with nitrate levels above the current MCL of 45 ppm and high TDS levels in portions of the Basin. Groundwater monitoring data from the mid-to-late 1990s indicate nitrate (as NO_3) concentrations periodically exceeding the primary MCL for drinking water of 45 ppm in two wells located in the southern portion of the groundwater basin near the Palmdale WRP. Agricultural fertilization practices and discharge of treated wastewater has likely contributed to the elevated levels. Actions have already been implemented by LACSD to address these concerns and to minimize any impact from treated wastewater, including, treatment upgrades, a change in effluent management practices, the implementation of a recycled water distribution system, and performing groundwater remediation activities near the Palmdale WRP site.

3.2.2 Imported Water Quality

DWR must monitor the effects of diversions and SWP operations to ensure compliance with existing water quality standards, in particular the maintenance of salinity levels in key parts of the Delta to help maintain its natural ecosystem. DWR also regulates the quality of non-Delta water entering the SWP, known as “non-project turn-ins”. These non-project turn-ins typically originate as groundwater, and in particular “pump back” projects that store imported water in groundwater banks, though other waters include excess surface flows or flood waters. DWR requires the proponents of any turn-in proposal to demonstrate that the water is of consistent, predictable and acceptable quality and that the comingled water does not result in a diminution of water quality (DWR 2012a).

The current water quality conditions in the California Aqueduct (data taken from Station KA024454, Check 29 near Lake Webb) are compared to the current federal primary and secondary drinking water standards and are provided in Table 3-18. It is important to note that while some constituents do not have a primary 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.

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 (the Leslie O. Carter 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 Lake Palmdale. 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.

Table 3-18: Comparison of SWP Water Quality Criteria (2013) to SWP Actual Data

Constituent	SWP Water Quality Data (Sta. KA024454)[a][b]			Current Drinking Water Standards (2013)
	Max.	Min.	Avg.	
Aluminum (Dissolved) (mg/L)	<0.01	<0.01	<0.01	1
Antimony (Dissolved) (ug/L)	< 1	< 1	< 1	6
Arsenic (Dissolved) (ug/L)	5	< 1	2	10
Barium (Dissolved) (mg/L)	0.04	0.02	0.03	1
Beryllium (Dissolved) (ug/L)	< 1	< 1	< 1	4
Bromide (Dissolved) (ug/L)	430	30	180	No standard
Cadmium (Dissolved) (ug/L)	< 1	< 1	< 1	5
Chromium (Total) (ug/L)	< 1	1	2.5	50
Copper (Dissolved) (ug/L)	2	<1	1.4	1,300
Fluoride (Dissolved) (ug/L)	(c)	(c)	100	2,000
Iron (ug/L)	28	< 5	12	300[d]
Manganese (ug/L)	7	< 5	< 5	50[d]
Mercury (inorganic) (ug/L)	< 0.2	< 0.2	< 0.2	2
Nickel (Dissolved) (ug/L)	2	< 1	1	No standard
Nitrate as N (mg/L)	6.9	< 0.1	2.7	10
Selenium (dissolved) (ug/L)	1	< 1	< 1	50
Silver				100[d]
Sulfate (dissolved) (mg/L)	60	14	33	250[d]
Total Organic Carbon (mg/L)	8.2	0.9	3.2	No standard
Zinc (dissolved) (ug/L)	21	< 5	8.4	5,000[d]
TDS (mg/L)	334	97	220	500[d]
Specific Conductance (uS/cm)	601	154	377	No standard
Chloride (dissolved) (mg/L)	117	19	57	250[d]

Notes: All values in ug/L unless otherwise noted.
(a) SWP Water Quality data collected by DWR between 1/1/2010 and 12/31/2012.
(b) SWP Water Quality data not shown was not sampled by DWR.
(c) One sample available.
(d) Denotes secondary standard.

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 recent expansion, the Quartz Hill WTP became capable of producing 90 mgd of potable water for consumers.

Expansion of the Eastside WTP located between Littlerock and Pearblossom to 10 mgd was completed in late 1988. It can now serve 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, EAFB 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 Barrel 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.

3.2.3 Wastewater and Recycled Water Quality

Tertiary treated effluent from the Region's three water reclamation plants will be of sufficient quality to meet unrestricted use requirements. It may then be used for irrigating 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 2009 and in 2011 for the Palmdale WRP. For recharge of recycled water, blending or additional water quality requirements may be needed. The management of TDS and nutrients from recycled water will be addressed by the SNMP for the Antelope Valley, an effort that is being conducted in parallel with this 2013 IRWMP Update. Recycled water from the EAFB Air Force Research Laboratory Treatment Plant and the Main Base WWTP is not included in this discussion of recycled water quality since all water is used on the base.

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. 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.

The Basin Plan for the Lahontan Region contains a specific ammonia objective for Amargosa Creek downstream of the LACSD 14 discharge point, and to the Piute Ponds and associated wetlands based on the USEPA 1999 freshwater criteria for total ammonia. This objective is pH and temperature dependent and shall not exceed the acute and chronic limits more than once every three years, on average. In addition, the highest four-day average concentration for total ammonia in a 30-day period cannot exceed 2.5 times the chronic toxicity limit.

The management of TDS and nutrients from imported water will be addressed by the SNMP for the Antelope Valley, an effort that is being conducted in parallel with this 2013 IRWMP Update.

3.2.5 Regional Water Quality Issues and Needs

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;
- Closed basin with no outfall for discharge;
- Must provide wastewater treatment for growing population;

3.2.5.1 Concern for Meeting Water Quality Regulations

The Region has a number of concerns regarding water quality regulations, including: (1) meeting water quality regulations for groundwater recharge, (2) meeting ever-evolving regulations, and (3) contaminants of concern.

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
  - Untreated raw water direct from the California Aqueduct
- Reclaimed Water (for spreading only or blending):
  - Tertiary treated
- Captured Stormwater

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 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 percolated. Water that LACWD 40 recharged through its ASR program met the RWQCB's water quality requirement.

Meeting Evolving Regulations

In response to groundwater quality concerns, the RWQCB Lahontan Region is revising the WDRs for WRPs in the Antelope Valley Region. For example, the WDR for Palmdale WRP has been amended (Board Order R6V-2011-0012) to limit the reuse of secondary-treated effluent to only certain agricultural sites, and to list effluent concentration limits for both secondary and tertiary treated effluent. The ability to comply with these evolving regulations is expected to be both economically and technologically challenging.

Contaminants of Concern

Contaminants such as arsenic, nitrate, and potentially chromium-6 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 contaminants also has a positive economic impact on the agricultural community since it reduces the impact to crops. It also benefits the WRPs and WTPs striving for compliance with more stringent WDRs.

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. Wastewater projections through the planning period are indicated above in Section 3.1.4.

3.2.6 AB 3030 Water Quality Considerations

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 AVSWCA "Study of Potential Recharge Areas in the Antelope Valley" evaluated, identified, and ranked potential recharge sites within the Antelope Valley Region. Additionally, AVEK is considering expansion of water banking facilities; and Lancaster, Palmdale, and PWD are proposing recharge projects or feasibility studies as part of 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 contaminant of concern in the Antelope Valley Region is arsenic. Boron CSD's Arsenic Management Feasibility Study and Well Design, 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 in 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.

3.3 Flood Management

The Antelope Valley Region is a closed watershed without a natural outlet for storm water runoff (LACDPW 1987). Precipitation in excess of 12 inches in the surrounding mountains creates numerous streams that carry highly erodible soils onto the valley floor, forming large alluvial river washes (Rantz, 1969 as cited in USGS 1995). Larger streams, including Big Rock Creek, Littlerock

Creek, Amargosa Creek, Cottonwood Creek, and Anaverde Creek then meander across the alluvial fans in poorly-defined flow paths that change from storm event to storm event.

Stormwater runoff that does not percolate into the ground eventually ponds and evaporates in the impermeable dry lake beds at EAFB near the Los Angeles/Kern County line (LACDPW 1987). The 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 (LACDPW 1987). Historical flooding has shown surface water to remain on the playa for up to five months until the water evaporates (LACDPW 2006).

Portions of the Antelope Valley floor are subject to flooding due to runoff from the nearby foothills (City of Lancaster 1997). The flooding sometimes exceeds the capacities of the limited drainage facilities and engineered flood channels. 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 overflow these facilities (LACSD 2005). There is also a flood retention basin along Anaverde Creek; and when this basin is overtopped, flooding occurs in the vicinity of 20th Street East, 30th Street East, and Amargosa Creek. Summer thunderstorms also increase the potential for flash floods, creating a yearlong potential problem.

Following severe flooding in the Antelope Valley Region in 1980, 1983, and 1987, the LACDPW prepared the “Antelope Valley Comprehensive Plan of Flood Control and Water Conservation.” This plan proposed floodplain 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 areas prone to flooding, 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 washes (LACDPW 1987).

Both the City of Palmdale and the City of Lancaster have incorporated major elements of the LACDPW comprehensive plan 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, LACDPW 2004). The cities have annexed portions of Los Angeles County, which 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 unincorporated areas of the Region.

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

3.3.1 Regional Flood Management Issues and Needs

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;
- Habitat and dry lakebed requirements to protect natural processes;
- Baseline flooding and sediment/erosion not well defined;
- No development guidelines for alluvial fans;
- Protection of habitat processes and sensitive habitats which rely on surface flow such as Antelope Valley Significant Ecological Areas (SEA), Piute Ponds, clay pans, mesquite woodlands, and dry lakes.

An Integrated Flood Management Summary Document was developed during the 2013 IRWMP Updates and is included in Appendix F.

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 no 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 region.

Flood management activities also need to be coordinated with other agencies, such as water purveyors, to support a multi-use perspective. For example, the development of stormwater capture and infiltration basins in the upper watershed areas will not only reduce flooding in the lower watershed (urban) areas but also contribute to groundwater recharge during the winter months. This groundwater recharge provides additional water supply in the summer months. In a similar fashion, activities of the development community will also need to be coordinated with flood management. New impervious surfaces not only increase peak surface flows but also decrease groundwater recharge capability.

3.3.1.2 Poor Water Quality of Runoff

Toxic pollutants are found within the Antelope Valley Region associated with the transport of sediment from the mountainous areas and mobilization of urban contaminants during storm events (Lahontan RWQCB 1994). Stormwater flows from the mountain areas to the Antelope Valley floor traverse highly erodible soils, which results in significant transport of sediments.

The sediment not only has the tendency to bulk peak flow and increase flood levels through sedimentation, but it also transports naturally-occurring contaminants such as arsenic and other heavy metals. Other contaminants, such as salts associated with de-icing of roads and parking lots are carried to the valley floor during rainfall events. In urban areas on the valley floor, contaminants such as pesticides, trash, oil, gasoline, radiator fluid, and animal wastes accumulate during dry months and are then mobilized at concentrated levels during storm events.

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, and poorly planned urban development further upsets the natural system within a watershed as follows:

- Direct impacts such as filling of wetlands, riparian areas, drainages, and other natural waters;
- Generation of pollutants and sediment during and after construction;
- Alteration of flow regimes;
- Reduction of groundwater recharge by impervious surfaces and stormwater collector systems;
- 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. The resulting condition then requires engineered solutions to the disrupted flow patterns which lead to near-total loss of natural functions and values in the affected basins. Impacts can be minimized through municipal stormwater programs that require use of Best Management Practices (BMPs) and conditions to be placed on new development proposals. Ideally stormwater programs would be developed through stakeholder involvement as part of an integrated program that would identify concepts and projects developed to maximize flood control benefits, water quality benefits, water supply benefits, and protection of natural surface flow routes and levels thereby protecting natural environments downstream.

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 EAFB) 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. This type of runoff concentrates contaminants in urban runoff and can negatively affect the water quality of receiving waters (e.g., groundwater).

Nuisance water and other dry weather flows need to be managed to prevent accumulation of contaminants by providing short and long term solutions through an integrated approach.

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. A poorly-designed 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 through an integrated management program that combines flood management, water quality improvements, and water supply augmentation.

3.3.1.5 Habitat and Dry Lakebed Requirements to Protect Natural Processes

Stormwater runoff within the Antelope Valley is carried by ephemeral streams. Between 0.36 inches and 0.56 inches of rainfall in the first 24 hours is required to saturate the soils and initiate surface flow runoff. As runoff moves from the headwaters to the lakebeds, some of the flow percolates into the stream beds and recharges the groundwater. Other portions flow through well-defined washes that change to braided alluvial fan washes and then top the channels and move as sheet flow across the lower valley floor, filling clay pan depressions (similar to vernal pools and potholes) and wetlands (most notable being Piute Ponds). Some of this water percolates into sand dunes where the water is sequestered for later use; the remainder flows down to the valley floor into the dry lakebeds at EAFB. The amount of flow depends on the size of the storm and how much rainfall has already occurred recently. It has been documented in the "Surface Flow Study Technical Report" (EAFB 2012) that a 5 year storm (approximately 2.5 inches) is sufficient to provide 946 +/- 189 acre feet of surface water flow to Rosamond Dry Lake with the peak discharge measured at 92 cfs. The total sediment discharge measured was 1,542 metric tons. However the error rate is high at +/- 30%. Rogers and Buckhorn Dry Lakes were not measured. Stormwater runoff is important to downstream habitats throughout the Valley. These habitats are seen at EAFB as particularly valuable to sustain the surface structure of the dry lakebeds for their operational missions, the overall air quality of the Antelope Valley, and the Piute Pond Complex's wetland functions and values (Deal 2013).

3.3.1.6 Baseline Flooding and Sediment/Erosion Not Well Defined

Although the mechanisms of flooding and sediment transport and deposition are well known in the Antelope Valley Region, very little definitive information is available regarding flood extents, depths, velocities or areas of deposition and sedimentation. The Federal Emergency Management Agency (FEMA) conducted hydrologic and hydraulic analysis of the region starting in the early 1980s and ending in the late 1990s to prepare approved Flood Insurance Rate Maps (FIRM). The FEMA analysis was done at different times and to different levels of detail for different panels and does not include EAFB. The mapping FEMA provided for the different flooding zones should be viewed as approximate and is in need of an update.

3.3.1.7 No Development Guidelines for Alluvial Fans

Alluvial fans are classified as high flood hazard areas according to FEMA and development on alluvial fans is discouraged. Although development is discouraged, there are engineering techniques that can reduce the risk of property loss or loss of life. A guidelines document could be developed that presents the risks of alluvial fan flooding along with mitigation techniques and approximate costs for the Antelope Valley Region.

3.3.1.8 Protection of Habitat Processes and Sensitive Habitats which rely on Surface Flow such as Antelope Valley Significant Ecological Areas (SEA), Piute Ponds, Clay Pans, Mesquite Woodlands, and Dry Lakes

Habitat processes and sensitive habitats that rely on surface flow are discussed in more detail in Section 3.4.

3.4 Environmental Resources

The Antelope Valley Region is part of a subbasin within the Mojave 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.

Unique Habitats

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, Amargosa Creek, Cottonwood Creek System), 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, wetland, and alkaline meadow habitat is present within the Piute Pond Complex. Wetland and wash areas are found within the Mesquite woodland. 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 the Antelope Valley Region means the 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 SEA designations by Los Angeles County, Desert Wildlife Management Area (DWMA) designations by USFWS, and development of a Habitat Conservation Plan (HCP) by the BLM.

Habitat Conservation

Habitat conservation activities in the Region include the establishment of SEAs and the development of habitat conservation plans such as the Antelope Valley Region Areawide Plan and the West Mojave HCP.

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).

The three Significant Ecological Areas in the Antelope Valley Region according to the Draft Los Angeles County General Plan Update include the Antelope Valley SEA, the Joshua Tree Woodland SEA, and the San Andreas SEA. (Los Angeles County 2012)

Antelope Valley SEA

The Antelope Valley SEA is located within the central portion of the Antelope Valley, primarily east of the cities of Palmdale and Lancaster, within a predominantly unincorporated area of Los Angeles County. This area includes tributary creeks to Littlerock and Big Rock Creeks downstream to the valley floor and floodplain zones of Rosamond, Buckhorn and Rogers dry lakes. Given the large area encompassed by this SEA, it has a highly diverse biota along with diverse desert habitats.

The watershed areas upstream of the dry lake beds provide wash, scrub, and desert riparian habitat for various plant, bird and burrowing mammal species. In particular, the South Fork of Big Rock Creek is part of the federally-designated critical habitat of the mountain yellow-legged frog, and serves as nesting area for bird species such as the gray vireo. The dry lake beds serve as habitat for many desert plants and wildlife species once found broadly across the Valley. The Piute Ponds and dry lakes have distributed habitat of marshy alkali grassland, alkali flats, and cattail and bulrush marsh augmented by wastewater treatment facilities that have additional ponds. The dry lake beds contain botanical features unique and limited in distribution, including the Mojave spineflower and the only healthy stands of mesquite in Los Angeles County.

The Desert-Montane area of this SEA, which centers on Mescal Creek, provides a combination of desert and montane habitats, making 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.

The Antelope Valley SEA also includes desert butte habitat which 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, den sites for mammals, and habitat for the desert wildflower and Joshua tree woodland areas. Suitable habitat for the Mojave ground squirrel (listed as "Threatened" under the California Endangered Species Act and "Special Concern" by the federal Endangered Species Act) is found in these butte areas.

Joshua Tree Woodland SEA

The Joshua Tree Woodland SEA is located in the western portion of the Antelope Valley in unincorporated Los Angeles County west and northwest of the Antelope Valley California Poppy Reserve. This SEA provides habitat to various plant and animal communities, particularly Joshua tree woodland. The scrubland, woodland and grassland habitats in this SEA provide foraging and cover habitat for year-round resident and seasonal resident song birds and raptors. In addition to Joshua trees, sensitive species in this SEA include the alkali mariposa lily, California horned lizard, golden eagle, Swainson's hawk, burrowing owl, loggerhead shrike, western mastiff bat, and Tehachapi pocket mouse.

San Andreas SEA

The San Andreas SEA is located in the western portion of the Antelope Valley in unincorporated Los Angeles County, and includes a small portion of the western Tehachapi foothills and then stretches in a southeasterly direction to include Quail Lake, the northern foothills of Liebre Mountain and Sawmill Mountain, large portions of Portal Ridge, Leona Valley, Ritter Ridge, Fairmont and Antelope Buttes, Anaverde Valley, Lake Palmdale, and terminating at Barrel Springs (a sag pond near the City of Palmdale). Vegetation in this SEA is extremely diverse, and includes desert scrub, chaparral, grassland, wildflower fields, southern willow scrub, foothill woodland, Joshua tree woodland, oak woodlands, southern cottonwood-willow riparian forest, freshwater marsh, alkali marsh, alluvial wash vegetation and ruderal vegetation. Given this variety of vegetation, wildlife within this SEA is diverse and abundant, and includes a number of sensitive species such as the California red-legged frog, California horned lizard, prairie falcon, southwestern willow flycatcher, Mojave ground squirrel, and the California condor.

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 USFWS. The *West Mojave Plan* also acts to amend the California Desert Conservation Area Plan. The Planning Area for the *West Mojave Plan* includes the entire Antelope Valley Region. The objective of this HCP is to develop a comprehensive strategy to preserve and protect the desert tortoise, the Mojave ground squirrel, and over 100 other sensitive plants, animals and habitats. The HCP would establish additional conservation areas for the desert tortoise and Mojave ground squirrel and alter allowable motorized vehicle routes on BLM managed lands. Jurisdictions that have adopted the 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 (Mojave 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.

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 Mojave 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.

3.4.1 Regional Environmental Resource Issues and Needs

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 among industry, growth, and preservation of natural areas and open space/Desire to preserve open space;
- Protection of threatened and endangered species; and
- Removal of invasive non-native species from sensitive ecosystems.

3.4.1.1 Conflict among Industry, Growth and Preservation of Natural Areas 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 2.10, population in the Antelope Valley Region is expected to increase by

153 percent between 2010 and year 2035. Some of this growth will result in conversion of agricultural land, but more of this growth will occur in locations that are currently natural areas. Loss of both agricultural acreage and natural areas decreases the amount of open space in the Antelope Valley Region.

3.4.1.2 Protection of Threatened and Endangered Species

Pressures for growth and recreational activities in the Antelope Valley Region have been linked to significant declines in desert species such as the desert tortoise, Mojave ground squirrel and burrowing owl. Growth of urban areas results in loss of available or suitable habitat for sensitive species. For example, studies of the desert tortoise have shown a significant downward decline in the population from 1975 to 2000 related to urban growth (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.

3.4.1.3 Removal of Invasive Non-native Species from Sensitive Ecosystems

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, 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.
- 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 farm land.
- Erosion: Increased erosion of stream banks, 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 (particularly near Piute Ponds).

- 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.

3.5 Land Use

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, last adopted in 1980; is currently being updated as part of a multi-year planning effort.

State 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 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 Regional Land Use Issues and Needs

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;
- Pressure for growth in the Antelope Valley Region;
- Loss of local culture and values; and
- Dust control.

3.5.1.1 Growing Public Demand for Recreational Opportunities

The Antelope Valley Region offers many recreational opportunities. The Antelope Valley Region has over 410 acres of developed park land including 27 parks, 22 softball fields, five baseball fields, 21 soccer fields and 17 tennis courts. In addition there are over 3,000 acres of natural park land and approximately 5,600 acres of upland and wetland natural areas at Piute Ponds. The 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, sightseeing, 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.

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.

3.5.1.2 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 climatic 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 were 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 (LACDPW 1989). However, the overall trend for agricultural land use continued to decrease through the 1980s and 1990s. 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 2.10, 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 nearly 550,000 people will reside in the Antelope Valley Region by the year 2035, an increase of approximately 153 percent from the 2010 population (refer to Section 2.10.2 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 in Los Angeles County, including residential, commercial/industrial, retail, and agricultural.

Development in the Antelope Valley is also projected to be influenced by the construction of California’s high-speed rail. The rail is planned to head northbound from Los Angeles to Bakersfield through a station in Palmdale. With the addition of high-speed rail station connecting the Antelope Valley to the rest of the state, development pressures in the Region are likely to increase.

3.5.1.3 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. EAFB 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. Mining, a large part of the history of the Antelope Valley, has been less prominent in recent years, yet there are several mines that still produce quantities of gold and silver. One such mine, the Golden Queen Mine (formerly known as the Silver Queen mine) is beginning a full scale recovery of gold, silver and aggregate within the next two years. A formal grand opening of the Golden Queen headquarters was completed in mid- October 2013 in the community of Mojave and many jobs are expected to come from the mining operation. Rio Tinto’s Borax mine in the community of Boron is considered one of the largest employers in the Antelope Valley aside from the U.S. Government, employing over

300 workers. Aside from these operations, rock and gravel quarrying is also conducted in the southeastern part of the Antelope Valley Region along the mountain foothills.

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, impacts fluctuations in groundwater levels, and heightens concerns over the potential for contamination and reliability of these supply sources.

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 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.

3.5.1.4 Dust Control

Dust control is a particular issue in the Antelope Valley as more land is disturbed and voided of vegetation by activities such as solar farming and mining. Disturbance to the soil causes a loss of soil protection that initiates dust issues and causes excessive runoff of soil particles and contaminants. Water supply can be impacted by a reduction of plant material in the soil that reduces soil permeability and water storage.

Water quality impacts from soil disturbance activities stem from an increase in runoff and a decrease in soil protection. Excessive runoff increases sediment and contaminant loading to streams and natural areas. Disturbed vegetation cover can also degrade ecosystems and delay the reestablishment of natural stream areas, which further impacts water quality.

Other environmental impacts from soil disturbance and vegetation cover loss include increased dust storms and lifestyle disturbance. Dust storms can cause road closures, a decline of populations in rural areas, and loss of utility services among other things. As land use in the Antelope Valley changes impacts to these resources need to be considered and balanced. As flood control and surface flow runoff diversion projects are considered, impacts to the dry lakebeds also need to be considered. A lack of surface water flow to maintain the cryptobiotic surface layer will cause breakdown of the lakebed surface structure and add to regional dust storm issues.

3.5.2 AB 3030 Land Use Considerations

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 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 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.

3.6 Climate Change

3.6.1 Identification of Vulnerabilities

Understanding the potential impacts and effects that climate change is projected to have on the Region allows an informed vulnerability assessment to be conducted for the Region's water resources. A climate change vulnerability assessment helps a Region to assess its water resource sensitivity to climate change, prioritize climate change vulnerabilities, and to ultimately guide decisions as to what strategies and projects would most effectively adapt to and mitigate against climate change. DWR has recommended IRWM Regions use the Climate Change Handbook for Regional Planning (developed by USEPA, DWR, Army Corps, and the Resource Legacy fund) as a resource for methodologies to determine and prioritize regional vulnerabilities. The Climate Change Handbook provided specific questions that help to identify key indicators of potential vulnerability, including:

- Currently observable climate change impacts (climate sensitivity)
- Presence of particularly climate-sensitive features, such as specific habitats and flood control infrastructure (internal exposure)
- Resiliency of a region's resources (adaptive capacity)

The Region's Climate Change Subcommittee conducted an exercise to answer vulnerability questions taken from Box 4-1 of the Climate Change Handbook and associated the answers with potential water management issues/vulnerabilities. See Appendix H for the completed vulnerability question worksheet. Included in this analysis are qualitative vulnerability questions framed to help assess resource sensitivity to climate change and prioritization of climate change vulnerabilities within a region. Answers to vulnerability questions are given for the Region with local examples provided as justification for the answer. Vulnerability issues are prioritized in the next section.

The Climate Change Subcommittee discusses the vulnerabilities of the Region's water resources to climate change

3.6.2 Prioritization of Vulnerabilities

The vulnerability issues identified in the climate change analysis discussed above were reviewed by the Climate Change Subcommittee, and some of the language was refined to better articulate the vulnerability issues of the Region. The revised vulnerability issues were then prioritized into three tiers based upon the perceived risk and importance of the issue. Those vulnerabilities posing the greatest risk of occurrence and resulting in the greatest impacts upon occurrence were ranked as the highest priority.

The list of prioritized vulnerabilities developed by the Workgroup is shown in Table 3-19, and they are discussed further below. Note that the vulnerability issues shown in Appendix H do not exactly match those in Table 3-19 since refinements and edits were made to the vulnerabilities during the prioritization process.

Table 3-19: Prioritized Regional Vulnerability Issues

Priority Level	Category and Vulnerability Issue
High	• Water Demand/Supply: Limited ability to meet summer demand and decrease in seasonal reliability • Flooding: Increases in flash flooding, with particular attention paid to the balance of flood control with habitat and lakebed needs which EAFB depends on • Water Supply: Lack of groundwater storage to buffer drought • Water Supply: Decrease in imported supply • Water Supply: Invasive species can reduce supply available • Ecosystem and Habitat: Increased impacts to water dependent species and decrease in environmental flows • Water quality: Increased constituent concentrations
Medium	• Water Supply: Decrease in local surface supply • Water Quality: Increased erosion and sedimentation • Water Supply: Sensitivity due to higher drought potential • Ecosystem and Habitat: Decrease in available necessary habitat
Low	• Water Demand: Industrial demand would increase • Water Demand: Crop demand would increase per acre • Water Demand: Habitat demand would be impacted • Flooding: Increases in inland flooding

The justifications as to why the following vulnerability issues were classified as high priority are provided below:

- *Limited ability to meet summer demand and decrease in seasonal reliability*: The Region has high irrigation demands during summers. Increases in temperature due to climate change would likely increase this already high demand, as well as decrease supplies available.
- *Increases in flash flooding, with particular attention paid to the balance of flood control with habitat and lakebed needs which EAFB depends on*: As discussed previously, flooding is common in the Region, particularly in the foothill areas. The projected increase in storm intensity will likely increase the occurrence and intensity of flash flooding. This increase

will need to be managed carefully in light of habitats that depend on these seasonal flash floods and the needs of EAFB.

- *Lack of groundwater storage to buffer drought*: Groundwater levels are a longstanding issue in the Region. The Region is limited in terms of the groundwater stored from year to year, and has issues with groundwater quality in some areas. Should a prolonged drought occur, this resource may not be available to buffer supply needs during additional drought years.
- *Decrease in imported supply*: The Region is heavily dependent upon imported water supplies which are very susceptible to the impacts of climate change given their reliance on seasonal snowpack. The Region could not be solely dependent upon local resources to sustain the current economy, so some imported water must be secured. The supply is highly vulnerable at its source given the dependence upon the stability of the California Bay Delta levee system. Climate change impacts to this area from higher sea level rise and higher storm surges could be catastrophic to the supply.
- *Invasives can reduce supply available*: Invasive species are becoming more common in the Region, and may increase with the projected changes to temperature and precipitation. Certain invasive species, such as Tamarisk and Arundo, may reduce the water supply available for native species.
- *Increased impacts to water dependent species and decrease in environmental flows*: A number of water dependent species are present in the Region that require certain stream flows to maintain habitats, such as those species dependent on the Piute Ponds. The projected changes to local temperature and precipitation may impact these environmental flows, and impact water dependent species, particularly since these species have limited opportunity for migration.
- *Increased constituent concentrations*: Decreases in stream flows may reduce the ability for these streams to dilute water quality constituents. Should stream flows decrease due to increases in temperature and decreases in annual precipitation, the water quality of local streams may be impacted. In addition, the projected increase in wildfires in the surrounding mountains may lead to increased erosion and sedimentation in local streams.

It is the intention of the stakeholder group to maintain an ongoing process to gather data and revisit the prioritized vulnerabilities every five years along with other updates to the Antelope Valley IRWM Plan. This data collection and analysis will be directed by the A-Team.

3.7 DAC Issues and Needs

To help characterize DAC areas in the Region, identify DAC water resource issues, and develop implementation strategies (including a monitoring plan), two separate technical memoranda were prepared during the 2013 IRWMP Updates:

- *DAC Water Supply, Quality and Flooding Data Final Draft TM* (August 2, 2013) – This document explains the methodology used to identify DAC areas in the Region with census and Geographical Information System (GIS) tools; develops maps for DACs; documents the DAC outreach efforts undertaken as a part of the 2013 IRWMP Updates; and outlines specific issues for DACs related to water supply, water quality, and flooding. Maps are included that further illustrate the scope of these issues. The document also provides a preview of monitoring studies that are needed to address data gaps in these three water-related areas.
- *DAC Monitoring Plan Final Draft TM* (September 25, 2013) – This document summarizes the water supply, water quality, and flood protection issues for DACs in the Region; develops monitoring objectives; and provides guidance for data dissemination and reporting.

The monitoring objectives developed in this TM may be summarized as:

- Water supply
  - Track volume of supplies delivered to DACs by water source and supplier
  - Assess conditions of aging facilities (wells, treatment systems and pipelines) to determine need for new or improved infrastructure
- Water quality
  - Track the quality of drinking water delivered to DACs
  - Map groundwater quality issues in DACs to determine areas of poor groundwater quality and need for treatment
- Flood protection
  - Track flood incidents in DACs to determine need for flood infrastructure improvements (flood incident date and location, storm intensity, and flood depth.

For additional details on these topics, these documents are included in Appendix D.

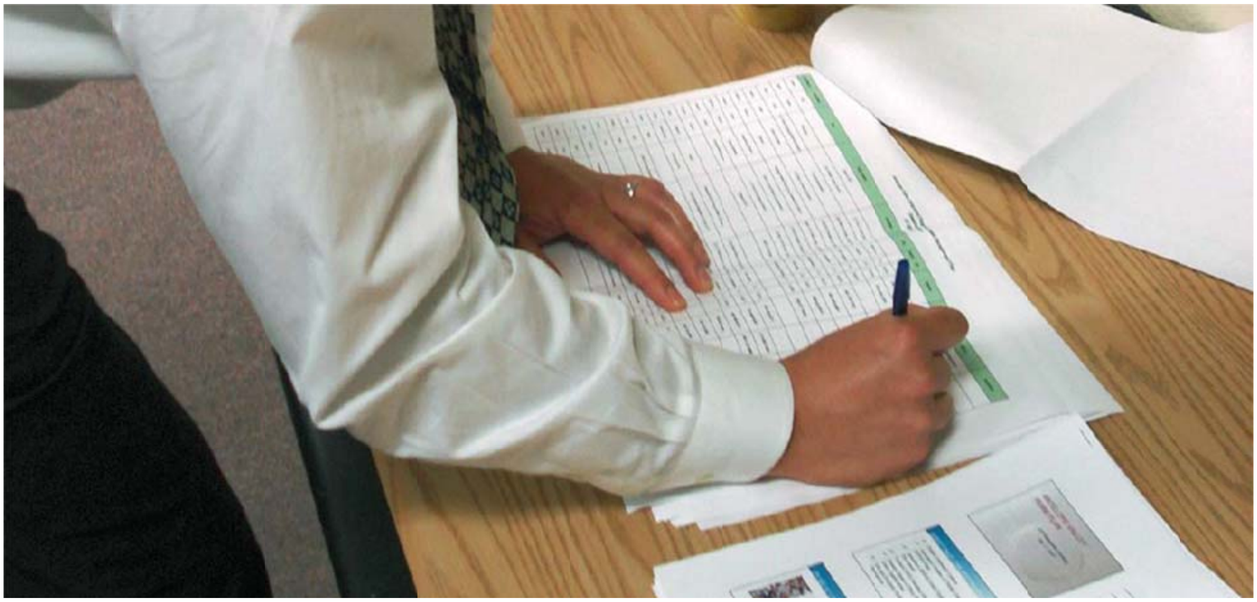
Section 4 | Objectives

The following section presents the Region's 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. These Objectives and Planning Targets were originally established in 2007 and were revised during the 2013 IRWM Plan updates. This section describes how the objectives were developed, what information was considered, what groups were involved in the process, and how the final decision was made and accepted by the IRWM stakeholders.

4.1 Objectives Development

The primary focus of this IRWM Plan is to develop a broadly-supported water resources management plan that defines a meaningful course of action to meet the expected demands for water and related resources within the Antelope Valley Region between now and 2035. Goals to meet this primary focus were originally established in 2007 and were revised during the 2013 IRWM Plan updates. The goals constitute the most general statement of intent and include maintaining a plan that will address:

- How to 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, enhance, and manage current water resources and the other environmental resources for human and natural benefit within the Antelope Valley Region.



These general goals were developed by the Stakeholder Group to provide broad direction. Soon after, the Stakeholder Group developed objectives to help clarify how the issues and needs of concern for the Antelope Valley Region would be addressed. These objectives were designed to be more specific than the general goals mentioned above. The list of objectives was developed in 2007 and then revised again during discussions at stakeholder meetings in August and October of 2012. During these revisions, stakeholders indicated broad consensus on the changes to the objectives during the meetings, and this was recorded in the meeting notes that are published to the www.avwaterplan.org website. The IRWM objectives consider all Lahontan Basin Plan objectives, 20x2020 water efficiency goals, and the CWC 10540(c) requirements as well as the specific needs of the Antelope Valley as represented by regional and local planning documents.

During the August and October 2012 stakeholder meetings, a discussion about prioritization of objectives was conducted. It was decided that for the Antelope Valley Region, objectives would not be prioritized with the understanding that each objective is equally important relative to the others given that the IRWM Plan is intended to be a truly integrated plan that incorporates all areas of water resource management. In addition, stakeholders feel that a more equal level of importance placed on each of the objectives contributes to the success of the stakeholder group interactions. The Antelope Valley Region may choose, however, to prioritize these objectives relative to grant requirements to enhance project prioritization and selection in the future. In those cases, the type of funding program will dictate which objective should be emphasized.

After objectives were established, even more specific planning targets were developed to establish quantified benchmarks for implementation of the IRWM Plan. The planning targets include deadlines and describe quantitative measurements where applicable. The IRWM Plan addresses the Antelope Valley Region's water resource management needs, open space, recreation, habitat, and climate change related targets. The planning targets were originally established in 2007 and were revised by the Stakeholder group during the 2013 IRWM Plan updates at stakeholder meetings in August and October 2012. During these revisions, stakeholders indicated broad consensus on the changes to the planning targets during the meetings, and this was recorded in the meeting notes that are published to the www.avwaterplan.org website. In addition, objectives and targets related to climate change were developed by the Region's Climate Change Committee in a workshop held in November 2012. The new climate change related objectives and targets were presented and agreed upon by stakeholders in the December 2012 stakeholder meeting as recorded in the meeting notes published to the www.avwaterplan.org website.

It is important to note that planning targets do not stipulate who is responsible for performing activities that will meet the numerical targets, nor do they specify exactly what projects will be implemented. The objectives and planning targets are presented below (and are summarized in Table 4-1).

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; and adapt to climate change.	Maintain adequate supply and demand in average years.
	Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
	Provide adequate reserves (164,800 AF/ 4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.
	Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.
Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries.	Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer by 2017
Stabilize groundwater levels.	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 regulatory requirements and 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 and maintain aquifers.	Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.
	Map contaminated sites and monitor contaminant movement, by 2017.
	Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017.
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.

Objectives	Planning Targets
Maximize beneficial use of recycled water.	Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand 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 2017 and incorporate adaptive management strategies for climate change.
Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses.	
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 2017.
Land Use Planning/Management	
Maintain agricultural land use within the Antelope Valley Region.	Preserve 100,000 acres of farmland in rotation[1] through 2035.
Meet growing demand for recreational space.	Contribute to local and regional General Planning documents to provide 5,000[2] 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 2017 and incorporate adaptive management strategies for climate change.
Climate Change Mitigation	
Mitigate against climate change	Implement "no regret" mitigation strategies,[3] when possible, that decrease GHG's or are GHG neutral

4.2 Water Supply Management Objectives and Planning Targets

Water supply management objectives and planning 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.

Water Supply Management Objectives and Planning Targets address the following CWC 10540(c) requirements:

- Protection and improvement of water supply reliability, including identification of feasible agricultural and urban water use efficiency strategies

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

[2] 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 547,000 residents in the Antelope Valley Region.

[3] No regret projects are projects that would still be considered beneficial even if climate change weren't happening.

- Identification of any significant threats to groundwater resources from overdrafting

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

Reliability is defined herein as the likelihood that a certain amount of water will be delivered to a specific place at a specific time. Reliability depends on the availability of water from the source, availability and capacity of the means of conveyance, and the level and pattern of water demand at the place of delivery.

As discussed in Section 3, the Antelope Valley Region's expected demand between 2010 and 2035 is approximately 179,000 and 210,000 acre-feet per year (AFY), respectively, for an average water year. The planned water supply for an average water year is approximately 212,200 to 210,600 AFY, respectively. This indicates a potential surplus of between 600 and 33,000 AFY for the Region. There is, however, a mismatch of 61,200 AFY for a single dry water year and 164,800 AF/4-yrs for a consecutive 4-year multi-dry year condition. 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 estimates shown in Table 2-3. However, if actual growth is less than projected 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 mismatches. Similarly, this target assumes the supply from only currently planned sources presented in Section 3 and that groundwater extractions are limited to the total sustainable yield of 110,000 AFY. Limitations on imported water, local surface water, and/or recycled water could reduce the available supplies.

The first target has been revised to reflect changed conditions since 2007.

- Target: Maintain adequate supply and demand in average years.
- Target: Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
- Target: Provide adequate reserves (164,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.
- Target: Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.[4]

These Planning Targets may be measured by using the supply and demand information in the various UWMPs developed for water suppliers in the Antelope Valley, along with the other information sources for demand and supply numbers described in Sections 2 and 3. These numbers will be updated each time the IRWM Plan is updated.

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

Given the Antelope Valley Region's dependence on 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

[4] Estimated imported water delivery reduction from California Climate Change Center, 2009. Using Future Climate Projections to Support Water Resources Decision Making in California. CEC-500-2009-052-F.

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 65,000 AFY in an average water year. This estimate assumes that 33 percent (1/3) of demands occur during winter months (October through March) and 66 percent (2/3) occur in summer months (April through September); and it is based on the direct deliveries for AVEK discussed in Section 3.1.2.[5] 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 over an average year without receiving SWP water for 6 months over the summer by the June 2017.

This Planning Target may be measured by using UWMPs and other capacity related planning documents to show that sufficient pumping capacity exists in the Region to provide 65,000 AFY of water over a six-month time period during the summer. This represents a "worst case scenario" since under dry year and multi-dry year scenarios, smaller allotments of imported water would be available to begin with. So 66 percent reductions in these smaller amounts would have less impact.

Objective: Stabilize groundwater levels.

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.

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.

This Planning Target may be measured by using the collective data from 2001 to 2010 to establish a groundwater level baseline in the year 2010. Then, the same monitoring systems may be used to track the changes in groundwater level over time, as reported through the State Water Resources Control Board's (SWRCB) Groundwater Ambient Monitoring and Assessment (GAMA) Program which collects groundwater quality data from a number of sources.

4.3 Water Quality Management Objectives and Targets

For this IRWMP, AB 3030 elements are used as a guideline for water quality objectives. Addressing the 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 agencies of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects; development of relationships with State and Federal regulatory agencies; and

[5] An average water year for the Region has approximately 95,500 AFY of direct deliveries from imported water providers. AVEK typically delivers 400 AF/day between June 15th and September 30th in any given year. During other times of year, AVEK typically delivers 150 AF/day. These values dictate that approximately 33% of annual demands occur in winter months (October to March) and 66% occur in summer months (April to September). Therefore, approximately 66% of average year direct deliveries (65,000 AFY) would not be available during a 6-month disruption over the summer.

review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

Water Quality Management Objectives and Planning Targets were developed to address the following CWC 10540(c) requirements:

- Identification and consideration of the drinking water quality of communities within the area of the Plan
- Protection and improvement of water quality within the area of the Plan consistent with relevant basin plan
- Protection of groundwater resources from contamination

Objective: Provide drinking water that meets regulatory requirements and customer expectations.

As discussed in Section 3.2, water quality is generally good within the Antelope Valley except for the northeast region that borders the Lancaster subunit. Some shallow wells in north EAFB and Boron show poor groundwater quality which 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 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 by CDPH. Additionally, TDS and nitrate are two primary constituents that present concern in the southern portion of the valley, as well as arsenic which has recently become a concern.

However, in addition to meeting the Federal and State standards for water quality, other secondary standards (i.e., 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 aesthetics throughout the planning period.

This Planning Target may be measured by using potable water quality data made available by the water purveyors in the Region through annual water quality reports, and using this information to track exceedances of drinking water quality standards.

Objective: Protect and maintain aquifers.

Groundwater is a main component of the Antelope Valley Region's water supply. Any loss of supply due to water quality degradation or contamination[6] would significantly hinder the Antelope Valley Region's ability to meet anticipated demands. As the Antelope Valley Region begins to reduce its exclusive 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, possibly to the point of contamination. Identifying sources of degradation 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

[6] 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".

implemented to prevent migration to other areas of the Basin. In some cases, treatment or remediation may be required to prevent migration. 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.[7] Other sources of potential degradation 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 should be identified, mapped, and monitored to prevent any future migration. The mapped information should include constituent concentrations in areas of concern, including TDS, nitrogen species (ammonia, nitrate, and nitrite), chloride, arsenic, chromium, fluoride, boron, and constituents of emerging concern (CECs; e.g., endocrine disrupters, personal care products or pharmaceuticals) consistent with the actions by the SWRCB taken pursuant to the Recycled Water Policy. Accordingly, 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.
- Target: Map contaminated sites and monitor contaminant movement by 2017.
- Target: Identify contaminated portions of aquifer and prevent migration of contaminants by 2017.

These Planning Targets may be monitored by mapping data from SWRCB's GAMA program to track changes in groundwater quality over time. The SWRCB is responsible for administering and maintaining the GAMA data.

Objective: Protect and maintain natural streams and recharge areas.

In addition to protecting the aquifer, it is also important to protect the surface water areas of the Antelope Valley Region from degradation and contamination[8]. Natural streams feed the Littlerock Creek, Amargosa Creek, Anaverde Creek, Cottonwood Creek, and others as well as recharge areas in the Antelope Valley Region. Thus, any degradation in water quality in the streams could result in contamination 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.

This Planning Target may be monitored by agencies already monitoring local surface waters, including PWD (which monitors Littlerock Creek), and the Los Angeles County Watershed Management Division and Kern County which monitor general surface water quality of surface waters (general minerals).

Objective: Maximize beneficial use of recycled water.

As discussed in Section 3, approximately 31,000 AFY of recycled water will be available for use by 2035, assuming treatment plant upgrades and distribution system development occur as planned. This estimate does not include current environmental maintenance uses. However, only approximately 21,900 AFY are planned to be utilized by 2035 for M&I users and groundwater

[7] As required by the November 2003 Cleanup and Abatement Order, and October 2004 Cease and Desist Order issued to LACSD by the Lahontan Region RWQCB.

[8] 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".

recharge, through the planned projects. Beneficial use of the remaining approximately 9,000 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 for existing beneficial uses or for groundwater recharge. The Los Angeles County and Antelope Valley Areawide General Plans currently identify general goals and policies to encourage groundwater recharge and reuse of recycled water. Moreover, the reuse of recycled water for municipal, industrial, and groundwater recharge end uses is critical for the long-term supply reliability of the Region. 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 to help meet expected demand by 2015, 66 percent by 2025, and 100 percent by 2035.

This Planning Target may be measured by monitoring programs maintained by LACSD to record the amounts of recycled water delivered to customers. Documents such as annual reports for the Lancaster WRP and Palmdale WRP may be used to obtain the information.

4.4 Flood Management Objectives and Targets

Flood Management Objectives and Planning Targets address the following California Water Code (CWC) 10540(c) requirements:

- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region

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

Objective: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses.

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. The Region recognizes that it may be vulnerable to potential increases in flooding due to projected changes in precipitation caused by climate change.

Extensive growth in the Antelope Valley has occurred in both major 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. Flood waters are necessary to provide benefits in natural areas of the Region. One example of the importance of maintaining natural flood flow areas is Rosamond Dry Lake at the lowest elevation in the watershed. This lake requires significant flooding to maintain the biological crust that protects the lakebed surface from breaking down during high wind events. By protecting the lakebed surface, the air quality in the Antelope Valley is protected, and the operational mission of EAFB is protected by providing a suitable surface to test experimental aircraft and processes, which in turn provides jobs to Antelope Valley residents.

To adequately address the need for maintained 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 supply need there is the added incentive for the flood management systems to convey waters of suitable quality to recharge systems to augment groundwater supply for the benefit of multiple communities. Additionally, as discussed in Sections 2 and 3, changes in precipitation brought on by climate change are predicted to increase flash flooding in the Valley. To help respond to this, the Region can implement adaptive flood management that will allow for the continued multi-benefit use of flood water while maintaining flood protection.

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 various land use authorities including incorporated cities and Kern and Los Angeles counties. New development is 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 Area Wide 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 the development (due to extreme hazard) or by requiring new development to conform to special performance requirements in the flood fringe areas adjacent to a waterway.

While optimizing the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses, it is important to acknowledge that the natural habitats downstream (e.g., Piute Ponds) are very dependent on the natural flows. Although some natural habitats have been sustained through the years by recycled water, the dramatic stormflows are still a major component of the system. The magnitude of these stormflows provides needed clearing of vegetation, sediment, and water to wetland and wet meadow areas. A major alkali mariposa lily population exists in the Piute Pond Complex and requires surface water flow to maintain.

The local and regional General Plan policy documents pertaining to flood management within the Antelope Valley Region can be found in Table 8-1 in Section 8.

Accordingly, the following Planning Target has been identified:

- Target: Coordinate a regional flood management plan and policy mechanism by the year 2017 and incorporate adaptive management strategies for climate change.

This Planning Target may be measured by the incorporation of regional integrated flood management strategies, including adaptive management strategies for climate change, into the 2013 IRWMP Update. The Update may also include recommendations for a policy mechanism.

4.5 Environmental Resource Management Objectives and Targets

Environmental Resource Management Objectives and Planning Targets address the following CWC 10540(c) requirements:

- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region

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. 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. that should not be considered 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 (e.g., filtration of surface water, stormwater detention, habitat), 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. As discussed in Section 3, besides a direct loss of habitat, increasing proximity to urban development is harmful to sensitive desert species, several of which are found only in the Antelope Valley Region. Examples of species that are impacted include the desert tortoise, Mojave ground squirrel, Arroyo toad, burrowing owl, alkali mariposa lily, and Joshua tree.

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 2017.

This Planning Target needs to be consistent with local planning objectives such as those identified in the Antelope Valley Area Wide General Plan, the Kern County General Plan, and other management plans approved for the Antelope Valley Region, some of which are discussed below. This target is not limited to 2,000 acres, and conservation of acreages greater than 2,000 acres is encouraged. For future consideration, it may be useful to set a Planning Target regarding the inventory, mapping, and protection of a minimum number of acres/linear area of remaining natural areas that are dependent on flooding and their connectivity to the headwaters.

This Planning Target will be measured using land acquisition information (including acreage of open space preserved and number of parcels acquired) obtained through the Los Angeles County Department of Regional Planning, the Kern County Planning and Community Development Agency, and the Antelope Valley Conservancy.

Policies within the Antelope Valley Area Wide General Plan implement Los Angeles County's General Plan, and further specify objectives and goals specific to that Antelope Valley Region. The Antelope Valley Area Wide 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 Littlerock Wash, Big Rock Wash, Portal Ridge-Liebre Mountain and Tehachapi Foothills and other SEAs.[9] 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 Area Wide General Plan, new urban growth or encroaching uses and activities would be controlled 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 located

[9] The SEA program is a component of the Los Angeles County General Plan Conservation/Open Space Element. SEAs are ecologically important land and water systems that support valuable habitat that plants and animals, often integral to the preservation of rare, threatened or endangered species and the conservation of biological diversity in Los Angeles County. Source: Los Angeles County Department of Regional Planning, http://planning.lacounty.gov/sea

around the existing biological resources (Los Angeles County 2006) would help to ensure protection of sensitive species and their habitats as well as helping to make the location and size of the preserved area scientifically defensible.

The Kern County General Plan does not identify specific open space or habitat areas to be preserved (Kern County 2008). 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." Additionally, the open-space element of the Kern County General Plan contains measures for preserving open-space for natural resources.

The West Mojave Plan covers 9.4 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 Mojave ground squirrel and over 100 other sensitive plants and animals and the natural communities of which they are a part. The West Mojave Plan accomplishes this 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 Mojave 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[10], 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 Planning/Management Objectives and Targets

Land Use Planning/Management Objectives and Planning Targets address the following CWC 10540(c) requirements:

- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region

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

As discussed in Section 3, there is an estimated 19,000 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

---

10 "While many of the general conservation concepts and species accounts are valid in the West Mohave Plan the Plan relies heavily upon habitat protection within BLM lands as mitigation for impacted habitats from development occurring elsewhere, perhaps many miles away……. the Department of Fish and Game did not endorse the WMP as a habitat protection planning document (personal communication, S. Harris, Department of Fish and Game.)"

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 (e.g., 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 Area Wide Plan have designated “Agricultural Resource Areas,” which consist of areas that have been historically farmed in the County, as well as farmland identified by the California Department of Conservation, that are protected by policies to prevent the conversion of farmland to incompatible uses. 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 agriculture into underutilized lands, such as utility rights-of-way and flood prone areas is encouraged. The Kern County General Plan also has policies in place to protect areas designated for agricultural use from incompatible residential, commercial, and industrial subdivision and development activities. 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[11] through 2035.

This Planning Target will be measured using farmland area shown in general plan map updates as compared to previous general plan maps.

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

[11] 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.

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. It is the intent of this IRWMP to support and promote the preservation of recreational space in parallel with general plan efforts.

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

This Planning Target will be measured using current recreational area as provided through general plan maps and by cities, and tracking the increased acreage of recreational space created through implementation of projects.

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 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 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. Additionally, the potential need to adapt to climate change in the future should be considered through the inclusion of adaptive management strategies that will allow the Region to be flexible in the implementation of the land use management plan. Accordingly, the following Planning Target has been identified.

- Target: Coordinate a regional land use management plan by the year 2017 and incorporate adaptive management strategies for climate change.

This Planning Target may be measured by the incorporation of regional land use management strategies, including adaptive management strategies for climate change, into the 2013 IRWMP Update. The Update may also include recommendations for development of a land use management plan.

4.7 Climate Change Mitigation Objectives and Targets

Objective: Mitigate against climate change

In addition to adapting to the effects of climate change (which have been incorporated into the above objectives and targets), the Region recognizes the need to mitigate against future climate change by implementing resource management strategies (to be discussed in Section 5) that will increase energy efficiency, reduce greenhouse gas emissions, and/or sequester carbon. In order to acknowledge the challenges of interpreting new climate change information and identify which response methods and approaches will be most appropriate for their planning needs, the Region has decided to target the implementation of "no regret[12]" mitigation strategies which are strategies that will provide benefits under current climate conditions, while also mitigating against future climate change impacts. Therefore, the following Planning Target has been identified.

- Target: Implement "no regret" mitigation strategies, when possible, that decrease GHGs or are GHG neutral

This Planning Target will be measured by the incorporation of "no regret" mitigation strategies into the 2013 IRWMP Update, and through tracking of GHG emissions and energy usage by the Region's agencies.

[12] No regret projects are projects that would still be considered beneficial even if climate change weren't happening.

Section 5 | Resource Management Strategies

The following section introduces a diverse menu of resource management strategies (RMS) available to meet the Objectives for the Antelope Valley Region, and it goes on to examine the impacts and benefits of these strategies.

5.1 Consideration of Strategies

The State of California, through the 2009 California Water Plan, has identified 33 different RMS to improve regional water resource management. In order to determine what regional water management strategies should be included in the IRWMP, the Region considered the RMS listed and defined in Table 5-1 below in relation to the issues and needs determined by stakeholders and presented in Section 3 and the Region Objectives developed in Section 4. The RMS included as strategies in the IRWM Plan are those that have synergies with the Region's goals and objectives. Some RMS were not considered feasible or applicable for implementation in the Antelope Valley Region for the reasons listed below:

- Conveyance – Delta: Although this strategy could improve water supply reliability for the Region, it involves projects that would be implemented outside the Region and therefore it is not considered applicable.
- Desalination: There is no brackish groundwater or ocean water in the Region and therefore this strategy is not considered applicable.
- Precipitation Enhancement: This technology is unproven and was therefore not considered feasible for the Region.
- Surface Storage – CALFED Bay-Delta Program (CALFED): There are no CALFED storage facilities in the Region and therefore this strategy is not considered applicable.

- Crop Idling for Water Transfers: Because there has been no adjudication of groundwater rights in the Region as of the 2013 Update of the Plan, this strategy was not considered feasible for the Region.
- Dewvaporation or Atmospheric Pressure Desalination: Because this technology is unproven and there is no brackish water in the Region, this strategy was not considered feasible.
- Fog Collection: This technology is unproven and was therefore not considered feasible for the Region.
- Irrigated Land Retirement: Because there has been no adjudication of groundwater rights in the Region as of the 2013 Update of the Plan, this strategy was not considered feasible.
- Rainfed Agriculture: Because there is insufficient rainfall on the Valley floor to meet agricultural demands, this strategy was not considered feasible as a significant water supply measure. Rainfall is incorporated into the agricultural demand calculations in Section 3.
- Waterbag Transport/Storage Technology: This technology is unproven and was therefore not considered feasible for the Region.

Table 5-1: 2009 California Water Plan Resource Management Strategies

Resource Management Strategy	Description	Included in IRWM Plan
Reduce Water Demand		
Agricultural Water Use Efficiency	Agricultural water use efficiency is the use of incentives, public education, and other programs to achieve reductions in the amount of water used for agricultural irrigation.	Yes
Urban Water Use Efficiency	Urban water use efficiency is the use of incentives, public education and other programs to reduce potable water used for municipal, commercial, industrial, irrigation and aesthetic purposes.	Yes
Improve Operational Efficiency and Transfers		
Conveyance – Delta	The Delta conveyance strategy seeks to improve existing Delta conveyance systems by upgrading aging distribution systems, as well as to increase system flexibility and reliability through the addition of interconnections among water resources systems.	No
Conveyance – Regional/Local	The local/regional conveyance strategy seeks to improve existing local and regional conveyance systems by upgrading aging distribution systems, as well as to increase system flexibility and reliability through the addition of interconnections among water resources systems.	Yes
System Reoperation	System reoperation allows for better management and movement of existing water supplies, and includes managing surface storage facilities to optimize the availability and quality of stored water supplies.	Yes
Water Transfers	Water transfers are temporary or long-term changes in the point of diversion, place of use, or purpose of use due to contracting.	Yes
Increase Water Supply		
Conjunctive Management and Groundwater	Conjunctive management can help improve the long term and seasonal reliability of surface water supplies by recharging these supplies in groundwater basins when available, and recovering them through groundwater pumping when needed.	Yes
Desalination	Desalination is the removal of salts from saline waters, including ocean water and brackish groundwater.	No

Resource Management Strategy	Description	Included in IRWM Plan
Precipitation Enhancement	Precipitation enhancement artificially stimulates clouds to produce more rainfall or snowfall than they would naturally.	No
Recycled Municipal Water	Implementation of the recycled municipal water strategy develops usable water supplies from treated municipal wastewater.	Yes
Surface Storage – CALFED	CALFED surface storage increases imported water supply through the construction or modification of surface storage reservoirs to capture surface water to improve supply reliability to the Delta.	No
Surface Storage – Regional/Local	Regional and local surface storage increases local supply through the construction or modification of local or regional surface reservoirs or developing surface storage capabilities in out-of-region reservoirs.	Yes
Water Quality Management		
Drinking Water Treatment and Distribution	Drinking water treatment and distribution includes improving the quality of potable water supplied to customers and improving conveyance systems to improve the quality of supplies delivered from treatment facilities.	Yes
Groundwater and Aquifer Remediation	Groundwater and aquifer remediation removes constituents or contaminants that affect the beneficial use of groundwater.	Yes
Matching Water Quality to Use	Matching water quality to use recognizes that not all water uses require the same quality of water. Agricultural, municipal, landscape and residential water uses have different water quality needs.	Yes
Pollution Prevention	Pollution prevention controls or reduces pollutants from point and nonpoint sources that can affect multiple environmental resources, including water supply, water quality, and riparian and aquatic habitat.	Yes
Salt and Salinity Management	Salt and salinity management encourages stakeholders to proactively seek to identify the sources, quantify the threat, prioritize necessary mitigation action, and work collaboratively with entities with the authority to take appropriate actions.	Yes
Urban Runoff Management	Urban runoff management includes strategies for managing or controlling urban runoff, such as intercepting, diverting, controlling, or capturing stormwater runoff or dry season runoff.	Yes
Flood Management		
Flood Risk Management	Flood risk management focuses on protecting people, property and infrastructure from floods.	Yes
Practice Resources Stewardship		
Agricultural Lands Stewardship	Agricultural lands stewardship protects and promotes agricultural production through integrating best management practices that conserve resources.	Yes
Economic Incentives	Economic incentives, in the form of loans, grants, or water pricing support, are important for successful implementation of projects as a lack of adequate funds can prevent a project from moving forward.	Yes
Ecosystem Restoration	Ecosystem restoration aims to return a selected ecosystem to a condition similar to its state before any disturbance occurred.	Yes
Forest Management	Forest management aims to implement forest management projects and programs to help support water resources.	Yes

Resource Management Strategy	Description	Included in IRWM Plan
Land Use Planning and Management	Land use planning and management uses land controls to manage, minimize, or control activities that may negatively affect the quality and availability of groundwater and surface waters, natural resources, or endangered or threatened species.	Yes
Recharge Areas Protection	Recharge areas protection focuses on protection of lands that are important locations for groundwater recharge.	Yes
Water-dependent Recreation	Water-dependent recreation seeks to enhance and protect water-dependent recreational opportunities and public access to recreational lands through water resources management.	Yes
Watershed Management	Watershed management utilizes planning, programs, and projects to restore and enhance watershed functions.	Yes
Other Strategies		
Crop Idling for Water Transfers	Crop idling is the removal of lands from irrigation with the aim of returning the lands to irrigation at a later time to allow for the temporary transfer of water supplies for other uses.	No
Dewvaporation or Atmospheric Pressure Desalination	Dewvaporation is the process of humidification-dehumidification desalination where brackish water is evaporated by heated air, which deposits fresh water as dew on the opposite side of a heat transfer wall.	No
Fog Collection	Fog collection is the collection of water from fog using large pieces of material to make the fog condense into droplets and flow down to a collection trough.	No
Irrigated Land Retirement	Irrigated land retirement is the permanent removal of farmland from irrigated agriculture to free up water supplies for other uses.	No
Rainfed Agriculture	Rainfed agriculture is when all crop consumptive water use is provided directly by rainfall on a real time basis.	No
Waterbag Transport/Storage Technology	The use of waterbag transport/storage technology involves diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them to an alternate coastal region.	No

Table 5-2 shows the relationship between the RMS and the Regional Objectives. In many instances, regional strategies can address multiple IRWMP Objectives and Planning Targets. The remainder of this chapter describes the RMS selected for inclusion in the Plan according to Objective, and is organized into the following categories:

- Strategies for water supply management
- Strategies for water quality management
- Strategies for integrated flood management
- Strategies for environmental resource management
- Strategies for land use planning/management
- Strategies for climate change mitigation

These categories align with the groupings for Regional Objectives shown in Table 5-2.

Table 5-2: Strategies that Support the Antelope Valley Region's Objectives

	Antelope Valley Region Objectives													
	Water Supply Management			**Water Quality Management**				**Flood Management**		**Environ. Resource Mgmt.**		**Land Use Planning/ Mgmt**		**Climate Change**
	Provide reliable water supply to meet the Region's expected demand between now and 2035; and adapt to climate change	Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries	Stabilize groundwater levels	Provide drinking water that meets regulatory requirements and customer expectations	Protect and maintain aquifers	Protect natural streams and recharge areas from contamination	Maximize beneficial use of recycled water	Reduce negative impacts of stormwater, urban runoff, and nuisance water	Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses	Preserve open space and natural habitats that protect and enhance water resources and species in the Region	Maintain agricultural land use within the Antelope Valley Region	Meet growing demand for recreational space	Improve integrated land use planning to support water management	Mitigate against climate change
Reduce Water Demand														
Agricultural Water Use Efficiency	•	•	•								•			•
Urban Water Use Efficiency	•	•	•											•
Improve Operational Efficiency and Transfers														
Conveyance – Regional/Local	•	•	•											•
System Reoperation	•	•	•											•
Water Transfers	•	•	•											•
Increase Water Supply														
Conjunctive Management and Groundwater	•	•	•		•		•						•	•
Recycled Municipal Water	•	•	•				•					•		•
Surface Storage – Regional/Local	•	•	•					•					•	•
Water Quality Management														
Drinking Water Treatment and Distribution				•										
Groundwater and Aquifer Remediation	•	•		•	•									
Matching Water Quality to Use							•		•			•		
Pollution Prevention				•	•	•		•		•				

	Antelope Valley Region Objectives													
	Water Supply Management			Water Quality Management				Flood Management		Environ. Resource Mgmt.		Land Use Planning/ Mgmt		Climate Change
	Provide reliable water supply to meet the Region's expected demand between now and 2035; and adapt to climate change	Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries	Stabilize groundwater levels	Provide drinking water that meets regulatory requirements and customer expectations	Protect and maintain aquifers	Protect natural streams and recharge areas from contamination	Maximize beneficial use of recycled water	Reduce negative impacts of stormwater, urban runoff, and nuisance water	Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses	Preserve open space and natural habitats that protect and enhance water resources and species in the Region	Maintain agricultural land use within the Antelope Valley Region	Meet growing demand for recreational space	Improve integrated land use planning to support water management	Mitigate against climate change
Salt and Salinity Management				•	•									
Urban Runoff Management	•		•		•	•		•	•				•	
Flood Management														
Flood Risk Management	•	•	•			•		•	•	•			•	
Practice Resources Stewardship														
Agricultural Lands Stewardship	•									•	•		•	•
Economic Incentives	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ecosystem Restoration					•	•		•	•	•		•	•	•
Forest Management						•				•		•	•	•
Land Use Planning and Management								•	•	•	•	•	•	
Recharge Areas Protection			•		•	•		•		•			•	
Water-dependent Recreation						•				•		•	•	
Watershed Management					•	•		•	•	•	•	•	•	•

5.2 Strategies for Water Supply Management

Objective: Provide reliable water supply to meet the Region's expected demand between now and 2035; and adapt to climate change

The following RMS help to meet this Region Objective in the following ways:

- *Agricultural Water Use Efficiency* – reduces agricultural demands and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase agricultural demands and/or reduce available supplies
- *Urban Water Use Efficiency* – reduces urban demands and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase municipal demands and/or reduce available supplies

Outdoor uses such as irrigation account for most urban water demands in the Region.

- *Conveyance - Regional/Local* – increases reliability and control of water movement between imported water turnouts, surface and groundwater storage supply locations, and demand locations; minimizes losses that occur in the conveyance system
- *System Reoperation* – increases reliability and control of water movement between imported water turnouts, surface and groundwater storage supply locations, and demand locations and therefore increases overall reliability of water supplies
- *Water Transfers* – increase the amount of imported water supplies available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; increases the amount of overall supplies and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Surface Storage - Regional/Local* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Groundwater and Aquifer Remediation* – increases the amount of groundwater supplies available to the Region (previously unavailable due to contamination) and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies

- *Urban Runoff Management* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Flood Risk Management* – increases the amount of surface water supplies (stormwater) available to the Region by using integrated flood management and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Agricultural Lands Stewardship* – reduces agricultural demands and improves groundwater recharge using best management practices and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase agricultural demands and/or reduce available supplies
- *Economic Incentives* – used to implement water supply and/or demand management projects and therefore reduce the Regional gap between supply and demand; this indirectly supports adaptation to climate change impacts that increase demands and/or reduce available supplies

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

The following RMS help to meet this Regional Objective in the following ways:

The operation of reservoirs may allow for increased water capture.

- *Agricultural Water Use Efficiency* – decreases agricultural demands during a plausible disruption of SWP deliveries; demand management programs typically include tiered strategies that can be implemented as needed under a variety of circumstances
- *Urban Water Use Efficiency* – decreases urban demands during a plausible disruption of SWP deliveries; demand management programs typically include tiered strategies that can be implemented as needed under a variety of circumstances
- *Conveyance - Regional/Local* – increases reliability and ability to move water throughout the Region and minimizes losses that occur in the conveyance system; greater flexibility allows for increased use of alternate supplies during a SWP disruption
- *System Reoperation* – increases reliability and ability to move water throughout the Region; greater flexibility allows for increased use of alternate supplies during a SWP disruption
- *Water Transfers* – may increase access to stored SWP water that could be delivered during a SWP disruption
- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption

- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region; increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Surface Storage - Regional/Local* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region; increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Groundwater and Aquifer Remediation* – increases the amount of groundwater supplies available to the Region (previously unavailable due to contamination); increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Flood Risk Management* – increases the amount of surface water supplies (stormwater) available to the Region by using integrated flood management and therefore increases the availability of supplies during a SWP disruption
- *Economic Incentives* – used to implement water supply and/or demand management projects and therefore increase the availability of supplies during a SWP disruption

Objective: Stabilize groundwater levels

The following RMS help to meet this Regional Objective in the following ways:

- *Agricultural Water Use Efficiency* – decreases agricultural demands and therefore reduces specific demands for agriculture that are supplied by pumped groundwater
- *Urban Water Use Efficiency* – decreases municipal demands and therefore reduces specific demands for municipal users that are supplied by pumped groundwater
- *Conveyance - Regional/Local* – increases reliability and ability to move water throughout the Region and minimizes losses that occur in the conveyance system; allows greater control of the draw and fill of water banks in relation to demands located throughout the Region and therefore allows for groundwater supplies to be obtained from areas that are managed

Agricultural water use efficiency measures can reduce the Region's agricultural demand.

- *System Reoperation* – increases reliability and ability to move water throughout the Region; allows greater control of the draw and fill of water banks in relation to demands located throughout the Region and therefore allows for groundwater supplies to be obtained from areas that are managed
- *Water Transfers* – increases the amount of imported water supply that could be available for groundwater recharge or in-lieu supply
- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; these additional supplies could be available for groundwater recharge or in-lieu supply

- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region that could be available for groundwater recharge or in-lieu supply
- *Surface Storage* - Regional/Local – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region that could be used for groundwater recharge or in-lieu supply
- *Urban Runoff Management* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region that could be available for groundwater recharge or in-lieu supply
- *Flood Risk Management* – increases the amount of surface water supplies (stormwater) available to the Region, by using integrated flood management, that could be made available for groundwater recharge or in-lieu supply
- *Economic Incentives* – used to implement water supply and/or demand management projects that either decrease groundwater pumping demands or increase the capacity to recharge groundwater supplies
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge, thus contributing to the stabilization of groundwater levels

5.3 Strategies for Water Quality Management

Objective: Provide drinking water that meets regulatory requirements and customer expectations

The following RMS help to meet this Regional Objective in the following ways:

- *Drinking Water Treatment and Distribution* – allows water providers to produce the needed quality of drinking water and to move it to the appropriate locations
- *Groundwater and Aquifer Remediation* – allows the Region to treat compromised groundwater supplies to a level where they are available for beneficial uses, including drinking
- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering drinking water supplies at the source
- *Salt and Salinity Management* – reduces and/or manages the accumulation of salinity in drinking water supplies
- *Economic Incentives* – used to implement water quality improvement projects and therefore help to meet regulatory requirements and customer expectations

Objective: Protect and maintain aquifers

The following RMS help to meet this Regional Objective in the following ways:

- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; these additional supplies recharge groundwater, and high quality sources can potentially improve or maintain water quality in the aquifer
- *Groundwater and Aquifer Remediation* – improves water quality in aquifers through groundwater treatment to restore beneficial uses
- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering aquifers and degrading water quality

- *Salt and Salinity Management* – reduces and/or manages the accumulation of salinity in groundwater supplies
- *Urban Runoff Management* – reduces the amount of constituents from dry weather and stormwater runoff that move into groundwater and degrade aquifers
- *Economic Incentives* – used to implement water quality improvement projects that protect and maintain aquifers
- *Ecosystem Restoration* – improves and protects water quality entering aquifers by restoring vegetation that act as a buffer and filter to many pollutants
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge free of pollutants and therefore protects underlying aquifers from contamination
- *Watershed Management* – protects ecosystem functions provided by natural systems including the natural filtration of runoff before it enters aquifers

Objective: Protect natural streams and recharge areas from contamination

The following RMS help to meet this Regional Objective in the following ways:

- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering streams and recharge areas
- *Urban Runoff Management* – reduces the amount of constituents from dry weather and stormwater runoff that move into streams
- *Flood Risk Management* – reduces erosion and sedimentation of natural streams and recharge areas through integrated flood management practices
- *Economic Incentives* – used to implement water quality improvement projects that reduce contaminant loading to natural streams and recharge areas
- *Ecosystem Restoration* – restores and protects native habitats that can surround or encompass natural streams and recharge areas, many of which act as a buffer and filter to pollutants

Installation of bioswales reduces the amount of contaminants reaching local creeks.

- *Forest Management* – protects downstream water quality by maintaining upland forested areas and mesquite woodland areas which act as a buffer and filter to pollutants
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge free of pollutants, protecting the areas from water quality degradation
- *Water-dependent Recreation* – protects water quality in streams for recreational purposes
- *Watershed Management* – maintains and enhances ecosystem functions, including those provided by natural streams and recharge areas

Objective: Maximize beneficial use of recycled water

The following RMS help to meet this Regional Objective in the following ways:

- *Conjunctive Management and Groundwater* – allows capture of previously unusable recycled water by providing storage capacity; recycled water that is percolated into groundwater supplies typically receives some level of water quality improvement from soil aquifer treatment
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to meet demands in the Region
- *Matching Water Quality to Use* – recognizes the value of using lower quality recycled water for non-potable uses; increases the amount of recycled water supplies available to meet non-potable demands in the Region
- *Economic Incentives* – used to implement projects that expand the use of recycled water in the Region


The Antelope Valley Region has set a target to reuse 100% of recycled water by 2035.

5.4 Strategies for Integrated Flood Management

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

The following RMS help to meet this Regional Objective in the following ways:

- *Surface Storage - Regional/Local* – increases capacity to capture and retain flows from storm events and therefore reduces the negative impacts of flooding.
- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering stormwater at the source and therefore reduces negative downstream impacts of poor stormwater quality
- *Urban Runoff Management* – utilizes low impact development and best management practices to allow the capture of some peak stormwater flows onsite to reduce the risk of negative downstream flooding and poor stormwater quality
- *Flood Risk Management* – reduces the risks of flooding by utilizing capture, retention, infiltration, limitations on building in flood zones, and other integrated flood management techniques
- *Economic Incentives* – used to implement stormwater management projects that improve stormwater and urban runoff water quality
- *Ecosystem Restoration* – enhances and maintains natural areas that can filter or infiltrate stormwater and urban runoff, thus providing some level of attenuation for peak flood flows including the preservation of existing wetland areas along natural watercourses
- *Land Use Planning and Management* – promotes land use planning that incorporates flood risk considerations to reduce the negative impacts of flooding
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge; reduces downstream flooding by providing capacity for stormwater capture and infiltration, thus providing some level of attenuation for peak flood flows

- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem functions such as stormwater capture and infiltration

Objective: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses

The following RMS help to meet this Regional Objective in the following ways:

EAFB depends on stormwater flows to resurface the Rosamond Dry Lake Bed for operational and emergency landing uses.

- *Matching Water Quality to Use* – recognizes the beneficial use of stormwater for the maintenance of existing habitat, dust control, and lakebed resurfacing
- *Urban Runoff Management* – utilizes low impact development and best management practices to capture and use stormwater for recharge or reuse
- *Flood Risk Management* – utilizes capture, detention, and infiltration to minimize flooding and provide greater control over the fate and use of stormwater flows
- *Economic Incentives* – used to implement projects that can provide multiple integrated flood management benefits
- *Ecosystem Restoration* – enhances natural areas that can contribute to attenuation of peak flows, support habitat preservation, and provide greater control over the fate and use of stormwater flows
- *Land Use Planning and Management* – promotes land use planning that supports stormwater capture, diversion, reuse, or infiltration for beneficial uses
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem functions such as stormwater capture and infiltration

5.5 Strategies for Environmental Resource Management

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

The following RMS help to meet this Regional Objective in the following ways:

- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering streams and degrading natural habitats
- *Flood Risk Management* – reduces erosion and sedimentation of natural streams and recharge areas through integrated flood management practices; restricts development in the floodplain which may allow natural habitats to redevelop or prevent damage to natural habitats
- *Agricultural Lands Stewardship* – promotes the conservation and improvement of open space and water resources through the use of agricultural best management practices
- *Economic Incentives* – used to conserve, restore, and maintain natural habitats and open space

- *Ecosystem Restoration* – improves modified natural landscapes such as aquatic, riparian, and floodplain ecosystems that will impact water resources and species in the Region
- *Forest Management* – maintains upland forested areas to improve downstream water resources and species habitats
- *Land Use Planning and Management* – promotes planning that reduces the negative impacts of land use on flooding, water supply, water quality, and habitat; reduces development in the floodplain
- *Recharge Areas Protection* - maintains lands that are most suitable for groundwater recharge; conserves open space
- *Water-Dependent Recreation* – protects and maintains open space areas, both urban and natural, that have water-related recreational benefits
- *Watershed Management* – promotes integrative projects and planning that enhance the water resources functions provided by ecosystems

5.6 Strategies for Land Use Planning/Management

Objective: Maintain agricultural land use within the Antelope Valley Region

The following RMS help to meet this Regional Objective in the following ways:

- *Agricultural Water Use Efficiency* – reduces agricultural water demands and therefore could potentially allow more land to stay in production in times of water scarcity
- *Agricultural Lands Stewardship* – maintains agricultural lands through the conservation of natural resources and watershed functions
- *Economic Incentives* – used to support agricultural practices and stewardship projects
- *Land Use Planning and Management* – promotes land use planning that balances other land uses with preservation of open space and agricultural lands
- *Watershed Management* - promotes integrative projects and planning that enhance the water resources functions including those provided by agricultural lands

Agricultural lands stewardship will help the Region to preserve existing agricultural land.

Objective: Meet growing demand for recreational space

The following RMS help to meet this Regional Objective in the following ways:

- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region that could be used for park and field irrigation or for natural areas such as the Piute Ponds and lakebeds, therefore helping to maintain recreational space in times of water scarcity

- *Matching Water Quality to Use* – increases the amount of recycled water supplies available to the Region that could be used for park and field irrigation or for natural areas such as the Piute Ponds and lakebeds, therefore helping to maintain recreational space in times of water scarcity
- *Economic Incentives* – used to implement projects that expand or enhance recreational space
- *Ecosystem Restoration* – improves and protects threatened natural landscapes such as aquatic, riparian, and floodplain ecosystems that can provide passive recreational benefits
- *Forest Management* – maintains forested and mesquite wooded areas with the intention of improving water resources; managed areas can be used for recreational purposes
- *Land Use Planning and Management* – promotes planning that balances the expansion of urban development with the preservation of open space areas
- *Water-dependent Recreation* – protects and maintains open space areas that have water-related recreational benefits
- *Watershed Management* - promotes integrative projects and planning that enhance ecosystem services

Objective: Improve integrated land use planning to support water management

The following RMS help to meet this Regional Objective in the following ways:

- *Conjunctive Management and Groundwater* – allows the use of lands for groundwater recharge and recovery as well as other beneficial uses

Spreading facilities will allow the Region to recharge the aquifer when imported, recycled, and storm waters are available.

- *Surface Storage - Regional/Local* – allows the use of lands for water resource needs, habitat preservation, and recreation
- *Urban Runoff Management* – allows the use of lands for supply, integrated flood management, and other beneficial uses with low impact development and best management practices to capture and infiltrate runoff
- *Flood Risk Management* – allows the use of lands for integrated flood management and beneficial water-dependent habitat uses
- *Agricultural Lands Stewardship* – promotes the conservation and improvement of open space and water resources through the use of agricultural best management practices
- *Economic Incentives* – used to support land use planning projects
- *Ecosystem Restoration* – improves modified natural landscapes to restore ecosystem uses and preserve natural areas; allows the preservation of habitats for recreation and other beneficial uses
- *Forest Management* – maintains upland forested and mesquite wooded areas to improve water resource conditions, preserve habitat, and provide other beneficial uses

- *Land Use Planning and Management* – promotes planning that balances the expansion of urban development with the preservation of open space, agricultural lands, habitats, and natural flood pathways; incorporates strategies to maintain water resources
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge as well as other beneficial uses
- *Water-dependent Recreation* – protects and maintains open space areas that have water-related recreational benefits
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem services

5.7 Strategies for Climate Change Mitigation

Objective: Mitigate against climate change

The following RMS help to meet this Regional Objective in the following ways:

- *Agricultural Water Use Efficiency* – reduces agricultural demands and therefore reduces the Region's reliance on imported water; mitigates against climate change by reducing the energy use and greenhouse gas emissions associated with transporting water
- *Urban Water Use Efficiency* – reduces urban demands and therefore reduces the Region's reliance on imported water; mitigates against climate change by reducing the energy use and greenhouse gas emissions associated with transporting water
- *Conveyance* - Regional/Local – minimizes water losses in the conveyance system; reduces the energy use and greenhouse gas emissions associated with transporting water
- *System Reoperation* – improves the efficiency of existing operation and management of existing reservoirs and conveyance facilities; reduces the energy use and greenhouse gas emissions associated with system inefficiency

Climate-friendly building design can reduce the Region's GHG emissions.

- *Water Transfers* – reduces the energy use and greenhouse gas emissions associated with importing water when transfers originate from closer locations
- *Conjunctive Management and Groundwater* – increases local water supplies which mitigates against climate change by reducing the greenhouse gas emissions associated with the energy required to import water
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region; increases local water supplies which mitigates against climate change by reducing the greenhouse gas emissions associated with the energy required to import water
- *Surface Storage - Regional/Local* – increases local water supplies which mitigates against climate change by reducing the greenhouse gas emissions associated with the energy

required to import water; however, the reduction in surface flow amplifies impacts to downstream natural areas

- *Agricultural Lands Stewardship* – promotes the conservation and improvement of agricultural lands through the use of agricultural best management practices; optimizes crop yield which may help to sequester carbon
- *Economic Incentives* – used to encourage the use of renewable energy for water treatment and conveyance; may provide funds to develop more local supplies to offset imported water use
- *Ecosystem Restoration* – increases local groundwater supplies by maintaining areas that allow for natural groundwater recharge, reducing the need to import water; restores and protects ecosystem processes in downstream areas
- *Forest Management* – maintains forested lands and mesquite woodlands which help sequester carbon
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem services such as groundwater recharge that increases local water supplies and reduces the need to import water; protects downstream surface water flows and habitats that can reduce GHGs

5.8 Impacts and Benefits of Implementing Strategies

The Region has identified the IRWM Plan's potential impacts and benefits relative to the strategies discussed above. Given the integrated nature of the Region, it is difficult to determine what strategies would provide a benefit or disproportionate impact to DACs or create Environmental Justice (EJ) concerns. Identification of impacts and benefits to DACs and EJ concerns will improve as projects are closer to implementation, at which point a detailed project-specific impact and benefit analysis can occur as part of the NEPA and/or CEQA process. Updates to DAC/EJ project impacts and benefits will also be included during regular IRWM Plan updates that will occur every five years, as discussed in Section 8. Refer to Appendix D of the IRWM Plan for two technical memoranda that were prepared to characterize DACs and to define issues related to DAC areas:

- DAC Water Supply, Quality and Flooding Data Final Draft TM
- DAC Monitoring Plan Final Draft TM

Tables 5-3 through 5-8 below list each of the IRWM Plan strategies and their potential impacts and benefits that could occur over the next 20 years. Strategies are grouped consistent with the California Water Plan RMS as follows: reduce water demand; improve flood management; improve operational efficiency and transfers; increase water supply, improve water quality, practice resources stewardship.

Table 5-3: Impacts and Benefits of Strategies that Reduce Water Demand

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Agricultural Water Use Efficiency	Decreased flow to downstream users	Decreased potable water demand Decreased dry weather runoff and pollutant loads to waterways Reduced pumping costs Improved ability to meet water supply needs and decreased dependence on imported supply	Loss of flow to downstream users	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water
Urban Water Use Efficiency	Loss of revenue to water agencies	Decreased potable water demand Decreased dry weather runoff and pollutant loads to waterways Reduced pumping costs Improved ability to meet water supply needs and decreased dependence on imported supply	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water

Table 5-4: Impacts and Benefits of Strategies that Improve Operational Efficiency and Transfers

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Conveyance – Regional/ Local	Increased short-term construction and site-specific impacts	Reduced system loss Improved water system reliability Improved ability to meet water supply needs and decreased dependence on imported supply	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water
System Reoperation	Increased short-term construction and site-specific impacts	Improved water system reliability Improved ability to meet water supply needs and decreased dependence on imported supply Decreased energy consumption and associated GHG emissions for water conveyance	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water
Water Transfers	Reduced return flows Loss of agricultural land	Increased water supply in normal, drought and emergency conditions Improved economic stability and environmental conditions	Reduced return flows Loss of agricultural land	Financial (for seller of water) Beneficial use of resources otherwise unused

Table 5-5: Impacts and Benefits of Strategies that Increase Water Supply

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Conjunctive Management & Groundwater	Increased short-term construction and site-specific impacts Increased local energy and GHG emissions associated with pumping levels Environmental impacts to natural habitats and open space from removing flood flows Reduction in sediment for downstream needs Increased air pollution from deteriorating lakebed surfaces	Improved ability to meet water supply needs and decreased dependence on imported supply Improved water supply reliability Increased available water supply to meet demand from growth Improved groundwater basin yield and production flexibility Increased water quality protection	Increased air pollution from deteriorating lakebed surfaces	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Recycled Municipal Water	Increased construction-related and site-specific impacts Increased local energy use, and GHG emissions associated with higher treatment levels Reduced effluent discharge available for in-stream flows Increased need for recharge facility capacity Increased need for brine disposal	Improved ability to meet water supply needs and decreased dependence on imported supply Increased water quality and beneficial use of WWTP/ recycled water flows Improved groundwater basin yield and production flexibility Advancement of technology and application for use by other entities Decreased long-term water costs	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water Advancement of technology and application for use by other entities
Surface Storage – Regional/ Local	Increased short-term construction and site-specific impacts Altered riparian flows and habitat quality Increased evaporative losses Increased air pollution from deteriorating lakebed surfaces	Increased system operational flexibility Improved access to previously untapped local supply and increased reliability Increased capacity for flood management	Increased air pollution from deteriorating lakebed surfaces	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water

Table 5-6: Impacts and Benefits of Strategies that Improve Water Quality

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Drinking Water Treatment and Distribution	Increased short-term construction and site-specific impacts Increased local energy use, and GHG emissions associated with higher treatment levels	Improved water quality and local water supply availability Reduced drinking water-related health problems	None identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water
Groundwater and Aquifer Remediation	Increased short-term construction and site-specific impacts Increased local energy use, and GHG emissions associated with higher treatment levels	Improved water quality and local water supply availability Reduced drinking water-related health problems	None identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water
Matching Water Quality to Use	None Identified	Decreased water treatment costs Improved ability to meet water supply needs and decreased dependence on imported supply	None Identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Pollution Prevention	Increased short-term construction and site-specific impacts Increased local energy, and GHG emissions associated with higher treatment levels	Improved water quality Reduced need for other water management and treatment options Enhanced recreation, water supply and habitat	None identified	Reduced pollutant loads Enhanced recreation, water supply and habitat
Salt & Salinity Management	Increased brine/ salt disposal issues	Decreased damage to crop yields and farmland Reduced corrosive damage to equipment Improved water quality Increased local water supply	None identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water
Urban Runoff Management	Increased construction of individual projects Reduced in-stream flows Natural habitat and open space deterioration from reduced flows Increased air pollution from deteriorating lakebed surfaces	Decreased urban runoff Reduced pollutants to receiving waters Improved habitat and recreation Improved ability to meet water supply needs and decreased dependence on imported supply Improved air quality through decreased GHG and other emissions relative to treated and pumped supplies	Increased air pollution from deteriorating lakebed surfaces	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water

Table 5-7: Impacts and Benefits of Strategies that Improve Flood Management

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Flood Risk Management	Increased short-term construction and site-specific impacts Changes in sediment loads and distribution Natural habitat and open space deterioration from reduced flows Increased air pollution from deteriorating lakebed surfaces	Reduced risk to property and life Reduced flood insurance costs Increased water supply, water quality, habitat and recreation Advancement of integrated flood management engineering and application for use by other entities	Increased air pollution from deteriorating lakebed surfaces	Advancement of integrated flood management engineering and application for use by other entities

Table 5-8: Impacts and Benefits of Strategies that Practice Resources Stewardship

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Agricultural Land Stewardship	Limited urban land use development	Increased water supply, quality, flood control, recreation and habitat benefits Reduced soil erosion	None identified	None identified
Economics Incentives	None identified	Increased project implementation	None identified	None identified

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
Ecosystem Restoration	Increased short-term construction and site-specific impacts Limiting urban land use development	Reduced invasive species, and increased native and endangered species Improved passive recreation, education, water quality, water supply and flood control Improved ability to increase or maintain habitat corridors	None Identified	None Identified
Forest Management	None identified	Improved water supply, water quality, flood control, habitat and recreation benefits	None identified	None identified
Land Use Planning and Management	None identified	Improved water supply, water quality, flood control, habitat and recreation benefits	None identified	None identified
Recharge Areas Protection	Increased short-term construction and site-specific impacts	Improved water supply, water quality, flood control, habitat and recreation benefits	None identified	None identified
Water-dependent Recreation	Increased human activity in natural areas Increased potential for water quality degradation Increased potential impacts to cultural resources Increased potential for disrupting or displacing wildlife	Increased water supply, water quality, flood control, habitat and recreation benefits Reduced overuse and improved quality of existing recreation facilities, enhancing the recreational experience Improved potential economic benefits to recreation-supporting businesses	None identified	None Identified

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Watershed Management	Increased short-term construction and site-specific impacts	Improved water supply, water quality, flood control, habitat and recreation benefits	None identified	None Identified

Section 6 | Project Integration and Objectives Assessment

Resource management strategy integration is a process to design resource management strategy alternatives to maximize regional benefits by identifying potential synergies, linkages, and gaps between the projects, actions and studies subsequently identified in Section 7. The aim of this section is to assess whether the strategies identified in Section 5 and the projects identified in Section 7 are sufficient to meet the needs and objectives of the Antelope Valley Region as defined by Sections 3 and 4, respectively. In cases where needs and objectives may not be met, Section 6 identifies future planning actions that are needed to meet this purpose. Below is a discussion of the identified projects evaluated against their specific objectives and planning targets (i.e., projects benefiting water supply are compared to water supply objectives).

It was important to the Stakeholder group to identify objectives that were SMART[1], and one way to be *Measurable* is to be quantifiable. Therefore, the objectives in Section 4 include quantifiable planning targets, where possible, to help gauge whether a particular objective has been met. For those projects that were far enough along in the planning stages to quantify the benefit, their benefit could be evaluated against its respective planning target. However, many of the projects submitted identified qualitative benefits only at this point because they are conceptual in nature. These projects were therefore evaluated according to whether they could contribute to the attainment of a particular objective qualitatively.

For example, one project concept submitted for evaluation is the establishment of an evapotranspiration (ET) based-controller program. Because this program was submitted as a concept project, with the number of potential users and other technical details not yet quantified, the amount of savings from this program would have to be determined as the project scope was more clearly defined. However, it is logical to assume that the program would result in some

[1] A SMART objective is one that is Specific, Measurable, Attainable, Relevant, and Time-Based.

amount of conservation, which would reduce the demand for irrigation water by some percentage, and would therefore help to meet the water supply planning target of reducing the mismatch of expected supply and demand and contribute to the objective of providing a reliable water supply to meet demands between now and 2035.

Gaps are areas where the suite of current and proposed projects identified in Section 7 fail to meet or contribute to the IRWM Plan objectives. In order to address these gaps, alternative project concepts and ideas are presented. As the AV IRWM Plan is updated and as project scopes are refined, opportunities exist to re-evaluate these projects, and evaluate whether this IRWM Plan is meeting the issues and needs of the Antelope Valley Region.

6.1 Water Supply Management

Issues and needs relating to the water supply for the Antelope Valley Region generally involve providing a reliable water supply to meet demands (primarily utilizing water banking, water transfers, conservation, and recycled water) and protecting the groundwater resource.

Progress to Date and Revisions to Regional Objectives

Since the 2007 IRWM Plan was adopted, the Region's supply and demand estimates have changed due to a number of factors. First, various projects have been implemented to increase the Region's supply reliability and diversification and to reduce demand through conservation measures. Additionally, groundwater adjudication proceedings determined that a total sustainable yield for the groundwater basin would be used to determine pumping rights.[2] Therefore, supply projections were updated to incorporate total sustainable yield in lieu of the previous numbers in the Regional water balance. Given these developments, the Region updated its supply related objectives from the 2007 IRWM Plan which had the result of decreasing its 2035 supply mismatch. In fact, in average years, the data presented in Section 3 indicate a potential surplus. Water banking projects such as the Antelope Valley Water Bank and the WSSP-2 have also been implemented with the intention to store up to approximately 600,000 AF of imported water. The data presented in Section 3 still indicate mismatches between supply and demand in single dry and multiple dry years. The Region's water supply targets were adjusted accordingly in Section 4. In addition, it was recognized that water supplies may be impacted by climate change in the future. Therefore, climate change adaptation was included as a part of the water supply objectives.

Assessment of IRWM Projects' Potential to Meet Water Supply Objectives

As detailed in Section 3, the Antelope Valley Region will need to maintain supplies and demand management measures for average water years between 2010 and 2035. The Region will need to implement supply and demand management projects in order to reduce the mismatch between supply and demand during single dry and multiple dry years. Section 4 presented objectives and planning targets identified by the Stakeholder group in order to address this deficit.

Most of the water supply projects proposed by the stakeholders involve the implementation of recharge projects, water banking programs, conservation programs, water transfers, and recycled water projects. For these supply-related projects, it should be noted that in some cases many project components have to come together to realize a supply benefit. For example, recycled water does not provide supply benefits until a treatment plant source is identified (and in some cases, upgraded), conveyance pipelines are constructed, and some kind of end use is established (e.g., a customer conversion or a groundwater recharge project). The necessary components for each type of supply-related project are described in Table 6-1.

[2] The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.

Table 6-1: Projects with Water Supply Benefits

Type of Project	Necessary components to realize water supply benefit
Recycled water	1. Water reclamation plant construction, expansion, and/or upgrades AND 2. Conveyance pipelines (backbone and smaller laterals) AND 3a. Site conversions (industrial, environmental, irrigation customers) OR 3b. Groundwater recharge sites (considered part of potable water supply once introduced to aquifer)
Imported Water	1. Transfer opportunity, Article 21, or increase in Table A amount must be identified AND 2a. Water banking facility, including recharge and recovery capability OR 2b. Distribution facilities to make use of increased volume of imported water
Stormwater	1. Facilities to capture and route storm water AND 2. Facilities to infiltrate storm water
Conservation	1. No additional measures required

These supply projects, shown in Table 6-2, demonstrate that the stakeholders view conjunctive use operations and recycled water use as essential in order to meet the water supply needs in the Antelope Valley Region and to lessen the gap between supply and demand for single dry and multiple dry years. Several of the submitted projects will also help the Region to develop its local supplies and reduce the Region's reliance on the Delta.

A number of water conservation projects were also submitted by the stakeholder group. These projects aim to reduce the gap between supply and demand by managing the demand side of the water balance equation. Thus, integration of those projects that manage the supply side with those that manage the demand side is essential for meeting the Region objectives for supply.

Water Supply Objective 1. Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035; and adapt to climate change.

- *Target:* Maintain adequate supply and demand in average years.
- *Target:* Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
- *Target:* Provide adequate reserves (164,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.

Table 6-2: Projects with Water Supply Benefits

Project	Supply Created	Status
Recycled Water Production	**Amount Produced**	
Lancaster WRP Stage V	16,000 AFY	Complete
Palmdale WRP Stage V	10,000 AFY	Complete
Recycled Water Conveyance	**Amount Conveyed**	
North Los Angeles/Kern County Regional Recycled Water Project – Division Street Corridor	786 AFY[(a)]	Complete
North Los Angeles/Kern County Regional Recycled Water Project – Phase 1b	2,161 AFY[(a)]	Complete
North Los Angeles/Kern County Regional Recycled Water Project – Phase 2	2,076 AFY[(a)]	Complete
Division Street and Avenue H-8 Recycled Water Tank	3 AF	Implementation
Palmdale Recycled Water Authority – Phase 2 Distribution System	1,000 AFY	Implementation
Avenue K Transmission Main, Phases I-IV	Not quantified	Conceptual
Avenue M and 62th Street West Tanks	Not quantified	Conceptual
KC & LAC Interconnection Pipeline	Not quantified	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project – Phase 3	up to approx. 1,300 AFY[(a)]	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project – Phase 4	up to approx.. 7,000 AFY[(a)]	Conceptual
Place Valves and Turnouts on Reclaimed Water Pipeline	Not quantified	Conceptual
RCSD Wastewater Pipeline	Not quantified	Conceptual
Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H	100 to 1,000 AFY	Conceptual
Tropico Park Pipeline	Not quantified	Conceptual
Recycled Water Conversions	**Amount Reused**	
McAdam Park Recycled Water Conversion	80 AFY	Complete
Division Street Corridor Recycled Water Conversions (various)	2 AFY	Complete
Whit Carter Park Recycled Water Conversion	50 AFY	Implementation
Pierre Bain Park Recycled Water Conversion	75 AFY	Implementation
Lancaster National Soccer Center Recycled Water Conversion	500 AFY	Implementation
Lancaster Cemetery Recycled Water Conversion	Not quantified	Conceptual
Recycled Water Recharge	**Amount Recharged**	
Littlerock Creek Groundwater Recharge and Recovery Project	5,000 AFY[(b)] / AF storage not quantified	Implementation
Lower Amargosa Creek Recharge Project	1,000 AFY / AF storage not quantified	Conceptual
Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H	1 to 100 AFY / AF storage not quantified	Conceptual
Imported Water Conveyance Infrastructure	**Amount Conveyed**	
South Antelope Valley Intertie Project	Not quantified	Implementation
AVEK Strategic Plan	Not quantified	Implementation

Project	Supply Created	Status
Imported Water Recharge	**Amount Recharged**	
Antelope Valley Water Bank - Phase 1	25,000 AFY / 450,000 AF[c]	Partially Complete[d]
Antelope Valley Water Bank - Phase 2	100,000 AFY / 450,000 AF[c]	Implementation
Aquifer Storage and Recovery Project: Additional Storage Capacity (WSSP-2)	Up to 150,000 AF of storage	Complete
Aquifer Storage and Recovery Project: Injection Well Development	12,000 AFY / AF storage not quantified	Complete
Water Supply Stabilization Project – Westside Project (WSSP-2)	Up to 150,000 AF of storage; currently 20 mgd (23,000 AFY) of withdrawal capacity	Complete
Eastside Banking & Blending Project	10,000 AFY / AF storage not quantified	Implementation
Littlerock Creek Groundwater Recharge and Recovery Project	38,000 AFY[c] / AF storage not quantified	Implementation
Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	24,300 AFY[e] / AF storage not quantified	Implementation
Water Supply Stabilization Project (WSSP) – Westside Expansion	6,000 AFY / 450,000 AF storage	Implementation
Hunt Canyon Groundwater Recharge and Flood Control Basin	Not quantified	Conceptual
Purchasing Spreading Basin Land	Not quantified	Conceptual
Stormwater Capture	**Amount of Capture**	
Littlerock Dam Sediment Removal	560 AFY	Implementation
Stormwater Harvesting	25 AFY	Conceptual
Stormwater Recharge	**Amount Recharged**	
Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	400[c] AFY / AF storage not quantified	Implementation
45th Street East Groundwater Recharge and Flood Control Basin	2,000 AFY / AF storage not quantified	Conceptual
Amargosa Creek Pathways Project	Not quantified	Conceptual
Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)	1,600 AFY / AF storage not quantified	Conceptual
Avenue R and Division Street Groundwater Recharge and Flood Control Basin	Not quantified	Conceptual
Barrel Springs Groundwater Recharge and Flood Control Basin	Not quantified	Conceptual
Big Rock Creek In-River Spreading Grounds	1,000 AFY / 5,500 AF storage	Conceptual

Project	Supply Created	Status
Littlerock Creek In-River Spreading Grounds	1,000 AFY / 7,600 AF storage	Conceptual
Multi-use/Wildlife Habitat Restoration Project	Not quantified	Conceptual
Groundwater	**Amount Pumped**	
Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation	Not quantified	Complete
BCSD Arsenic Management Feasibility Study and Well Design	Not quantified	Implementation
RCSD Arsenic Consolidation Project	Not quantified	Implementation
Deep Wells to Recapture Banked Water	Not quantified	Conceptual
QHWD Partial Well Abandonment	Not quantified	Conceptual
Conservation	**Amount Conserved**	
Antelope Valley Regional Conservation Project	Not quantified	Implementation
ET Based Controller Program	240 AFY	Conceptual
Implement ET Controller Program	Not quantified	Conceptual
Precision Irrigation Control System	150 AFY	Conceptual
Ultra-Low Flush Toilet Change-out Program	100 to 1,000 AFY	Conceptual
Waste Water Ordinance	Not quantified	Conceptual
Water Conservation School Education Program	Not quantified	Conceptual

Notes:
(a) Source: *Final Facilities Planning Report, Antelope Valley Recycled Water Project*, August 2006.
(b) Assumes that the Littlerock Creek Groundwater Recharge and Recovery Project will use approximately 5,000 AFY of recycled water and 38,000 AFY of imported water for recharge.
(c) Not all of the future capacity in the Antelope Valley Water Bank will be allocated to entities in the Region.
(d) It is assumed that the Antelope Valley Water Bank - Phase 1 is complete but not yet operational.
(e) The Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project will use approximately 400 AFY of stormwater and 24,300 AFY of imported water for recharge.

As shown in Table 6-1, the water supply projects submitted by the stakeholders show a range of quantified supply benefits, from 1 AFY to 100,000 AFY. Included in these projects are new recycled water facilities, imported water recharge, stormwater capture and recharge, and conservation. It should be noted that most projects will not alone provide a supply benefit. As stated above, recycled water projects will require projects to increase recycled water supply coming from water reclamation plants, pipes and pump stations to convey the recycled water to users and groundwater recharge facilities, and conversions to enable customers to use the recycled water.

The recycled water projects shown in Table 6-2 are classified as recycled water production, recycled water conveyance, recycled water conversion, and recycled water recharge. As discussed in Section 3, approximately 20,000 AFY of recycled water is currently produced at water reclamation facilities are currently available for non-potable reuse. Currently, approximately 82 AFY of this recycled water supply is used.

A number of implementation projects were identified that can utilize this water, including approximately 1,000 AFY of conveyance facilities, 625 AFY of conversion for non-potable reuse, and 5,000 AFY of groundwater recharge. It should be noted that additional conveyance, conversion, and recharge facilities would be necessary to reuse all of the available recycled water.

It is expected that by 2035, an additional 11,000 AFY of recycled water production will be available for reuse, for a total of 31,000 AFY. Conceptual recycled water conveyance projects were identified that would provide up to an additional 9,300 AFY of recycled water conveyance. Conceptual recycled water recharge projects were identified for up to an additional 1,100 AFY.

In total, approximately 31,000 AFY of recycled water will be available in 2035 and projects (implementation and conceptual) have been identified that could use up to approximately 22,000 AFY as shown in Section 3 (Table 3-12). Many of these projects still need further development before they can be implemented. It is likely that as groundwater recharge regulations evolve, much of the available recycled water will be reused in future groundwater recharge projects. Ultimately, recycled water will be limited by future population growth which impacts wastewater flows and, in turn, recycled water production. It should also be noted that projects that could recharge with recycled water will likely require blending with imported water or stormwater as diluent flow.

Imported water projects that increase available supplies can include both water transfers and imported water banking projects. There were no projects proposed to acquire additional imported water through transfers; however, there are existing banking projects that have the capacity to bank up to 150,000 AF of imported water (WSSP-2) and implementation projects that could bank up to an additional 450,000 AF (Antelope Valley Water Bank). Other water banking projects are also proposed, which could increase the total storage capacity in the Antelope Valley groundwater basin. Annual recharge and withdrawal capacities vary as shown in Table 6-2. In order to obtain additional water for banking, imported water purveyors in the area would need to acquire water transfers or capture excess imported water during wet years.

Stormwater supply projects proposed include projects to capture additional stormwater and stormwater recharge projects. Stormwater capture projects include the Littlerock Dam Sediment Removal Project which is estimated to increase stormwater capture by 560 AFY, and Leona Valley's Stormwater Harvesting Project which would capture an additional 25 AFY for treatment and direct use. Stormwater recharge projects include proposed spreading grounds on Amargosa Creek, Littlerock Creek, Big Rock Creek, and at numerous flood control basins in urban areas. Of these recharge projects, only the Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project has implementation project status. This project is estimated to recharge 400 AFY of stormwater. An additional 5,600 AFY of conceptual stormwater recharge projects were also proposed. Some stormwater recharge projects also estimated the total acre-feet of water that would be stored in groundwater aquifers; potentially up to 13,000 AF of stormwater could be stored. It is assumed that projects that would recharge Littlerock Creek water would be operated in conjunction with the Littlerock Creek Dam Sediment Removal Project. In total, stormwater recharge projects with approximately 6,000 AFY of capacity were identified that could store up to approximately 13,000 AF.

Finally, several conservation projects that would reduce water demand were proposed, including programs to install ET based irrigation controllers, install ultra-low flush toilets, develop conservation ordinances, and implement conservation education programs. In total, the proposed conservation projects are estimated to reduce demand by up to 1,390 AFY.

The implementation and conceptual projects described in this IRWM Plan can help to achieve the Supply Planning Targets as follows:

- *Average Year: Provide up to an additional 30,000 AFY of new supply for average years with increased recycled water use (22,000 AFY), stormwater capture (6,585 AFY), and conservation (1,390 AFY). Some of these new supplies can also serve as sources of water for banking.*
- *Single Dry Year: Provide up to an additional 30,000 AFY of new supply for a single dry year and approximately 600,000 AF of storage capacity (potentially more) with recharge and recovery capability of up to 250,000 AFY; use of water banked in storage would require the Region to have obtained and recharged supplies prior to a single dry year event, potentially including transfers*

- *Multi-Dry Year Period: Provide up to an additional 30,000 AFY of new supply in multi-dry year periods and approximately 600,000 AF of storage capacity (potentially more) with recharge and recovery capability of up to 250,000 AFY; use of water banked in storage would require the Region to have obtained and recharged supplies prior to a multi-dry year event, potentially including transfers*

As mentioned in Section 3, the total sustainable yield of the Region's groundwater basin could potentially be adjusted through the course of ongoing adjudication proceedings. If future total sustainable yield is determined by the court to be lower than 110,000 AFY,[3] the supply-demand mismatch will be greater for single- and multi-dry year periods, increasing the need to implement supply related projects. If the final total sustainable yield is determined to be higher than 110,000 AFY, the Region's supply-demand mismatch will decrease, and the Region will be in a better position to meet single and multiple dry year demands.

Water Supply Objective 2. Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP water deliveries.

- *Target:* Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer by June 2017.

This scenario is, in some sense, a variation on the dry year scenario if it is assumed that it represents a "very dry 6-month period" during summer months. In the event of a temporary loss of SWP for 6 months over the summer, the Antelope Valley Region would be short approximately 65,000 AFY in an average water year. This estimate assumes that 33 percent (1/3) of demands occur during winter months (October through March) and 66 percent (2/3) occur in summer months (April through September); and it is based on the direct deliveries for AVEK discussed in Section 3.1.2.

This Planning Target may be measured by using UWMPs and other capacity-related planning documents to show that sufficient pumping capacity exists in the Region to provide 65,000 AFY of water over a six-month period during the summer. This represents a "worst case scenario" since under dry year and multi-dry year scenarios, smaller allotments of imported water would be available to begin with. So 66 percent reductions in these smaller amounts would have less impact.[4]

Water Supply Objective 2 was more difficult to evaluate in terms of whether the proposed projects adequately met this objective without a developed contingency plan. In order to meet this objective, the Antelope Valley Region would be required to rely on groundwater, recycled water, and demand management measures to meet supply needs. Given that many of the projects proposed were recharge programs, some of which have quantifiable benefits of up to 250,000 AFY of recharge and recovery capacity and/or 600,000 AF of storage capacity (potentially more) as mentioned above, it is likely that this IRWM Plan will contribute towards meeting this objective.

Additionally, each water purveyor in the Antelope Valley Region has already developed Contingency Plans to address emergency situations as discussed in their Urban Water Management

[3] The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.

[4] An average water year for the Region has approximately 95,500 AFY of direct deliveries from imported water providers. AVEK typically delivers 400 AF/day between June 15th and September 30th in any given year. During other times of year, AVEK typically delivers 150 AF/day. These values dictate that approximately 33% of annual demands occur in winter months (October to March) and 66% occur in summer months (April to September). Therefore, approximately 66% of average year direct deliveries (65,000 AFY) would not be available during a 6-month disruption over the summer.

Plans. These are not included in the Plan as implementation projects. Emergency demand management measures listed in water districts' urban water management plans include:

- Ordinances prohibiting water waste (e.g. allowing water to run off of property from landscape areas)
- Ordinances controlling landscape irrigation
- Ordinances restricting outdoor water uses (e.g. washing of sidewalks, motor vehicles, decorative fountains)
- Prohibitions on new connections of the incorporation of new areas
- Serving of drinking water in restaurants only when requested
- Rationing of water supplies
- Limiting use of fire hydrants to only firefighting and related activities
- Water shortage pricing

These measures, in conjunction with the proposed recharge programs, would further help the Region to meet the objective to accommodate a six month stoppage of SWP water over the summer period.

Water Supply Objective 3. Stabilize groundwater levels.

- *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 January 2010.

This planning target will be heavily influenced by the outcome of the adjudication process that has a similar objective to stabilize groundwater levels in the Region. As mentioned above, many of the projects proposed by the stakeholders are groundwater recharge projects and water banking programs. These projects and programs will require monitoring to identify which regions of the aquifer are best suited for these activities, and will require continued monitoring to ensure they are operating effectively. Monitoring and data collection are the first step in managing groundwater levels throughout the basin.

As discussed in Section 3, adjudication proceedings are ongoing, and have yet to establish pumping rights and restrictions to account for groundwater recharge. Groundwater recharge, banking, water rights transfers, in-lieu recharge, and conservation projects are all intended to help meet the target to maintain or increase groundwater levels. Actual stabilization of groundwater levels is expected to be monitored by the Court through a watermaster or other court appointed agent. As such, this target will be re-assessed in subsequent revisions of this IRWM Plan.

Future Planning Efforts and Actions to Fill the Identified Water Supply Management Gaps

Because it is difficult at this stage in the IRWM Plan process to quantify the potential benefits of all the projects, it is difficult to assess whether the water supply projects will adequately meet this IRWM Plan objective. However, given the projected supply deficits, the following future planning efforts and actions are additional options that could help to meet this objective in addition to the proposed projects described in Section 7.

Aggressive Conservation. Implementing an aggressive water conservation program (i.e., beyond current and planned measures) could conserve up to 20,000 AFY in the Antelope Valley Region, assuming an additional 10 percent per capita reduction in urban water demand by 2020. A determination would need to be made as to whether the amount of conservation that is required under this alternative would be achievable or insufficient.

As discussed in Section 5, all water agencies in the Antelope Valley Region currently utilize water conservation methods as a means to reduce demand during drought conditions. However, only LACWD 40 is a member of the California Urban Water Conservation Council (CUWCC) and a signatory of the MOU Regarding Urban Water Conservation in California. AVEK, PWD, QHWD, and RCSD are not signatories to the CUWCC MOU and are not members of CUWCC; however, they have each implemented their own conservation methods.

An aggressive water conservation program would also include agricultural water conservation. On-farm water use can be reduced substantially without decreasing productivity through improved irrigation technologies and efficient water management practices.

Develop Further Conjunctive Use Management. The amount of planned and conceptual conjunctive use capacity is considerable for the Region. The number of water banking and ASR projects proposed by the Stakeholders are an indication of how important conjunctive use operations will be in order to meet the water supply needs in the Antelope Valley Region. Below is a discussion of additional conjunctive management project options that may expand water banking and ASR in the Region even further. Successful conjunctive use programs include both new supplies of water as well as storage capacity to accommodate seasonal and wet/dry year variations.

The first option is to increase the amount of imported SWP water into the Antelope Valley Region for direct use or water banking. The main issues associated with increasing use of imported SWP for conjunctive uses include cost, availability, and quality of SWP water (generally high in TDS compared to local stormwater and groundwater).

The capture and recharge of surface water is another conjunctive use method available to the Antelope Valley Region. Most of the runoff into the Antelope Valley Region originates in the surrounding mountains. Rainfall records indicate that runoff sometimes may be available that could be retained and used for artificial groundwater recharge (USGS 1995). Surface water recharge could be increased by limiting development in key recharge areas of the Antelope Valley Region as well as by establishing effective methods to capture surface water. Surface water capture and recharge would need to be evaluated for feasibility prior to implementation to identify recharge areas, as discussed above.

Lastly, conjunctive uses could be expanded to the treatment of poor quality groundwater which could be extracted, treated, and then re-injected into the aquifer. The extraction would be accomplished through the increased use of existing wells and by the installation of additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities. Pumps and treatment facilities would use electrical power. A detailed geohydrologic investigation would be necessary prior to drilling on a site-by-site basis. Field studies and groundwater modeling activities would be needed to hydraulically evaluate where in the aquifer the additional extraction should come from and if the basin could handle increased pumping without negatively affecting groundwater levels. The pending adjudication would determine the feasibility of this alternative, and to what extent it could be implemented in the Antelope Valley Region.

Participate in Water Banks Outside of the Antelope Valley Region. Another potential water supply option is to participate in water banking programs outside of the Antelope Valley Region to bring water into the Antelope Valley Region. Such additional banks could include Wheeler Ridge Maricopa Water Storage District White-Wolf Ridge, the Chino Basin Groundwater Basin Storage and

Recovery Program, the Semitropic Water Banking and Exchange Program, Calleguas Municipal Water District (CMWD) and Metropolitan Water District of Southern California (MWD), Los Posas ASR, and the Rosedale-Rio Bravo Water Storage District. It should be noted that while water banks operating outside of Antelope Valley Region are possibilities for the Antelope Valley Region, the feasibility of utilizing each still needs to be determined. Benefits to the Antelope Valley Region from utilization of these banks would be to increase water supply reliability for the Antelope Valley Region by increasing the number and mix of sites potentially available in which to bank water for later withdrawal and use. The Region would still need to identify and procure additional water supplies to store in an outside water bank.

Create Regional Database for Groundwater Pumping. The analysis in Section 3 helped to identify a number of issues regarding the availability of accurate water resource data for the Antelope Valley Region. M&I and major agricultural pumpers generally measure their groundwater extractions and submit this information to DWR. The pumpers that do not measure groundwater extractions are anticipated to be agricultural and small domestic water users. The existing databases do not have broad agreement for pumping within the same areas and it is thought that pumping is generally underreported (USGS 1995). Furthermore, there is a significant lack of groundwater pumping data available for the Kern County portion of the Antelope Valley Region and for the smaller mutual water companies in the Antelope Valley Region. By creating a regional database for groundwater pumping and a methodology for its management, this data can be regularly obtained and made available for research studies such as this IRWM Plan and contribute to meeting the objective of stabilizing groundwater at current conditions. It is recommended that these data be regularly collected and compiled. For pumpers that do not monitor groundwater extractions, indirect methods, such as estimates based on power or consumptive use, can be utilized for groundwater management purposes.

Use Alternative Sources of Water. Groundwater and imported SWP water make up the majority of the water supplies in the Antelope Valley Region, with groundwater historically providing between 50 and 90 percent of overall supply. The pending adjudication and variability of SWP in light of global climate change conditions calls into question the reliability of these sources. Another solution is to use alternative sources of water to meet demands. These other sources could include water from the Central Valley of California (Central Valley Project [CVP] water) transfers from other water rights holders in the Sacramento Valley, water from other water supply systems (Los Angeles Department of Water and Power [LADWP]), recycled water, Article 21 water, treated stormwater captured and recharged into the ground, and desalinated water. In addition, alternative imported water sources from SWP contractors other than AVEK could be considered. There are a number of issues involved with the use of these other sources. The use of water from the CVP water would be transported to AVEK via SWP facilities, and as non-SWP water, transmission by these facilities would have low priority. Therefore, the water supply could be less reliable than that of water that AVEK currently supplies. Additionally, the permanent conveyance of this water through the Bay-Delta could result in economic and social impacts associated with transferring water from agricultural use to urban use. Water transfers from CVP contractors also would not likely be feasible because their water already has been allocated for other uses, including environmental restoration projects, and is not available for long-term, reliable sale or exchange.

Various SWP contractors (or their member agencies) hold contractual SWP Table A Amounts in excess of their demands. Due to the high annual fixed costs of SWP Table A Amounts, these agencies may wish to sell this excess to another contractor. Such Table A Amounts would be subject to the SWP annual allocation and SWP delivery reliability constraints. Potential sellers include the County of Butte and Kern County Water Agency (from its member agencies). Article 21 water refers to the SWP contract provision defining this supply as water that may be made available by DWR when excess flows are available in the Delta (i.e., when Delta outflow requirements have been met, SWP storage south of the Delta is full, and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter. Due to the short duration of its availability and capacity constraints at Edmonston Pumping Plant, Article 21 water is generally delivered most readily to agricultural contractors and to San Joaquin Valley banking programs. Therefore, Article 21 water is not considered a long-term reliable supply for the Antelope Valley Region.

The SWP Contractors Authority (Authority) Dry-year Water Purchase Program allows for the purchase of water from many agents within the California water system on a one-time or short-term basis. Participants could increase reliability during drought years by participating in this program to supplement supplies. This program has historically operated only in years when the SWP allocation is below 50 percent, or when a potentially dry hydrologic season is combined with expected low SWP carryover storage; it thus provides a contingency supplemental water supply. Typical water costs include an option payment (to hold water); the call price (actual purchase price); and loss of water due to movement through the Sacramento/San Joaquin Delta, in addition to SWP transmission costs. Turnback Pools are a means by which SWP contractors with excess Table A Amounts in a given hydrologic year may sell that excess to other contractors. This is included in a provision in the SWP water supply contracts. This provision is available in all year types, but is most in demand during dry periods when Table A allocations are low and almost all contractors are seeking additional supplies. Of course, in those year types, less water is made available to the Turnback Pools. The program is administered by DWR and requires selling and buying contractors to adhere to a specific schedule by which options to water must be exercised. The total amount of water placed into the pools by the selling contractors is allocated to the participating buying contractors based on their contractual Table A Amounts. The water supply contract provides for Turnback Pools in a given water year. Pool "A," which must be purchased by March 1, is priced at 50 percent of the current SWP Delta water rate and the later Pool "B," which must be purchased by April 1, is priced at 25 percent of the current Delta water rate. All of the above mentioned supply alternatives have issues related to capacity and delivery priority in the California Aqueduct and other SWP facilities. SWP contractors, via their water supply contracts with DWR, are allocated specified shares of "reach repayment" capacity in various reaches of the SWP system, starting at Banks Pumping Plant in the Delta and proceeding through the main stem of the Aqueduct and the Aqueduct branches to each contractor's delivery turnout(s). This share of capacity pertains to SWP supplies only, and provides each contractor with delivery priority for its SWP supplies. The water supply contracts also provide for the delivery of non-SWP supplies through the SWP system, provided that other contractors are not coincidentally utilizing all available capacity; these non-SWP supplies are delivered at a lower priority than SWP supplies. Reach repayment capacity is often less than the actual constructed physical capacity of SWP facilities.

It is generally accepted among the SWP contractors that, based on future demand forecasts for all contractors, wet years (which tend to lower service area demands), will result in ample capacity in the southerly reaches of the SWP system, even though Table A allocations are high (i.e., not all water will be needed in the contactors' service areas, and much of it will be banked in other locations or sold into the SWP Turnback Pools). During times when dry years occur in the Antelope Valley (which tend to cause higher service area demands), SWP capacity constraints may occur as southern contractors take water from the various banking programs in the San Joaquin Valley or from various dry year supply programs and attempt to deliver them within the same window of time (i.e., peak demand periods), in addition to Table A allocations. It is also generally accepted that all contractors in a given repayment reach will work cooperatively with DWR and each other to attempt delivery of all requested supplies, whether SWP or non-SWP. As additional contractors obtain additional supplies through time, this cooperative arrangement will be tested.

Utilization of desalinated water is also an alternate source of water that could be made available in the Antelope Valley Region. It is not likely that a desalination plant would be constructed in the Antelope Valley Region due to the distance from the ocean and the associated construction and operation costs. However, it is plausible to obtain desalinated water by exchange. For example, in this situation, AVEK could contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast, and water produced by this facility would be exchanged with AVEK for SWP water. A likely partner in such an arrangement could be MWD. If both parties agreed, AVEK would enter into a contract with MWD indicating that a portion of MWD's annual SWP Table A Amount would be delivered to AVEK in exchange for AVEK's contribution to a desalination facility to be constructed by MWD. AVEK would treat and distribute SWP water in existing AVEK facilities, and MWD would use water from the desalination facility in lieu of the SWP water exchanged with AVEK. All of these options present challenges in terms of conveyance, water quality, and cost.

Make Further Use of Recycled. Many of the Stakeholder-identified projects involve the use of recycled water. Increasing this amount beyond what is already planned could help to further reduce the gap between future supply and demand. Since the use of recycled water in the Region is currently limited to landscaping and other non-potable uses, it would be important to identify uses for the water beyond those for which its uses are currently dedicated or planned. Another important use for recycled water is groundwater recharge. Particular concern should be paid to salinity concentrations in recycled water. Numerous factors contribute to salinity in recycled water, including imported potable water sources and salts entering with each cycle of urban use for residential, commercial, or industrial purposes. Management of the salt imbalance is important because as salinity increases, irrigation water use must also increase to flush out salts that accumulate in the root zone. Furthermore, industrial users incur extra costs for cooling towers, boilers, and manufacturing processes to deal with the higher salinity water. In addition, groundwater recharge can also be affected when source water quality does not satisfy regulatory requirements (i.e., Basin Plan Objectives). To make full use of recycled water and to realize a water supply benefit, water reclamation plants would need to be expanded to treat increased sewer flows as population increases, additional conveyance pipelines would need to be constructed, and additional end uses (irrigation, industrial, and recharge) would need to be developed.

6.2 Water Quality Management

The issues and needs for water quality management in the Antelope Valley Region generally involve providing drinking water that meets current and future standards, protecting existing and future water sources from potential contamination, and making beneficial use of treated wastewaters for recycled water applications.

Progress to Date and Revisions to Regional Objectives

The Region has implemented several projects since 2007 to improve the water quality of the Valley's groundwater and surface water, as well as increase the beneficial use of recycled water. For example, treatment upgrades and effluent management at the Lancaster WRP and Palmdale WRP have been implemented to support efforts to maximize the beneficial use of recycled water. Additionally, construction of additional portions of the recycled water backbone will expand the availability of recycled water for future use. LACWD 40's aquifer storage and recovery project, if continued, will help to improve the quality of the Region's aquifers by increasing available groundwater and reducing constituent concentrations.

Assessment of IRWM Projects' Potential to Meet Water Quality Management Objectives

As detailed in Section 3, the Region has a number of water quality concerns regarding the quality of groundwater, local surface water and stormwater runoff, recycled water, and imported water. Section 4 presented objectives and planning targets identified by the Stakeholder group in order to address these concerns. The projects, shown in Table 6-3, will help the Region to address these concerns.

The objectives and planning targets identified for water quality management are:

Water Quality Objective 1. Provide drinking water that meets regulatory requirements and customer expectations.

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

Table 6-3: Projects with Water Quality Management Benefits

Project	Status
Antelope Valley Water Bank	Complete
Aquifer Storage and Recovery Project: Additional Storage Capacity	Complete
Aquifer Storage and Recovery Project: Injection Well Development	Complete
Lancaster WRP Effluent Management Sites	Complete
Lancaster WRP Stage V	Complete
North Los Angeles/Kern County Regional Recycled Water Project – Division Street Corridor	Complete
North Los Angeles/Kern County Regional Recycled Water Project – Phase 1b	Complete
North Los Angeles/Kern County Regional Recycled Water Project – Phase 2	Complete
Palmdale WRP Effluent Management Sites	Complete
Palmdale WRP Stage V	Complete
Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation	Complete
Water Supply Stabilization Project – Westside Project (WSSP-2)	Complete
AVEK Strategic Plan	Implementation
BCSD Arsenic Management Feasibility Study and Well Design	Implementation
Division Street and Avenue H-8 Recycled Water Tank	Implementation
Eastside Banking & Blending Project	Implementation
Littlerock Creek Groundwater Recharge and Recovery Project	Implementation
Littlerock Dam Sediment Removal	Implementation
RCSD Arsenic Consolidation Project	Implementation
South Antelope Valley Intertie Project	Implementation
Water Supply Stabilization Project (WSSP) – Westside Expansion	Implementation
42nd Street East, Sewer Installation	Conceptual
45th Street East Groundwater Recharge and Flood Control Basin	Conceptual
Antelope Valley Watershed Surface Flow Study	Conceptual
Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)	Conceptual
Avenue R and Division Street Groundwater Recharge and Flood Control Basin	Conceptual
Barrel Springs Groundwater Recharge and Flood Control Basin	Conceptual
BCSD Arsenic Removal Treatment Plant (Construction)	Conceptual
Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H	Conceptual
Hunt Canyon Groundwater Recharge and Flood Control Basin	Conceptual
KC & LAC Interconnection Pipeline	Conceptual
Lower Amargosa Creek Recharge Project	Conceptual
Multi-use/Wildlife Habitat Restoration Project	Conceptual
New PWD Treatment Plant	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project – Phase 3	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project – Phase 4	Conceptual
Palmdale Power Plant Project	Conceptual
Place Valves and Turnouts on Reclaimed Water Pipeline	Conceptual
QHWD Partial Well Abandonment	Conceptual
RCSD Wastewater Pipeline	Conceptual
Stormwater Harvesting	Conceptual
Tertiary Treated Recycled Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H	Conceptual

Projects that would help to meet this first water quality objective include many of the projects shown in Table 6-3. Projects that recharge the Region's aquifers, such as the Littlerock Creek Groundwater Recharge and Recovery Project and Eastside Banking and Blending Project, will provide soil aquifer treatment and some degree of blending with other groundwater sources. This can support improvements to the quality of drinking water. Other projects may directly treat groundwater to meet drinking water standards, such as the Boron CSD Arsenic Removal Treatment Plant Project.

Water Quality Objective 2. Protect and maintain aquifers.

- *Target:* Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.
- *Target:* Map contaminated sites and monitor contaminant movement by 2017.
- *Target:* Identify contaminated portions of aquifer and prevent migration of contaminants by 2017.

As with the 2nd water supply objective mentioned above, many of the projects proposed by the stakeholders are groundwater recharge projects and water banking programs. These projects and programs will require monitoring to identify which regions of the aquifer are best suited, and they will require continued monitoring to ensure they are operating effectively. Monitoring and data collection are the first steps in protecting the aquifer from contamination. Additional projects submitted that will help to meet these objectives are the Boron CSD Arsenic Management Feasibility Study and Well Design Project, and the Boron CSD Arsenic Removal Treatment Plant Project, both of which will reduce arsenic concentrations in the local aquifer. Another project that will support water quality objectives is the City of Palmdale 42nd Street East Sewer Installation Project which will reduce groundwater pollution by eliminating septic tanks currently in use by homes in the vicinity of 42nd Street East.

Water Quality Objective 3. Protect natural streams and recharge areas from contamination.

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

Projects proposed by the stakeholders to address this objective include groundwater recharge projects, retention and detention basin projects, and flood control projects. These projects and programs will require monitoring to identify which locations best suited and will require continued monitoring to ensure they are operating effectively. Monitoring and data collection are the first steps in protecting the natural streams and recharge areas from contamination. Examples of these projects include the City of Lancaster's Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H Project and the Lower Amargosa Creek Recharge Project, both of which will restore riparian habitat along Amargosa Creek (a natural stream and known recharge area).

Water Quality Objective 4. Maximize beneficial use of recycled water.

- *Target:* Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66 percent by 2025, and 100 percent by 2035.

Currently, the Region uses a small amount (82 AFY) of the available 20,000 AFY of recycled water to meet non-potable customer demands. These numbers do not include recycled water currently used for environmental maintenance. A number of the proposed projects in the IRWM Plan involve enhancements to treatment facilities. Additionally, a number of the stakeholder-identified projects specify the use of recycled water for irrigation, effluent management, and recharge projects; many of which benefit not only water quality objectives, but also water supply and land use management objectives. There are a number of opportunities for integration between water quality projects, including proposed recharge basins that use effluent from the Palmdale or Lancaster WRPs as a source of recharge water.

Future Planning Efforts and Actions to Fill the Identified Water Quality Management Gaps

Future efforts are needed to protect the groundwater aquifer from contamination, which includes identifying and mapping the contaminated portions of the aquifer and identifying potential future sources of contamination. The following future planning efforts and actions are suggested to better meet the objectives identified for this strategy.

Identify Contaminated Portions of the Aquifer. The planning target, which is provided in order to gauge success on meeting the water quality management objectives, is to identify and prevent migration of contaminated portions of the aquifer. The SNMP for the Antelope Valley, prepared concurrently with this IRWM Plan update, identified and analyzed various constituents found in the Region's aquifer. Additional monitoring and evaluation efforts may be necessary to further study those contaminants that jeopardize the Region's water quality objectives. Refer to the SNMP for information about the Region's groundwater quality.

Map Contaminated Portions of Aquifer. The planning target is to map the contaminated portions of the aquifer and monitor contaminant movement. The SNMP mapped the concentrations for select constituents. Additional monitoring, evaluation and mapping efforts may be necessary to better understand the Region's groundwater issues. Refer to the SNMP for available contaminant concentration maps.

Establish a Well Abandonment Ordinance. Abandoned wells in the Antelope Valley Region present water quality problems in that they act as conduits for surface and subsurface pollutants. The establishment of a well abandonment ordinance would provide the policing authority to enforce the timely destruction of abandoned wells. The ordinance could provide the authority to require well destruction or rehabilitation as a condition upon sale of property, change of ownership or change of use. The ordinance could also require that new well applications be processed only after the applicant has demonstrated that all existing wells on all property they own are not in violation of the well ordinance.

Develop and Implement a Regional Groundwater Wellhead Protection Program. A Wellhead Protection Program (WPP) is a pollution prevention and management program used to protect underground sources of drinking water. A national WPP was established in 1986 by the Federal Safe Drinking Water Act. Some of the elements of these types of programs include the identification of recharge areas, zones of influence, groundwater flow directions, and potential contamination sources. This information is then compiled into a management plan, based on the assessment of alternatives for addressing potential sources of contamination, describing the local ordinances, zoning requirements, monitoring program and other local initiatives. The development of a regional WPP could additionally promote smart land use practices, including prohibiting new industrial, commercial and residential development in areas of sensitive groundwater recharge.

Develop Management Program for Nitrate and TDS. TDS and nitrate are of particular concern with regard to water quality in the Antelope Valley Region. TDS is concentrated in the groundwater when SWP water is imported and used for irrigation purposes, especially since the Antelope Valley Region is a closed basin. Nitrates are also present from historical irrigation practices and effluent management. Suggested management measures for these constituents include:

- TDS management measures:

  - Reducing the amount of salts imported into the sub-basins – imported water treatment/processes
  - Reducing the amount of salts added to groundwater via source water - wastewater treatment, modified processes such as increased retention time, or blending prior to use for irrigation or basin recharge
  - Reducing the amount of salts added to water via anthropogenic sources – BMPs, public outreach, land management guidelines
  - Natural treatment such as wetland systems
  - Transporting and exporting salts to a landfill
  - Disposing of salts via brine sales or deep well injection
  - Water softener ban
- Nitrate management measures:
  - Developing BMPs such as limiting excess fertilizing (set realistic goals for maximum crop yield) and eliminating over-irrigation to curtail the leaching transport process
  - Developing nutrient management programs and crop-specific nutrient application rates to improve crop fertilizer efficiency (decrease the total residual mass of nitrogen in the soil by using nitrification inhibitors or delayed-release forms of nitrogen)
  - Evaluating activities such as animal operations, food operations, and septic system discharges

Development of a management program and projects for these pollutants of concern, as well as for other emerging contaminants as they are identified, would contribute to meeting the objective of protecting the aquifer from contamination. Additionally, the SNMP for the Antelope Valley found that, based on the Antelope Valley Groundwater Basin's baseline water quality and project source water quality, managing salt and nutrient loadings on a sustainable basis is feasible with a minimal number of implementation measures.

Expand the Water Quality Monitoring Program. Monitoring activities in the Antelope Valley Region include groundwater levels, groundwater quality, land surface subsidence, aquifer compaction, and stream flow. According to the DWR Bulletin 118 (2004), the USGS actively monitors 262 wells for groundwater levels, 10 wells for miscellaneous water quality, and the Department of Health Services monitors 248 wells in the Antelope Valley Region for Title 22 water quality compliance. Expansion of the existing water quality monitoring efforts would allow for more current data collection to better assess the state of the Antelope Valley Region's water quality and other groundwater parameters. These groundwater quality monitoring programs need to be continued in order to capture the effects of changes in management practices. As Phillips states in his 1993 USGS report, "the need for an ongoing monitoring program transcends the importance of the selection of management alternatives." Further, in order for a water quality monitoring program to be successful in the Antelope Valley Region, the information collected needs to be shared regionally (i.e., by establishing a clearinghouse) in order to integrate and synthesize the data.

The SNMP includes a monitoring component to ensure the groundwater quality is consistent with applicable SNMP water quality objectives. Select drinking water wells, near projects that may impact groundwater quality (such as recharge projects), will be used as monitoring locations. Refer to the SNMP for monitoring and reporting details.

6.3 Flood Management

Progress to Date and Revisions to Regional Objectives

Flood management issues in the Antelope Valley Region generally relate to management of stormwater flows of variable water quality and the management of nuisance water that ponds after a storm event and eventually evaporates. As part of this IRWM Plan Update, the Region has evaluated its flood management needs in order to update its objectives. The Region recognized that stormwater flow has beneficial uses that may be impacted by upstream flood control, and therefore added a second objective to protect, restore and improve the stewardship of aquatic, riparian and watershed resources in the Region.

Though an integrated flood management summary document was developed in conjunction with this 2013 IRWM Plan Update (see Appendix F), the target set to coordinate a regional flood management plan and policy mechanism by 2010 was not met. The Region revised the target to extend out the goal year to 2017.

Assessment of IRWM Projects' Potential to Meet Water Quality Management Objectives

The objectives and planning targets identified for flood management include:

> *Flood Management Objective 1:* Reduce negative impacts of stormwater, urban runoff, and nuisance water.
>
> *Flood Management Objective 2:* Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses.

- *Target:* Coordinate a regional flood management plan and policy mechanism by the year 2017 and incorporate adaptive management strategies for climate change.

Current integrated flood management practices include the identification of infrastructure improvement projects necessary to reduce localized flooding, mitigate poor water quality and/or to enhance localized recharge. Projects proposed as part of this IRWM Plan that will have flood benefits are shown in Table 6-4.

Future Planning Efforts and Actions to Fill the Identified Flood Management Gaps

The small scale view typically taken in flood management has a tendency to move projects forward prematurely or to ignore other benefits a project may provide if operated or designed with multi-benefits in mind. Examples of the two tendencies include:

- Example 1: Concurrent water supply retention and flood control projects that could each meet the same objectives if combined and designed in an integrated fashion.
- Example 2: Concurrent groundwater recharge and flood control projects that could each meet the same objectives if combined and designed in an integrated fashion.

Table 6-4: Projects with Flood Management Benefits

Project	Status
Quartz Hill Storm Drain	Complete
Littlerock Dam Sediment Removal	Implementation
45th Street East Groundwater Recharge and Flood Control Basin	Conceptual
Amargosa Creek Pathways Project	Conceptual
Antelope Valley Watershed Surface Flow Study	Conceptual
Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)	Conceptual
Avenue R and Division Street East Groundwater and Flood Control Basin	Conceptual
Barrel Springs Groundwater Recharge and Flood Control Basin	Conceptual
Big Rock Creek In-River Spreading Grounds	Conceptual
Build a bridge at the existing dip crossing of Mt. Emma Road @ Littlerock Creek	Conceptual
ET Based Controller Program	Conceptual
Flooding Issues Avenue P-8 between 160th and 170th Street East	Conceptual
Flooding Issues Avenue W. near 133rd Street East	Conceptual
Hunt Canyon Groundwater Recharge and Flood Control Basin	Conceptual
Implement ET Controller Program	Conceptual
Littlerock Creek In-River Spreading Grounds	Conceptual
Precision Irrigation Control System	Conceptual
Stormwater Harvesting	Conceptual

These examples illustrate just a few of the concepts that provide support for regional planning. Regional planning begins with stakeholders getting together and formulating a plan to develop a regional plan from flood control, water quality and water supply perspectives, mixing all the components together to optimize the benefits of the program. Typical components of an Integrated Flood Management Plan include:

Beneficial Use Identification. In-stream and downstream beneficial uses need to be identified so that the uses can be protected during the Flood Mitigation component. In-stream and downstream beneficial uses would include:

- Diversions for agriculture and stock watering.
- Diversions to percolation ponds.
- Flood flows to maintain the "biological crust: and resurfacing of Rosamond Dry Lake at EAFB.
- Flood flows overbank for riparian habitat.
- Dust control

Existing Flood Hazard Mapping. Existing flood hazards need to be well understood and mapped to inform policy and zoning guidelines and identify locations of potential flood mitigation projects. The flood hazards would be developed through hydrologic and hydraulic modeling to create base maps that show flood extents and hazard ratings based on depth and velocity predictions. Potential stakeholders that may contribute financing to the effort would be FEMA and/or the U.S. Army Corps of Engineers (USACE).

Development Policy. Standard policy for the Region would need to be enacted for new development projects. The policy would be based on the Existing Flood Hazard Mapping component and would specify criteria for eliminating increased peak flow and volume due to new impervious surfaces and present guidelines for techniques such as Low Impact Development (LID), source control and BMP designed to improve water quality and decrease runoff volume and peak flow. The policy would also address building within the floodplain by setting finished floor elevation criteria with respect to flood event water surface and upstream and downstream impact criteria associated with floodplain encroachment.

Flood Mitigation. Areas prone to flooding that were built prior to the Development Policy component would need to be protected through flood mitigation. Flood mitigation techniques include capacity, detention and diversion techniques such as levees, flood walls, detention basins and upsized infrastructure to increase conveyance capacity. The mitigation options would be tested using the existing hydrologic and hydraulic models developed for the Existing Flood Hazard Mapping component. The design and operation of the infrastructure improvements would be conducted to insure beneficial uses and to optimize the other integrated components of water quality improvements and increases in water supply through groundwater recharge.

6.4 Environmental Resource Management

Progress to Date and Revisions to Regional Objectives

Since the 2007 IRWM Plan was completed, the entities in the Region have worked to preserve open space and natural habitat. For example, the Antelope Valley Conservancy preserved 40 acres of wetlands in 2011 near the community of Pearblossom, in addition to ensuring hundreds of miles of recreational trail preservation. Despite this, as of the 2013 IRWM Plan Updates, the Region was unable to meet its target of preserving an additional 2,000 acres of open space and natural habitat. The Region updated the target goal date from 2015 to 2017.

Assessment of IRWM Projects' Potential to Meet Environmental Resource Management Objectives

The main issues of concern regarding environmental resource management in the Antelope Valley Region are protection and preservation of open space and protection of endangered species. The following objectives and planning targets were identified to address these concerns:

Environmental Resource Objective 1. 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 2017.

A number of proposed projects, shown in Table 6-5, will help the Region to meet its environmental resource management objective. A number of the projects include components to restore habitat. In addition, projects that will recharge the aquifer using spreading grounds will have the secondary benefit of preserving open space. In total, the projects propose to conserve over 2,000 acres of open space and habitat, which exceeds the Region's target.

Future Planning Efforts and Actions to Fill the Identified Environmental Resource Management Gaps

To better meet the objectives identified for this strategy, the following future planning efforts and actions are suggested.

Develop a Habitat Conservation Plan for the Antelope Valley Region. HCPs are developed to outline what steps must be taken to minimize and mitigate the impact of a permitted "take" on a threatened or endangered species. Many HCPs designate open space or habitat as mitigations of "take." Therefore, an HCP is a tool that could be used in the Antelope Valley Region for preserving and protecting open space and habitat.

Table 6-5: Projects with Environmental Resource Management Benefits

Project	Open Space and Habitat Conserved	Status
Antelope-Fremont Watershed Assessment Plan	2,000 acres	Plan/Study
Antelope Valley Regional Conservation Project	5 acres	Implementation
Littlerock Dam Sediment Removal	Not quantified	Implementation
Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	15 acres	Implementation
45th Street East Groundwater Recharge and Flood Control Basin	208 acres	Conceptual
Amargosa Creek Pathways Project	Not quantified	Conceptual
Antelope Valley Watershed Surface Flow Study	Not quantified	Conceptual
Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)	161 acres	Conceptual
Avenue R and Division Street Groundwater Recharge and Flood Control Basin	93 acres	Conceptual
Barrel Springs Groundwater Recharge and Flood Control Basin	40 acres	Conceptual
Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H	100 acres	Conceptual
Hunt Canyon Groundwater Recharge and Flood Control Basin	300 acres	Conceptual
Multi-use/Wildlife Habitat Restoration Project	Not quantified	Conceptual
Tropico Park Pipeline Project	Not quantified	Conceptual

Promote Land Conservation Projects that Enhance Flood Control, Aquifer Recharge, and Watershed and Open Space Preservation. Though a number of agencies are pursuing groundwater recharge projects, additional promotion of conservation projects could be accomplished through the adoption of a MOU with municipalities in the Antelope Valley Region to elicit and promote compliance with plans approved for the Antelope Valley Region including the area General Plans and the Mojave HCP.

6.5 Land Use Planning/Management

Progress to Date and Revisions to Regional Objectives

Since the 2007 IRWM Plan was developed, the Region has had little growth due to the economic downturn, limiting the Region's ability to meet its land use objectives and targets. The Region has maintained the same objectives and targets, extending out the target date for developing a regional land use management plan to 2017.

Assessment of IRWM Projects' Potential to Meet Environmental Resource Management Objectives

The main issues of concern regarding land use management in the Antelope Valley Region relate to the preservation of agricultural land, which includes a recognition of the historical relationship to the land and a support of a right to farm as well as the private property rights of all owners to economic benefits from their property, and the ability to provide recreational opportunities for a growing population. The following objectives and planning targets were identified to address these concerns:

Land Use Management Objective 1. Maintain agricultural land use within the Antelope Valley Region.

- *Target:* Preserve 100,000 acres of farmland in rotation through 2035.

Land Use Management Objective 2. Meet growing demand for recreational space.

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

Land Use Management Objective 3. Improve integrated land use planning to support water management.

- *Target:* Coordinate a regional land use management plan by the year 2017 and incorporate adaptive management strategies for climate change.

Several projects were submitted for inclusion in the AV IRWM Plan that provide direct benefits associated with land use management. Projects such as the Multi-use/Wildlife Habitat Restoration Project will directly create recreational area. Projects that recharge groundwater and expand recycled water availability will help to preserve agricultural lands by continuing to provide a reliable water source. These types of projects indirectly benefit land use management, but do not directly meet the objectives identified for the Antelope Valley Region. Employing land use planning as a strategy provides a way to better manage and protect local water supplies. Programs can be developed to assist in water conservation, protect and improve water quality, address stormwater capture and flooding, protect and enhance environmental habitat areas and recreational opportunities. Thus, implementing land use planning strategies can assist in achieving not only the land use management objectives, but also the overall AV IRWM Plan objectives. The projects shown in Table 6-6 will help the Region to meet its land use planning/management objectives.

Table 6-6: Projects with Land Use Planning/Management Benefits

Project	Status
Antelope Valley Water Bank	Complete
Antelope Valley Regional Conservation Project	Implementation
AVEK Strategic Plan	Implementation
Eastside Banking & Blending Project	Implementation
South Antelope Valley Intertie Project	Implementation
Water Supply Stabilization Project – Westside Project (WSSP-2)	Implementation
Water Supply Stabilization Project (WSSP) – Westside Expansion	Implementation
Amargosa Creek Pathways Project	Implementation
Lancaster National Soccer Center Recycled Water Conversion	Implementation
Pierre Bain Park Recycled Water Conversion	Implementation
Whit Carter Park Recycled Water Conversion	Implementation
Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	Implementation
Palmdale Power Plant Project	Conceptual
Big Rock Creek In-River Spreading Grounds	Conceptual
Multi-use/Wildlife Habitat Restoration Project	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 2	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 3	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 4	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Division Street Corridor	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 1b	Conceptual
Palmdale Recycled Water Authority – Phase 2 Distribution System	Conceptual

Future Planning Efforts and Actions to Fill the Identified Land Use Management Gaps

Below are additional future planning efforts and actions that have been identified in order to better meet the land use management objectives.

Preserve Farmland. The planning target, which is provided in order to gauge success in meeting the land use management objectives, is to preserve 100,000 acres of farmland in rotation through 2035. At any given time, approximately 19,000 acres of farmland are actively being farmed in the Antelope Valley Region. While some of the proposed projects include farmland as a component that would contribute to this target, it is still being suggested as a future planning effort for the Antelope Valley Region because the planning target was not entirely met.

Build Public Parks and Recreational Amenities. The planning target, which is provided in order to gauge success in meeting the land use management objectives, is to increase public parks and recreational amenities by providing 5,000 acres of recreational space by 2035. As this planning target was not met by the projects proposed in this IRWM Plan, it is being suggested as a future planning effort for the Antelope Valley Region. As part of this planning effort, an Antelope Valley Region-wide inventory of existing water-related recreational opportunities could be developed that would aid in providing a needs assessment for future opportunities. Implementation of LID techniques where feasible are recommended.

Create a Watershed Management Plan. There is currently no watershed management plan for the Antelope Valley Region. Watershed management plans are similar to this IRWM Plan in that they bring together a wide range of stakeholders, including city and county staff, resource managers and policy officials, and community organizations to protect and restore the aesthetic and function of the watershed where needed. Watershed management plans focus on the 'function' of a watershed, and thereby assess the health and value of watershed components.

Create Incentives for Landowners to Protect/Restore/Preserve Open Space. Land use agencies have the ability to create incentives and/or eliminate disincentives for landowners to protect and restore open spaces and habitat on their property. Technical assistance and financial incentives have proven effective in protecting and restoring privately held natural areas, which in turn helps to meet regional water quality, flood management and environmental management objectives. Implementation of LID techniques where feasible are recommended.

Coordinate a Regional Land Use Management Plan. Traditionally, cities and counties have the responsibility for land use planning, much of which is continued in the local and regional General Plans. These planning documents to some extent address water and environmental resources in the context of land use planning. However, through the coordination of a regional land use plan, these efforts can be combined to better manage and protect local water supplies, improve water quality, reduce flooding, restore habitats and ecosystems, and provide recreational, educational, and access opportunities to the public for a potentially greater regional benefit.

6.6 Climate Change Mitigation

Progress to Date and Revisions to Regional Objective

The Region did not include a climate change mitigation objective as part of its 2007 IRWM Plan. As part of this Plan Update, the Region considered climate change throughout the various Plan sections, including the addition of a climate change mitigation target in Section 4.

Assessment of IRWM Projects' Potential to Meet Environmental Resource Management Objectives

The objective and planning target identified for climate change mitigation include:

Objective 1: Mitigate against Climate Change

- Target 1: Implement "no regret" mitigation strategies, when possible, that decrease GHGs or are GHG neutral

The projects shown in Table 6-7 will help the Region to decrease GHG emissions caused by water resources management projects or will help the Region to become GHG neutral. Some projects will directly reduce GHG emissions, such as the Solar Power System at K-8 Division which will reduce GHG emissions caused by power generation. Projects that restore habitat will produce carbon sequestration benefits through the introduction of plants to the area. Projects that offset imported water supply will indirectly reduce GHG emissions by reducing the amount of energy required to move water south from the Delta.

Table 6-7: Projects with Climate Change Mitigation Benefits

Project	Status
Antelope Valley Water Bank	Complete
Solar Power System at K-8 Division	Complete
Water Supply Stabilization Project – Westside Project (WSSP-2)	Complete
Antelope Valley Recycled Water Master Plan	Implementation
Antelope Valley Regional Conservation Project	Implementation
AVEK Strategic Plan	Implementation
BCSD Arsenic Management Feasibility Study and Well Design	Implementation
Division Street and Avenue H-8 Recycled Water Tank	Implementation
Eastside Banking & Blending Project	Implementation
Lancaster National Soccer Center Recycled Water Conversion	Implementation
Littlerock Creek Groundwater Recharge and Recovery Project	Implementation
Littlerock Dam Sediment Removal	Implementation
Pierre Bain Park Recycled Water Conversion	Implementation
RCSD Arsenic Consolidation Project	Implementation
Water Supply Stabilization Project (WSSP) – Westside Expansion	Implementation
Whit Carter Park Recycled Water Conversion	Implementation
45th Street East Groundwater Recharge and Flood Control Basin	Conceptual
Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)	Conceptual
Avenue R and Division Street Groundwater Recharge and Flood Control Basin	Conceptual
Barrel Springs Groundwater Recharge and Flood Control Basin	Conceptual
BCSD Arsenic Removal Treatment Plant	Conceptual
Big Rock Creek In-River Spreading Grounds	Conceptual
ET Based Controller Program	Conceptual
Hunt Canyon Groundwater Recharge and Flood Control Basin	Conceptual
Implement ET Controller Program	Conceptual
KC & LAC Interconnection Pipeline	Conceptual
Little Rock Creek In-River Spreading Grounds	Conceptual
Lower Amargosa Creek Recharge Project	Conceptual
Multi-use/Wildlife Habitat Restoration Project	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Division Street Corridor	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 2	Conceptual

Project	Status
North Los Angeles/Kern County Regional Recycled Water Project - Phase 3	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 4	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project - Phase 1b	Conceptual
Palmdale Power Plant Project	Conceptual
Palmdale Recycled Water Authority – Phase 2 Distribution System	Conceptual
Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation	Conceptual
Place Values and Turnouts on Reclaimed Water Pipeline	Conceptual
Precision Irrigation Control System	Conceptual
Pressure Reducing Turbine Electric Generation System (Hydropower)	Conceptual
QHWD Partial Well Abandonment	Conceptual
RCSD Wastewater Pipeline	Conceptual
Stormwater Harvesting	Conceptual
Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H	Conceptual
Tropico Park Pipeline Project	Conceptual
Ultra-Low Flush Toilet Change-out Program	Conceptual
Waste Water Ordinance	Conceptual
Water Conservation School Education Program	Conceptual

Future Planning Efforts and Actions to Fill the Identified Land Use Management Gaps

Below are additional future planning efforts and actions that have been identified in order to better meet the climate change mitigation objective.

Create or Update Climate Action Plans. Climate Action Plans are used by municipalities to define how municipal operations can reduce energy and greenhouse gas emissions. The Region's municipalities may consider creating a climate action plan or continuing to update their Climate Action Plans, particularly focusing on how water operations impact the climate.

Implement Additional Projects to reduce GHG emissions. The projects proposed will help the Region to reduce its GHG emissions. It may be possible to further reduce GHG emissions or become GHG neutral through the implementation of strategies that are not considered no-regret strategies.

Section 7 | Project Evaluation and Prioritization

This section presents the process used by the Region to submit, review, and prioritize projects. In general, the Region seeks to include projects in the IRWM Plan that support the Regional Objectives and Planning Targets described in Section 4. Section 7.1 provides a discussion of the Project Submittal Process, including the types of projects encouraged, how projects can be submitted, and the information required. Section 7.2 discusses the Project Review Process for the acceptance of projects into the IRWM Plan, and Section 7.3 discusses how the project list will be communicated to the public. Section 7.4 discusses the criteria and methodology used to prioritize the project list.

7.1 IRWM Project Submittal Process

The Antelope Valley IRWM Region allows proponents to submit projects and project updates for consideration on an ongoing basis, and it has a process in place to review submittals on a semi-regular basis utilizing the A-Team and Stakeholder Group. In addition, the Region periodically conducts open "calls for projects". These calls for projects are intended to encourage updates to existing projects and to solicit information about new projects that could be accepted into the IRWM Plan. They primarily occur prior to IRWM Plan Updates and/or grant funding opportunities. Whenever new or revised projects are being considered for acceptance into the IRWM Plan, notices are posted on the Region's website (www.avwaterplan.org), and email notifications are sent to the Region's stakeholders.

Generally speaking, projects that have already been accepted into the IRWMP are considered "grandfathered" in and may be updated by project proponents as appropriate. Revisions to these existing projects will be reviewed by the A-Team as needed, and questions may be presented to the Stakeholder Group for discussion if needed.


The Stakeholders are presented with the projects proposed for inclusion in the Plan

New projects must go through the submittal process. New projects selected for inclusion in the 2013 IRWM Plan Update were submitted in three ways: (1) by email using an electronic or scanned form, (2) on the www.avwaterplan.org website using an electronic form, and (3) with in-person meetings between project proponents and consultants during the Plan Updates. After submittal, the website information was updated with the assistance of LACDPW. The master list of IRWM projects (i.e., accepted into the IRWMP) is maintained on the www.avwaterplan.org website. Before projects are considered to be accepted into the IRWM Plan, they must go through the review process described below. A database of submitted projects that have not yet been accepted into the IRWM Plan is maintained separately from the master projects list on the website. Once projects go through the review process, they may be included in the master projects list. After the 2013 IRWM Plan Updates are complete, all project proponents will be encouraged to submit new projects and updates by logging in to the website and entering project information directly.

What types of projects are encouraged?

Projects eligible for inclusion in the plan include implementation projects, plans and studies, and conceptual projects. Projects at all levels of development are encouraged so that a thorough inventory of ideas can be made available on the website.

IRWM Plan projects that support the following Antelope Valley Regional Objectives are encouraged:

- Provide reliable water supply to meet Antelope Valley's expected demand between now and 2035; and adapt to climate change
- Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries
- Stabilize groundwater levels
- Provide drinking water that meets regulatory requirements and customer expectations
- Protect and maintain aquifers
- Protect natural streams and recharge areas from contamination
- Maximize beneficial use of recycled water
- Reduce negative impacts of stormwater, urban runoff, and nuisance water
- Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses
- Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region
- Maintain agricultural land use within the Antelope Valley Region
- Meet growing demand for recreational space
- Improve integrated land use planning to support water management
- Mitigate against climate change

How can projects be submitted and/or updated?

The projects selected for inclusion in the 2013 IRWM Plan Update were submitted in one of three ways: (1) via email using an electronic or scanned form, (2) via online form through www.avwaterplan.org, or (3) via in-person interviews. Project proponents were then contacted by the Region to collect additional information on the projects. In the future, all regional stakeholders will be encouraged to submit projects using the web interface project form as follows:

1. Register for an account at www.avwaterplan.org in the "Projects" section of the website or, if the applicant does not have internet access, contact the Los Angeles County Department of Public Works at (626) 300-3353 for a hard copy of the project submittal form.
2. Collect the required project information (described below).
3. Upload the required project information to the website; or, if a hard copy form was requested, submit the form to Los Angeles County Department of Public Works by emailing a scanned copy of the form to ajaramillo@dpw.lacounty.gov, or sending the form to the County of Los Angeles Department of Public Works, Waterworks Districts, 1000 South Fremont Avenue, Building A9-E, 4th Floor, Alhambra, CA 91803.

Once a project has been submitted, it will be retained in a list of "submitted projects" for subsequent review by the Region's A-Team and Stakeholder Group for potential acceptance into the IRWM Plan.

What information is required?

Projects at all levels of development are eligible for submittal to the IRWM Plan. For grant funding opportunities, well-developed projects are preferred because they are more competitive in terms of satisfying the typical scoring criteria. Projects eligible for inclusion in the plan include implementation projects, plans and studies, and conceptual projects.

<u>Implementation Projects</u>

For implementation projects, the basic project information is required:

- Project title
- Project proponent
- Project partners
- Project contact information
- Proponent's IRWM Plan adoption status
- Project description (2-3 paragraphs)
- Project location (using GeoTracker)
- Project integration information

The following narrative and technical information is also required:

- **How the project will contribute to IRWM Plan objectives**: The project must help the Region to achieve its IRWM Plan objectives, as discussed in Section 4. To demonstrate this, the project sponsor must indicate which objectives the project will support.
- **How the project is related to resource management strategies**: The IRWM Plan identifies the RMS selected for use in the Plan with the goal of diversifying the Region's

water management portfolio, as indicated in Section 5. The project sponsor must indicate which of these RMS that the project aligns with.

- **Technical feasibility of the project:** Technical feasibility is related to the knowledge of the project location; knowledge of the water system at the project location; or with the material, methods, or processes proposed to be employed in the project. The project sponsor must cite supporting documents to demonstrate that there is enough known about existing conditions where the project will be located and that there is sufficient technical data to indicate that the project will result in a successful outcome.
- **Specific benefits to critical DAC water issues:** Identification and consideration of water-related needs of DACs in the area must be addressed by the Region in the IRWM Plan. Therefore, it is required that the project sponsor indicate if and how the project will address such needs.
- **Specific benefits to critical water issues for Native American tribal communities:** Identification and consideration of water-related needs of Native American tribal communities in the area must be addressed by the Region in the IRWM Plan. Therefore, it is required that the project sponsor indicate if and how the project will address such needs.
- **Environmental justice considerations[1]:** As IRWM plans contain multiple projects that will affect stakeholders in the Region, environmental justice concerns must be considered. The Region is required to ensure that project sponsors are aware of the impacts of the project on stakeholders, and therefore the project sponsor is required to indicate whether there are known environmental justice concerns or whether these concerns are unknown.
- **Project costs and financing:** The project's estimated costs and how it will be financed must be indicated by the project sponsor. If a cost estimate has been prepared for the project, a link to that estimate must be provided.
- **Economic feasibility:** The economic feasibility of the project must be discussed by the project sponsor. This can take the form of either a cost-effectiveness or benefit-cost analysis, and should include the types of benefits and the types of costs including capital costs, O&M costs, and potential adverse effects to others from the project.

- **Project status:** The status of the project, also referred to as the project's readiness to proceed, should be indicated by specifying whether the project is conceptual (minimal planning has been completed), in the design phase (design drawings are being prepared, or more detailed planning is underway), or ready for construction. The project sponsor must also indicate whether CEQA is complete. As the planning horizon for the 2013 IRWM Plan Update is 22

1 Environmental justice is the "fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (California Government Code §65040.12(e)).

years (to 2035), projects at all levels of development will be considered for inclusion in the IRWM plan.

- **Contribution of the project in adapting to or mitigating against the effects of climate change:** The Region is dedicated to adapting to and mitigating against future climate change impacts. Project sponsors should indicate whether the project may help the Region to adapt to the predicted impacts of climate change (see Section 2), or will mitigate against climate change by reducing GHG emissions or providing greater energy efficiency as compared to project alternatives.

Once the project is submitted, it will be considered for inclusion in the IRWM Plan by the A-Team and Stakeholder Group. A copy of the Project Submittal Form is included in Appendix J.

Plans and Studies

The above discussion applies to implementation projects. Plans and studies may also be submitted as projects, but the level of detail discussed above may not be applicable.

For plans and studies, the basic project information is required:

- Project title
- Project proponent
- Project partners
- Project contact information
- Proponent's IRWM Plan adoption status
- Project description (2-3 paragraphs)
- Project location (if applicable, using GeoTracker)
- Project integration information

The following narrative and technical information is also required (see above for descriptions of these items):

- How the project will contribute to IRWM Plan objectives
- How the project is related to RMS
- Specific benefits to critical DAC water issues
- Specific benefits to critical water issues for Native American tribal communities
- Project costs and financing
- Contribution of the project in adapting to or mitigating against the effects of climate change

Conceptual Projects

Projects that do not meet the basic review criteria for implementation projects may still be admitted as "conceptual" projects. These are projects that the A-Team and Stakeholder Group determine could contribute to meeting the Region's IRWM objectives, but may not yet be developed enough to include in the IRWM Plan as an implementation project. For the purposes of this Plan, the Stakeholder Group has determined that if a preliminary economic analysis has not been conducted the project will be considered conceptual. For conceptual projects, the following basic information is required:

- Project title
- Project proponent
- Project partners
- Project contact information
- Proponent's IRWM Plan adoption status
- Project description (1 paragraph) – should indicate how the project could provide the Region with at least one benefit, address at least one regional IRWMP objective, and utilize at least one of the RMS
- Project location (using GeoTracker, if appropriate)
- Project integration information

Conceptual projects will be revisited should additional information be provided.

7.2 IRWM Project Review for Inclusion in the Plan

As with project submittal, project review is intended to be an ongoing process. The A-Team is responsible for reviewing new projects and project updates and for making recommendations to the Stakeholder Group about acceptance into the IRWM Plan. This is done on an ongoing basis as projects are submitted.

Projects are reviewed by the A-Team using the process shown in Figure 7-1 and based on the required criteria listed below in Table 7-1. Those projects that meet the minimum requirements may be recommended for inclusion in the Plan as conceptual projects. If a preliminary economic analysis has been conducted, the A-Team may recommend a project to be accepted as an implementation project. The list of projects recommended by the A-Team for acceptance in the Plan is then approved by the Stakeholder Group at regular stakeholder meetings.

Figure 7-1: IRWM Project Review Process

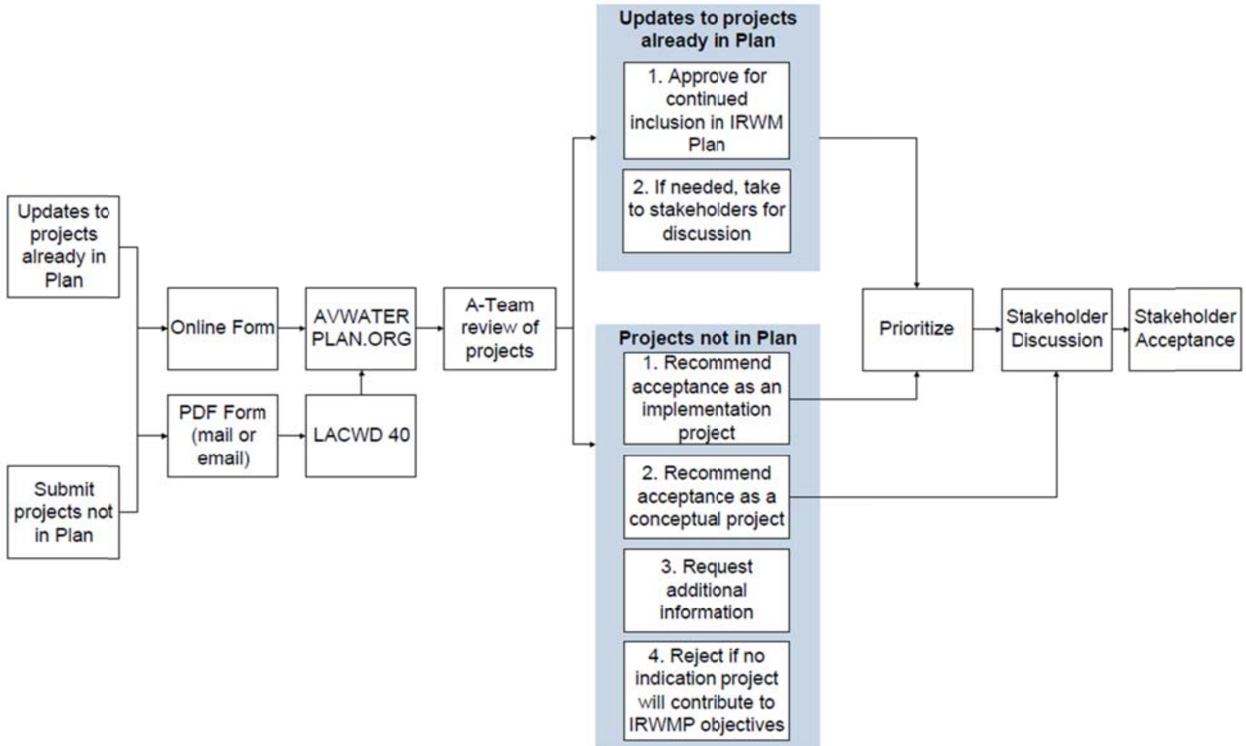


Table 7-1: Project Review Factors for Acceptance into the IRWM Plan

Review Factor[2]	Criteria and Comments
General Information	Has general information been provided? This includes project title, proponent, partners, contact information, and proponent's IRWM Plan adoption status.
Project Description	Has a complete project description been provided? This includes a project description, project integration information, and project document sources.
Project Location	Has the project location been provided?
Project Benefits	Is a minimum of one quantifiable benefit identified?
IRWMP Objectives[3]	Will at least one Antelope Valley IRWMP objective be addressed?
Resource Management Strategies[4]	Will at least one Resource Management Strategy be addressed?
Technically Feasible	Is at least one study/report/document identified that justifies technical feasibility?
DAC Benefits	If the project will benefit a DAC, has the proponent described how the project addresses the needs of the DAC?
Native American Tribal Community Benefits	If the project will benefit a Native American tribal community, has the proponent described how the project addresses the needs of the Native American tribal community?
Environmental Justice Considerations	If the project has environmental justice issues, have they been described?
Project Costs and Financing	Have the project capital cost, operations and maintenance costs, and funding/financing sources been provided? If a cost estimate has been completed, has it been provided?
Economic Feasibility	If a cost-effectiveness or benefit-cost analysis has been performed, has it been provided?
Readiness to Proceed	Is the project status identified (i.e., conceptual, design, ready for construction, CEQA Compliance)?
Benefits to Multiple Stakeholders	Will the project benefit more than one stakeholder or are there multiple project benefits?
Climate Change Adaptation/GHG Mitigation	Has the proponent indicated how the project will help the Region adapt to climate change and/or aid the Region in reducing GHG emissions?

[2] Shaded review factors indicate those criteria that are required to be accepted into the plan as a conceptual project.
[3] See *2013 Antelope Valley IRWMP, Section 4 Objectives* for more information.
[4] See *California Water Plan Update 2009*, http://www.waterplan.water.ca.gov/cwpu2009/index.cfm

7.3 Procedures for Communicating the Project List of Selected Projects

The project list in the original 2007 IRWM Plan was included in that document as an appendix. However, the updated project list is meant to be a "living document" and will therefore be maintained on the www.avwaterplan.org website as both a database of "submitted" projects and a listing of "accepted" projects. The Region's A-Team will evaluate submitted projects based on the previously discussed information. After review of a given project, the A-Team may take one of three actions: (1) recommend the project to the Stakeholder Group for acceptance into the IRWM Plan, (2) hold the project and request additional information, or (3) maintain the project within the database as a "submitted" project.

As the AV IRWM Plan is updated, the opportunity exists to reevaluate the projects included in this IRWM Plan as their project scopes are refined, and a continual assessment of whether this IRWM Plan is meeting the issues and needs of the Antelope Valley Region will be conducted. Additionally, this IRWM Plan provides a mechanism for identifying new projects designed in accordance with the regional objectives, priorities, and management strategies.

7.4 IRWM Project Prioritization

The projects included in the IRWM Plan are projects that will implement the Plan and help to achieve the Plan objectives. The intent of the project prioritization process is to identify those projects and management actions the Region's stakeholders would like to pursue first to address the Region's issues and needs. Projects should embody the priorities of the planning effort and are intended to represent a prudent investment for sources of grant funding. For the purposes of this plan, only implementation projects were prioritized. The general process and criteria used to determine the priority level of implementation projects are described below. These criteria could be superseded by specific grant criteria as grant opportunities become available.

7.4.1 Project Prioritization Criteria

Each project is assessed using the project review criteria described below. The methodology for applying the criteria is also described. Studies and reports are considered "implementation" projects since for some grant programs certain studies/reports are eligible for implementation funding. If a project or plan is not far enough along to have a preliminary economic analysis available, then it is considered conceptual and not scored with the implementation projects. Table 7-2 summarizes the criteria and scoring used to categorize and prioritize the projects.

Project Benefits: Each project is evaluated on the number of quantifiable water-related benefits it could produce that would help the Region meet its objectives. There is no limit to the number of quantifiable benefits as long as adequate justification is provided. Each benefit is assessed as having "good", "fair", or "poor" justification. Projects that could contribute more benefits and/or that have more substantial technical justification are favored over projects that have less. Recharge projects with spreading basins are assumed to have water quality benefits because of soil aquifer treatment. This benefit is not assumed for projects that inject water into the basin (ASR). Projects that increase local supply are assumed to also offset water supply from the Sacramento-San Joaquin Delta and thereby also reduce energy consumption/greenhouse gas emissions by decreasing water conveyance energy requirements.

IRWM Plan Objectives: Each project is evaluated on the number of IRWM Plan Objectives it would help the Region meet. Projects with more IRWM Objectives are preferred over projects with fewer. Recharge projects are assumed to support the objective of "protect and maintain aquifers" when they recharge groundwater with water from high quality sources, such as imported water. Projects that offset water supply from the Sacramento-San Joaquin Delta are also assumed to mitigate climate change impacts since they reduce the energy consumption and greenhouse gas emissions associated with pumping and transporting imported water. Projects that increase the transport or storage of recycled water to recreational areas are assumed to support the objective of "meet the growing demand for recreational space". These types of projects would help recreational areas remain operational during droughts when potable supplies may be rationed.

Resource Management Strategies: Each project is evaluated on the number of RMS it would help to implement. These RMS are listed in the 2009 update of the DWR's California Water Plan. Projects that support more RMS are favored over those that support fewer.

DAC Benefits: Projects that provide water supply, quality, and/or flood management benefits to DACs are favored over projects that do not. Projects that produce region-wide benefits were assumed to also benefit DACs if it can be demonstrated that DAC areas lie within the regional influence.

Native American Tribal Community Benefits: Projects that provide benefits to Native American tribal communities are favored over projects that do not. No Native American Tribal Communities have been identified in the watershed at this time.

Environmental Justice Considerations: Projects that address environmental justice issues are favored over projects that do not.

Table 7-2: Prioritization Method and Scoring

Criterion	Conceptual	Implementation	Prioritization Scoring
General Information	Project description, location, and general info	Project description, location, and general info	---
Prelim. Economic Analysis	NO	YES	---
Project Benefits	At least one	At least one	Per Benefit: 3 pts = good justification 2 pts = fair justification 1 pts = poor justification
IRWMP Objectives	At least one	At least one	1 pt per Objective
Resource Mgmt. Strategies	At least one	At least one	1 pt per RMS
DAC/Tribal/Env. Justice	Sufficient information	Sufficient information	For each: Yes = 3 pts No = 0 pts
Project Costs	Sufficient information for level of design	Sufficient information for level of design	---
Technically Feasible	At least one supporting document	At least one supporting document	---
Readiness to Proceed	Status clearly defined	Status clearly defined	---
Climate Change	Sufficient information	Sufficient information	---

Other criteria not directly addressed in the project prioritization include a project's technical feasibility, project costs and financing, benefits to multiple stakeholders and climate change adaptation and greenhouse gas mitigation. These criteria are already captured in the other prioritization criteria. Additionally, a project's economic feasibility is incorporated into the judgment of whether it is considered an implementation or conceptual project through the requirement of a preliminary economic analysis.

7.4.2 Prioritized Projects

The Antelope Valley IRWMP project list should be considered a "living document" to be continually modified and updated on the IRWMP website. The projects listed below are only a snapshot of the projects as of the development of this IRWMP and should only be considered as such. For more updated project information, please consult the website at www.avwaterplan.org.

The projects shown in Table 7-3 are classified as studies or plans and implementation projects and are scored according to the prioritization method. Those projects that received higher scores are shown at the top of the table. Projects that were accepted into the Plan as conceptual projects were not scored but are listed in Table 7-4. For a more detailed table of the projects accepted into the Plan, including completed projects and detailed scoring of the implementation projects, please see Appendix K.

Table 7-3: Prioritized Implementation Projects Accepted into the Antelope Valley IRWM Plan

Sponsor	Project Name		Benefits Score	Objectives Score	RMS Score	DAC	Total Score
City of Palmdale	Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	Implementation	13	11	8	3	**35**
Palmdale Water District	Littlerock Creek Groundwater Recharge and Recovery Project	Implementation	11	9	5	3	**28**
Palmdale Water District	Littlerock Dam Sediment Removal	Implementation	15	6	4	3	**28**
Antelope Valley Resource Conservation District	Antelope Valley Regional Conservation Project	Implementation	10	5	6	3	**24**
AVEK	Water Supply Stabilization Project (WSSP) – Westside Expansion	Implementation	8	8	4	3	**23**
AVEK	Eastside Banking & Blending Project	Implementation	9	7	3	3	**22**
AVEK	AVEK Strategic Plan	Study/Report	6	6	7	3	**22**
Palmdale Recycled Water Authority	Palmdale Recycled Water Authority – Phase 2 Distribution System	Implementation	9	6	4	3	**22**
AVEK	South Antelope Valley Intertie Project	Implementation	5	6	7	3	**21**
City of Lancaster	Antelope Valley Recycled Water Master Plan	Study/Report	9	4	5	3	**21**
Boron CSD	BCSD Arsenic Management Feasibility Study and Well Design	Study/Report	9	5	3	3	**20**
City of Lancaster	Division Street and Avenue H-8 Recycled Water Tank	Implementation	9	5	3	3	**20**
City of Lancaster	Lancaster National Soccer Center Recycled Water Conversion	Implementation	9	5	3	3	**20**
City of Lancaster	Pierre Bain Park Recycled Water Conversion	Implementation	9	5	3	3	**20**
City of Lancaster	Whit Carter Park Recycled Water Conversion	Implementation	9	5	3	3	**20**
Rosamond CSD	RCSD Arsenic Consolidation Project	Implementation	8	4	5	3	**20**
City of Palmdale	Palmdale Power Plant Project	Implementation	3	3	3	3	**12**

Table 7-4: Conceptual Projects Accepted into the Antelope Valley IRWM Plan

Sponsor	Conceptual Projects
Antelope Valley Duck Hunting	• Multi-use/Wildlife Habitat Restoration Project
Boron CSD	• BCSD Arsenic Removal Treatment Plant
City of Lancaster	• Amargosa Creek Pathways Project • Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H • Lancaster Cemetery Recycled Water Conversion • Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H
City of Palmdale	• 42nd Street East, Sewer Installation • 45th Street East Groundwater Recharge and Flood Control Basin • Avenue R and Division Street Groundwater Recharge and Flood Control Basin • Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin) • Barrel Springs Groundwater Recharge and Flood Control Basin • Hunt Canyon Groundwater Recharge and Flood Control Basin • Lower Amargosa Creek Recharge Project
EAFB	• Antelope Valley Watershed Surface Flow Study
LACDPW	• Big Rock Creek In-River Spreading Grounds • Little Rock Creek In-River Spreading Grounds
LACWD 40	• Avenue K Transmission Main, Phases I-IV • Avenue M and 62th Street West Tanks • Implement ET Controller Program • North Los Angeles/Kern County Regional Recycled Water Project - Phase 3 • North Los Angeles/Kern County Regional Recycled Water Project - Phase 4 • Ultra-Low Flush Toilet Change-out Program • Waste Water Ordinance • Water Conservation School Education Program
Leona Valley Town Council	• Precision Irrigation Control System • Stormwater Harvesting
North Edwards WD	• Arsenic Contamination Project
Palmdale Water District	• ET Based Controller Program • New PWD Treatment Plant
QHWD	• QHWD Partial Well Abandonment
Road Maintenance Division (LACDPW)	• Build a bridge at the existing dip crossing of Mt. Emma Road @ Littlerock Creek • Flooding issues Avenue P-8, between 160th and 170th Street East • Flooding issues Avenue W, near 133rd Street East
Rosamond CSD	• Deep Wells to Recapture Banked Water • Gaskell Road Pipeline • KC & LAC Interconnection Pipeline • Place Values and Turnouts on Reclaimed Water Pipeline • Purchasing Spreading Basin Land • RCSD Wastewater Pipeline • Tropico Park Pipeline Project

Section 8 | Implementation

This section develops a comprehensive implementation plan for the IRWM Plan. The objectives of this section are to describe how the governance structure of the Region operates now and in the future, develop a financial plan for implementation of the Plan and projects selected as implementation projects, describe how the Region will manage and report data, describe the technical information used in developing this plan and data gaps found, identify a means for monitoring progress in meeting Plan objectives, and describe how the Plan will be updated and maintained throughout the planning horizon.

8.1 Framework Introduction

This subsection discusses the agencies and stakeholders that develop plans or participate in the development of plans in the Antelope Valley Region, and it identifies the different scales at which planning occurs. How local agencies and stakeholders choose to link regional water issues and challenges with the IRWM Plan priorities, strategies, and objectives noted in Section 4; combine water management strategies; or determine which specific activities should occur for any specific water management strategy may vary based on the scale of planning. It is within this framework that the stakeholders intend to move toward the shared resource management objectives, following a course of greater integration and coordination of water projects and programs in the Region.

8.1.1 Existing Plans and Programs

A substantial number of federal, state and local/regional agencies and jurisdictions are responsible for, or participate in, the development and implementation of plans and programs that satisfy the resource management strategies developed earlier in this report.

Land use decisions have the potential to affect the resource management strategies utilized in the AV IRWM Plan, as land use can affect population growth, water demand, and surface water quality. The implementation of stormwater capture projects may require acquisition of land which could displace existing uses and may warrant consideration of modifications to land use policies and practices. In addition, the passage and implementation of water conservation or floodplain management ordinances can further address IRWM Plan objectives. In developed areas, the land use decision makers are primarily the cities and the counties. In open space areas, the Forest Service, National Park Service, and California State Parks have regulatory responsibility for the conservation and preservation of those spaces. Additionally, many 'open spaces' in the Antelope Valley Region are undeveloped rural lands under Los Angeles and Kern County jurisdiction. All of these agencies and jurisdictions have been involved in the AV IRWM Plan as part of the stakeholder process, or are active members of the Antelope Valley RWMG (e.g., cities and counties).

The stakeholder process allows for interactive feedback to occur between local land use and water resources planning, and regional IRWM Plan planning. Local planning is conducted by cities, counties, and local agencies and districts. Most of the cities and counties in the Antelope Valley Region have participated either directly, or through the participation of a regional representative. Through the stakeholder workshops, the cities, counties and municipal agencies have advocated for their respective local planning needs and issues, which have been incorporated into the IRWM Plan through stakeholder feedback and project solicitation. Subsequently, the outcomes from the AV IRWM Plan process have been disseminated by the representatives back to their local decision makers, allowing the IRWM Plan priorities, objectives and planning targets to be considered in local planning efforts where appropriate. For example, the Los Angeles County General Plan is currently being updated (to be completed in 2014), and as appropriate, the AV IRWM Plan can be used to inform that process in areas related to water resource management.

Given this, numerous plans and studies related to water resources and land use management in the Antelope Valley Region have contributed to the development of the IRWM Plan. Thus, the AV IRWM Plan has been developed from and is consistent with local planning efforts in the Antelope Valley Region shown in Table 8-1.

8.2 Governance Structure

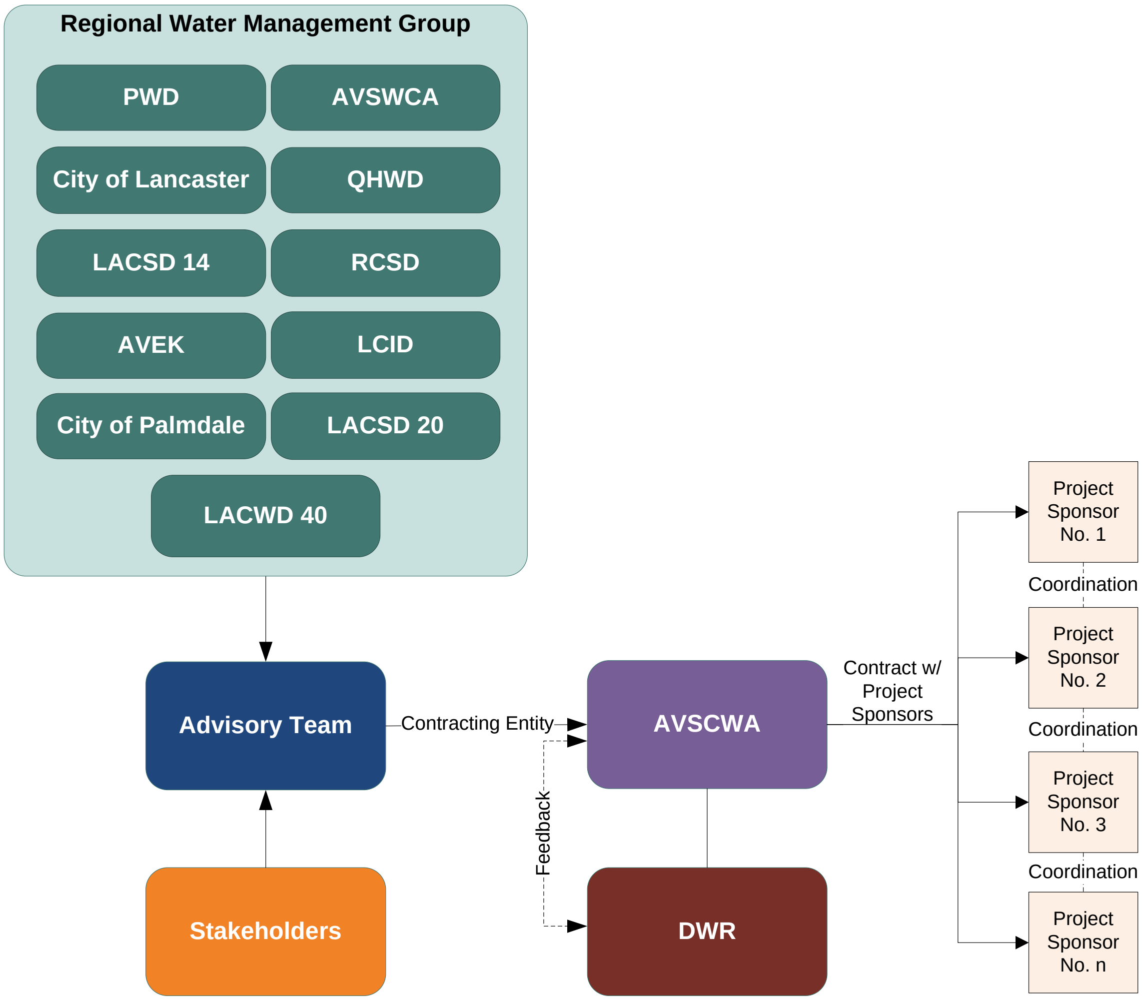
Governance structure means "decision-making" structure or management structure. As described in Section 1, the RWMG uses a governance structure established through an MOU that prescribed the roles and responsibilities for the RWMG. The MOU identifies how the RWMG will incorporate new members. When approved by all parties, new members may join the RWMG by adopting the IRWMP and executing the MOU. The MOU also states that, when appropriate, new members may pay a reasonable financial contribution as the existing RWMG members shall determine. The MOU intentionally does not identify a level of financial contribution for each member. Any action of the RWMG requiring funding from the members, including updates to the IRWMP, public noticing, and preparation of grant applications, will require a separate agreement approved by the governing boards of each respective member.

As shown in Figure 8-1, the RWMG is the governing body, and invites stakeholder involvement beyond the MOU signatories through regularly scheduled stakeholder meetings and participation in the Advisory Team and subcommittees. The RWMG has engaged a balance of interested persons or entities representing sectors or interests by conducting all business in consultation with the larger Stakeholder Group in meetings which are open to the public. The Stakeholder Group includes all participants within the IRWMP process including 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. Any interested person may participate in Stakeholder meetings and provide input. The Stakeholder Group meets at least once per quarter (i.e., 4 times per year) to review progress on IRWMP implementation and to consider updates to the IRWMP (such as newly proposed projects or management actions that address the Regional Plan objectives).

Table 8-1: IRWM Plan Relationship to Local Planning Documents

Planning Document	Jurisdiction	Relationship to IRWM Plan	Updates
General Plans	Land use and zoning	Include land use and zoning information, significant ecological areas and growth projections for Antelope Valley cities and counties.	As needed
Lahontan Regional Water Quality Control Board Basin Plan	Water quality	Includes water quality information on local surface waters such as 303(d) listings, beneficial uses, non-point source pollution, and total maximum daily loads.	As needed
Urban Water Management Plans	Water supply	Provides current and 25-year projected water supply and demand, drinking water supply/quality issues, population and facilities	Every 5 years
State Water Project Reliability Report	Water supply	Contains information on projected reliability of imported water from the Delta.	Every 5 years
Groundwater Adjudication Documents	Water supply	Includes information on ongoing proceedings to adjudicate Antelope Valley groundwater, including historical pumping patterns, conditions of overdraft, and total sustainable yield.	As needed
Recycled Water Facilities Plans (Lancaster, Palmdale, Palmdale Water District, Rosamond Community Services District, LA County Waterworks District 40)	Water supply	Includes information on current and projected available recycled water supply and plans for future recycled water system expansion.	As needed
2009 California Water Plan	Water resources planning	Includes statewide discussion of water resources in California, including resource management strategies, strategic planning, and regional discussions.	Every five years
Species Recovery Plans	Habitat	Contains information on the locations of habitats of local endangered species.	As needed
Water Reclamation Plant Facilities Plans	Wastewater planning	Includes information on current and projected available recycled water supply and plans for future water reclamation plant expansion.	As needed

Figure 8-1: Antelope Valley IRWM Governance Structure



The RWMG has agreed to evaluate the effectiveness of the Region's governance structure periodically, and to explore additional options for governance structures for integrated regional water management in the Antelope Valley if needed. The following discussion provides additional detail on how the Region's governance structure performs various activities.

8.2.1 Public Involvement Process

The Region encourages public involvement in both the IRWM Plan development process and implementation process. The regional planning and public involvement process, described in Section 1, provided useful, broadly accepted information that supported development of the IRWM Plan Update. The public is encouraged to participate in the implementation of the updated IRWM Plan. To ensure continued participation, the Region will continue to hold regular stakeholder meetings open to the public. These meetings will allow the Region to accept project proposals on an ongoing basis, to continue to reach out to DACs, and to provide technical assistance when needed. DACs will be continually represented in the Stakeholder group so that the AV IRWM Plan will address the diverse issues and needs of the Antelope Valley Region.

8.2.2 Effective Decision Making

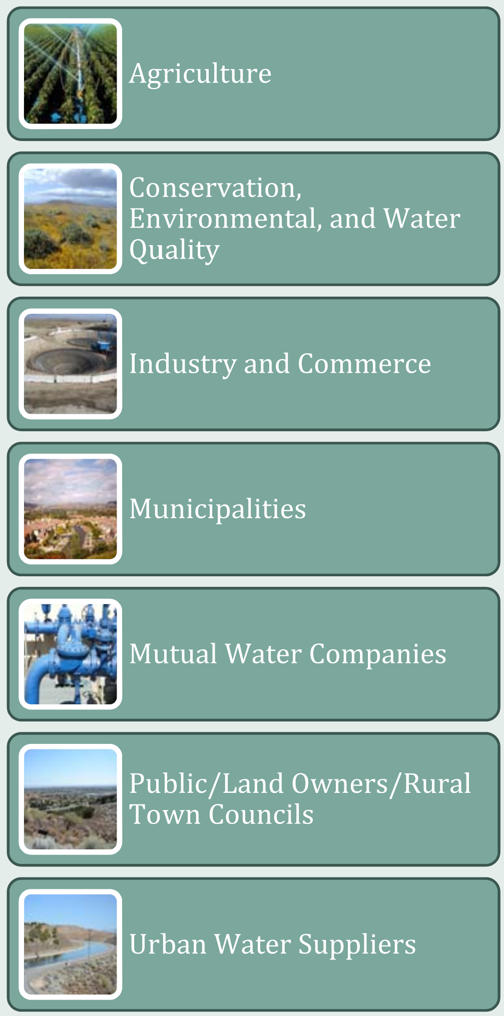
The RWMG has operated since its inception using a systematic approach called "facilitated broad agreement." Whenever a decision needs to be made, the discussion between the RWMG members and the Stakeholder Group is facilitated until all members come to a consensus on an acceptable course of action.

8.2.3 Balanced Access and Opportunity for Participation

The Region's planning efforts involve a diverse group of people with differing expertise, perspectives and authority of various aspects of water management to ensure balanced access and opportunity for participation. The RWMG itself is composed of various entities that represent water suppliers, wastewater service providers, land-use managers, flood managers, parks and recreation service providers, and environmental services. The Region's stakeholders represent a diverse group of entities that actively participate in regular stakeholder meetings and other IRWM program related activities, as described in Section 1.2.2.

Meeting materials for the Plan Update were developed by a consultant team in cooperation with RWMG members and other stakeholders, and made available for review and comment by the stakeholders. In addition to this, the Region has formed various subcommittees which stakeholders can participate in to provide further input, including the advisory team, a public outreach subcommittee, a DAC subcommittee, a flood management subcommittee, a SNMP subcommittee, and a climate change subcommittee. These are described below.

Figure 8-2: Advisory Team Interest Representation



8.2.3.1 Advisory Team

The MOU created an Advisory Team (A-Team) to provide focused initiative and effort to implement the IRWM Plan. The A-Team is not a decision-making body but is responsible for tasks such as:

- Organizing stakeholder meetings
- Maintaining the AVIRWM Plan website
- Identifying grant opportunities for which the RWMG or its members may apply
- Developing a list of short-term implementation objectives for consideration and approval by the RWMG and stakeholders[1]
- Maintaining a list of long-term implementation objectives for the RWMG to address and update at stakeholder meetings
- Recommending an annual scope and budget for the RWMG

[1] This task was completed when the first IRWMP was developed in 2007.

- Drafting agendas and preparing minutes for stakeholder meetings;
- Distributing information to stakeholders

The A-Team includes seven members selected by the Stakeholder Group to serve a three year term, and represent the categories of water-related interests shown in Figure 8-2.

The current list of A-Team seats and active members is maintained on the www.avwaterplan.org website.

8.2.3.2 Public Outreach Subcommittee

The Public Outreach Subcommittee was formed in order to provide public outreach for the Region's IRWM Program. This subcommittee is responsible for:

- Assisting with community events
- Assisting with outreach presentations
- Assisting with public notices
- Collaborating with DAC outreach

These responsibilities have largely been assumed by the A-Team, but all stakeholders are invited to participate in this subcommittee. This subcommittee provides recommendations to the stakeholder group and RWMG for inclusion of the above items in the IRWM Plan Update and reporting on public outreach activities as needed at stakeholder meetings. There is no limit to the term of service for serving on this subcommittee.

8.2.3.3 DAC Subcommittee

The DAC Subcommittee was formed in order to encourage participation by DACs in the IRWM Program and to solicit feedback in DAC-related issues. This subcommittee was responsible for:

- Helping coordinate DAC meetings
- Assisting with outreach discussions
- Reviewing technical memorandums related to DAC water supply and water quality needs
- Collaborating with the Public Outreach subcommittee

All stakeholders were invited to participate in this subcommittee through the duration of the IRWM Plan update process. This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of these items in the IRWM Plan Update and reporting on DAC outreach activities, and it will only meet as needed to incorporate additional DAC related information into subsequent IRWM Plan updates.

8.2.3.4 Flood Subcommittee

The Flood Subcommittee was formed in order to incorporate integrated flood management concepts into this Plan Update. This subcommittee was responsible for:

- Participating in flood/stormwater discussions related to existing flood plans, flood needs, project priorities, multiple-benefits, stormwater quality, NFIP, and FloodSAFE
- Reviewing technical memorandums related to existing flood plans, flood needs, project priorities, multiple-benefits, stormwater quality, NFIP, and FloodSAFE

All stakeholders were invited to participate in this subcommittee through the duration of the IRWM Plan update process. This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of these items in the IRWM Plan Update, and it will only meet as needed to incorporate additional flood related information into subsequent IRWM Plan updates.

8.2.3.5 Climate Change Subcommittee

The Climate Change Subcommittee was formed in order to incorporate climate change projections and impacts into this Plan Update. This group was responsible for:

- Reviewing and vetting projected effects and impacts of climate change
- Determining and prioritizing the Region's climate change vulnerabilities
- Assessing strategies for responding to climate change
- Developing climate change related objectives and targets

All stakeholders were invited to volunteer to participate in this subcommittee through the duration of the IRWM Plan update process. This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of these items in the IRWM Plan Update, and it will only meet as needed to incorporate new climate change related information into subsequent IRWM Plan updates.

8.2.4 Communication

The Region's IRWM program fosters communication with various functional groups both within the Region and outside the Region. Communication among the Region's stakeholders (including RWMG representatives, governmental agencies, project proponents, general stakeholders, and neighboring RWMGs) regarding the IRWM program typically occurs through email notifications, announcements posted to the Region's website (www.avwaterplan.org), public presentations, stakeholder workshops, subcommittee workshops and A-Team meetings. In addition, several one-on–one meetings were conducted in support of this IRWM Plan update to encourage participation by DACs (see Section 1 for additional information regarding DAC outreach), develop projects, and evaluate regional needs and issues (e.g., groundwater adjudication).

8.2.5 Long-term Implementation of the IRWM Plan

The Antelope Valley IRWM Program is committed to ensuring long-term implementation of the IRWM Plan to ensure sustainability of the Region's water supply, water quality and natural resources. All interested stakeholders will continue to be invited to participate in IRWM program meetings and planning efforts. The Region's MOU reflects the commitment to ensure long-term implementation of the IRWM Plan given that the MOU signed by each RWMG member does not expire for 20 years after the date of execution (i.e., January 2027).

It is expected by the stakeholder group that each member of the RWMG will adopt the 2013 IRWM Plan Update in early 2014. Project proponents who plan to submit grant funding applications are also encouraged to adopt the 2013 IRWM Plan Update prior to the grant application deadline. Other members of the stakeholder group may also adopt the Plan.

8.2.6 Coordination with Neighboring IRWM Efforts, State Agencies, and Federal Agencies

The Region's governance structure allows for coordination with neighboring IRWM Regions, State Agencies, and Federal Agencies. Representatives from neighboring IRWM regions, state agencies, and federal agencies are included in the Region's email list to receive meeting notifications and updates on IRWM program activities. When necessary, the Region coordinates directly with neighboring IRWM efforts and state and federal agencies by electing an appropriate RWMG or A-Team member to represent the Region. In the past, the Antelope Valley Region has coordinated with the Mojave IRWM and Kern IRWM Regions on regional boundary overlaps and city and agency overlaps for the Region Acceptance Process. The Antelope Valley Region has also coordinated with the Mojave, Inyo-Mono, and Tahoe-Sierra Regional on potential fund-sharing ideas within DWR's Lahontan funding area.

Additionally, the Region coordinates with state and federal agencies on grant and planning efforts by electing appropriate representatives. For example, the RWMG selected the AVSWCA to interface with DWR for the Proposition 84 grant efforts. Grant administration includes the ability to receive and administer funds to the awarded sponsored projects, to prepare the necessary progress reports and invoicing reports, to make investigations, and to execute, and file such documents and agreements with DWR as required.

8.2.7 Changes and Updates to the IRWM Plan

The AV IRWM Plan is a dynamic planning document. Given that the Region will continue the IRWM Program into the future, it will be possible to perform interim and formal changes to the IRWM Plan in response to changing conditions, and/or update or amend the IRWM Plan as needed. Should a change in the Region's water resources occur, stakeholders will have the opportunity to provide feedback at stakeholder meetings where the A-Team will determine necessary action items.

The AV IRWM Plan at a minimum will be updated every five years[2] as further study and planning is conducted, projects continue to be developed and objectives and priorities are adjusted. There will be an ongoing process for keeping the proposed project list up-to-date through regular quarterly updates with additional meetings. Revisions to the project list will be made as needed before major grant applications, as conditions change, as funding is identified, as projects are implemented, and as objectives are revised. The process for revising the project list is detailed in Section 7.

8.2.8 Future Governance Structure

Though no changes were made to the existing governance structure since 2007, in the future, the Region may consider formation of a JPA to replace the MOU. A JPA is formed when it is to the advantage of two or more public entities (e.g., utility or transport districts) with common powers to consolidate their forces to acquire or construct a joint-use facility. Their bonding authority and taxing ability is the same as their powers as separate units. A JPA is distinct from the member authorities, as they have separate operating boards of directors, yet these boards can be given any of the powers inherent in all of the participating agencies. In setting up a JPA, the constituent authorities must establish which of their powers the new authority will be allowed to exercise. A term and the membership and standing orders of the board of the authority must also be laid down. The joint authority can employ staff and establish policies independently of the constituent authorities. A prominent JPA in the Antelope Valley Region is the AVSWCA, formed in May 1999 by the three local SWP contractors of the Antelope Valley.

8.3 Funding and Financing of the IRWM Plan

Funding and financing needs for implementation of the IRWM Plan falls into the three categories of IRWM program, projects, and planning, as shown in Figure 8-3. IRWM Program activities meet the most basic requirements necessary for the Region to exist and implement the Plan according to DWR standards. These activities include outreach/communication activities discussed in Section 1 and 8.2 (e.g., website maintenance, email list and notifications management, participation in the public outreach subcommittee), data management activities discussed in Section 8.4, governance activities discussed in Section 8.2 (e.g., A-Team and stakeholder meeting preparation and attendance, program administration), and regular plan updates every 5 years.

[2] The 2007 IRWMP originally said that updates would be completed every two years. This has been adjusted to every five years in this 2013 IRWMP Update to coordinate with UWMP updates and SNMP updates.

Figure 8-3: Antelope Valley IRWM Financing Needs

IRWM Program	Projects	Additional Planning
• Outreach/communication • Plan performance • Data management • Governance • Plan updates (every 5 years)	• Project review • Project prioritization • Grant application preparation • Grant management • Project implementation • Project O&M	• Regional planning needs • More frequent Plan updates

Activities related to the Region's projects include project review and prioritization (discussed in Section 7), grant application preparation and management (which the Region intends to continue), project implementation, and project operations and maintenance (O&M). Additional planning activities in the Region beyond IRWM and project activities allow the Region to further enhance regional planning and coordination activities. Since these additional planning activities are not required, the resources dedicated to them would be discretionary and only provided after the IRWM and project related activities are funded. Additional planning activities may include implementation of plans and studies in response to regional needs such as preparing a Region-wide watershed management plan or a groundwater master plan and more frequent Plan updates.

8.3.1 Funding/Financing Options

To meet the resource needs identified above, the Region will need to secure funding as both in-kind services and monetary resources. Potential funding sources and methods include:

- Sources
    - Ratepayers
    - Operating Funds
    - Water Enterprise Funds
    - Assessments/Fees/Taxes
    - Loans/Grants
    - Bonds
- Methods
    - In-Kind Time
    - Annual Dues
    - As-Needed Assessments
    - Grants/Loans

Given that local revenue sources will not be sufficient to fully fund all aspects of the IRWM Program's financing needs over the 20-year planning horizon, the Region intends to fund its activities using a combination of local, state and federal funds. The following is a program-level description of the sources of funding which will be utilized for the development and ongoing funding of the IRWM Plan; and it includes potential funding sources for projects that implement the IRWM Plan, including project O&M costs.

Local Financing

Local in-kind services provided by representatives of the Region's RWMG, A-Team and Stakeholder Group are the most important resource used by the Region. All of the Region's governance, outreach, communication, data management, plan review, plan performance and project development work is contributed as in-kind services. The capability of these entities to continue to dedicate staff resources for implementation of the IRWM Plan is critical to the Region's success.

In addition to in-kind services, members of the RWMG will continue to contribute funds to the Region as defined in the MOU, and provide local funds to finance projects included in the IRWM Plan. While existing funding mechanisms are in place for development of water supply and wastewater facilities and operation and maintenance of these facilities, the funds may not be sufficient to achieve the planning targets described in Section 4 of this IRWM Plan Update. It will be necessary for local agencies to implement additional local funding measures and/or pursue state and federal opportunities to fully fund implementation of the Plan.

O&M costs for specific implementation projects in this IRWM Plan will be funded by the project proponents/agencies from ratepayers, operating funds, water enterprise funds, assessments, fees, and taxes. The certainty of O&M funding is dependent on the particular project and project proponent. Additional detail on O&M costs may be found in Appendix K.

State Financing

The Region has pursued funding to implement projects in its IRWM Plan in the past, including grant opportunities through Propositions 50, 84 and 1E. The Region will continue to evaluate and apply for state funding opportunities such as the Proposition 84, Round 3 grant program for IRWM Plan project implementation and state revolving fund (SRF) loans. The Region will also participate in opportunities to provide leadership on statewide funding measures such as statewide discussions regarding the future of the IRWM Program and discussions on the language of future funding measures.

Federal Financing

Local agencies may seek federal funding opportunities to fund projects as they become available.

8.3.2 Funding/Financing Plan

Table 8-2 shows the Region's funding and financing plan to achieve the IRWM Program O&M and Project activities discussed above. Note that additional planning needs are not included here as they have not been determined at this time.

Table 8-2: IRWM Plan Financing Plan

Activity	Approximate Total Cost	Sources and % of Total Cost	Funding Certainty/Longevity	Assumptions
IRWM Program				
Outreach/ communication	48 hours/year $5,000/year	*In-kind* 100% RWMG agencies and/or A-Team members *Funds* 100% RWMG agencies	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution	• 4 hours/month for regular communication to stakeholder group = 48 hours/year • $5,000 per year to maintain program website
Plan performance	24 hours/year	*In-kind* 100% RWMG agencies and/or A-Team members	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution	• 24 hours/year (completed on annual basis by A-Team or subcommittee)
Data management	120 hours/year	*In-kind* 100% RWMG agencies and A-Team members	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution	• 10 hours/month = 120 hours/year
Governance	760 hours/year	*In-kind* 100% RWMG agencies and A-Team members	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution	• Stakeholder meeting attendance: 6 meetings/year * 4 hours * 25 attendees = 600 hours • Program administration: 8 hours/month = 96 hours/year • A-Team meeting attendance: 4 meetings/year * 2 hours * 8 attendees = 64 hours/year
Plan update: stakeholder review and consultant assistance	128 hours/update $500,000/ update	*In-kind* 100% RWMG agencies and A-Team members *Funds* 50% RWMG agencies 50% State grant funds	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution Contingent on success in obtaining future grant funds for IRWM planning	• Stakeholder review of plan update: 4 reviewers/section * 8 sections * 4 hours/section = 128 hours/update • Consultant assistance with plan update: $160,000/update

Activity	Approximate Total Cost	Sources and % of Total Cost	Funding Certainty/Longevity	Assumptions
Projects				
New projects: Initial review and prioritization, and stakeholder approval of new projects	12 hours/year	*In-kind* 100% RWMG agencies and A-Team members	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution	• Initial review and prioritization of new projects: 7 person* 2 hours/year = 14 hours/year • A-Team and stakeholder approval of new projects: 0 hours (approval will occur at regular stakeholder and A-Team meetings)
Grant application preparation	40 hours/project application $20,000/ project application	*In-kind* 90% Project proponents 10% Program manager *Funds* 100% project proponents or RWMG	Contingent on on-going agency staff allocations MOU program fund sharing in place for 20 years from date of execution	• Project proponents: 40 hours/project application • Consultant assistance: $20,000/project application
Grant management	620 hours/year	*In-kind* 25% Project proponents 75% Program manager	Contingent on continued success in grant programs.	Program manager: 40 hours/month = 480 hours/year Project proponent reporting: 12 hours/month = 144 hours/year
Project implementation	Between $70 million and $80 million capital costs Between $1 million/year and $2 million/year O&M costs	*In-kind* 100% Project proponents *Funds* 25% Project proponents 75% State grant assistance	Contingent on on-going agency staff allocations and agency funds. Contingent on continued success in grant programs.	Total capital and O&M costs for implementation projects that have provided cost estimates

8.4 Data Management

This section discusses the importance of collecting, managing, disseminating and utilizing data to create a sustainable integrated plan. A comprehensive data management approach will help to quickly identify data gaps, detect and avoid duplication, support regional data collection, and integrate with other regional and statewide programs.

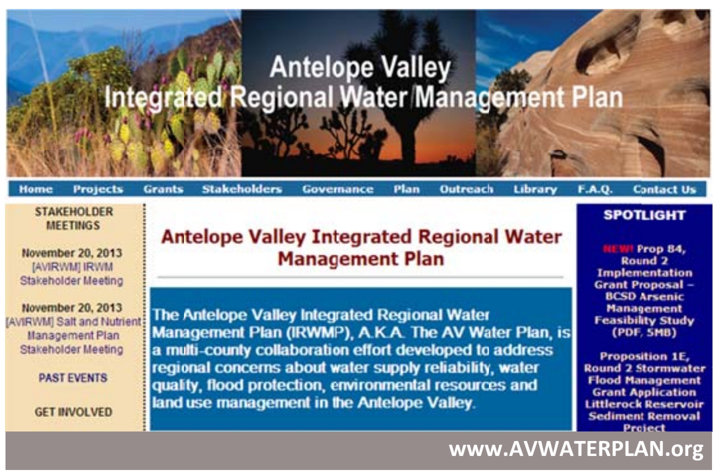
A wide variety of information is necessary to effectively manage water. The kinds of data needed include information regarding water quality, quantity, population demographics, climate and rainfall patterns, treatment plant effluent, habitat locations and needs, water costs, and more. Data is vitally important to agencies trying to maximize operating efficiency and design projects with limited budgets. The types of data available, current relevance and trends, and knowledgeable people that can interpret the data are all important. Equally important is the opportunity for Federal and State agencies to view local data for their own monitoring needs and to better understand local conditions.

The collection, management, dissemination and utilization of data (e.g., information gathered from studies, sampling events, or projects) are essential elements to creating a sustainable integrated plan. Information needs to be available to regional leaders, stakeholders, and the public to facilitate effective planning and decision-making.

As part of this IRWM Plan, the data management strategies described below will be applied to coordinate data collection between implementation projects, leverage existing data available from ongoing statewide and regional programs, provide timely data to stakeholders and the public, and consolidate information to be used in other state programs. These strategies are explained in more detail below.

8.4.1 Management and Data Reporting

Dissemination of data to stakeholders, agencies, and the general public is integrated into the AV IRWM Plan process to ensure overall success. A requirement of the Proposition 84 Guidelines is the routine reporting on project performance. The routine collection of this data naturally lends itself to the routine collection and reporting that is required as part of the AV IRWM Plan process. The AVSWCA, as the grant contracting entity, will compile the reporting of this IRWM Plan and work individually with the project proponents to receive updates on individual project progress. A standardized reporting format will be created which the AVSWCA could use to compile this data, which will then be uploaded to the project website described in more detail below. Data collected or produced as part of the AV IRWM Plan will then be presented and disseminated during bi-monthly stakeholder meetings.



A public website has been created to store data and information about the AV IRWM Plan process so that the public can find information about public meeting dates, agendas, and notes. The website provides information on the AV IRWM Plan process and posts annual reports and relevant documents. Data collected during the AV IRWM Plan process is available on the website as well. The website also provides links to other existing monitoring programs to promote data sharing between these programs and the AV IRWM Plan. This provides a means to identify data gaps (e.g., information needed to provide a more complete assessment of the status of a specific issue or program) and to ensure that monitoring efforts are not duplicated between programs.

The AV IRWM Plan website, www.avwaterplan.org, provides a mechanism for stakeholders to upload project information regarding water supply, water quality, and other benefits of projects which will be collected in a database to manage, store, and disseminate information to the public. A data collection template will be available on the website in the future so that data collected during the AV IRWM Plan can be stored and managed in a consistent format. This template will be compatible with those used in state databases, discussed further in subsection 8.4.4. The Region expects that project proponents will ensure the quality of their data prior to upload to the IRWM Plan website.

8.4.2 Regional Data Needs

This subsection identifies regional data needs including information required to evaluate the effectiveness of projects that produce non-traditional data.

As part of this IRWM Plan Update, data sets and reports were reviewed for their applicability to the Antelope Valley Region. This knowledge has provided the information necessary to identify data gaps which represent information crucial to a greater understanding of the Antelope Valley Region and help develop context for future projects (as discussed in Section 8.5 below). Data gaps identified through this IRWM Plan Update include:

- Water demands for users served by small, mutual water companies or private well owners
- Actual agricultural pumping
- Detailed agricultural acreage by crop-type
- Outdoor verses indoor water use
- Consumptive use losses in the basin
- Consolidated regional data on groundwater levels and quality monitoring
- Consolidated regional data on flooding issues, including flood hazard mapping
- Flood mitigation needs identification
- Natural groundwater recharge
- Groundwater return flows (municipal & industrial, agricultural, agricultural reuse)
- Groundwater recharge loss due to septic removal
- Subsurface flow
- Stormwater beneficial use identification
- Water available for recovery from surface water runoff, particularly from Amargosa Creek
- Baseline embedded energy use and GHG emissions emitted by water resources related activities

It is recommended that additional monitoring and studies be conducted to fill in these data gaps.

In the future, the AV IRWM Region will also collect non-traditional data (i.e., summarizing the effectiveness of water conservation programs throughout the Antelope Valley Region) in a comprehensive way that can be a powerful contribution to statewide water management efforts. Comprehensive data collection and measurement of these efforts will provide leadership and guidance to growing metropolitan areas throughout California.

8.4.3 Existing Monitoring Efforts

This subsection will provide the existing surface and groundwater level and quality monitoring efforts in the Antelope Valley Region and will identify opportunities for additional monitoring and/or for partnership.

8.4.3.1 Surface Water

Surface water for the Region comes from the state aqueduct and Littlerock Reservoir. Water from the state aqueduct is monitored by both DWR and by local water purveyors receiving the water. Surface water from Littlerock Reservoir is monitored by PWD. Data on the quantity of surface water in the Region is available through UWMPs and DWR reporting. See Section 8.4.3.2 below for a discussion of drinking water quality monitoring.

8.4.3.2 Drinking Water

Drinking water quality is monitored through the following means:

- Safe Drinking Water Act (SDWA) compliance monitoring and reporting: All public water systems are required to produce water that complies with the SDWA. To this end, specific monitoring information is required and conducted routinely. Results of the monitoring are reported to the California DPH. In addition, monitoring information is required to be published in the annual Consumer Confidence Report (also required by the SDWA).
- Unregulated Contaminant Monitoring Rule Results: The 1996 SDWA Amendments mandate that EPA publish a list of unregulated contaminants that may pose a potential public health risk in drinking water. This list is called the Contaminant Candidate List (CCL). The initial 1998 accounting listed 60 contaminants. USEPA uses this list to prioritize research and data collection efforts for future rulemaking purposes. The 1996 SDWA amendments incorporated a tiered monitoring approach. The rule required all large public water systems and a nationally representative sample of small public water systems serving less than 10,000 people to monitor the contaminants. The information from the monitoring program for the Antelope Valley Region will be compiled and submitted to the State as well as be available on the website.

8.4.3.3 Groundwater

AVEK and the USGS have coordinated groundwater monitoring efforts in the Antelope Valley Region for several years. Groundwater monitoring is also required in areas on and surrounding the EAFB as well as regional landfills. The Region's SNMP includes a groundwater monitoring component for tracking of groundwater quality with a focus on water supply wells and areas proximate to large water projects. These data will be reported to the CDPH, and compiled through the State's GAMA program.

8.4.4 Integration of Data into Existing State Programs

Data collected as part of this IRWM Plan can be used to support existing state programs such as:

- California Environmental Data Exchange Network (CEDEN)
- Water Data Library (WDL)
- California Statewide Groundwater Elevation Monitoring Program (CASGEM)
- Surface Water Ambient Monitoring Program (SWAMP)
- GAMA
- California Environmental Information Catalog (CEIC)
- Integrated Water Resources Information System
- California Environmental Resources Evaluation System (CERES)
- California FloodSAFE

To facilitate the integration of the Region's data with state databases, the Region's data collection templates discussed under subsection 8.4.1 will be compatible with state databases. The Region assumes that project proponents will ensure the quality of their data and that project proponents will upload their data to the appropriate state databases.

8.5 Technical Information

This subsection describes the technical information used in the development of the Plan Update which relied on an extensive list of plans, studies, and other documents and information sources. In addition, several technical memoranda were prepared to further study the Region's DAC and flood management related needs and develop a SNMP. These memoranda are included as Appendix D, F, and G, respectively. Table 8-3 provides a summary of the documents and data sources used, the method of analysis, the results derived, and how they were used in the 2013 Plan Update.

Table 8-3: Technical Information

Technical Information	Analysis Method	Results/Derived Information	Use in IRWM Plan	Reference or Source
Population Projections	Extracted 2010 populations using 2010 census block group data Extracted projected population information for Palmdale and Lancaster	2010 population estimates Projected population increases between 2010 and 2035	Used to describe regional characteristics, estimate future demand	US Census Bureau, 2010. 2010 US Census statistics. Southern California Association of Governments, 2008. Adopted 2008 RTP Growth Forecast, by City.
DAC identification	Extracted income information by census block group and place	Median household income	Used to identify DACs within the Region	US Census Bureau, 2011. 2006-2010 American Community Survey 5-year Estimates. RMC, 2013. Task 2.1.2 DAC Water Supply, Quality, and Flooding Data. Antelope Valley IRWMP 2007 Update.
Water Supply Projections	Reviewed 2010 urban water management plans	Water supply by source projected between 2010 and 2035 by water district	Used to project water supply availability for the Region, and identify water supply needs and issues	AVEK, 2011. 2010 Urban Water Management Plan. LCID, 2011. Annual CDPH Drinking Water Program Report. LACWD 40 and QHWD, 2011. 2010 Urban Water Management Plan. PWD, 2011. 2010 Urban Water Management Plan. RCSD, 2011. 2010 Urban Water Management Plan.

Technical Information	Analysis Method	Results/Derived Information	Use in IRWM Plan	Reference or Source
Urban Water Demand Projections	Review of 2010 urban water management plans	Projected total demand and per capita demand	Used with population projections to project demand for the Region	AVEK, 2011. 2010 Urban Water Management Plan. LCID, 2011. Annual CDPH Drinking Water Program Report. LACWD 40 and QHWD, 2011. 2010 Urban Water Management Plan. PWD, 2011. 2010 Urban Water Management Plan. RCSD, 2011. 2010 Urban Water Management Plan.
Agricultural Water Demand Projections	Review of existing records of agricultural land use Estimation of crop evapotranspiration using Palmdale area ETo station Calculation of crop water requirements using ETo, crop types, crop area, historical rainfall	Estimated crop water requirements for the Antelope Valley	Used to describe current water demands, and estimate future supply needs	Hansen, B.R., et al. 2004. “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., et al. “Reference Evapotranspiration (ETo) for California,” UC Bull. 1922. CIMIS, 2012. Evapotranspiration Estimates. Palmdale Station 197 from Jan. to Dec. 2012. Los Angeles County Agricultural Commissioner, 2011. 2010 Crop Reports.
Total Sustainable Yield	Review of Antelope Valley groundwater basin adjudication documents Discussion with stakeholders	Estimated range of the total sustainable yield of the Antelope Valley Groundwater Basin	Used to estimate groundwater supply availability	Appendix I documents

Technical Information	Analysis Method	Results/Derived Information	Use in IRWM Plan	Reference or Source
Groundwater Quality	Extraction of groundwater quality data by well for select constituents	Wells that exceed drinking water limits for select constituents within the Antelope Valley	Used to describe current groundwater quality, and determine drinking water quality issues and needs	SWRCB, 2013. GeoTracker GAMA. Groundwater Ambient Monitoring & Assessment Program. LACWD 40, 2013. Salt and Nutrient Management Plan for the Antelope Valley.
Regional Flood Needs	Review of existing records of localized flooding Review of FEMA flood zones	Locations of localized flooding Locations of 100 year flood zone	Used to determine flood infrastructure or management needs	RMC, 2013. Task 2.3.2 Flood Protection Needs. Antelope Valley IRWMP 2007 Update.
DAC water resources needs	Review of existing records supply availability, groundwater quality, and flooding records for DAC areas in Antelope Valley	Identified water supply, water quality and flood related needs in the DAC areas of Antelope Valley	Used to determine DAC related issues and needs.	RMC, 2013. Task 2.1.2 DAC Water Supply, Quality, and Flooding Data. Antelope Valley IRWMP 2007 Update.
SWP reliability	Review of DWR's State Water Project Reliability Report	Projected state water project deliveries under various hydrologic scenarios	Used to project imported water supplies under average year, singly dry year, multiple dry year scenarios.	DWR, 2011. State Water Project Reliability Report

8.6 IRWM Plan Performance

This subsection develops measures that will be used to evaluate Plan and project performance, monitoring systems that will be used to gather performance data, and mechanisms to adapt strategy implementation and operations based on performance data collected.

8.6.1 Performance Measures

Generally, the success of the AV IRWM Plan will depend on how well the individual plan objectives are accomplished. Achievement of all of these objectives will, in large part, determine the success of local integrated regional water management planning processes. Additionally, the success may be attributed to the AV IRWM Plan when individual projects meet their goals and objectives and help to cumulatively and positively address Regional plan objectives.

This IRWM Plan is a dynamic document, part of an ongoing local effort to achieve integration of local water management. The process, through stakeholder participation and plan revisions, will continue for many years and will be an effective mechanism for addressing the water management issues facing the Antelope Valley Region. On an ongoing basis, plan objectives and statewide priorities will be reviewed for relevance and modified as needed to ensure the overall IRWM Plan reflects changing needs and continues to be effective. Additionally, the projects identified for future implementation will be reviewed and evaluated periodically to ensure that current plan objectives will be met and that the proposed projects offer the greatest benefit possible. Periodically, a new set of projects will be developed to address plan objectives and State and regional priorities.

Performance measures for each of the planning targets discussed in Section 4 are addressed below. These measures are based on the AV IRWM Plan objectives and were developed to allow progress of the overall IRWM Plan to be measured. This section describes the monitoring methods and programs that will be used to collect data and the mechanisms by which this data will drive future improvements to projects and the AV IRWM Plan.

It is recognized that more detail is needed for a number of these performance measures in order for them to sufficiently be measured and implemented. Therefore, the Stakeholder group agrees to continue to refine these performance measures. The A-Team, in conjunction with a potential committee made up of stakeholder group members, will be taking primary responsibility for organizing the tracking and evaluation of IRWM Plan performance, though tracking of individual output indicators may be completed by different entities.

Water Supply Management Targets

Maintain adequate supply and demand in average years. Implementation of a project with a quantifiable benefit, either supply enhancement, or demand reduction with a known timeline for implementation or realization of the benefit will allow for measurement of this planning target. For example, on the demand management side, the performance of this planning target could be measured through the number of water conservation devices installed. Each agency participating in a water conservation program would maintain records of water conservation devices provided to customers for installation, such as ultra-low flush toilets (ULFT), high-efficiency clothes washers (HECW), rotary sprinkler nozzles (RSN), and weather-based irrigation controllers (WBIC). The number of water conservation devices provided on an annual basis would be recorded and the estimated water savings per unit determined through use of existing documentation and accepted methodologies, such as CUWCC worksheets, and would be submitted on a monthly or quarterly basis for inclusion in a central data management program as described in Section 8.4. The volume of recycled water produced will be monitored by the treatment plants and Wastewater Operations Reports maintained by the governing agency. Recycled water served to customers will be measured and reported in water purveyor annual reports and in UWMPs every five years. This target will also be met by additional potable water produced and stored. Potable water served to customers will also be measured and reported in these ways. Annual precipitation data for groundwater and surface water conditions, total volumes of recycled water produced, potable water produced, and potable or recycled water stored will be recorded on a monthly or quarterly basis by the individual agencies managing the projects and included in the central data management program, as described in Section 8.4.

Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009. The performance of this planning target can be measured through monitoring the amount of water in reserve each year along with the volumes of groundwater banked and withdrawn quarterly. The cumulative total amount of water banked may also be recorded quarterly. As water is put into storage, the total mismatch and reduction in demand for meeting this single-dry year target volume would be recorded and included in the central data management program.

Provide adequate reserves (164,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009. The performance of this planning target would similarly be measured through monitoring the amount of water in reserve each year and by recording the volumes of groundwater banked and withdrawn quarterly, with the cumulative total amount of water banked also recorded quarterly. As water is put into storage, the total mismatch and reduction in demand for meeting multi-dry year conditions would be recorded and included in the central data management program..

Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100. The performance of this planning target would be monitoring in the same way as the target above to reduce mismatch of expected supply and demand in dry and multi-dry years by providing new water supply and reducing demand, starting 2009.

Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer, by 2017. The ability to provide a diversity of water supply sources to meet peak demands over the summer without receiving SWP water can be measured by first refining the estimate of how much imported water is used during that time period and then comparing that number to how much water is available as an emergency supply or demand-reduction source. The total volume of water required during the 6-month peak summer period would be measured through monitoring SWP deliveries from AVEK, LCID, and PWD under current average conditions. Once the demand is determined, the current reserve supply can be quantified by measuring the total water supply available as emergency supply sources, such as banked water reserves, emergency transfer contracts, short-term paid non-use contracts, the maximum demand reduction that can be achieved through an aggressive water conservation program, and the overall storage capacity of recharge and extraction facilities. Annual total volumes would be recorded and included in a central data management program and the demand may be compared against the supply reserves to show whether there is sufficient supply (or potential to reduce demand) to accommodate the loss of SWP supply.

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. The ability to stabilize long-term groundwater levels in the region by showing groundwater recharge and extractions are in balance can be measured through monitoring groundwater levels through a GAMA Program well monitoring program, and recording volumes of groundwater pumped and banked. Groundwater levels should be monitored, at a minimum, on a quarterly basis to account for seasonal variations. In order to sufficiently measure the performance of this planning target, a number of details about measuring need to be determined: the number of groundwater monitoring wells, which wells to be monitored, which subbasins to be monitored, who will collect the data, and how it will be coordinated. The data acquired through these monitoring efforts will be included in the central data management program.

It is assumed that a watermaster or other Court-appointed entity would be responsible for monitoring groundwater levels when the adjudication process has been completed.

Water Quality Management Targets

Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period. To measure the performance of this planning target, water quality will be tested in accordance with EPA and Consumer Confidence Reporting (CCR) Protocols and the data compared to adopted water quality standards such as California Drinking Water Standards established by the CDPH. If the measurements indicate that compliance is not being achieved, additional water quality monitoring of taste and odor causing compounds, such as geosmin (a compound found in soils that is responsible for the earthy, musty odor and taste in water) and algae could be undertaken. To monitor overall customer satisfaction and perceived taste and aesthetics, consumer input would be solicited at community fairs and in semi-annual mail-in surveys. The data acquired through these monitoring efforts will be recorded by the local water districts and agencies responsible for providing drinking water and included in the central data management program.

Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period. To preserve the acceptable quality of groundwater, with close attention paid to potential contaminants such as arsenic, nitrate, salinity and other problem pollutants, monitoring of groundwater quality would be undertaken, using GAMA Program methodology, as appropriate. The quality of groundwater in recharge zones will also be monitored to ensure that the non-impacting activities that help meet Basin Plan requirements are sited appropriately. These monitoring efforts would align with SNMP monitoring efforts. The difference between the baseline groundwater quality measured and the Basin Plan goals will be an indicator of plan performance. In order to sufficiently measure the performance of this planning target, a number of details about measuring need to be identified including, but not limited to: identification of sampling sites, establishing groundwater monitoring wells, the number of wells to be monitored, the frequency of monitoring, who will collect the data, and how it will be handled. The data acquired through the groundwater monitoring, as well as monitoring of areas where impacting activities are located near recharge zones, will be included in the central data management program.

Map contaminated and degraded sites and monitor contaminant movement, by 2017. Achievement of this planning target would be establishment of a process for identifying, mapping and monitoring contaminated sites. To measure program performance, general groundwater quality monitoring of the Region would be conducted to identify locations of contaminated sites and to support the establishment of a monitoring program in the problem area to document the change in contaminant plume over time and rate of migration. These monitoring efforts would align with SNMP monitoring efforts. Sites can be identified by reviewing historical land use to search for potential high risk uses including industrial, agricultural or military, as well as through databases listing known pollutant leaks, spills or contamination issues. Additional details needed for measuring performance include determination of water quality constituents of concern, the number of groundwater monitoring wells needed per site, the frequency of monitoring, who will map and collect the data, and how it will be recorded in the central data management program.

Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017. To prevent migration of existing contaminants to currently uncontaminated portions of the aquifer, groundwater quality monitoring will be used to collect data to determine the potential sources of contaminants and the drivers influencing migration, such as seasonal variation. These monitoring efforts would align with SNMP monitoring efforts. The data would be input into a database for continual monitoring and modeling, if required, to help evaluate management alternatives to prevent further migration. To measure the performance of this planning target, a number of details to be further defined include the identification of a groundwater modeling expert, determination of the number of groundwater monitoring wells needed, and identification of who will collect and incorporate the data into the central data management program.

Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period. To preserve the ecosystem health of current stream systems and groundwater recharge areas, the sources of flow that could carry contaminants would be measured through surface water monitoring efforts. Potential contamination sources and mechanisms and areas that need protection and additional monitoring would be identified using standard methods and procedures for water quality testing, such as GAMA Program methodologies, as appropriate. Additional information to be developed in support of this planning target include establishing groundwater monitoring wells, determining the number of wells to be monitored and how frequently, as well as identifying who would collect and disseminate the data for the central data management program.

Increase infrastructure and establish policies to use 33 percent of recycled water to help meet expected demand by 2015, 66 percent by 2025, and 100 percent by 2035. To increase the use of recycled water, and thereby reduce the demand on imported water or groundwater resources, the annual volume of recycled water produced and the annual volume of recycled water banked or delivered would be measured using flow meters. The recycled water infrastructure is already planned for expansion, as shown by the Los Angeles/Kern County Regional Recycled Water Project and the LACSD's tertiary treatment facility upgrades. Additional urban and agricultural recycled water users should also be identified through ongoing planning efforts. The data acquired through these monitoring efforts would then be included in the central data management program.

Flood Management Targets

Coordinate a regional flood management plan and policy mechanism by the year 2017 and incorporate adaptive management strategies for climate change. Development of a Regional Flood Management Plan and policy mechanism would require identification of data gaps related to flood management; preparation of detailed flood use maps for the Region; identification of policies to protect aquifers, natural streams and recharge areas from contamination in the area; and identification of flood management opportunities. The progress of this planning target would be measured by monitoring the progress of development of the plan on a section by section basis. The signing of an MOU (or other suitable governance structure) and the commitment of funds for the regional flood management plan would also be indicators of program performance. Progress would be included in the central data management program to ensure close coordination of efforts.

Environmental Resource Management Targets

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 2017. This planning target will be measured by recording the existing acres of open space and natural habitat and comparing those totals to the newly developed acres of open space and natural habitats created, restored or enhanced annually. The change between baseline acreage and new, measured open space and natural habitat created or preserved through community-based projects would be reported and included in the central data management program. A stakeholder process would further help to identify projects, create awareness for, or provide financial contributions towards the development of open space, and this information could be compiled and mapped for future project concepts or integration with other IRWM Plan projects.

Land Use Planning/Management Targets

Preserve 100,000 acres of farmland in rotation through 2035. To measure the economic health of the Agricultural community in the Region, and the land remaining in agricultural use, the existing acreage of agricultural land in rotation will be compared to the future, measured agricultural land in rotation. Landowners working would work with local water agencies in coordinated water banking rotation projects, and the resulting number of acres of farmland and the number of water resource projects that integrate agricultural land with irrigation practices would be indicators of progress. This data would be included in the central data management program.

Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2035. Providing low impact recreational opportunities for residents and visitors into the future will require the measurement of existing acreage of recreational space to compare against future acreage. A stakeholder process would contribute to the identification of community-based projects that could be developed to increase recreational space, and coordination with General Plan updates and policy directives would further build consensus. The annual acreages would then be included in the central data management program.

Coordinate a regional land use management plan by the year 2017 and incorporate adaptive management for climate change. Development of a Regional Land Use Management Plan would require identification of data gaps, preparation of detailed land use maps for the Region, identification of policies to protect and enhance land uses in the area, and identification of land use management opportunities. The progress of this planning target would be measured by monitoring the progress of development of the plan on a section by section basis. The signing of an MOU (or other suitable governance structure) and the commitment of funds for the regional plan would also be indicators of performance. Quarterly progress reports on the development of the plan would be included in the central data management program to ensure close coordination of efforts.

Climate Change Mitigation Target

Implement "no regret" mitigation strategies, when possible, that decrease GHG's or are GHG neutral. To measure GHG reductions in the Region, the existing GHG emissions created through water resources management will be compared to the future GHG emissions created. Water purveyors would estimate the GHG emissions reductions created through the implementation of mitigation strategies, or the reduction of embedded energy used to imported water and associated GHG emissions. This data would be included in the central data management program.

Table 8-4 summarizes the project monitoring and program performance measures.

Table 8-4: Project Monitoring and Program Performance Measures

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods				Measurement to be Reported and Overall Reporting Guidelines
			What needs to be measured:	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	
Maintain adequate supply and demand in average years.							
Supply and demand balance in average years (no mismatch) over the planning horizon	Update estimated supply and demand each year (for that year and future years) using similar approach to that used in the IRWM Plan including any updated information such as new population estimates, per capita use, etc.	Create an "accounting table" that starts with the estimated mismatch from the IRWM Plan and report expected changes to the mismatch that would result from management actions (e.g., a groundwater banking project, a low flow toilet rebate program, etc.). This would allow quarterly reporting of expected adjustments to the mismatch based on project actions being implemented. In addition to accounting for the expected changes to the mismatch, require projects that are estimating increases in supply, or reductions in demand to track tangible metrics that demonstrate the progress they are making over time.	Precipitation measurement to determine if it is an average, single dry or multiple dry year ETo from CIMIS weather stations in Palmdale and Victorville.	Rain gauges in mountains and stream/run-off gauges for groundwater conditions and recharge estimates (still need to determine how many, where to place these, who will operate, and how to report the data.) Littlerock precipitation data for surface water conditions Northern California conditions for imported water conditions	Daily/Annually	Western Regional Climate Center, EAFB	Measurement to be reported: Total reduction in mismatch Reporting: Report quarterly with updates to regional board and compare against objectives
			Imported water delivered to AVEK, PWD, LCID, how much they deliver, and how much water is banked	Annual Water Production Reports	Monthly/ Quarterly	AVSWCA	
			Inflows to and deliveries from Littlerock Reservoir (including water levels in reservoir, delivered water, spill over, and amount evaporated)	PWD	Monthly/ Quarterly	PWD	
			Amount of recycled water produced, delivered (by water use category), and banked (including quantity, timing, and location)	Wastewater Operations Reports flow meters at reuse sites	Monthly/ Quarterly	LACSD	
			Population Projections	Census statistics SCAG population projections	Annually	Counties and cities	
			M&I Demand	Recalculate the regional average per capita demand. Then use this number and the projected population estimates to calculate total demand.	Annually	Water purveyors	
			Agricultural Demand	Obtain annual agricultural acreage by crop type from LA and Kern County Agricultural Commissioners and calculate demand using the crop use requirements in the Plan. Update crop estimates with release of new data (Use actual demand measurements when available.)	Annually	Los Angeles County Farm Bureau, Kern County Farm Bureau	

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods *What needs to be measured:*	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	Measurement to be Reported and Overall Reporting Guidelines
			Proposed/Actual amount of new water supply	All Projects: Estimated in 5-year intervals from project information • Amount of water produced from project (operation records) • Amount delivered from project (billing records) • For projects with banking/ recharge element: monitored daily, reported monthly • Overall Project injection, storage, and pumpback capacity • Actual amount injected • Actual amount pumped from bank • Total amount in storage • Percent remaining in storage to improve groundwater levels For Water Deals/Transfers: • Amount agreed/allotted (water right) • Actual amount transferred.	Monthly/ Quarterly	Project Proponents	
			Planned and actual reduction in demand	Proposed/Actual number of units installed/lines replaced/ rebates planned (est. water savings per unit from existing documentation such as CUWCC worksheets and methods for estimating water savings for various BMPs) Also need to consider impacts of demand reduction on wastewater inflows and recycled water availability. Should try to reduce outdoor use as much as possible.	Monthly/ Quarterly	Project Proponents	
Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.							
Establish a mechanism to dedicate supply in groundwater for dry year use. Start banking water in average year conditions to meet the expected quantity by 2009 and beyond.	Amount of water in reserve each year.	Amount of water banked and withdrawn quarterly and a cumulative total in bank quarterly.	Amount of water banked	Water put in storage for purpose of reserve	Quarterly	Water bank operators	Measurement to be reported: Total mismatch and reduction in demand Reporting: Report every five years minimum

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods: *What needs to be measured:*	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	Measurement to be Reported and Overall Reporting Guidelines
Provide adequate reserves (164,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.							
Establish a mechanism to dedicate supply in groundwater for dry year use. Start banking water in average year conditions to meet the expected quantity by 2009 and beyond.	Amount of water in reserve each year.	Amount of water banked and withdrawn quarterly and a cumulative total in bank quarterly.	Amount of water banked	Water put in storage for purpose of reserve	Quarterly	Water bank operators	Measurement to be reported: Total mismatch and reduction in demand Reporting: Report every five years with update of the Plan and compare against objectives
Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.							
Increased local supply development.	Amount of local water supply development each year.	Amount of groundwater, local surface water and recycled water used each year.	Local water supply accessibility.	Use deliveries of groundwater, local surface water, and recycled water from annual reports. Estimation of local supplies made accessible by implemented projects.	Annually	AVSWCA in conjunction with water purveyors	Measurement to be reported: Total increase in local water supply delivery and development. Reporting: Report every five years with update of the Plan and compare against objectives.
Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer, by 2017.							
Provide a diversity of water supply sources to meet peak demands over the summer	Estimated SWP demand during 6-month summer period Estimate of maximum savings from emergency conservation program Estimate of recycled water demand Estimate of banked water amount	Percent change in SWP water deliveries over the 6-month period Percent change in groundwater extractions from using banked water Quantification of additional water transported to Region (i.e. banked water from outside region, transfers from south of Delta Water Supplies during emergency conditions from trade agreements) Quantification of reduction in demand from emergency conservation measures	Amount of SWP received in a 6-month summer period (updated from estimate provided in Section 4.2)	Use deliveries from AVEK, LCID, and PWD during 6-month summer periods.	Annually	AVEK, LCID, PWD	Measurement to be reported: The difference between how much water is needed, compared to how much water is available during the 6-month summer period. Reporting: Report every five years with update of the Plan and compare against objectives Need to show have sufficient reserves (or potential to reduce demand) to meet the loss of SWP supply.
			Total water supply available over 6-month summer period without above	Account for available emergency supply sources, such as banked water reserves, emergency transfer contracts, short-term paid non-use contracts, etc.	Annually	Water bank operators	
			Maximum reduction in demand that can be reasonable achieved	Using Contingency/Water Conservation Plans and Emergency Response Plan assuming highest level of water shortage Compare economic tradeoffs of aggressive short-term rationing to the cost of securing other supplies	Annually	Local water purveyors	
			Overall storage capacity within existing or proposed recharge and extraction facilities.	Master Plans/Infrastructure Reports	Annually	Water bank operators, agencies implementing local groundwater recharge	

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods: *What needs to be measured:*	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	Measurement to be Reported and Overall Reporting Guidelines
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.							
Stabilize long-term groundwater levels in region, meaning groundwater recharge and extractions are in balance.	Observed groundwater levels in a monitoring network that provides representative view of entire groundwater basin Coordination with the Lahontan RWQCB for continued compliance with new or changes to existing discharge permits, regulations, etc.	Annual change in groundwater level (+ / -) from previous year averaged over past 10 years	Groundwater levels	Well monitoring (GAMA Program methodology will be followed, when applicable)	Quarterly	RWQCB	Measurement to be reported: Observed groundwater level improvements; calculate 10-year average Reporting: Report with update of the Plan and compare against objectives
Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period.							
Meet Federal and State water quality standards and achieve high levels of customer satisfaction	Monitoring to ensure compliance Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc.	Compliance with Consumer Confidence Reporting (CCR) and EPA's unregulated contaminant monitoring rule reporting Customer Satisfaction	Standard lab methods for water quality testing, EPA Protocols, CCR Reporting Protocols	See EPA and CCR Protocols	See EPA and CCR Protocols	See EPA and CCR Protocols	Measurement to be reported: Comparison of measured water quality data to water quality standards. For taste & aesthetics, overall consumer satisfaction with water quality. Reporting: Taste & aesthetics collect annual data, report with updates, could also add to CCR Reporting.
			Taste & aesthetic	Solicit consumer input at a community fair	Monthly/Annually	Local water districts	
			Overall customer satisfaction	Include a bi-annual mail-in survey in the monthly water bill	Semi-annually	Local water districts	
Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.							
Preserve acceptable quality of groundwater paying special attention to potential contaminants such as arsenic, nitrate, salinity and other problem pollutants	Monitoring of groundwater quality Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc. Monitor areas where impacting activities are located near recharge zones.	Difference between background or baseline groundwater quality and goals for arsenic, nitrate, salinity and other problem pollutants Promote non-impacting activities in recharge zones (not allow impacting activity in recharge zones)	Bacteria, Coliform, Radioactivity, Taste and Odor, Ammonia, Biostimulatory, Substances, Chemical Constituents, Chlorine, Total Residual Color, Dissolved Oxygen, Floating Materials, Oil and Grease, Non-degradation of Aquatic Communities, Pesticides, pH, as required by Basin Plan and additionally measure pollutants of concern such as arsenic, nitrate, TDS	Standard methods and procedures for water quality testing; GAMA Program methodology will be followed, when applicable. The Basin Plan requires that all drinking water requirements (MCL and Secondary MCL) are to be met	Monthly or more frequently, can refer to Title 22 for additional monitoring requirements Report quarterly	RWQCB	Measurement to be reported: water quality limits Reporting: Report with update of the Plan and compare against objectives

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods				Measurement to be Reported and Overall Reporting Guidelines
			What needs to be measured:	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	
Map contaminated and degraded sites and monitor contaminant movement, by 2017.							
Set up a process for identifying, mapping and monitoring contaminated sites. *Note: Groundwater quality monitoring is being completed as part of ongoing SNMP efforts.*	Locations, constituents, and constituent concentrations Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc. Records database search for pollutant leaks, spills, contamination, etc. Enhance monitoring system to detect identified potential pollutants (i.e. modify sampling plan to include identified potential pollutants or indicators of those pollutants, perform vertically discrete sampling, etc.).	Change in contaminant plume over time and rate of migration of contaminant	Water quality of Region to identify contaminated sites. Do a general sweep, then monitor more often in problem areas.	Database with location of the well, contaminants and detection levels, continually monitor that, monitoring of a few wells near it. Upstream and downstream well. May require additional monitoring wells.	Quarterly for common contaminants, if no contamination found for 5-10 years, then go to annually for that well.	Groundwater pumpers in conjunction with RWQCB	Measurement to be reported: Record of contaminated sites Reporting: Report every year with update of the Plan and compare against objectives
Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017.							
Provide information for groundwater management that will prevent migration of existing contaminants to currently uncontaminated portions of the aquifer *Note: Groundwater quality monitoring is being completed as part of ongoing SNMP efforts.*	Locations, constituents, and constituent concentrations Potential sources of contaminants Potential drivers influencing migration (e.g., nearby cone of depression) Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc. Install monitoring wells (need several years of data to know if the contamination is due to seasonal variation or not)	Change in contaminant plume over time and rate of migration of contaminant Locate production wells geographically and with respect to depth in order to manipulate groundwater movement	Water quality of Region to identify contaminated sites. Do a general sweep, then monitor more often in problem areas. Migration of the contaminant	Database with location of the well, contaminants and detection levels, continually monitor, monitoring of nearby wells.	Quarterly	Groundwater pumpers in conjunction with RWQCB	Measurement to be reported: water quality data, contour level data, TBD Reporting: Report with update of the Plan and compare against objectives

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods *What needs to be measured:*	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	Measurement to be Reported and Overall Reporting Guidelines
Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period.							
Preserve ecosystem health of current stream systems Preserve opportunity to use existing and promising future groundwater recharge areas *Note: Groundwater quality monitoring is being completed as part of ongoing SNMP efforts.*	Identification of potential contamination sources and mechanisms Identification of areas that need to be protected and monitored. Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc.	Sources of flow that could carry contaminants Contaminants in flows entering areas desired to protect	Bacteria, Coliform, Radioactivity, Taste and Odor, Ammonia, Biostimulatory, Substances, Chemical Constituents, Chlorine, Total Residual Color, Dissolved Oxygen, Floating Materials, Oil and Grease, Non-degradation of Aquatic Communities, Pesticides, pH, as required by Basin Plan and additionally measure pollutants of concern such as arsenic, nitrate, and TDS	Standard methods and procedures for water quality testing; GAMA Program methodology will be followed, when applicable. The Basin Plan requires that all drinking water requirements (MCL and Secondary MCL) are to be met.	Monthly or more frequently, can refer to Title 22 for additional monitoring requirements Report quarterly	RWQCB, purveyors	Measurement to be reported: water quality limits Reporting: Report with update of the Plan and compare against objectives
Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66% by 2025, and 100% by 2035.							
Increased use of recycled water, which would decrease demand on other resources, such as imported water or groundwater.	New users for 7,700 AFY in 2015, 18,000 AFY in 2025, and 31,000 AFY of recycled water under contract by 2035. These numbers do not include recycled water used currently for environmental maintenance.	Volume of recycled water available: 23,000 AFY in 2015, 27,000 AFY in 2025, and 31,000 AFY in 2035 that will be used in the M&I, GWR, or agricultural setting where it is not currently used.	Amount of recycled water delivered and banked.	Deliveries would be measured using flow meters. Monitoring will be consistent with the permit requirements for the use sites.	Monthly/ Quarterly	LACSD	Measurement to be reported: Total volume of recycled water banked or delivered compared to 33%, 66%, 100% Reporting: Report with update of the Plan and compare against objectives
Coordinate a regional flood management plan and policy mechanism by the year 2017 and incorporate adaptive management strategies for climate change.							
Identification of data gaps, preparation of detailed flood use maps for the Antelope Valley Region, identification of policies to protect aquifer, natural streams and recharge areas from contamination in the Valley, and identification of flood management opportunities.	Identification of entities that would be involved in coordination of the regional flood management plan; the establishment of a regional flood management committee; and the identification of the funding mechanism for creating and implementing a plan.	Signing of an MOU (or other suitable governance structure) and commitment of funds for the regional flood management plan.	Monitoring progress of development of the Plan and policy mechanism	Monitoring of localized flooding incidents Monitoring of new flood control projects Development of an integrated flood management plan	Quarterly	Counties and Cities	Measurement to be reported: Measuring progress of a flood management plan development. Reporting: Report with update of the Plan and compare against objectives

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods *What needs to be measured:*	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	Measurement to be Reported and Overall Reporting Guidelines
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 2017.							
Help contribute through identification of, awareness for, financial contribution towards, or similar for creating, restoring, or preserving near-term open space and natural habitat in the Antelope Valley.	Stakeholder-coordinated meetings with implementation partners to develop community projects. Increase in restoration plantings or mitigation planting sites.	Community consensus and agreement on project list/alternative, as developed through meetings and coordination Work with individual landowners to re-vegetate the areas Number of acres preserved & treated for open space and natural habitat; measurement of the health of open space and natural habitat	To measure 'preservation': existing acres of open space and natural habitat to measure additional open space and natural habitat acreage Fugitive dust management (measured and mapped); tons of soil per acre (particulate matter pm10, pm2.5) Acreage of new plantings	Land use maps; satellite imagery; AV conservancy database; General Plan GIS data Measure fugitive dust according to Air Quality Management District (AQMD) standards	Annually Soil data measured daily/reported annually	Counties, AVRCD	Measurement to be reported: Comparison between existing (2005) acreage of open space and natural habitat and measured open space and natural habitat. Reporting: Report with update of the Plan and compare against objectives
Preserve 100,000 acres of farmland in rotation through 2035.							
The agricultural community in the Antelope Valley stays economically healthy and land use remains in agriculture.	Landowners working with local water agencies in coordinated water banking rotation projects.	Number of water-resource integrated projects The number of acres of farmland in active rotation	Existing acreage in rotation and current land use by type (active farming, fallowing, recharge, etc.) Fugitive dust management (measured and mapped); tons of soil per acre (particulate matter pm10, pm2.5)	land use maps; satellite imagery; survey of landowners; General Plan GIS data, County commissioner reports Measure fugitive dust according to Air Quality Management District (AQMD) standards	Quarterly/ Annually Soil data measured daily/reported annually	Los Angeles County Farm Bureau, Kern County Farm Bureau	Measurement to be reported: Comparison between existing (2005) acreage of agricultural land in rotation and measured agricultural land in rotation. Reporting: Report with update of the Plan and compare against objectives
Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2035.							
Provide low impact recreational opportunities for residents and visitors into the future.	Stakeholder-coordinated meetings with implementation partners to develop community projects	Community consensus and agreement on project list/alternatives, as developed through meetings and coordination	Existing acreage of recreational space and future acreage	Land use maps; satellite imagery; General Plan GIS data	Quarterly/ Annually	Counties and cities	Measurement to be reported: Comparison between existing acreage of recreational land and measured recreational land. Reporting: Report with update of the Plan and compare against objectives
Coordinate a regional land use management plan by the year 2017 and incorporate adaptive management strategies for climate change							
Identify data gaps, prepare detailed land use maps for the Antelope Valley Region, identify policies to protect land uses in the Valley, identify land use management opportunities	Identification of entities that would be involved in coordination of the regional land management plan; the establishment of a regional land management committee; and the identification of the funding mechanism for the plan.	Signing of an MOU and commitment of funds for the regional land use management plan. A broadly supported regional land use management plan.	Monitoring progress of development of the plan and policy mechanism	Plan development	Quarterly	Counties and cities	Measurement to be reported: Measuring progress of land use management plan development. Reporting: Report with update of the Plan and compare against objectives

Desired Outcome	Output Indicators *(measures to effectively track output)*	Outcome Indicator *(measures to evaluate change that is a direct result of the work)*	Measurement Tools and Methods				Measurement to be Reported and Overall Reporting Guidelines
			What needs to be measured:	*How it should be measured:*	*Measurement/ Reporting Frequency*	*Who should measure*	
Implement "no regret" mitigation strategies, when possible, that decrease GHGs or are GHG neutral							
Decrease or neutralize GHG emissions from water resources management activities.	Records of GHG emissions from water and wastewater treatment and distribution. Records of imported water use versus local water supply use.	Reported decrease in estimated GHG emissions from water/wastewater distribution systems. Decrease in imported water usage.	Monitoring of GHG emissions from local activities and import of water.	Existing reporting through annual reports, UWMPs, and Air Resources Board reporting.	Annually	AVSWCA and purveyors	Measurement to be reported: Reduction in GHG emissions Reporting: Report with update of the Plan and compare against objectives

8.6.2 Project Specific Monitoring Plans

Project-specific monitoring plans will be developed for projects as they are implemented. They will be required to track each project's progress in meeting the Region's objectives and targets as well as in meeting the individual project's expected benefits. Table 8-5 describes the types of information that may be monitored for the implementation projects described in Section 7.

Table 8-5: Implementation Project Potential Monitoring Activity

Sponsor	Project Name	Potential Monitoring Activity
City of Palmdale	Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	• Volume of water recharged • Volume of imported water used before and after project implementation • Water quality in Amargosa Creek upstream and downstream of project • Acres of habitat and open space created • Acres of improved flood protection
Palmdale Water District	Littlerock Creek Groundwater Recharge and Recovery Project	• Volume of water recharged • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Water quality in Littlerock Creek upstream and downstream of project • Acres of habitat and open space created • Acres of improved flood protection
Palmdale Water District	Littlerock Dam Sediment Removal	• Volume of water recharged • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Water quality in Littlerock Creek upstream and downstream of project • Acres of habitat and open space created • Acres of improved flood protection
Antelope Valley Resource Conservation District	Antelope Valley Regional Conservation Project	• Volume of stormwater recharged • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Acres of recreation and open space created • Energy created through solar panel use • Number of trees planted
AVEK	Water Supply Stabilization Project – Westside Project (WSSP-2)	• Volume of water recharged • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Acres of open space created • Acres of improved flood protection
AVEK	Water Supply Stabilization Project (WSSP) – Westside Expansion	• Volume of water recharged • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Acres of open space created • Acres of improved flood protection

Sponsor	Project Name	Potential Monitoring Activity
AVEK	Eastside Banking & Blending Project	• Volume of water recharged • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • THM levels in drinking water before and after project
AVEK	AVEK Strategic Plan	• Not applicable – planning document
Palmdale Recycled Water Authority	Palmdale Recycled Water Authority – Phase 2 Distribution System	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new recycled water use
AVEK	South Antelope Valley Intertie Project	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • THM levels in drinking water before and after project
City of Lancaster	Antelope Valley Recycled Water Master Plan	• Not applicable – planning document
Boron CSD	BCSD Arsenic Management Feasibility Study and Well Design	• Arsenic concentrations in target well and drinking water • Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new groundwater pumping available
City of Lancaster	Division Street and Avenue H-8 Recycled Water Tank	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new recycled water use
City of Lancaster	Lancaster National Soccer Center Recycled Water Conversion	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new recycled water use
City of Lancaster	Pierre Bain Park Recycled Water Conversion	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new recycled water use
City of Lancaster	Whit Carter Park Recycled Water Conversion	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new recycled water use
Rosamond CSD	RCSD Arsenic Consolidation Project	• Decrease in arsenic concentrations in drinking water • Reduction in drinking water conveyance system energy use
Antelope Valley Water Storage	Antelope Valley Water Bank	• Acre-feet of water stored
City of Palmdale	Palmdale Power Plant Project	• Acre-feet of imported water used before and after project implementation, and associated energy use reduction • Volume of new recycled water use

Projects proponents will be expected to monitor at the locations and frequency required by regulatory agencies and permitting. As described under Section 8.4.1, the AV IRWM Plan website, www.avwaterplan.org, provides a mechanism for stakeholders to upload project information regarding water supply, water quality, and other benefits, which will be collected in a database to manage, store, and disseminate information to the public. A data collection template will be available on the website in the future so that data collected during the AV IRWM Plan can be stored and managed in a consistent format.

8.7 Adaptive Management

The Antelope Valley Region will use an adaptive management process in its analysis of Plan and project performance and will utilize a methodology to update the Plan and modify projects. The Region will perform reviews of Plan performance at the frequency described in the above monitoring plan in addition to IRWM Plan updates that will occur every five years.

At the Plan level, the Region will review its progress in meeting the planning targets to determine whether they are being met. If the Region's planning targets are not being met, then a review of the original targets, verification of submitted project data, a request for additional data, and/or consideration of a broader mix of strategies and or projects may be warranted. The Region will perform a more in depth examination of its targets and objectives during its five-year Plan updates that will incorporate new studies and data relevant to the Region, and the Region will re-evaluate its issues and needs (i.e., the Region's prioritized vulnerabilities to climate change).

At the project level, project proponents will be responsible for tracking project performance and adjusting project operations for maximum benefit. Those projects that are funded through IRWM program grants will be expected to report on project performance to the Region.

If both project and plan level responses do not lead to satisfactory results, then a change in the Region's governance structure may be considered. This could involve identifying and inviting additional stakeholders whose participation would improve success. Changes to the stakeholder process could be explored to bring new ideas. Finally, a change in decision making process could be considered.

Section 9 | References

Antelope Valley-East Kern Water Agency (AVEK). 2011. 2010 Urban Water Management Plan.

Antelope Valley State Water Contractors Association (AVSWCA). September 2002. Study of Potential Recharge Areas in the Antelope Valley, Final Report.

Aspen Creek Environmental Group. June 2005.Littlerock Reservoir Hydrologic and Sediment Transport Analysis Technical Report. Prepared for Palmdale Water District.

Building Industry Association (BIA). 2006. New Housing Trends in the AV, Presentation.

Bureau of Land Management (BLM). May 2005. Final Environmental Impact Report and Statement for the West Mohave Plan. A Habitat Conservation Plan and California Desert Conservation Area Plan Amendment.

Blodgett, J. C. 1996. Precipitation depth-duration and frequency characteristics for Antelope Valley, Mojave Desert, California: Water-Resources Investigations Report 92-4035, published by the U.S. Geological Survey.

Boschman, W. October 9, 2002. Letter Agreement Establishing Right to Store Water in Semitropic on an Interim Basis between Semitropic Water Storage District and Castaic Lake Water Agency. Letter to Dan Masnada, CLWA.

California Department of Public Health (CDPH). Drinking Water Program. 2013. Water System Details. Available at: http://drinc.ca.gov/DWW/index.jsp

California Department of Water Resources (DWR). 2012a. Water Quality Assessment of Non-Project Turn-ins to the California Aqueduct, 2012.

California Department of Water Resources (DWR). 2012b. The State Water Project 2011 Delivery Reliability Report.

California Department of Water Resources (DWR). 2009. DWR's California Water Plan Update 2009, Bulletin 160-09.

California Department of Water Resources (DWR). September 2005a. "Management of the California State Water Project," Bulletin 132-04.

California Department of Water Resources (DWR). February 2004. California's Groundwater Bulletin 118, South Lahontan Hydrologic Region, Antelope Valley Groundwater Basin.

California Irrigation Management Information System (CIMIS). California Department of Water Resources. Data for Palmdale No. 197 Station. Available at: http://wwwcimis.water.ca.gov/cimis/data.jsp

California State Water Resources Control Board (SWRCB). 2012. GAMA – Groundwater Ambient Monitoring & Assessment Program.

Deal, Wanda. December 2013. Personal Communication.

Edwards Air Force Base (EAFB). April 2012. Surface Flow Study Technical Report.

Geolabs-Westlake Village. February 1991. City of Lancaster-Geological Reconnaissance to Determine Extent of Ground Fissures, 10 Square Miles, Northwest Portion of Lancaster.

Hansen, B.R.; Shwannkl, L.; and Fulton, A. Department of Land, Air and Water Resources. "Scheduling Irrigation: When and How much Water to Apply," Water Management Series Publication Number 3396, published by University of California, Davis.

Izbicki, J.A., et al, 2008. "Artificial Recharge Through a Thick, Heterogeneous Unsaturated Zone". Groundwater. Vol. 46, No. 3. May-June 2008. Pages 475-488.

Kennedy/Jenks Consultants. February 28 2007. Evaluation of Potential Water Transfer Opportunities. Memorandum dated from M.L. Cotton and L. Takaichi to J. Davis, San Gorgonio Pass Water Agency.

Kennedy/Jenks Consultants. 1995. Antelope Valley Water Resources Study.

Kern County Agricultural Commissioner, Department of Weights and Measures, Antelope Valley Office. 2013.

Lancaster, City of. 2011. Groundwater Wells in Antelope Valley Depth Changes from 1975 to 2011, and 2005 to 2011.

Lancaster, City of. 2007. Groundwater Recharge Feasibility Study.

Lancaster, City of. 2006. Visioning Survey Summary.

Lancaster, City of. 1997. General Plan, Plan for Public Health and Safety.

Littlerock Creek Irrigation District (LCID), 2005. Personal Communication.

Los Angeles County Agricultural Commissioner, Department of Weights and Measures, Antelope Valley Office. 2006. Crop acreage reports for Los Angeles Portion of the Antelope Valley for 2001 through 2005.

Los Angeles County Agricultural Commissioner, Department of Weights and Measures, Antelope Valley Office. 2013.

Los Angeles County. Department of Regional Planning. 2012. Draft Los Angeles County General Plan.

Los Angeles County. Department of Regional Planning. 2006. Los Angeles County Comprehensive Update and Amendment to the Los Angeles County General Plan, Environmental Impact Report Initial Study.

Los Angeles County. Department of Regional Planning. 1986. Antelope Valley Areawide General Plan.

Los Angeles County. Department of Regional Planning. 1980. Los Angeles County General Plan.

Los Angeles County Sanitation District (LACSD). 2013. Lancaster Water Reclamation Plant. Available at: http://www.lacsd.org/wastewater/wwfacilities/antelope_valley_water_reclamation_plants/lancaster_wrp.asp.

Los Angeles County Sanitation District (LACSD). 2013. Palmdale Water Reclamation Plant. Available at: http://www.lacsd.org/wastewater/wwfacilities/antelope_valley_water_reclamation_plants/palmdale_wrp.asp.

Los Angeles County Sanitation District (LACSD). October 2005. Final Palmdale Water Reclamation Plant 2025 Facilities Plan and Environmental Impact Report.

Los Angeles County Sanitation District (LACSD). May 2004. Lancaster Water Reclamation Plant 2020 Facilities Plan. Final Environmental Impact Report.

Los Angeles County Superior Court. 2011. Antelope Valley groundwater Litigation (Consolidated Cases). Lead Case No. BC 325 201.

Los Angeles County Waterworks District 40 (LACWD 40) and Quartz Hill Water District (QHWD). June 2011. 2010 Integrated Regional Urban Water Management Plan for the Antelope Valley.

Los Angeles County Waterworks District 40 (LACWD 40). August 2006. Final Facilities Planning Report, Antelope Valley Recycled Water Project.

Los Angeles County Waterworks District 40 (LACWD 40). 1999. Water System Master Plan for Los Angeles County, Antelope Valley.

Los Angeles Department of Public Works (LACDPW). 2006. Los Angeles County Hydrology Manual.

Los Angeles Department of Public Works (LACDPW). Watershed Management Division. 2004. Biennial Report. San Gabriel River/Santa Clara River/Antelope Valley Watershed. 2002-2004.

Los Angeles Department of Public Works (LACDPW). February 1989. Antelope Valley Spreading Grounds Study, Phase 1, Preliminary Report.

Los Angeles Department of Public Works (LACDPW). 1987. Antelope Valley Comprehensive Plan of Flood Control and Water Conservation.

Local Agency Formation Commission for Los Angeles (LAFCO). August 1994. Municipal Service Review, Water Service – High Desert Region, Final Report.

Local Agency Formation Commission for Los Angeles County (LAFCO). August 2004. Municipal Service Review, Water Service – High Desert Region.

Law Environmental. November 1991. Water Supply Evaluation, Antelope Valley, California.

Metropolitan Water District of Southern California (MWD). 2007. 2006/2007 Budget. http://www.mwdh2o.com/mwdh2o/pages/finance/Exec2007.pdf (April 17, 2007).

National Marine Fisheries Service (NMFS), Southwest Region. June 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project.

Orloff, S.B., "Deciduous Orchard Water Use: Clean Cultivated Trees for a Normal Year in Littlerock," Local Extension Publication.

Palmdale, City of. March 2009. Palmdale Recycled Water Facilities Plan Final Report.

Palmdale, City of. November 2006. Palmdale Power Plant - Overview of Water Supply Issues, Draft Report.

Palmdale Water District (PWD). February 2013. Stormwater Flood Management Proposition IE, Round 2. Littlerock Reservoir Sediment Removal Project.

Palmdale Water District (PWD). June 2011. 2010 Urban Water Management Plan.

Palmdale Water District (PWD). March 2010. Strategic Water Resources Plan.

Palmdale Water District (PWD). February 2010. Recycled Water Facilities Plan.

Palmdale Water District (PWD). February 2006. Strategic Plan for the Palmdale Water District.

Palmdale Water District (PWD). March 2001. Final Water System Master Plan Update.

Pruitt, W.O., Fereres, E.; Kelta, K.; and Snyder, R.L. 1987. Reference Evapotranspiration (ETo) for California.

Personal communication. Brad Bones, Littlerock Creek Irrigation District (LCID). August 2013.

Personal communication. Aracely Jaramillo, Los Angeles County Waterworks District 40. November 6, 2013.

Personal communication. Gordon Phair, City of Palmdale. November 6, 2013.

Regional Water Quality Control Board, Lahontan Region (RWQCB). 1994. Lahontan Regional Water Quality Control Board Basin Plan.

Rosamond Community Services District (RCSD). June 2011. 2010 Urban Water Management Plan.

Rosamond Community Services District (RCSD). August 2004. Water System Master Plan.

Snyder, J.H. 1955. "Groundwater in California – The experience of Antelope Valley." published by, University of California, Berkeley, Division of Agriculture Science, Giannini Foundation, Ground-Water Studies No. 2.

United States Census Bureau. 2011. 2006-2010 5-Year American Community Survey.

United States Census Bureau. 1980, 1990, 2000, 2010 Census Tract Data.

United States Census Bureau. 2010. 2010 United States Census.

United States Department of Agriculture (USDA). 2002. Natural Resources Conservation Service "2002 Farm and Ranch Irrigation Survey."

United States Environmental Protection Agency (US EPA). May 2008. Drinking Water Health Advisory For Boron. (822-R-08-013).

United States Fish and Wildlife Service (USFWS). December 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP) (81420-2008-F-1481-5).

United States Fish and Wildlife Service (USFWS). January 2006. Biological Opinion for the California Desert Conservation Area Plan [West Mojave Plan] (6840(P) CA-063.50) (1-8-03-F-58).

United States Geological Survey (USGS). 2013. National Water Information System. http://nwis.waterdata.usgs.gov/nwis.

United States Geological Survey (USGS). 2003. Simulation of Ground-water Flow and Land Subsidence, Antelope Valley Ground-Water Basin, California. Water-Resources Investigations Report 03-4016.

United States Geological Survey (USGS). 2000a. Antelope Valley Ground-water Study. Available at: http://ca.water.usgs.gov/projects00/ca532.html.

United States Geological Survey (USGS). 2000b. Aquifer-System Compaction: Analyses and Simulations-the Holly Site, Edwards Air Force Base, Antelope Valley, California. By Michelle Sneed and Devin L. Galloway. Water-Resources Investigations Report 00-4015.

United States Geological Survey (USGS). 1995. Land Use and Water Use in the Antelope Valley, California. Water-Resources Investigations Report 94-4208.

United States Geological Survey (USGS). 1994. USGS 1994 Draft Report. Water-Resources Investigations Report 94-XXXX.

United States Geological Survey (USGS). 1993a. Draft Study Plan for the Geohydrologic Evaluation of Antelope Valley, and Development and Implementation of Ground-Water Management Models.

United States Geological Survey (USGS). 1993b. Hydrogeology and Land Subsidence, Edwards Airforce Base, Antelope Valley, California, January 1989- December 1991. Water-Resources Investigation Report 93-4114.

United States Geological Survey (USGS). 1992. Land Subsidence and Problems Affecting Land Use at Edwards Air Force Base and Vicinity, California. Water-Resources Investigations Report 92-4035.

United States Geological Survey (USGS). 1987. Geohydrology of the Antelope Valley Area California and Design for Groundwater-Quality Monitoring Network.

United States Geological Survey (USGS). 1967. Water Resources of the Antelope Valley-East Kern Water Agency Area, California. (67-21).

Western Regional Climate Center, Historical Climate Information for Palmdale Station (046624) 1903-2012. http://www.wrcc.dri.edu/CLIMATEDATA.html.

Section 10 | Glossary & Acronyms

10.1 Glossary of Terms

Term	Definition
- A -	
ACRE-FOOT	The quantity of water required to cover one acre to a depth of one foot; equal to 43,560 cubic feet, or approximately 325,851 gallons.
ADJUDICATION	A case that has been heard and decided by a judge. In the context of an adjudicated groundwater basin, landowners or other parties have turned to the courts to settle disputes over how much groundwater can be extracted by each party to the decision.
ADOPTED IRWM PLAN	The version of the IRWM Plan that is adopted by the governing bodies of at least three or more member agencies to the Regional Water Management Group (RWMG), two of which have statutory authority over water supply, as evidenced by resolutions.
AGRONOMIC RATE	The rate of nutrient application to fulfill a plant's nitrogen requirements while minimizing the amount of nutrients that passes to groundwater.
ALLUVIUM	Sediment deposited by flowing water, such as in a riverbed, flood plain or delta.

ALLUVIAL AQUIFER	Earth, sand, gravel or other rock or mineral materials laid down by flowing water, capable of yielding water to a well.
ANTELOPE VALLEY REGION	The Antelope Valley Region, as defined for the purposes of this IRWM Plan, follows the Antelope Valley's key hydrologic features, bounded by the San Gabriel Mountains to the south and southwest, and the Tehachapi Mountains to the northwest, forming a well-defined triangular point at the Valley's western edge. The Region covers portions of northern Los Angeles and southeastern Kern Counties, and encompasses the majority of the AVEK service area.
APPLIED WATER DEMAND	The quantity of water that would be delivered for urban or agricultural applications if no conservation measures were in place.
AQUIFER	An underground layer of rock, sediment or soil, or a geological formation/unit that is filled or saturated with water in sufficient quantity to supply pumping wells.
ARID	A term describing a climate or region in which precipitation is so deficient in quantity or occurs so infrequently that intensive agricultural production is not possible without irrigation.
ARTICLE 21 WATER	Refers to the SWP contract provision defining this supply as water that may be made available by DWR when excess flows are available in the Delta. Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter.
ARTIFICIAL RECHARGE	The addition of water to a groundwater reservoir by human activity, such as irrigation or induced infiltration from streams, wells, or recharge/spreading basins. See also GROUNDWATER RECHARGE, RECHARGE BASIN.
- B -	
BEDROCK AQUIFER	A consolidated rock deposit or geological formation of sufficient hardness and lack of interconnected pore spaces, but which may contain a sufficient amount of joints or fractures capable of yielding minimal water to a well.
BENEFICIAL USES	Include fish, wildlife habitat, and education, scientific and recreational activities which are dependent upon adequate water flow thorough rivers, streams and wetlands. The Regional Water Quality Control Board's Basin 4A Plan categorizes beneficial uses per water quality standards.

BEST MANAGEMENT PRACTICE (BMP)	An urban water conservation (water use efficiency) measure that the California Urban Water Conservation Coalition agrees to implement among member agencies. The BMP's are intended to reduce long-term urban water demand.
BRACKISH WATER	Water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than sea water.
- C -	
CLOSED BASIN	A topographic water basin with no outlet to the ocean
CONFINED AQUIFER	A water-bearing subsurface stratum that is bounded above and below by formations of impermeable, or relatively impermeable, soil or rock.
CONJUNCTIVE USE	The operation of a groundwater basin in coordination with a surface water storage and conveyance system. The purpose is to recharge the basin during years of above average water supply to provide storage that can be withdrawn during drier years when surface water supplies are below normal.
CONSERVATION	*Urban water conservation or water use efficiency* includes reductions realized from voluntary, more efficient, water use practices promoted through public education and from state-mandated requirements to install water-conserving fixtures in newly constructed and renovated buildings. *Agricultural water conservation or agricultural water use efficiency*, means reducing the amount of water applied in irrigation through measures that increase irrigation efficiency. See NET WATER CONSERVATION.
CRITICAL DRY PERIOD	A series of water-deficient years, usually an historical period, in which a full reservoir storage system at the beginning is drawn down (without any spill) to minimum storage at the end.
CRITICAL DRY YEAR	A dry year in which the full commitments for a dependable water supply cannot be met and deficiencies are imposed on water deliveries.
CUBIC FEET PER SECOND (cfs)	A unit of measurement describing the flow of water. A cubic foot is the amount of water needed to fill a cube that is one foot on all sides, about 7.5 gallons.
- D -	
DECISION 1641	An action by the State Water Resources Control Board (SWRCB) to establish water quality objectives for water users in the Delta. The Bay/Delta Water Quality Control Plan was developed as a means to attain these water quality objectives.

DESALTING/DESALINATION	A process that converts sea water or brackish water to fresh water or an otherwise more usable condition through removal of dissolved solids.
DISADVANTAGED COMMUNITY	A community with an annual median household income that is less than 80 percent of the statewide annual median household income (CWC § 79505.5 (a)).
DISTRIBUTION UNIFORMITY (DU)	The ratio of the average low-quarter depth of irrigation water infiltrated to the average depth of irrigation water infiltrated, for the entire farm field, expressed as a percent.
DRAINAGE BASIN	The area of land from which water drains into a river; as, for example, the Sacramento River Basin, in which all land area drains into the Sacramento River. Also called, "WATERSHED."
DRY-WEATHER RUNOFF	Urban runoff that enters the drainage system due to human activities such as car washing and lawn irrigation. Dry-weather runoff can also result from illicit connections to the stormwater or sewer systems.
- E -	
EFFICIENT WATER MANAGEMENT PRACTICE (EWMP)	An agricultural water conservation measure that water suppliers could implement. EWMPs are organized into three categories: 1) Irrigation Management Services; 2) Physical and Structural Improvements; and 3) Institutional Adjustments.
EFFLUENT	Waste water or other liquid, partially or completely treated or in its natural state, flowing from a treatment plant.
EMPIRICAL YIELD	See SAFE YIELD (GROUNDWATER)
EPHEMERAL	An ephemeral water body is one that exists for only a short period of time following precipitation or snowmelt. This is not the same as an intermittent or seasonal water body which exists for a longer period of time.
EVAPOTRANSPIRATION (ET or ETo)	The quantity of water transpired (given off), retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces. Quantitatively, it is expressed in terms of depth of water per unit area during a specified period of time.
- F -	
FINAL IRWM PLAN	The version of the IRWM Plan that is deemed ready for adoption by 50 percent or more of the representatives from the RWMG member agencies.
FIRM YIELD	The maximum annual supply of a given water development that is expected to be available on demand, with the understanding that lower yields will occur in accordance with a predetermined schedule or probability.

FOREBAY	A groundwater basin immediately upstream or upgradient from a larger basin or group of hydrologically connected basins. Also, a reservoir or pond situated at the intake of a pumping plant or power plant to stabilize water levels.
- G -	
GROUNDWATER	Water that occurs beneath the land surface and completely fills all pore spaces of the alluvium or rock formation in which it is located.
GROUNDWATER BASIN	A groundwater reservoir, together with all the overlying land surface and underlying aquifers that contribute water to the reservoir.
GROUNDWATER MINING	The withdrawal of water from an aquifer greatly in excess of replenishment; if continued, the underground supply will eventually be exhausted or the water table will drop below economically feasible pumping lifts.
GROUNDWATER OVERDRAFT	The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that replenishes the basin over a period of years.
GROUNDWATER RECHARGE	Increases in groundwater quantities or levels by natural conditions or by human activity. See also ARTIFICIAL RECHARGE.
GROUNDWATER STORAGE CAPACITY	The space contained in a given volume of deposits. Under optimum use conditions, the usable groundwater storage capacity is the volume of water that can, within specified economic limitations, be alternately extracted and replaced in the reservoir. (Directly related to SAFE YIELD).
GROUNDWATER TABLE	The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface is formed by an impermeable body.
- H -	
HYDRAULIC CONDUCTIVITY	A property of vascular plants, soil or rock, that describes the ease with which water can move through pore spaces or fractures. It depends on the permeability of the material and on the degree of saturation.
- I -	
INSTREAM USE	Use of water that does not require diversion from its natural watercourse. For example, the use of water for navigation, recreation, fish and wildlife, esthetics, and scenic enjoyment.

IRRIGATION EFFICIENCY	The efficiency of water application. Computed by dividing evapotranspiration of applied water by applied water and converting the result to a percentage. Efficiency can be computed at three levels: farm, district, or basin.
IRRIGATION RETURN FLOW	Applied water that is not transpired, evaporated, or deep percolated into a groundwater basin, but that returns to a surface water supply.
- L -	
LACUSTRINE	In geology, the sedimentary environment of a lake.
LAND SUBSIDENCE	Land subsidence is the lowering of the land-surface elevation from changes that take place underground. Overdrafting of aquifers is the major cause of subsidence in the southwestern United States.
LEACHING	The flushing of salts from the soil by the downward percolation of applied water.
- M -	
MAXIMUM CONTAMINANT LEVEL (MCL)	The maximum level of a drinking water contaminant allowed under the federal Safe Water Drinking Act. MCLs set under National Primary Drinking Water Regulations are legally enforceable standards that apply to public water systems.
M&I	Municipal and Industrial (water use); generally urban uses for human activities.
MILLIGRAMS PER LITER (MG/L)	The mass (milligrams) of any substance dissolved in a standard volume (liter) of water. One liter of pure water has a mass of 1000 grams. For dilute solutions where water is the solvent medium, the numerical value of mg/l is very close to the mass ratio expressed in parts per million (ppm).
MINERALIZATION (OF GROUNDWATER)	The addition of inorganic substances, usually dissolved from surface or aquifer material, to groundwater.
NATURALLY OCCURRING CONTAMINANTS (IN GROUNDWATER)	A deleterious substance present in groundwater which is of natural origin, i.e., not caused by human activity.
- N -	
NATURAL HABITAT	See OPEN SPACE.
NET WATER CONSERVATION	The difference between the amount of applied water conserved and the amount by which this conservation reduces usable return flows.
NET WATER DEMAND	The applied water demand less water saved through conservation efforts (= net applied water = actual water used).

NON-POINT SOURCE POLLUTION	A diffuse discharge of pollutants throughout the natural environment. See POINT SOURCE.
- O -	
OPEN SPACE	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. See also NATURAL HABITAT.
OVERDRAFT	Withdrawal of groundwater in excess of a basin's perennial yield. See also PROLONGED OVERDRAFT.
- P -	
PARTS PER MILLION (PPM)	A ratio of two substances, usually by mass, expressing the number of units of the designated substance present in one million parts of the mixture. For water solutions, parts per million is almost identical to the milligrams per liter.
PER-CAPITA WATER USE	The amount of water used by or introduced into the system of an urban water supplier divided by the total residential population; normally expressed in gallons per-capita-per-day (gpcd).
PERCHED GROUNDWATER	Groundwater supported by a zone of material of low permeability located above an underlying main body of groundwater with which it is not hydrostatically connected.
PERCOLATION	The downward movement of water through the soil or alluvium to the groundwater table.
PERENNIAL YIELD	Perennial yield is an estimate of the long-term average annual amount of water that can be withdrawn without inducing a long-term progressive drop in water level. The term "safe yield" is sometimes used in place of perennial yield, although the concepts behind the terms are not identical: the older concept of "safe yield" generally implies a fixed quantity equivalent to a basin's average annual natural recharge, while the "perennial yield" of a basin or system can vary over time with different operational factors and management goals.
PERMEABILITY	The capability of soil or other geologic formation to transmit water.
PLAYA	A dry lakebed, also known as an alkali flat. Playas consist of fine-grained sediments infused with alkali salts and are devoid of vegetation.
PLAYA DEPOSIT	A thick salt deposit that forms over time through the accumulation of layers of dissolved minerals from rocks. Dissolved salts that form a playa deposit are laid by rainfall that rapidly evaporates once reaching the earth's surface.

POINT SOURCE	Any discernable, confined and discrete conveyance site from which waste or polluted water is discharged into a water body, the source of which can be identified. See also NON-POINT SOURCE.
POLLUTION (OF WATER)	The alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.
POTABLE WATER	Water suitable for human consumption without undesirable health consequences. Drinkable. Meets Department of Health Services drinking water requirements.
PROLONGED OVERDRAFT	Net extractions in excess of a basin's perennial yield, averaged over a period of ten or more years.
PROPOSITION 50	The "Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002", as set forth in Division 26.5 of the California Water Code (commencing with § 79500).
- Q -	
QUATERNARY GEOLOGY	Younger of the two geologic periods of the Cenozoic era of geologic time lasting from 2 million years ago to the present. Comprising all geologic time from the end of the Tertiary period to today.
- R -	
REACH REPAYMENT CAPACITY	SWP contractors, via their water supply contracts with DWR, are allocated specified shares of "reach repayment" capacity in various reaches of the SWP system. This share of capacity pertains to SWP supplies only, and provides each contractor with delivery priority for its SWP supplies. Reach repayment capacity is often less than the actual constructed physical capacity of SWP facilities.
RECHARGE BASIN	A surface facility, often a large pond, used to increase the infiltration of water into a groundwater basin.
RECYCLED WATER	Urban wastewater that becomes suitable for a specific beneficial use as a result of treatment.
REGIONAL PRIORITIES	The short-term and long-term issues and/or objectives that are determined to be most important on the Region's needs.

REGIONAL WATER MANAGEMENT GROUP	A group that, at a minimum, includes three or more local public agencies, at least two of which have statutory authority over water management, which may include but is not limited to water supply, water quality, flood control, or storm water management. The Antelope Valley Regional Water Management Group includes Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, Los Angeles County Sanitation District Nos. 14 & 20, Rosamond Community Services District, and Los Angeles County Waterworks District No. 40, Antelope Valley.
REVERSE OSMOSIS	Method of removing salts from water by forcing water through a membrane.
RETURN FLOW	The portion of withdrawn water that is not consumed by evapotranspiration and returns instead to its source or to another body of water.
REUSE	The additional use of once-used water.
RIPARIAN	Of, or on the banks of, a stream or other of water.
RIPARIAN VEGETATION	Vegetation growing on the banks of a stream or other body of water.
RUNOFF	The surface flow of water from an area; the total volume of surface flow during a specified time.
- S -	
SAFE YIELD (GROUNDWATER)	The maximum quantity of water that can be withdrawn from a groundwater basin over a long period of time without developing a condition of overdraft. Sometimes referred to as sustained yield.
SAG POND	An enclosed depression formed where active or recent fault movement results in impounded drainage.

SALINITY	Generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. Where seawater is the major source of salt, salinity is often used to refer to the concentration of chlorides in the water. See also TDS.
SERIOUS OVERDRAFT	Prolonged overdraft that results, or would result, within ten years, in measurable, unmitigated adverse environmental or economic impacts, either long-term or permanent. Such impacts include but are not limited to seawater intrusion, other substantial quality degradation, land surface subsidence, substantial effects on riparian or other environmentally sensitive habitats, or unreasonable interference with the beneficial use of a basin's resources.
SEAWATER INTRUSION	Occurs when extractions exceed freshwater replenishment of groundwater basins and causes seawater to travel laterally inland into fresh water aquifers.
SECONDARY TREATMENT	In sewage treatment, the biological process of reducing suspended, colloidal, and dissolved organic matter in effluent from primary treatment systems. Secondary treatment is usually carried out through the use of trickling filters or by an activated sludge process.
SHEET FLOW	Shallow-depth, low velocity water flow.
SILT	A sedimentary material composed of very fine particles intermediate in size between sand and clay.
SILTATION	The deposition or accumulation of silt.
SPREADING BASIN	See RECHARGE BASIN.
SPREADING GROUNDS	See RECHARGE BASIN.
STAKEHOLDER	An individual, group, coalition, agency or others who are involved in, affected by, or have an interest in the implementation of a specific program or project.
SOLUTE	A substance dissolved in another substance, usually the component of a solution present in the lesser amount.
SUBSIDENCE	See LAND SUBSIDENCE.

- T -	
TABLE A AMOUNT	A reference to the amount of water listed in "Table A" of the contract between the State Water Project (SWP) and the contracting agencies and represents the maximum amount of water an agency may request each year.
TERTIARY GEOLOGY	Geologic time period between roughly 65 million and 2 million years ago.
TERTIARY TREATMENT	In sewage, the additional treatment of effluent beyond that of secondary treatment to obtain a very high quality of effluent.
TOTAL DISSOLVED SOLIDS (TDS)	A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter (mg/l) or in parts per million (ppm). See also Salinity.
TURBIDITY	A measure of cloudiness and suspended sediments in water. Water high in turbidity appears murky and contains sediments in suspension. Turbid water may also result in higher concentrations of contaminants and pathogens, that bond to the particles in the water.
TURNBACK POOLS	A means in which SWP contractors with excess Table A Amount water in a given hydrologic year may sell that excess to other contractors. This is included in a provision in the SWP water supply contracts. The program is administered by DWR.
- W -	
WASH	A wash, also called an arroyo, is a usually dry creek bed or gulch that temporarily fills with water after a heavy rain, or seasonally.
WATER MANAGEMENT STATEGIES	Specified categories of approaches to meet regional objectives. According to the IRWM Grant Program Guidelines, the water management strategies include, but are not limited to, ecosystem restoration, environmental and habitat protection and improvement, water supply reliability, flood management, groundwater management, recreation and public access, storm water capture and management, water conservation, water quality protection and improvement, water recycling, wetlands enhancement and creation, conjunctive use, desalination, Imported water, land use planning, non-point source pollution control, surface storage, watershed planning, water and wastewater treatment, and water transfers.
WATER MANAGEMENT STRATEY ALTERNATIVE	A set of projects, project concepts, actions, and/or studies that when implemented together would fill the gaps, minimize the overlaps, maximize benefits for multiple water management strategies, and ultimately achieve the regional planning objectives.

WATER MANAGEMENT STRATEGY AREA	A group of similar or related water management strategies to make the Antelope Valley IRWM Plan development more efficient and manageable (data collection, management, and dissemination).
WATER MANAGEMENT STRATEGY INTEGRATION	A process to design water management strategy alternatives to maximize regional benefits by identifying potential synergies, linkages, and gaps between water management strategies and evaluating geographical distribution of project benefits.
WATER MANAGEMENT STRATEGY OBJECTIVE	A goal for the Region to achieve in order to meet the needs for a water management strategy. A quantifiable objective can be used to allow future measurement of progress towards accomplishment of the objectives (e.g., conserve 10,000 AFY of drinking water by 2030).
WATER QUALITY	A term used to describe the chemical, physical, and biologic characteristics of water with respect to its suitability for a particular use.
WATER QUALITY CONTAMINATION	For the purposes of the IRWM Plan, any increase in water constituent levels over the State or Federal standards is considered contamination.
WATER QUALITY DEGRADATION	Any increase in water constituent levels over naturally occurring levels is considered degradation.
WATER RECLAMATION	The treatment of water of impaired quality, including brackish water and seawater, to produce a water of suitable quality for the intended use.
WATER RIGHT	A legally protected right, granted by law, to take possession of water occurring in a water supply and to divert the water and put it to beneficial uses.
WATERSHED	The area or region drained by a reservoir, river, stream, etc.; drainage basin.
WATER TABLE	The surface of underground, gravity-controlled water.

10.2 Acronym List

Acronym	Meaning
AB	Assembly Bill
ACEC	Areas of Critical Environmental Concern
AF	acre-foot
AFB	Air Force Base
AFY	acre-feet per year
AQMD	Air Quality Management District
ASR	Aquifer Storage and Recharge/Recovery
A-Team	Advisory Team
AV	Antelope Valley
AVEK	Antelope Valley-East Kern Water Agency
AVSWCA	Antelope Valley State Water Contractors Association
AVWCC	Antelope Valley Water Conservation Coalition
BIA	Building Industry Association
BLM	Bureau of Land Management
BMP	Best Management Practice
BO	Biological opinion
CAS	Conventional Activated Sludge
CASGEM	California Statewide Groundwater Elev. Monitoring Program
CCD	Census County Division
CCL	Contaminant Candidate List
CCR	California Code of Regulations
CCR	Consumer Confidence Reporting
CDFG	California Department of Fish and Game
CDFA	California Department of Food and Agriculture
CDPH	California Department of Public Health
CEDEN	California Environmental Data Exchange Network
CEIC	California Environmental Information Catalog
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
CIP	Capital Improvements Plan
CLWA	Castaic Lake Water Agency
CMWD	Calleguas Municipal Water District
CRS	Community Rating System
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CWA	Clean Water Act
CWC	California Water Code
DAC	Disadvantaged Communities

DPH	Department of Public Health
DMM	Demand management measure
DU	Distribution Uniformity
DWMA	Desert Wildlife Management Area
DWR	Department of Water Resources
EAFB	Edwards Air Force Base
EIR	Environmental Impact Report
EJ	Environmental Justice
EJCW	Environmental Justice Coalition for Water
EPA	Environmental Protection Agency
ESA	Federal Endangered Species Act
ETc	Evapotranspiration (for a particular crop)
ETo	Evapotranspiration (general or reference)
EWMP	Efficient Water Management Practice
° F	degree Fahrenheit
FEIR	Final Environmental Impact Report
FEMA	Federal Emergency Management Agency
FIRM	Flood insurance rate map
FWSMPU	Final Water System Master Plan Update
gal	gallon
GAMA	Groundwater Ambient Monitoring and Assessment
GHG	Greenhouse gas
GIS	Geographic Information System
gpcd	gallons per-capita-per-day
gpd	gallons per day
gpm	gallons per minute
GPS	Global positioning system
GWR-RW	Groundwater Recharge Using Recycled Water
GWR	Groundwater recharge
HCP	Habitat Conservation Plan
HECW	High-Efficiency Clothes Washer
IFM	Integrated Flood Management
IRWM Plan (or IRWMP)	Integrated Regional Water Management Plan
IUWMP	Integrated Urban Water Management Plan
IWRP	Integrated Water Resources Plan
JPA	Joint Powers Authority
LACSD	Los Angeles County Sanitation District
LACWD 40	Los Angeles County Waterworks District No. 40
LACDPW	Los Angeles County Department of Public Works
LADWP	Los Angeles Department of Water and Power
LAFCO	Local Area Formation Commission
Lancaster	Lancaster, City of
LAWA	Los Angeles World Airports

LCID	Littlerock Creek Irrigation District
LID	Low Impact Development
LWRP	Lancaster Water Reclamation Plant
M&I	municipal & industrial
MAF	Million acre-feet
MBR	Membrane bioreactor
MCL	Maximum Contaminant Level
MG	million gallon
mgd	million gallons per day
mg/L	milligrams per liter
MHI	median household income
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MW	megawatt
MWA	Mojave Water Agency
MWD	Metropolitan Water District of Southern California
ND	Non-detect
NFIP	National Flood Insurance Program
NLFC	Newhall Land and Farming Company
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
O&M	operations and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
OHV	Off-Highway Vehicle
NRCS	Natural Resource Conservation Service
PHG	Public Health Goal
ppb	parts per billion
ppm	parts per million
PAC	Performance Advisory Committee
Palmdale	Palmdale, City of
PID	Palmdale Irrigation District
Plant 42	U.S. Air Force Plant 42
PM	Particulate Matter
PWD	Palmdale Water District
PWRP	Palmdale Water Reclamation Plant
QHWD	Quartz Hill Water District
RAP	Region Acceptance Process
RCSD	Rosamond Community Services District
Region	Antelope Valley Region
RMS	Resource Management Strategy
RO	reverse osmosis

ROC	reactive organic compound
RRBWSD	Rosedale-Rio Bravo Water Storage District
RSN	Rotary Sprinkler Nozzle
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
RWQCB-LR	Regional Water Quality Control Board – Lahontan Region
SB	Senate Bill
SCAG	Southern California Association of Governments
SDWA	Safe Drinking Water Act
SEA	Significant Ecological Area
Semitropic	Semitropic Water Storage District
SMART	Specific Measurable Attainable Relevant Time-based
SNMP	Salt and Nutrient Management Plan
SRF	State Revolving Fund
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
THM	Trihalomethanes
TTHM	Total Trihalomethanes
TMDL	Total Maximum Daily Load
TOC	total organic carbon
TSY	Total Sustainable Yield
TTP	Tertiary Treatment Plant
UCCE	University of California Cooperative Extension
ug/L	micrograms per liter
ULFT	Ultra Low Flush Toilet
(uS/cm)	microsiemens per centimeter
U.S.	United States
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
WBIC	Weather-Based Irrigation Controller
WDL	Water Data Library
WDR	Waste Discharge Requirements
WPP	Wellhead Protection Program
WRP	Water Reclamation Plant
WSA	Water Supply Assessment
WSMP	Water System Master Plan
WSSP-2	Water Supply Stabilization Project

WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Appendix A: MOU

Page Intentionally Left Blank

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING (MOU), made and entered into on this 9th day of January by and between the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, Rosamond Community Services District, and Los Angeles County Waterworks District No. 40, Antelope Valley, hereinafter referred to as "DISTRICT," and in the aggregate hereinafter referred to as "parties":

WITNESSETH

WHEREAS, the parties are designated as a "Regional Water Management Group" under the California Water Code Division 6, Part 2.2, known as the *Integrated Regional Water Management Planning Act of 2002*, hereinafter referred to as "ACT"; and

WHEREAS, Section 10531 of the ACT includes the following declarations:

(a) Water is a valuable natural resource in California and should be managed to ensure the availability of sufficient supplies to meet the State's agricultural, domestic, industrial, and environmental needs. It is the intent of the Legislature to encourage local agencies to work cooperatively to manage their available local and imported water supplies to improve the quality, quantity, and reliability of those supplies.

(b) Improved coordination among local agencies with responsibilities for managing water supplies and additional study of groundwater resources are necessary to maximize the quality and quantity of water available to meet the State's agricultural, domestic, industrial, and environmental needs.

(c) The implementation of the Integrated Regional Water Management Planning Act of 2002 will facilitate the development of integrated regional water management plans, thereby maximizing the quality and quantity of water available to meet the State's water needs by providing a framework for local agencies to integrate programs and projects that protect and enhance regional water supplies.

WHEREAS, Section 10537 of the ACT states that "Regional Water Management Group" means a group in which three or more local public agencies, at least two of which have statutory authority over water supply, participate by means of a joint powers agreement, memorandum of understanding, or other written agreement, as appropriate, that is approved by the governing bodies of those local public agencies; and

WHEREAS, under the ACT, the parties propose to collaboratively prepare an Integrated Regional Water Management Plan for the Antelope Valley, hereinafter referred to as "PLAN," as set forth in this MOU; and

WHEREAS, the study area for the PLAN includes all, or a portion of, the service areas of the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, Rosamond Community Services District, and DISTRICT within the Antelope Valley; and

WHEREAS, the DISTRICT is willing to administer a contract ("CONTRACT") to engage a third-party consultant ("CONSULTANT") to prepare the PLAN, including preparation of a request for proposals, evaluation of CONSULTANT proposals, award of the CONTRACT, and general oversight of the CONTRACT; and

WHEREAS, the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District are willing to provide the CONSULTANT with the necessary data to prepare the PLAN and to review and comment on the draft versions of the PLAN; and

WHEREAS, the "CONSULTANT COSTS" for preparation of the PLAN consist of all amounts paid to the CONSULTANT upon completion of the PLAN; and

WHEREAS, the CONSULTANT COSTS are currently estimated to amount to $325,000 with DISTRICT'S share being $60,000, Antelope Valley-East Kern Water Agency's share being $50,000, Palmdale Water District's share being $60,000, Quartz Hill Water District's share being $5,000, Littlerock Creek Irrigation District's share being $5,000, City of Palmdale's share being $50,000, City of Lancaster's share being $45,000, County Sanitation District No. 14 of Los Angeles County's share being $22,500, County Sanitation District No. 20 of Los Angeles County's share being $22,500, and Rosamond Community Services District's share being $5,000, and

WHEREAS, the FINAL PLAN is defined to be the version of the PLAN that is deemed ready for adoption by 100 percent* ~~XX XXXXXXX XXXXXX~~ of the representatives from the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District, where each agency has one representative.

*Exception taken per AVEK Board action on January 09, 2007.

WHEREAS, the ADOPTED PLAN is defined to be the version of the PLAN that is adopted by the governing bodies of at least three or more member agencies to the Regional Water Management Group, two of which have statutory authority over water supply, as evidenced by resolutions substantially similar to the sample included as Exhibit A.

NOW, THEREFORE, in consideration of the mutual benefits to be derived by the parties and of the promises herein contained, it is hereby agreed as follows:

(1) ANTELOPE VALLEY-EAST KERN WATER AGENCY AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or Antelope Valley-East Kern Water Agency's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $50,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $50,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(2) PALMDALE WATER DISTRICT AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or Palmdale Water District's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $60,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $60,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(3) QUARTZ HILL WATER DISTRICT AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or Quartz Hill Water District's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $5,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $5,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(4) LITTLEROCK CREEK IRRIGATION DISTRICT AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or Littlerock Creek Irrigation District's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $5,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $5,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(5) ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or Antelope Valley State Water Contractors Association's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(6) CITY OF PALMDALE AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or City of Palmdale's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $50,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Cit of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $50,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(7) CITY OF LANCASTER AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or City of Lancaster's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $45,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $45,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(8) COUNTY SANITATION DISTRICT NO. 14 OF LOS ANGELES COUNTY AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or County Sanitation District No. 14 of Los Angeles County's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $22,500 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $22,500 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(9) COUNTY SANITATION DISTRICT NO. 20 OF LOS ANGELES COUNTY AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or County Sanitation District

No. 20 of Los Angeles County's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $22,500 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $22,500 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(10) ROSAMOND COMMUNITY SERVICES DISTRICT AGREES:

a. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

b. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or Rosamond Community Services District's comments may not be incorporated in the FINAL PLAN.

c. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

d. To provide a contribution in the amount of $5,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

e. To deposit the contribution in the amount of $5,000 with the DISTRICT within thirty (30) calendar days of execution of this MOU.

f. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(11) DISTRICT AGREES:

a. To administer a CONSULTANT CONTRACT for the PLAN, including preparation of a request for proposals, evaluation of CONSULTANT proposals, award of a CONSULTANT CONTRACT, and oversight of the CONSULTANT services.

b. To facilitate stakeholder meetings.

c. To provide and share all necessary and relevant information, data, studies, and/or documentation for the PLAN in its possession as may be requested by the CONSULTANT within thirty (30) calendar days of the request by the CONSULTANT or such information and data, should it be provided at a later date, may not be incorporated in the PLAN due to time constraints.

d. To provide each agency with copies of the draft and final versions of technical reports and the draft PLAN within seven (7) calendar days from the date of receipt of said documents from the CONSULTANT, and to transmit comments to the CONSULTANT within seven (7) calendar days from the date of receipt of said documents from each agency.

e. To review and comment on the draft and final versions of technical reports and the draft PLAN within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT or DISTRICT's comments may not be incorporated in the PLAN.

f. To present the FINAL PLAN to its governing body for consideration and adoption within forty-five (45) calendar days from the date of receipt of the FINAL PLAN.

g. To provide a contribution in the amount of $60,000 towards the CONSULTANT COSTS collectively shared by the DISTRICT, Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

h. To prepare, review, and approve future grant applications for implementation of the ADOPTED PLAN.

(12) IT IS MUTUALLY UNDERSTOOD AND AGREED AS FOLLOWS:

a. If the governing body of the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, Rosamond Community Services District or DISTRICT does not adopt the PLAN within forty-five (45) calendar days from the date of receipt of the FINAL PLAN, such action or inaction shall constitute withdrawal from the Regional Water Management Group. An agency which withdraws from the Regional Water Management Group may be reinstated when the agency adopts the FINAL PLAN and agrees to any additions and/or amendments to the MOU.

b. Upon completion of the ADOPTED PLAN, the DISTRICT shall prepare a final accounting (the "Accounting") of all final actual CONSULTANT COSTS for review by the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District.

c. If the funds deposited with the DISTRICT exceed the CONSULTANT COSTS, based upon the Accounting, the DISTRICT shall refund the excess funds to the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District in proportion to their contribution towards the CONSULTANT COSTS within sixty (60) days after completion of the PLAN.

d. If the CONSULTANT COSTS exceed the funds deposited with the DISTRICT, ~~the Antelope Valley-East Kern Water Agency,~~* Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, and Rosamond Community Services District will supplement this MOU to fund the additional portion of the CONSULTANT COSTS in excess of the funds deposited with the DISTRICT in proportion to their original contributions towards the CONSULTANT COSTS.

*Exception taken per AVEK Board action on January 09, 2007.

e. This MOU may be amended or modified only by mutual written consent of all parties.

f. The Regional Water Management Group shall terminate twenty (20) years after the date of execution unless renewed by mutual written consent from all parties prior to expiration.

g. All parties agree to release the DISTRICT of any liability and in connection with all claims arising out of this MOU, including relating to the CONTRACT with the CONSULTANT, and including in connection with any and all claims by third parties relating to the CONSULTANT's work under the CONTRACT and/or any violation or alleged violation of the ACT as a result thereof, including pursuant to Civil Code Section 1542, which states:

> "A general release does not extend to claims which the creditor does not know or suspect to exist in his or her favor at the time of executing the release, which if known by him or her must have materially affected his or her settlement with the debtor."

h. Notwithstanding the foregoing and notwithstanding any provision of law, including as contained in the California Government Code, and including Sections 895 *et. seq.*, therein, any and all liability or expenses (including attorneys' and experts' fees and related costs) to the DISTRICT for claims by third parties or CONSULTANT and injury to third parties or CONSULTANT, arising from or relating to this MOU shall be allocated among the parties on the basis of the percent of contribution required of each party under this MOU. As an example only, the percentage of contribution of Antelope Valley-East Kern Water Agency is 15 percent. Each party shall reimburse the DISTRICT for its allocated share of the costs described herein within thirty (30) calendar days of issuance of an invoice by the DISTRICT. The term "injury" shall have the meaning prescribed by Section 810.8 of the Government Code. This provision shall survive termination of this Agreement.

i. If any provision of this MOU is held, determined or adjudicated to be illegal, void, or unenforceable by a court of competent jurisdiction, the reminder of this MOU shall be given effect to the fullest extent possible.

j. Any correspondence, communication, or contact concerning this MOU shall be directed to the following:

ANTELOPE VALLEY-EAST KERN WATER AGENCY:

Mr. Russell E. Fuller
General Manager
6500 West Avenue N
Palmdale, CA 93551

PALMDALE WATER DISTRICT:

Mr. Dennis LaMoreaux
General Manager
2029 East Avenue Q
Palmdale, CA 93550

QUARTZ HILL WATER DISTRICT:

Mr. Dave Meraz
General Manager
42141 50th Street West
Quartz Hill, CA 93536

LITTLEROCK CREEK IRRIGATION DISTRICT:

Mr. Brad Bones
General Manager
35141 North 87th Street East
Littlerock, CA 93543

ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION:

Ms. Barbara Hogan
Chairperson
c/o Palmdale Water District
2029 East Avenue Q
Palmdale, CA 93550

CITY OF PALMDALE:

Mr. Leon Swain
Public Works Director
38250 Sierra Highway
Palmdale, CA 93550

CITY OF LANCASTER:

Mr. Randy Williams
Public Works Director
44933 Fern Avenue
Lancaster, CA 93534

COUNTY SANITATION DISTRICT NO. 14 OF LOS ANGELES COUNTY:

Mr. James F. Stahl
Chief Engineer and General Manager
County Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90601

COUNTY SANITATION DISTRICT NO. 20 OF LOS ANGELES COUNTY:

Mr. James F. Stahl
Chief Engineer and General Manager
County Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90601

ROSAMOND COMMUNITY SERVICES DISTRICT:

Mr. Claud Seal
Assistant General Manager
3179 35th Street
Rosamond, CA 93560

DISTRICT:

Mr. Manuel del Real
Assistant Deputy Director
Waterworks & Sewer Maintenance Division
County of Los Angeles
Department of Public Works
P.O. Box 1460
Alhambra, CA 91802-1460

k. Each person signing this MOU represents to have the necessary power and authority to bind the entity on behalf of which said person is signing and each of the other parties can rely on that representation.

l. This MOU may be executed in counterparts, each counterpart being an integral part of this MOU.

//
//
//
//
//

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by ANTELOPE VALLEY-EAST KERN WATER AGENCY; and

ANTELOPE VALLEY-EAST KERN
WATER AGENCY

By ______________________

APPROVED AS TO FORM:

By ______________________
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by Palmdale Water District; and

Palmdale Water District

By ______________________
General Manager

APPROVED AS TO FORM:

By ______________________
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by Quartz Hill Water District; and

Tier No. 3 Level of
Contribution - $5000.00

Quartz Hill Water District

By [signature]
Dave Meraz,
General Manager

APPROVED AS TO FORM:

By [signature]
Legal Counsel
Brad Weeks, Esq.

By: [signature]
Allen Flick, Sr.
Quartz Hill Water District
Board President

Approved at the Regular Board
Meeting, held on Thurs.,
September 14, 2006.

Attested
By: [signature]
Denise Burks,
Board Secretary

Carried: 4-0

Ayes: P.Powell, J. powell, A. Flick,
F. Tymon

Noes: Ø

Abstained: Ø

Absent: Ben Harrison, Jr.
Passed on 8-7-06

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by Littlerock Creek Irrigation District; and

Littlerock Creek Irrigation District

By ______________________
Brad Bones, General Manager

APPROVED AS TO FORM:

By ______________________
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION; and

ANTELOPE VALLEY STATE WATER
CONTRACTORS ASSOCIATION

By Barbara Hogan
Barbara Hogan

APPROVED AS TO FORM:

By Wayne Lemieux
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by City of Palmdale; and

City of Palmdale

By ______________________
James C. Ledford
Mayor

APPROVED AS TO FORM:

By ______________________
Wm. Matthew Ditzhazy
City Attorney

Attest:

By: ______________________
Victoria L. Hancock, CMC
City Clerk

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by CITY OF LANCASTER; and

APPROVED BY DEPT. HEAD ________

CITY OF LANCASTER

By ______________________
Bishop Henry W. Hearns
Mayor

APPROVED AS TO FORM:

By ______________________
Legal Counsel

Attest:

____
City Clerk

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by County Sanitation District No. 14 of Los Angeles; and

County Sanitation District No. 14
of Los Angeles County

By ______________________________
Chief Engineer and General Manager

ATTEST:

By ______________________________
Secretary to the Board

APPROVED AS TO FORM:

Lewis, Brisbois, Bisgaard, and Smith LLP

By ______________________________
District Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by County Sanitation District No. 20 of Los Angeles; and

County Sanitation District No. 20
of Los Angeles County

By ______________________
Chief Engineer and General Manager

ATTEST:

By ______________________
Secretary to the Board

APPROVED AS TO FORM:

Lewis, Brisbois, Bisgaard, and Smith LLP

By ______________________
District Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by ROSAMOND COMMUNITY SERVICES DISTRICT; and

ROSAMOND COMMUNITY
SERVICES DISTRICT

By ______________________

APPROVED AS TO FORM:

By ______________________
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this MOU to be executed by their respective officers, duly authorized, by DISTRICT.

DISTRICT:

LOS ANGELES COUNTY
WATERWORKS DISTRICT NO. 40

By Dean D Efstathiou
for Director of Public Works

APPROVED AS TO FORM:

RAYMOND G. FORTNER, JR.
County Counsel

By Michael L. Moore
Deputy

Exhibit A

RESOLUTION OF THE *[governing body of agency]*,
ADOPTING THE INTEGRATED REGIONAL WATER MANAGEMENT PLAN
FOR THE ANTELOPE VALLEY

WHEREAS, the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, City of Palmdale, City of Lancaster, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, Rosamond Community Services District, and Los Angeles County Waterworks District No. 40, Antelope Valley are designated as a "Regional Water Management Group" under the California Water Code Division 6, Part 2.2, known as the *Integrated Regional Water Management Planning Act of 2002*, hereinafter referred to as "ACT"; and

WHEREAS, under the ACT, the parties collaboratively prepared an Integrated Regional Water Management Plan for the Antelope Valley that meets the requirements of the ACT, hereinafter referred to as "PLAN"; and

WHEREAS, Section 10531 of the ACT includes the following declarations:

(d) Water is a valuable natural resource in California, and should be managed to ensure the availability of sufficient supplies to meet the state's agricultural, domestic, industrial, and environmental needs. It is the intent of the Legislature to encourage local agencies to work cooperatively to manage their available local and imported water supplies to improve the quality, quantity, and reliability of those supplies.

(e) Improved coordination among local agencies with responsibilities for managing water supplies and additional study of groundwater resources are necessary to maximize the quality and quantity of water available to meet the state's agricultural, domestic, industrial, and environmental needs.

(f) The implementation of the Integrated Regional Water Management Planning Act of 2002 will facilitate the development of integrated regional water management plans, thereby maximizing the quality and quantity of water available to meet the state's water needs by providing a framework for local agencies to integrate programs and projects that protect and enhance regional water supplies.

WHEREAS, the adoption of the PLAN will allow the Antelope Valley Region to compete for State grant funding available under Proposition 50, proposed Proposition 84, and other future State and/or Federal grant programs.

NOW, THEREFORE, BE IT RESOLVED, that the *[governing body of agency]*, hereby adopts the PLAN.

The foregoing Resolution was adopted on the____day of_______, 2007, by the *[governing body of agency]*, as the governing body of the *[agency]*.

By ______________________________

APPROVED AS TO FORM:

By ______________________________
Legal Counsel

AGREEMENT ON THE IMPLEMENTATION OF THE INTEGRATED REGIONAL WATER MANAGEMENT PLAN

THIS AGREEMENT is made and entered into as of this 7th day of APRIL, 2009 by and between the Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, Antelope Valley State Water Contractors Association, ("Association"), City of Palmdale, City of Lancaster, County of Los Angeles, County Sanitation District No. 14 of Los Angeles County, County Sanitation District No. 20 of Los Angeles County, Rosamond Community Services District, and Los Angeles County Waterworks District No. 40, Antelope Valley, (collectively, the "parties"):

RECITALS

A. On or about January 9, 2007, the parties entered into a Memorandum of Understanding for Integrated Regional Water Management Planning and Implementation ("MOU") under the California Water Code Division 6, Part 2.2, known as the *Integrated Regional Water Management Planning Act of 2002* (the "Act").

B. The parties desire to engage the various stakeholder interests throughout the Antelope Valley in implementing the Integrated Regional Water Management Plan (IRWMP) through broad facilitated agreement.

C. The parties desire to obtain grant or other funding to supplement the costs of implementing the IRWMP.

NOW, THEREFORE, the parties agree as follows:

1. The parties to this Agreement shall be known as and referred to as the Regional Water Management Group (RWMG). If approved by all parties, new entities may join the RWMG by adopting the IRWMP, executing this Agreement, agreeing to be bound by the terms hereof, and payment of such reasonable sums as the existing RWMG members shall determine.

2. Entities that are not members of the RWMG may contribute funding or in-kind services to support the activities of the RWMG without becoming signatories to this Agreement.

3. Each party shall designate a representative and an alternate to attend meetings, work with representatives of the other parties and to formulate

proposed actions by the RWMG. Any party may change designated representatives by notification to the other parties.

4. Representatives of the RWMG shall do the following:

   a) Designate a person to serve as the central point of contact for the representatives of the RWMG and as chairperson at any meetings.

   b) Hold public meetings for interested members of the public to meet, share ideas and discuss actions taken by the parties to implement the IRWMP. These meetings will be referred to as Stakeholder Meetings and people who attend these meetings may be referred to as the Stakeholder Group. The Stakeholder Group will be encouraged to participate in Stakeholder Meetings, advocate for regional projects, and disseminate information from the Stakeholders Meetings to the general public. In order to maintain effective meetings, the Stakeholder Group will follow a Code of Conduct at the Stakeholder Meetings to:

      i. Participate fully.

      ii. Treat others with dignity and respect.

      iii. Consider new ideas and perspectives.

      iv. Share accurate facts.

   c) Promote regional cooperation among its members to implement the IRWMP.

   d) Gather, compile, and manage data, as defined in the IRWMP.

   e) Develop proposals for the voluntary funding of cooperative efforts to implement the IRWMP. The ideas and suggestions of the Stakeholder Group shall be considered in the development of such proposals.

   f) Develop a list of short-term implementation objectives. The ideas and suggestions of the Stakeholder Group shall be considered in the development of such implementation objectives.

   g) Prepare and/or disseminate to the RMWG progress reports and proposed updates to the IRWMP. This task may be delegated to the Advisory Team as defined below.

   h) Identify and recommend to the governing bodies of the parties that applications be submitted for appropriate funding opportunities.

5. The parties shall designate one party, the Association, to solicit and administer one or more contracts ("Contracts"), with one or more third-party

consultants, to assist the RWMG to promote collaboration between members of the RWMG and other stakeholders during implementation of the Plan, prepare grant applications, update the IRWMP, and manage data collected consistent with the IRWMP on behalf of the RWMG. Any contract recommended by the Association shall be subject to the written approval of each party.

6. The parties shall establish a seven-member Advisory Team to the RWMG selected by the Stakeholder Group in the following manner:

   a) The Stakeholder Group shall select seven members according to the following categories for staggered three-year terms[1].

      i. Agriculture (2010)

      ii. Conservation, Environmental, and Water Quality (2011)

      iii. Industry and Commerce (2009)

      iv. Municipalities (2010)

      v. Mutual Water Companies (2011)

      vi. Public/Land Owners/Rural Town Councils (2009)

      vii. Urban Water Suppliers (2010)

   b) Nominations for each category can be made by any member of the Stakeholder Group and must be made during a Stakeholder Meeting.

   c) If the person nominated is willing to serve on the Advisory Team as described, that person will be considered as a potential member by the Stakeholder Group.

   d) Nominations for each open category will be discussed by the Stakeholder Group during a Stakeholder Meeting. If more than one qualified nomination is made per category, the Stakeholder Group shall choose one team member per category. Selections will be made by consensus. If a selection cannot be made by consensus, a selection will be made based on simple majority vote of the members at a meeting. Each Stakeholder Group member present may cast one vote per category.

   e) If an Advisory Team position becomes vacant before the regularly-scheduled reselection year, the same selection process described in this section will be used to select a replacement.

---

[1] Members for each category will be reselected in the year shown and every three years thereafter.

f) Advisory Team members may not designate an alternate.

g) Members of the Advisory Team shall use their best efforts to make decisions by consensus. If a consensus cannot be reached on a particular matter, a simple majority vote of the members present at a meeting at which a quorum is present will be sufficient to take action. A quorum shall be half the number of members plus one.

h) If the Stakeholder Group is not satisfied with the performance of one or more Advisory Team members, one or more members of the Stakeholder Group can request that the RWMG conduct a new nomination and selection cycle for the category (or categories) involved.

7. The parties will delegate the following tasks to the Advisory Team:

a) Schedule and facilitate Stakeholder Meetings

b) Draft agendas and prepare minutes for the Stakeholder Meetings

c) Distribute information to the Stakeholder Group

d) Develop a list of short-term implementation objectives for consideration and approval by the RWMG and Stakeholder Group.

e) Maintain a list of long-term implementation objectives for the RWMG to address and update at Stakeholder Meetings.

f) Recommend an annual scope and budget to the RWMG

g) Maintain the AVIRWMP website

h) Identify grant opportunities for the RWMG or its members to apply for

i) Review and edit grant applications submitted by the RWMG

j) Designate a single point of contact for all AVIRWM efforts

k) Recommend options to the RWMG to consider for establishing a long-term governance structure for integrated regional water management in the Antelope Valley

8. The parties shall designate a lead applicant for the RWMG for grant programs that require regional collaboration to contract with and receive funds from the granting agency, invoice the granting agency, fulfill the administrative responsibilities of the grant contract, and distribute the funds received from the granting agency to the specific project sponsors, subject to the written approval of each party. A party's (or parties') failure to approve a grant

application shall not prevent other parties from seeking that grant application on their own behalf.

9. Each party shall provide and share with other parties, all necessary and relevant information, data, studies, and/or documentation in its possession as necessary to further the purposes of this Agreement. To the extent allowed by law, the parties may enter into confidentiality agreements to maintain the confidentiality of any documents that are exempt from disclosure under the California Public Records Act or otherwise privileged and confidential.

10. Each party shall review and comment on draft and final versions of technical reports, grant applications, and revisions or addendums to the IRWMP within twenty-one (21) calendar days from the date of receipt of those documents from their representative.

11. Each party shall consider for adoption final versions of IRWMP revisions or addendums within forty-five (45) calendar days from the date of receipt of the document.

12. Consistent with their powers and purposes, each party shall work together in a spirit of cooperation, collaboration, and mutual respect, with the overall goal of bringing the highest possible benefit for the Antelope Valley as a hydrologic region.

13. This Agreement shall be executed in duplicate originals, one for each Party, each of which duplicate original shall be deemed to be an original, but all of which shall constitute one and the same agreement.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by ANTELOPE VALLEY-EAST KERN WATER AGENCY;

ANTELOPE VALLEY-EAST KERN WATER AGENCY

BY David Rizzo

APPROVED AS TO FORM:

By
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by Palmdale Water District;

PALMDALE WATER DISTRICT

____
By: Jeff A. Storm, President
Board of Directors

APPROVED AS TO FORM:

____
By: Lagerlof, Senecal, Gosney & Kruse, LLP
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by Quartz Hill Water District;

QUARTZ HILL WATER DISTRICT

____

By: Allen Flick, Sr.
Board President

APPROVED AS TO FORM:

____

By: Brad Weeks, Esg.,
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by Littlerock Creek Irrigation District;

LITTLEROCK CREEK IRRIGATION DISTRICT

By: BJ Bones

APPROVED AS TO FORM:

____

By
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION;

ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION

By:

APPROVED AS TO FORM:

By:
Legal Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by City of Palmdale;

CITY OF PALMDALE

By:____________________
James C. Ledford, Jr.
Mayor

APPROVED AS TO FORM:

By:____________________
Wm. Matthew Ditzhazy,
City Attorney

ATTEST:

By: Victoria L. Hancock
Victoria L. Hancock, CMC
City Clerk

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by CITY OF LANCASTER;

CITY OF LANCASTER

By: Ronald D. Smith
Vice Mayor

APPROVED AS TO FORM

By: David R. McEwen
City Attorney

Attest:

City Clerk Geri K. Bryan, CMC
City Clerk

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by County Sanitation District No. 14 of Los Angeles;

COUNTY SANITATION DISTRICT NO. 14 OF LOS ANGELES COUNTY

By: ______________________ FEB 25 2009

ATTEST:

By: ______________________

APPROVED AS TO FORM:

By: Lewis, Brisbois, Bisgaard, and Smith LLP
District Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by County Sanitation District No. 20 of Los Angeles;

COUNTY SANITATION DISTRICT NO. 20 OF LOS ANGELES

____

FEB 25 2009

ATTEST:

____

APPROVED AS TO FORM:

____

By: Lewis, Brisbois, Bisgaard, and Smith LLP
District Counsel

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by ROSAMOND COMMUNITY SERVICES DISTRICT;

ROSAMOND COMMUNITY SERVICES DISTRICT

By: ______________________

APPROVED AS TO FORM:

By: ______________________

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by COUNTY OF LOS ANGELES:

COUNTY OF LOS ANGELES

By ______________________________

APPROVED AS TO FORM:

ROBERT E. KALUNIAN
Acting County Counsel

By______________________
Deputy

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by DISTRICT.
DISTRICT:

LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 40

By ______________________

APPROVED AS TO FORM:

ROBERT E. KALUNIAN
Acting County Counsel

By ______________________
Deputy

Page Intentionally Left Blank

Appendix B: Sample Stakeholder Meeting Sign-in Sheet

Page Intentionally Left Blank

Antelope Valley Integrated Regional Water Management Plan
Stakeholders
09/18/2013

Last Name	First Name	Title	Organization	Address	City	State	Zip	Phone	Fax	E-Mail	Signature
Armstrong	Scott	Vice President	Paleo Solutions	911 S Primrose Ave, Unit J	Monrovia	CA	91016	949-813-1240	949-813-1240	scott@paleosolutions.com	[illegible]
Baker	Jess	Manager	White Fence Farm #3	PO Box 3411	Quartz Hill	CA	93586	816-1741	943-2127		
Barnes	Tom	Resources Manager	AVEK	6500 W. Avenue	Palmdale	CA	93550	661-943-3201	661-943-3204	tbarnes@avek.org	[illegible]
Bevins	Michael	PW Director	City of California City		California City	CA	93505	760-596-2861		pwdir@californiacity.com	
Brown	Marta Golding	Antelope Valley Director	BIA LAV	44903 10th Street West	Lancaster	CA	93534	661-949-6857	661-949-6090	mgbrown@bialav.org	[illegible]
Caulkins	Richard	Senior Engineer	LA County Sanitation District	41769 11th St W, Ste A	Palmdale	CA	93551	866-422-8474		rcaulkins@lacsd.org	[illegible]
Chen	Timothy	Associate Civil Engineer	Los Angeles County Waterworks Districts	900 S. Fremont Ave.	Alhambra	CA	91803	626-300-3342	626-300-3385	tchen@dpw.lacounty.gov	[illegible]
Chisam	Dwayne	Asst. General Manager	Antelope Valley-East Kern Water Agency	6500 W. Ave N	Palmdale	CA	93551	661-943-3201		dchisam@avek.org	[illegible]
Copeland	Patrice	Senior Engineering Geologist	Lahontan Regional Water Quality Control Board					760-241-7404		pcopeland@waterboards.ca.gov	
Dadey	Natalie	Office Manager	Boron CSD	27167 Carmichael Street PO Box 1060	Boron	CA	93596	760-762-6127	760-762-6508	boroncsd@yahoo.com	
Darensbourg	Charles	Associate Civil Engineer	Los Angeles County Flood Contrl District (LACWPD)	900 S. Fremont Ave.	Alhambra	CA	91803	626-458-5923	626-457-1526		
Dassler	Steve	Utility Services Manager	City of Lancaster	44933 Fern Ave.	Lancaster	CA	93534	661-723-6088	661-723-6182	sdassler@cityoflancasterca.org	
de Hollan	Erika	Project Engineer	Los Angeles County Sanidation Districts							edehollan@lacsd.org	
Deal	Wanda		Edwards AFB Natural Resources	5 E Popson Ave	Edwards AFB	CA	93524	661-810-9622		wanda.deal@edwards.af.mil	
Dietrick	Brian	Project Manager	RMC	2400 Broadway, Suite 300	Santa Monica	CA	90404	310-566-6460		bdietrick@rmcwater.com	[illegible]
DuBois	Jamie	Operations	Rosamond CSD	3179 35th St W	Rosamond	CA	93560	256-6789			
Dyas	Keith	Director	AVEK					256-4512		keith.dyas77@gmail.com	[illegible]
Flores	Dawn		RMC					310-566-6460		dflores@rmcwater.com	
Frost	Amy	Chief, Asset Optimization Office	Edwards AFB	225 N. Rosamond B3500	Edwards AFB	CA	93524	661-275-2126		amy.frost@edwards.af.mil	
Fuller	Peggy	Representative	Leona Valley Town Council	P.O. Box 795	Leona Valley	CA	93551			pfuller@leonavalleytc.org	[illegible]
Gaboudian	Lysa	Engineer	Los Angeles County Sanidation Districts					562-908-4288 x2707		laposhian@lacsd.org	
Glaser	Mitch		Los Angeles County Planning	320 W Temple St.	Los Angeles	CA	90012	213-974-6476		mglaser@planning.lacounty.gov	

Appendix C: Community Outreach Materials

Page Intentionally Left Blank

PROOF OF PUBLICATION

STATE OF CALIFORNIA }
} SS
COUNTY OF LOS ANGELES }

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the assistant principal clerk of the printer of the Acton Agua Dulce News, (Acton Agua Dulce Weekly News) a newspaper of general circulation, printed and published weekly in the Community of Acton, county of Los Angeles, and which newspaper has been adjudicated a newspaper of general circulation by the Superior Court of the County of Los Angeles, State of California, under date of February 8, 1989, Case Number 9391; that the notice, of which the annexed is a printed copy has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

7/15, 7/22

in the year 2013

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

M. Gayle Joyce

Public Notice

The Antelope Valley Integrated Regional Water Management (IRWM) Program is preparing an update to the Antelope Valley IRWM Plan adopted in 2007. IRWM Plans are regional plans designed to improve collaboration in water resources management. The first IRWM Plan for Antelope Valley was published in 2007, following a multi-year effort among water retailers, wastewater agencies, storm water and flood managers, watershed groups, the business community, agriculture representatives, and non-profit stakeholders to improve water resources planning in the Antelope Valley IRWM Region.

In response to changes in the State's integrated planning requirements, the Antelope Valley IRWM Program is preparing an update to the 2007 IRWM Plan. This update is an opportunity to incorporate additional stakeholder interests into the IRWM Plan, and revisit the Plan in light of changes that have occurred since 2007.

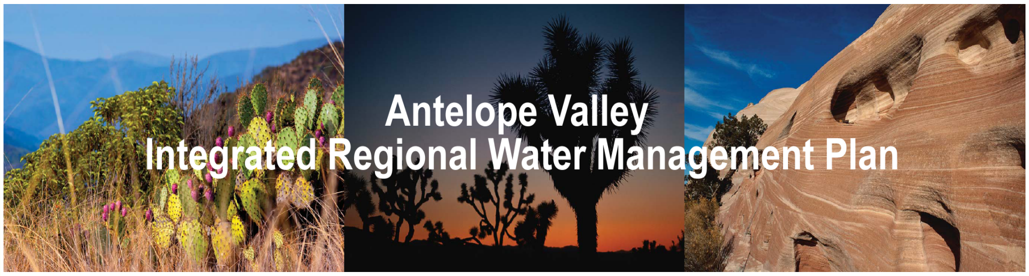
The 2007 IRWM Plan and information concerning the update may be viewed online at http://avwaterplan.org.

Questions regarding the AV IRWM update should be directed to: Aracely Jaramillo at AJaramillo@dpw.lacounty.gov

This public notice is being published in accordance with section 10543 of the California Water Code.

Submitted by an Advisory Team member representing Industry and Commerce

Page Intentionally Left Blank



STAKEHOLDER MEETINGS

November 20, 2013
[AVIRWM] IRWM Stakeholder Meeting

November 20, 2013
[AVIRWM] Salt and Nutrient Management Plan Stakeholder Meeting

PAST EVENTS

GET INVOLVED

Subscribe or Login to manage IRWMP event notifications.

Submit Your Projects

Press Room

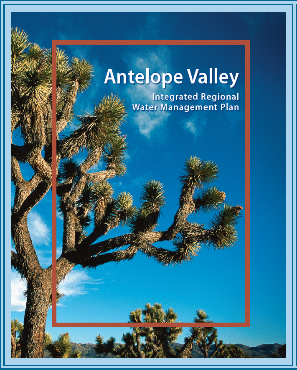
CLEARCHANNEL
Interview with LACWWD's Adam Ariki

California's Water Crisis: A Public Education Program CalWaterCrisis.org

Antelope Valley Integrated Regional Water Management Plan

The Antelope Valley Integrated Regional Water Management Plan (IRWMP), A.K.A. The AV Water Plan, is a multi-county collaboration effort developed to address regional concerns about water supply reliability, water quality, flood protection, environmental resources and land use management in the Antelope Valley.

ANNOUNCEMENT:



The Antelope Valley Water Plan is now COMPLETE and has been posted for review.

You can read the document by clicking on the icon to the left.

SEE WHAT OUR STAKEHOLDERS HAVE TO SAY!

SPOTLIGHT

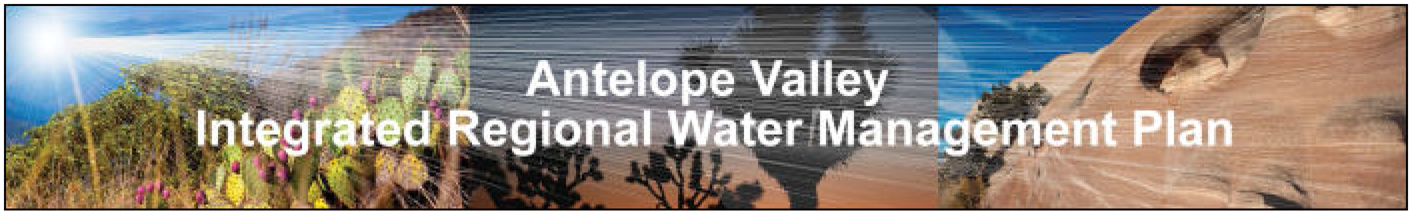
NEW! Prop 84, Round 2 Implementation Grant Proposal – BCSD Arsenic Management Feasibility Study (PDF, 5MB)

Proposition 1E, Round 2 Stormwater Flood Management Grant Application Littlerock Reservoir Sediment Removal Project (PDF, 58MB)

Salt/Nutrient Management Plan - Scope of Work (PDF, 24 KB)

Page Intentionally Left Blank

From: eNotify@dpw.lacounty.gov [mailto:eNotify@dpw.lacounty.gov]
Sent: Friday, November 01, 2013 12:28 AM
To: Brenda Ponton
Subject: AVIRWM Stakeholder Group Event Update



The LADPW offers this free e-mail based service to notify interested parties in a timely manner of news and events of specific interest. You are receiving this e-mail because you have signed up with the LADPW eNotify system. If you have received this e-mail in error or wish to unsubscribe please click here.

Below are the upcoming events that match your preferences:

If you are interested in attending one of these events, click on the "Send me Reminder" link to receive a reminder e-mail just before the event happens! You will be given the option to schedule the exact date you would like to receive the reminder e-mail.

Name	Date/Time	Location	View Map	Driving Directions	Send me Reminder
[AVIRWM] IRWM Stakeholder Meeting	11/20/2013, 10:00 AM - 11:00 AM	Larry Chimbole Cultural Center - Lilac Room at Palmdale City Hall 38350 Sierra Highway Palmdale,		Get Driving Directions	Send me Reminder

		93550			
[AVIRWM] Salt and Nutrient Management Plan Stakeholder Meeting	11/20/2013, 11:00 AM - 12:00 PM	Larry Chimbole Cultural Center - Lilac Room at Palmdale City Hall 38350 Sierra Highway Palmdale, 93550		Get Driving Directions	Send me Reminder

View All Antelope Valley IRWM Stakeholder Group Events

Your eNotify preferences:
E-mail Format: HTML
Zip Code 1: 93535
Zip Code 2: 93534
Coverage Area: All LA County

You can edit these by logging into your online account: eNotify Login

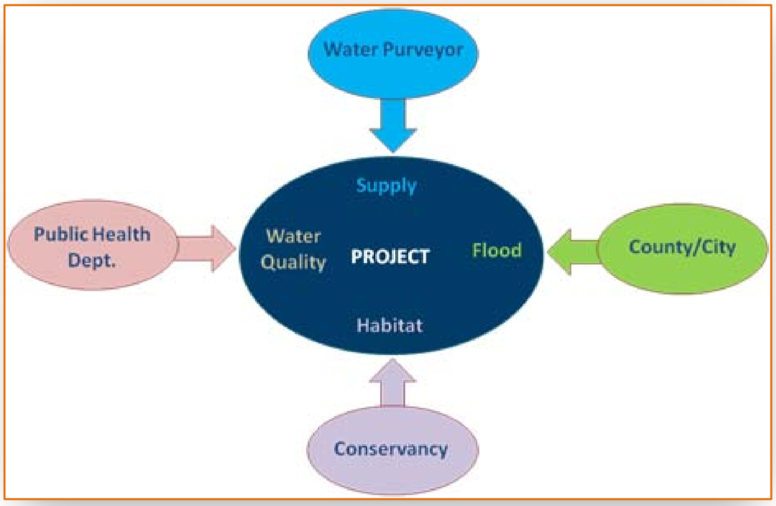
If you have questions, comments or suggestions, please contact us.

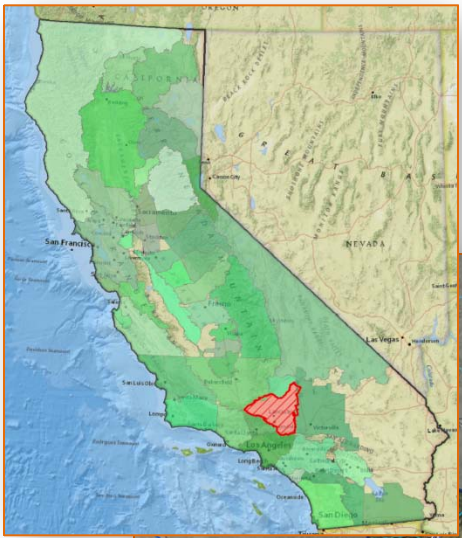
Antelope Valley Integrated Regional Water Mangement

What is integrated regional water management?

Integrated Regional Water Management (IRWM) is a collaborative effort to manage all aspects of water resources in a region. IRWM crosses jurisdictional, watershed, and political boundaries; involves multiple agencies, stakeholders, individuals, and groups; and attempts to address the issues and differing perspectives of all the entities involved using mutually beneficial solutions.

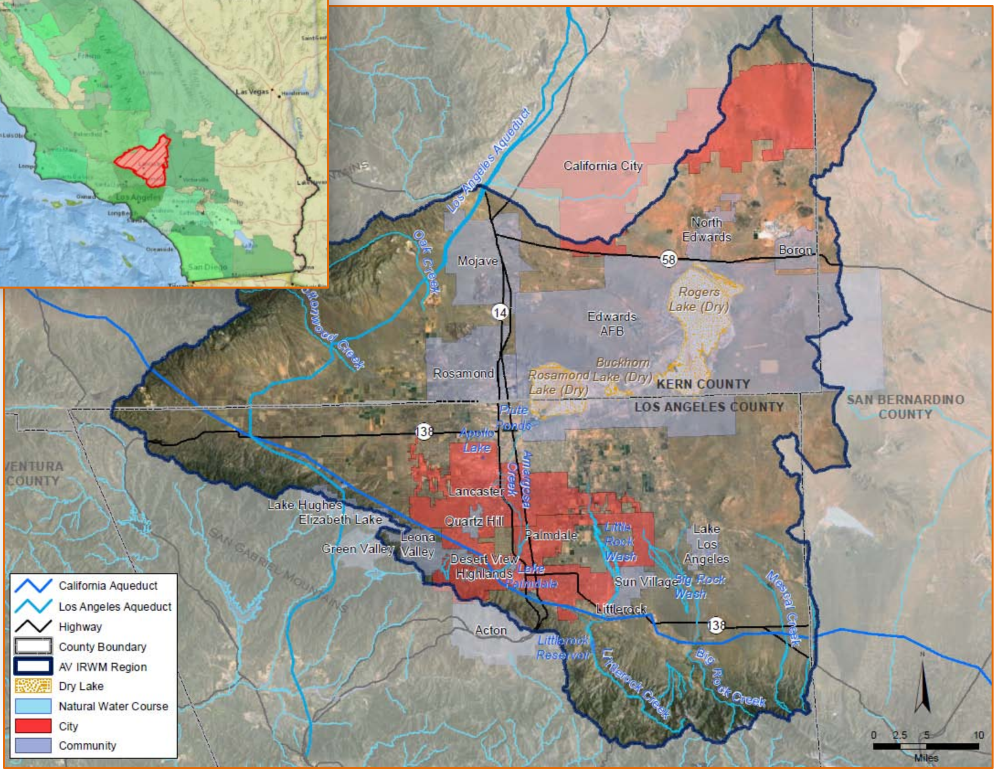
This State program encourages local agencies to work cooperatively to manage local and imported water supplies to improve quality, quantity, and reliability.





The IRWM Program organizes the State into Regions based on shared challenges & responsibilities

The Antelope Valley is one of 48 regions in the State of California. Regions are defined as contiguous geographic areas encompassing the service areas of multiple local agencies, and are defined to maximize the opportunities to integrate water management activities. Each region is self defined, and is approved by the California Department of Water Resources. Approved Regions are eligible to apply for grant funding.



The Antelope Valley Region encompasses approximately 2,400 sq miles in northern Los Angeles County, southern Kern County, and western San Bernardino County.

Numerous Antelope Valley stakeholders have been engaged in the Program since 2006

Leaders and agencies in the Antelope Valley joined together to form a Regional Water Management Group (RWMG):

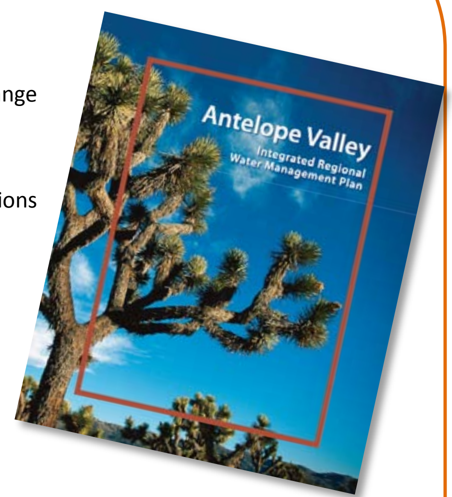
Other stakeholders also participate in the Antelope Valley IRWM process:

- Antelope Valley Board of Trade
- Antelope Valley Conservancy
- Antelope Valley Resource Conserv. District
- Antelope Valley United Water Purveyors
- Building Industry Association
- California Dept. of Fish & Game
- California Dept. of Public Health
- California Dept. of Water Resources
- CA State Water Resources Control Board
- California State Parks
- City of Boron
- City of California City
- Edwards Air Force Base
- Kern County Board of Supervisors, Dist. 2
- Kern County Farm Bureau
- Kern County Planning Department
- Lahontan Reg. Water Qual. Control Board
- Lake Los Angeles Town Council
- Leona Valley Town Council
- LA County Board of Supervisors
- LA County Dept. of Public Works
- LA County Dept. of Regional Planning
- LA County Farm Bureau
- Mojave Desert Mountain Resource Conservation and Development Council
- National Education Association
- National Resources Conservation Service
- Roosevelt Town Council
- Sierra Club
- Sundale Mutual
- U.S. Department of Agriculture
- Westside Park
- White Fence Farms

Stakeholders have collaborated to develop water management objectives, to develop projects, and to write an IRWM Plan that is periodically updated

The Region's objectives help to manage current and future resources.

Water Supply	•Provide reliable water supply and adapt to climate change •Establish a supply contingency plan •Stabilize groundwater levels
Water Quality	•Meet regulatory requirements and customer expectations •Protect and maintain aquifers •Protect streams and recharge areas •Maximize beneficial use of recycled water
Flood Management	•Reduce negative impacts of stormwater, urban runoff, and nuisance water
Environmental Resources Management	•Preserve open space and natural habitats, and enhance water resources and species in the Region
Land Use Planning/ Management	•Maintain agricultural land use •Meet growing demand for recreational space •Improve integrated land use planning
Climate Change	•Mitigate against climate change

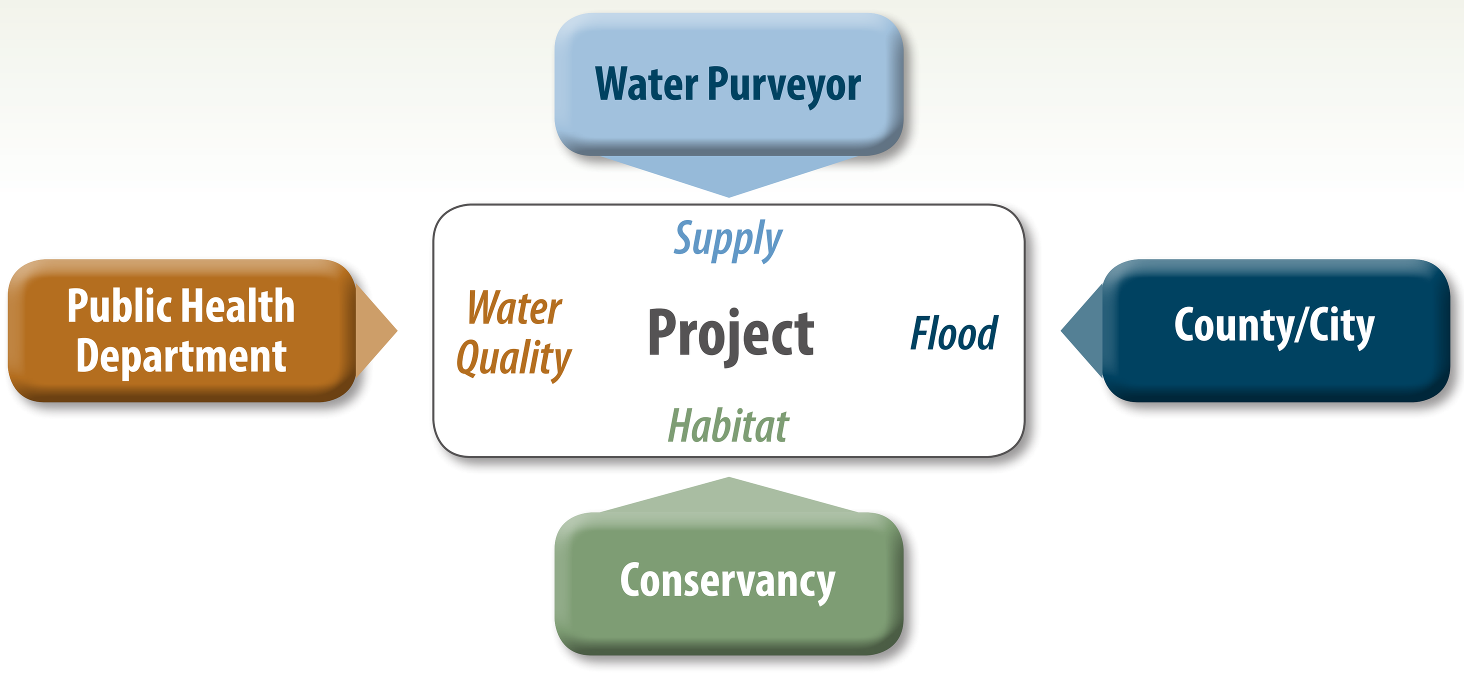


BECOME AN IRWM STAKEHOLDER!
Please visit **www.avwaterplan.org** or contact the Los Angeles County Department of Public Works at (626) 300-3353 for stakeholder meeting information.

Prepared by RMC

Antelope Valley Integrated Regional Water Management (IRWM)

The IRWM Program was developed to encourage collaboration on water issues



Integrated Regional Water Management (IRWM) is a collaborative effort to manage all aspects of water resources in a region. IRWM crosses jurisdictional, watershed, and political boundaries; involves multiple agencies, stakeholders, individuals, and groups; and attempts to address the issues and differing perspectives of all the entities involved using mutually beneficial solutions.

This State program encourages local agencies to work cooperatively to manage local and imported water supplies to improve quality, quantity, and reliability.

The State is organized into IRWM Regions based on shared challenges & responsibilities

The Antelope Valley Region is one of 48 regions in the State of California. Regions are defined as contiguous geographic areas encompassing the service areas of multiple local agencies, and are defined to maximize the opportunities to integrate water management activities. Each region is self-defined, and is then approved by the California Department of Water Resources. Approved Regions are eligible to apply for grant funding.

Numerous Antelope Valley stakeholders have been engaged in the Program since 2006

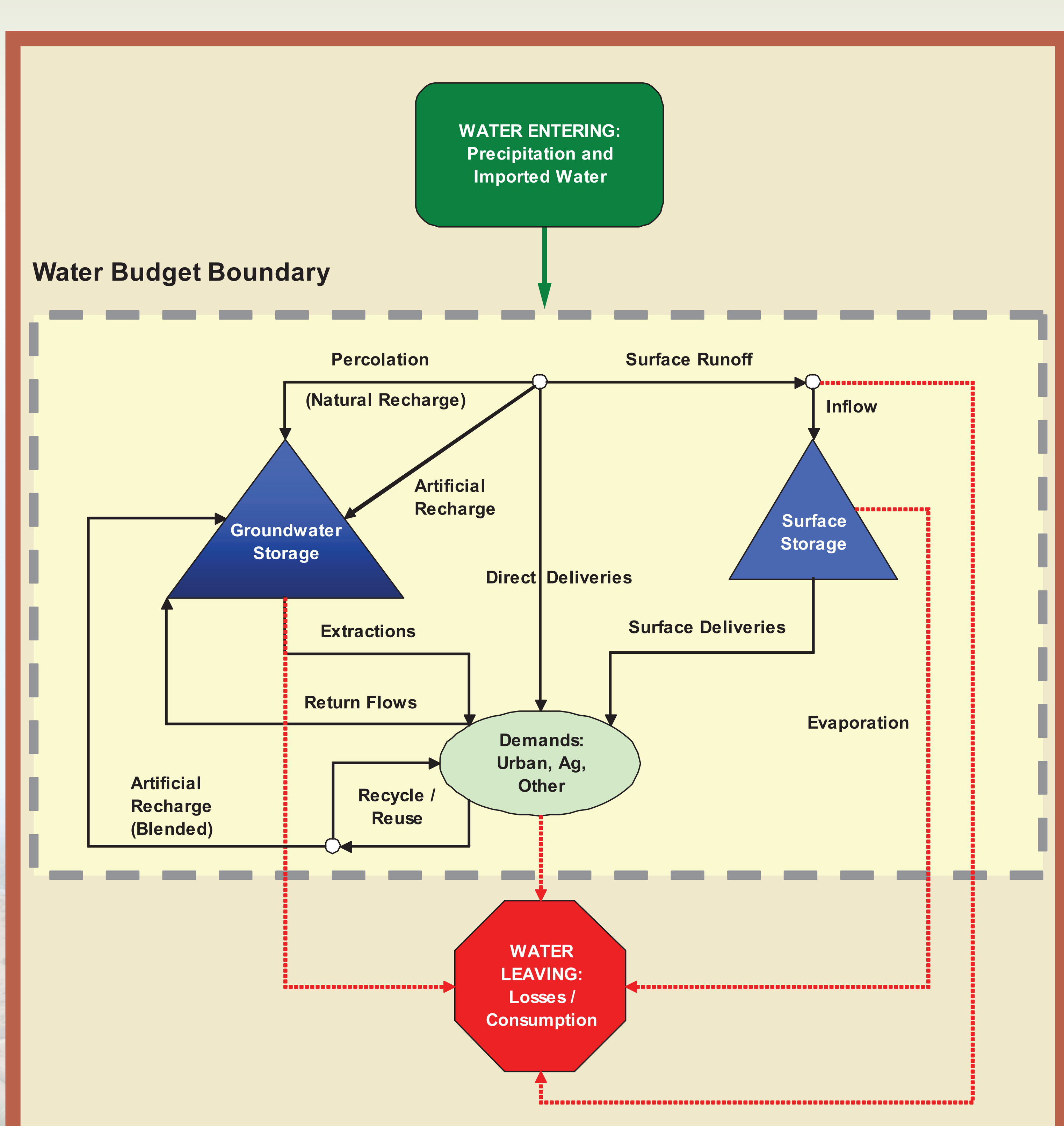
Regional Water Management Group

City of Palmdale; Quartz Hill Water District; Rosamond Community Services District; Sanitation Districts of Los Angeles County; Palmdale Water District; County of Los Angeles; AVEK (Antelope Valley - East Kern Water Agency); AVSWCA (Antelope Valley State Water Contractors Association); LACWD (Los Angeles County Waterworks Districts); Littlerock Creek Irrigation District; lancaster ca

Other Stakeholders

- Antelope Valley Board of Trade
- Antelope Valley Conservancy
- Antelope Valley Resource Conservation District
- Antelope Valley United Water Purveyors
- Building Industry Association - Antelope Valley Chapter
- California Dept. of Fish & Game
- California Dept. of Public Health
- California Dept. of Water Resources
- California State Water Resources Control Board
- California State Parks
- City of Boron
- City of California City
- Edwards Air Force Base
- Kern County Board of Supervisors, District 2
- Kern County Farm Bureau
- Kern County Planning Dept.
- Lahontan Regional Water Quality Control Board
- Lake Los Angeles Town Council
- Lake Los Angeles Park Association
- Leona Valley Town Council
- Los Angeles Co. Board of Supervisors Office, District 5
- Los Angeles Co. Dept. of Public Works, Watershed Management Division
- Los Angeles Co. Dept. of Regional Planning
- Los Angeles Co. Farm Bureau
- Mojave Desert Mountain Resource Conservation and Development Council
- Mutual Water Companies
- National Education Association, Antelope Valley
- National Resources Conservation Service
- Roosevelt Town Council
- Sierra Club
- Sundale Mutual Water
- Town Councils
- Tybrin Corporation at Edwards Air Force Base
- U.S. Department of Agriculture
- Westside Park Mutual Water Company
- White Fence Farms Mutual Water Company

The Region has a complex water balance



Stakeholders have collaborated to develop water management objectives and to write an IRWM Plan that is periodically updated

Water Supply
- Provide reliable water supply and adapt to climate change
- Establish a supply contingency plan
- Stabilize groundwater levels

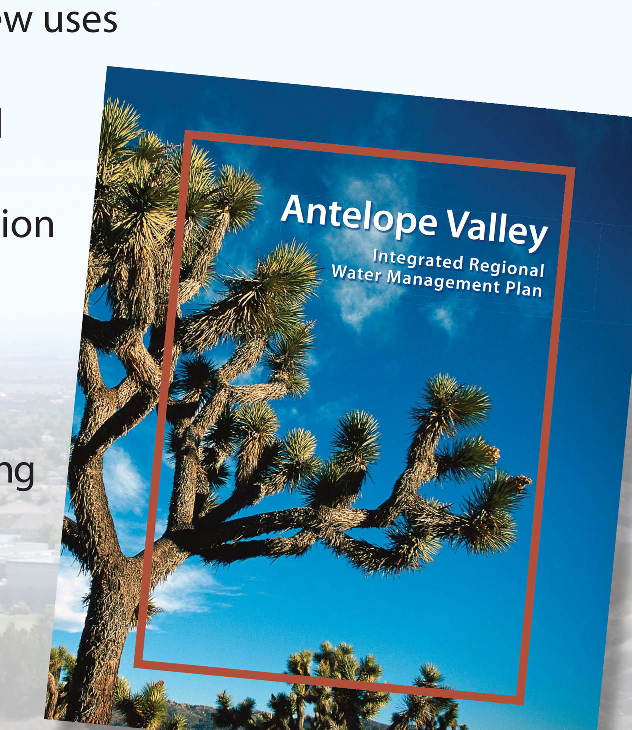
Water Quality
- Meet regulatory requirements and customer expectations
- Protect and maintain aquifers
- Protect streams and recharge areas
- Maximize beneficial use of recycled water

Flood Management
- Reduce negative impacts of stormwater, urban runoff, and nuisance water
- Optimize the balance between existing beneficial uses of stormwater and capturing stormwater for new uses

Enivornmental Resources Management
- Preserve open space and natural habitats, and enhance water resources and species in the Region

Land Use Planning/ Mangement
- Maintain agricultural land use
- Meet growing demand for recreational space
- Improve integrated land use planning to support water management

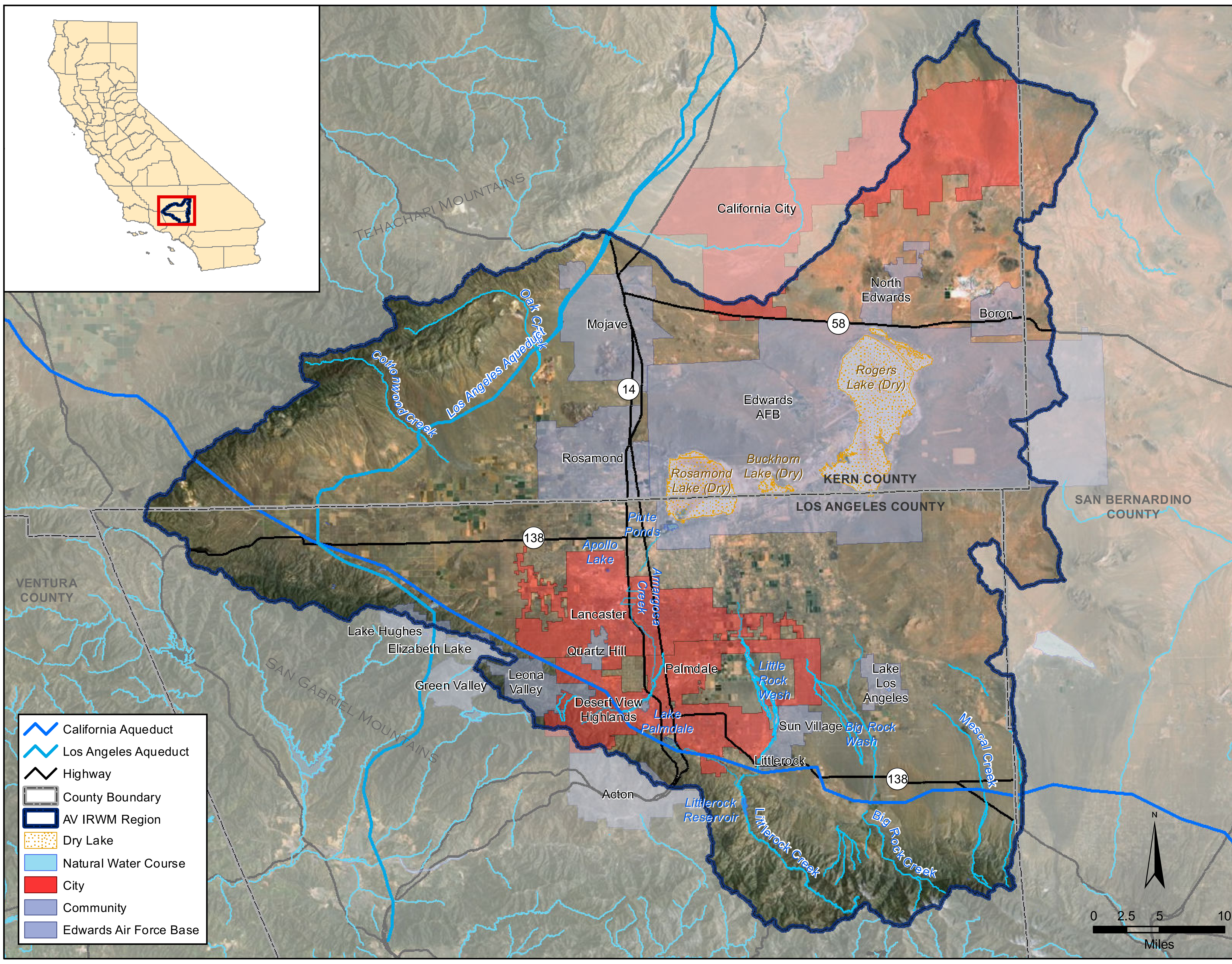
Climate Change
- Mitigate against climate change



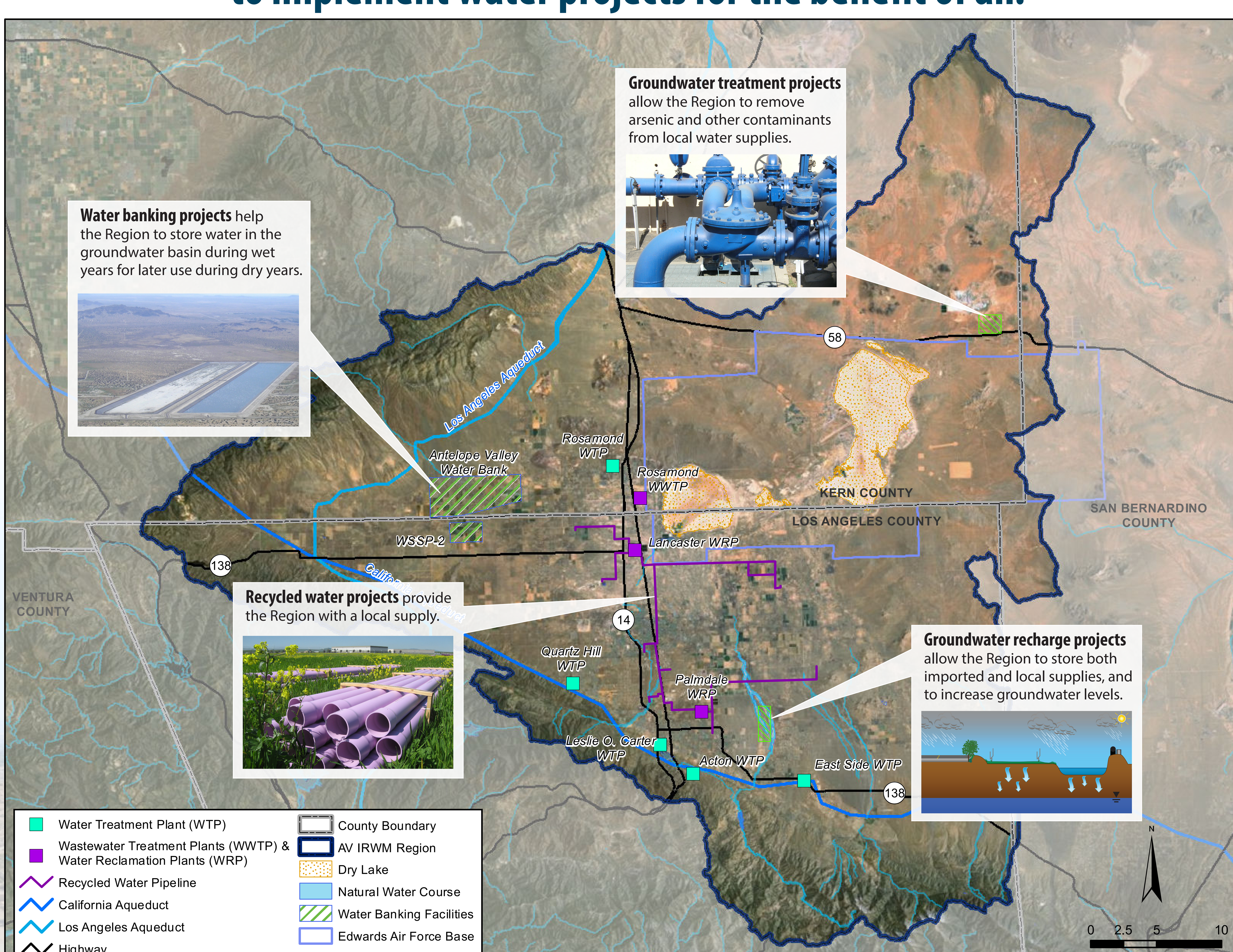
Prepared by: RMC

FOR MORE INFORMATION PLEASE VISIT: WWW.AVWATERPLAN.ORG

The Antelope Valley IRWM Region is made up of many unique cities and communities.



The Antelope Valley communities are working together through IRWM to implement water projects for the benefit of all.

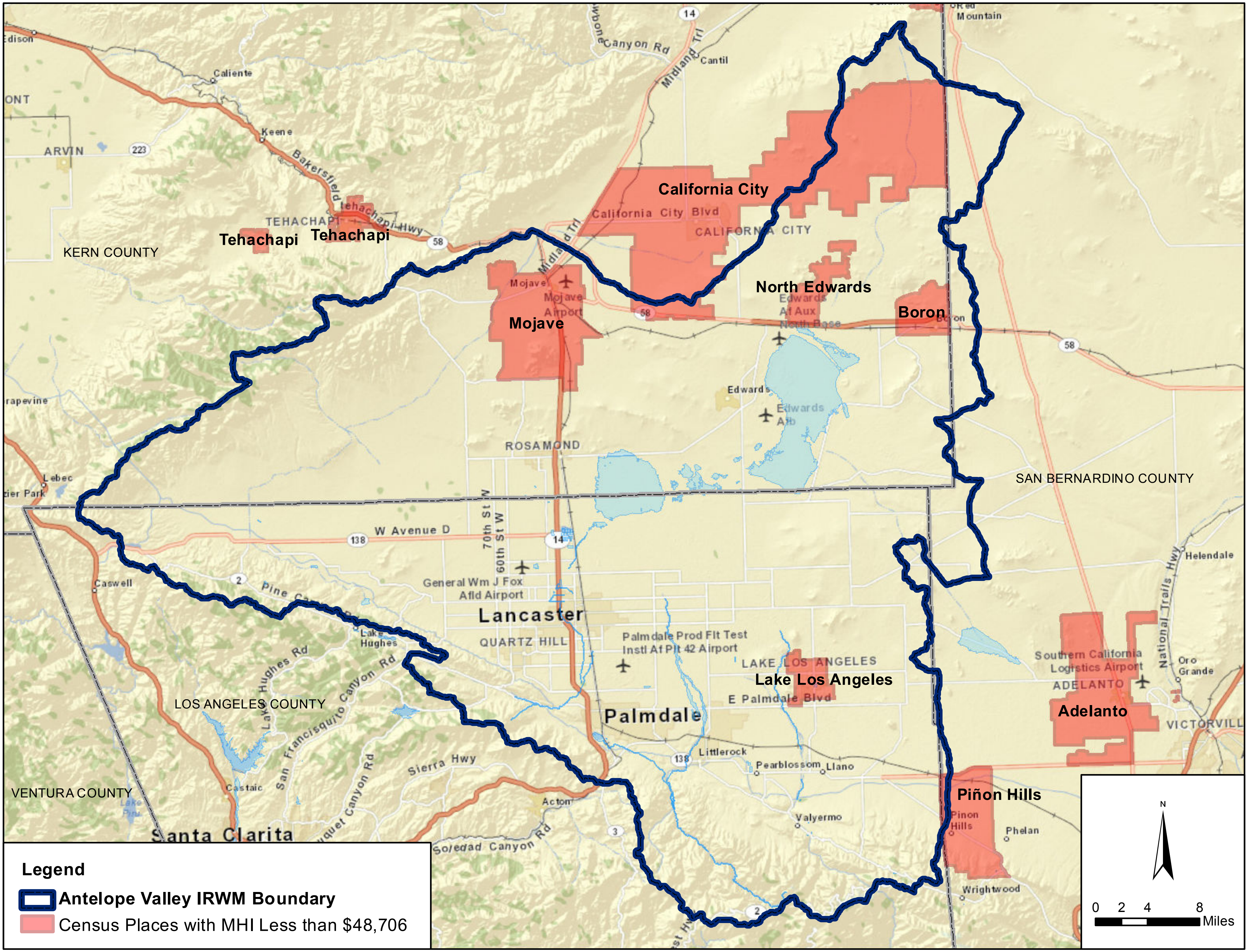


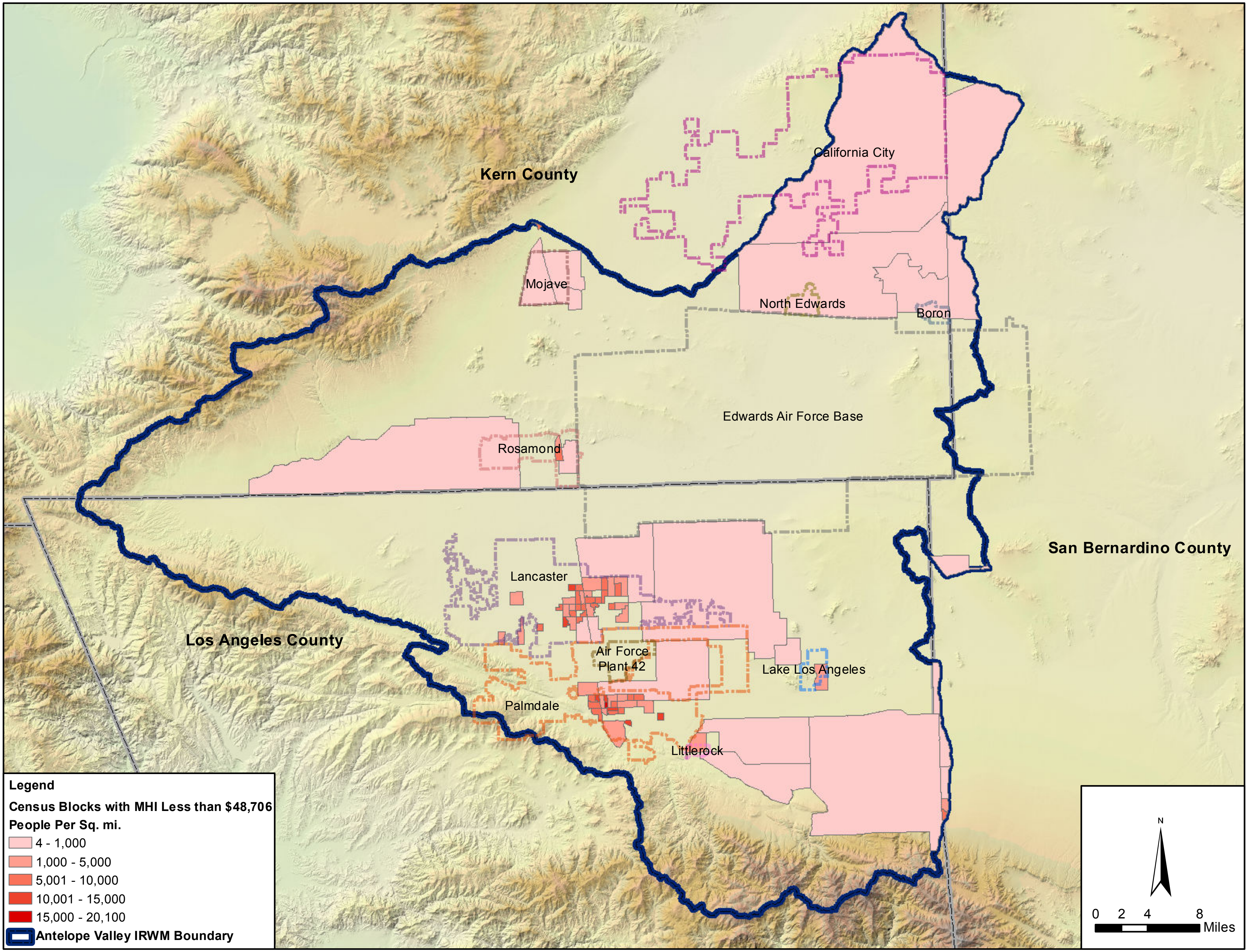
Prepared by: RMC

FOR MORE INFORMATION PLEASE VISIT: WWW.AVWATERPLAN.ORG

Appendix D: DAC Maps and Technical Memoranda

Page Intentionally Left Blank


California City
Tehachapi
Tehachapi
KERN COUNTY
North Edwards
Mojave
Boron
SAN BERNARDINO COUNTY
Lancaster
Lake Los Angeles
Adelanto
LOS ANGELES COUNTY
Palmdale
VENTURA COUNTY
Piñon Hills
Santa Clarita
Legend
Antelope Valley IRWM Boundary
Census Places with MHI Less than $48,706
N
0 2 4 8
Miles



Kern County
California City
Mojave
North Edwards
Boron
Edwards Air Force Base
Rosamond
San Bernardino County
Lancaster
Los Angeles County
Air Force
Plant 42
Lake Los Angeles
Palmdale
Littlerock
Legend
Census Blocks with MHI Less than $48,706
People Per Sq. mi.
4 - 1,000
1,000 - 5,000
5,001 - 10,000
10,001 - 15,000
15,000 - 20,100
Antelope Valley IRWM Boundary
N
0 2 4 8
Miles

FINAL DRAFT Technical Memorandum

Antelope Valley IRWMP 2007 Update

Subject: **Task 2.1.2 DAC Water Supply, Quality, and Flooding Data**

Prepared For: Antelope Valley State Water Contractors Association

Prepared by: Grizelda Soto/Dawn Flores

Reviewed by: Brian Dietrick

Date: May 20, 2013 (Revised August 2, 2013)

1 Purpose

The purpose of this technical memorandum (TM) is to document the process for identifying disadvantaged community (DAC) areas in the Antelope Valley Region and to compile and summarize the existing water quality, supply, and flooding information available for DACs[1]. The findings of this TM will be used to develop a conceptual monitoring plan for DAC areas in the Region (Task 2.1.3).

2 DAC Background

A DAC under the Integrated Regional Water Management (IRWM) Program is defined as a community with a median household income (MHI) less than 80% of the Statewide average. An MHI of less than $48,706 is the IRWM DAC threshold from the 2012 Proposition 84 Guidelines.

Within the Antelope Valley Region IRWM stakeholder group, a DAC Outreach committee was formed to assist with data collection, outreach efforts, and project solicitation in DAC areas. The committee was composed of volunteer members representing a diverse cross section of the active stakeholders including DACs, the California Department of Water Resources (DWR), and mutual water companies. The members soon developed and implemented a multifaceted outreach campaign to support the IRWM Plan that would more actively address the needs of DACs. Overall, the two main goals of the committee were to:

- Encourage participation by DACs and solicit input (including potential projects) into the Antelope Valley IRWM Plan updates
- Educate target audiences in DAC areas about the purpose and benefits of the Antelope Valley IRWM Plan

3 Determination of DAC Areas

This section provides a short background on the types of census data that are available for determining DAC areas, and it then discusses how two DAC maps were developed for the Region. Finally, a description of DAC outreach efforts is provided.

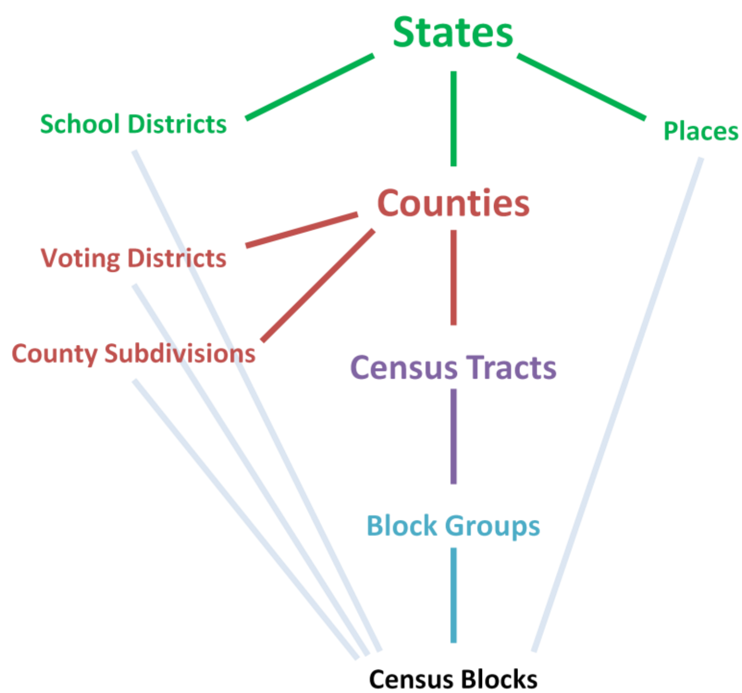
3.1 Background on Census Data

United States Census data is organized in multiple ways. The most basic unit of measurement is the "block". Census blocks are used to make up larger areas of organization, such as block groups, tracts, and up to counties, states and nations. This sequence of organization is used by the Census Bureau for statistical analysis. Another unit of organization that is also built from Census blocks is called a Census

[1] As recommended in the 2012 DWR IRWM Grant Program Guidelines, Appendix G.

"Place". Census places are areas that have a particular identity or meaning for local residents. For example, an unincorporated area that is a town could be a Census place. A Census place is simply another way to organize blocks. Figure 1 below illustrates multiple ways that are used to organize Census blocks.

Figure 1: Organization of Census Blocks



3.2 DAC Maps Developed for the Antelope Valley Region

The Department of Water Resources (DWR) developed a mapping tool to help determine which communities within the IRWM region meet the DAC MHI definition.[2] The maps and GIS files were derived from the US Census Bureau's American Community Survey (ACS) for the five year period 2006-2010. The initial DAC map was drafted using Census Place GIS data from DWR (Figure 3-2), which provided a larger scale overview of the DAC areas within the Antelope Valley IRWM Region. After an initial review of the Antelope Valley IRWM DAC map that was subsequently shared with the DAC Outreach committee and Stakeholder group, a second map was developed using Census Block GIS data from DWR. The Census Block GIS data provided DAC information at the smallest geographic unit available. The result was that more DAC areas within the Antelope Valley IRWM Region were captured than had previously been captured using the Census Places GIS data. The Census Block GIS data was further defined to include the population density (people per square mile) within the Antelope Valley IRWM Region (Figure 3). For the purposes of DAC outreach, it was decided that the Census Block information would be used since it provides a more inclusive accounting of DAC areas.

[2] As defined by the Department of Water on the Integrated Regional Water Management Site: http://www.water.ca.gov/irwm/grants/resourceslinks.cfm

Figure 2: Antelope Valley IRWM Disadvantaged Communities as Defined by Census Places

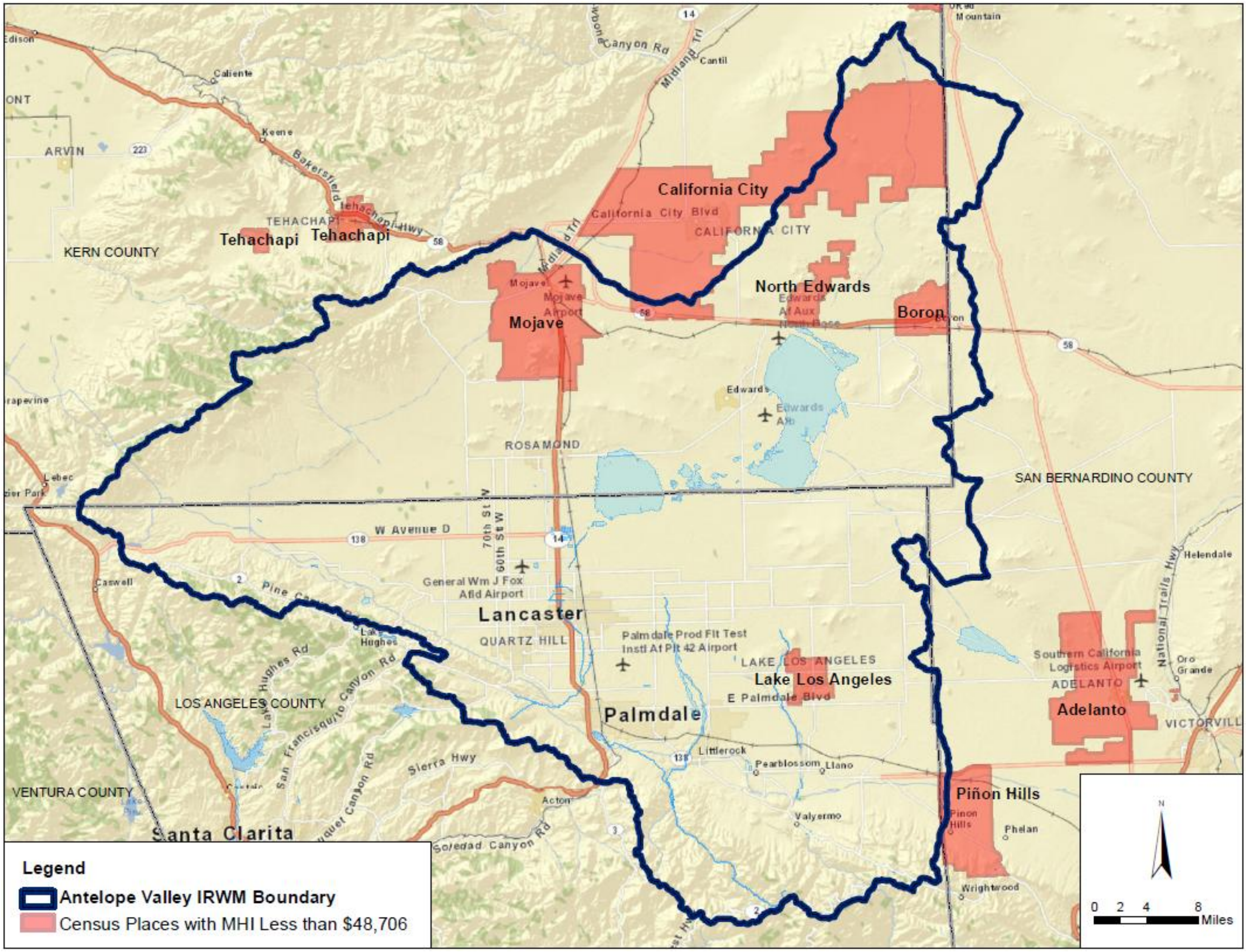
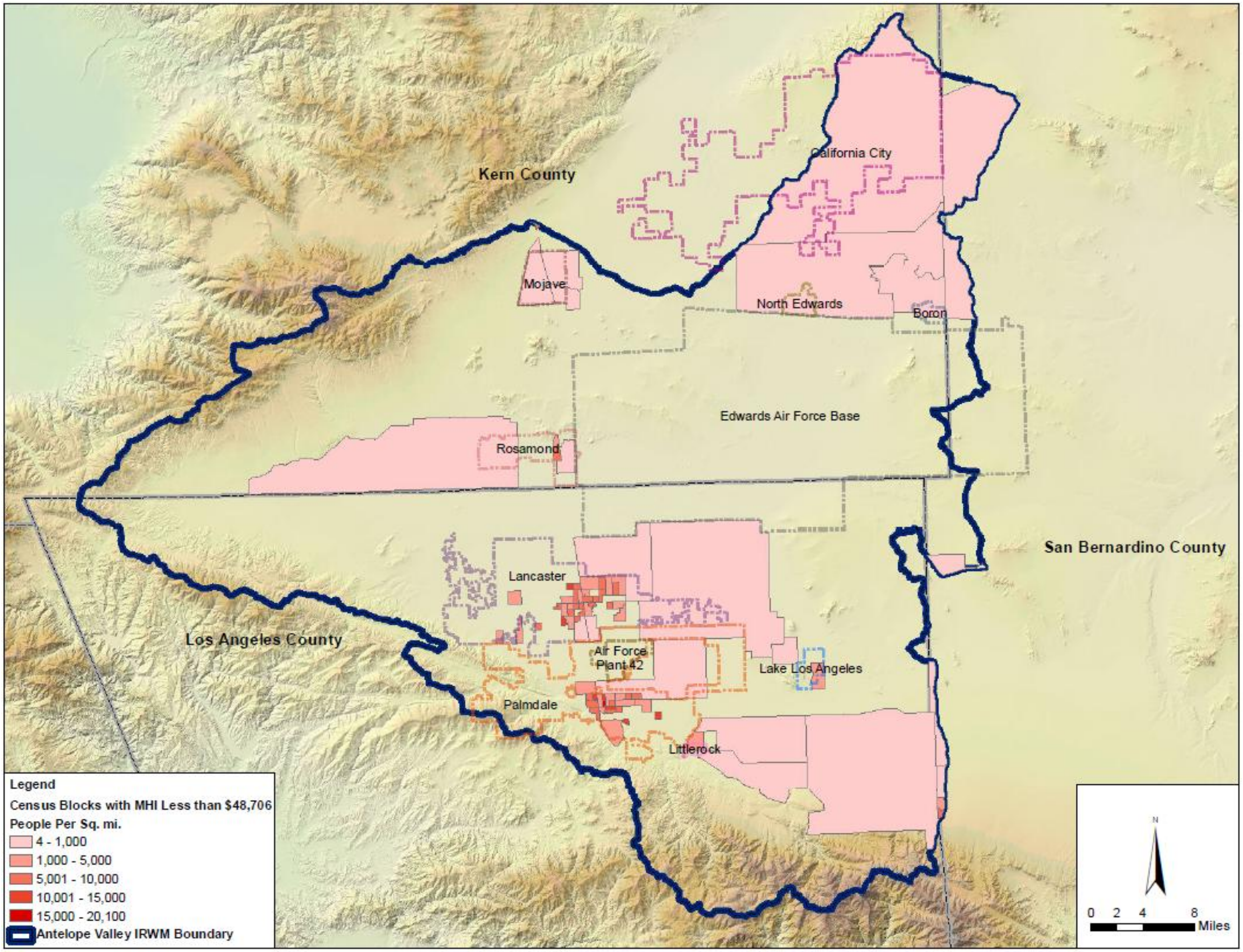


Figure 3: Antelope Valley IRWM Disadvantaged Communities as Defined by Census Blocks and Population Densities



3.3 DAC Outreach Efforts

After the various DAC areas were identified, a coordinated effort was initiated to provide outreach. Initial contact was made with representatives from Lake Los Angeles, Mojave Public Utility, Boron Community Services District, North Edwards Water District, Edgemont Acres Mutual Water Company, California City, and others. Subsequent presentations at local community meetings were also arranged. In addition to PowerPoint presentations, handouts were provided at each meeting that included detailed schedules, project eligibility criteria, IRWM Plan goals, plan objectives, and technical assistance listings with contact information. At these meetings, data was requested on any water resource issues and DAC projects that could be eligible for Prop 84 and Prop 1E grant funding. Calls were also conducted with representatives of several of the DAC areas. Table 3-1 contains a list of the DAC outreach meetings thus far for the 2013 IRWM Plan updates and those that are anticipated in the near future.

Table 3-1: DAC Outreach Meetings

Meeting/Event	RMC Attendees	Meeting Date	Other Attendees
DAC Committee Meeting No. 1	Brian Dietrick Tom West Grizelda Soto	April 18, 2012	11 people from AV IRWMP stakeholder group
North Edwards Water District/Desert Lake CSD	Brian Dietrick Grizelda Soto	Aug 10, 2012	Dollie Kostopoulos, GM
Boron Community Services District	Brian Dietrick Grizelda Soto	Aug 10, 2012	Stopped by office and left copies of the AV IRWM Kern County DAC Outreach materials; follow-up call to Natalie Dadey on 8/14/2012
Mojave Public Utility District	Brian Dietrick Grizelda Soto	Aug 10, 2012	Stopped by office and left copies of the AV IRWM Kern County DAC Outreach materials; follow-up call to Bee Coy on 8/14/2012
Lake Los Angeles Town Council Meeting	Brian Dietrick	Aug 28, 2012	Approx. 15 w/council
DAC Committee Meeting No. 2	Brian Dietrick Grizelda Soto	March 20, 2013	Approx. 6 from AV IRWMP stakeholder group
DAC Committee Meeting No. 3	Brian Dietrick Dawn Flores	May 15, 2013	Approx. 10 from AV IRWMP stakeholder group
Edgemont Acres Mutual Water Company	Brian Dietrick	Anticipated June 2013	TBA
Quartz Hill - AV Board of Trade	Brian Dietrick Dawn Flores	Anticipated June 5, 2013	TBA
Rosamond CSD	Brian Dietrick Dawn Flores	Anticipated in June 2013	TBA

4 DAC Issues

This section describes the methodology for identifying water supply, water quality, and flooding issues in the DAC areas discussed in Section 3.

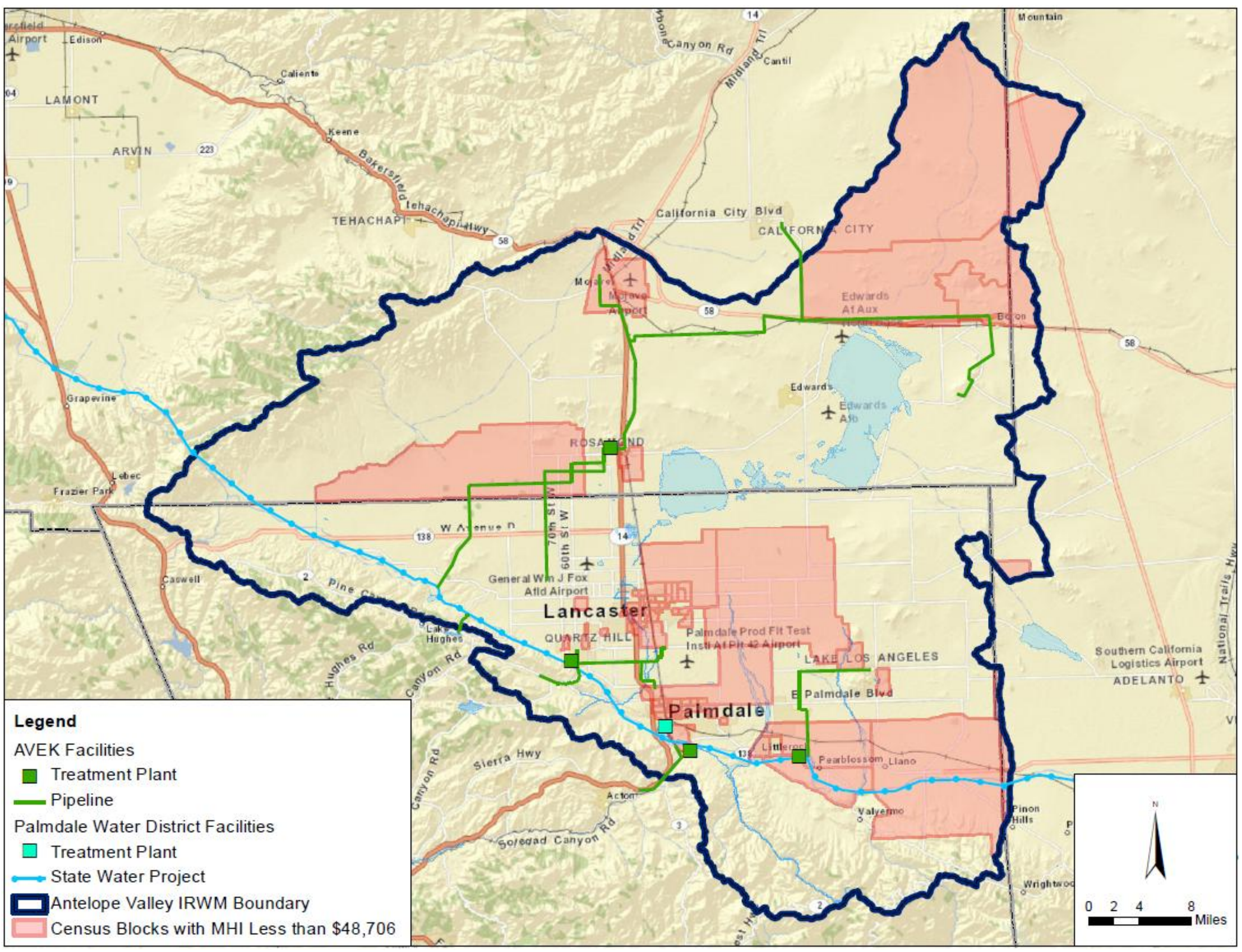
4.1 Water Supply

To identify water supply issues in each of the DAC areas, the consultant team contacted water agencies that served each area and verified the information with available 2010 Urban Water Management Plans (UWMPs). In general, DAC areas rely on (1) imported water served from the Antelope Valley East Kern (AVEK) Water Agency, Palmdale Water District (PWD), or Littlerock Creek Irrigation District (LCID); (2) groundwater pumped from wells; or (3) recycled water from water reclamation plants operated by the Los Angeles County Sanitation Districts (LACSD). Water supply issues in specific DAC areas will be documented in a subsequent DAC TM.

4.1.1 Imported Supply

Imported water supply issues are similar to non-DAC areas. For DAC areas, AVEK supplies are provided by the State Water Project (SWP) and transfers/exchanges with surrounding agencies. AVEK supplies potable water directly to Los Angeles County Waterworks District (LACWWD 40), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD). Other areas receive imported supply water through purveyors such as Palmdale Water District (PWD), which in turn treats imported water for the Littlerock Creek Irrigation District. Imported water facilities for the Region are shown below in Figure 4 in relation to DAC areas.

Figure 4: AVEK and PWD Imported Water Facilities in Relation to DAC Areas



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 customers.

AVEK currently treats SWP water with four Water Treatment Plants (WTPs) that are capable of treating approximately 132,270 acre-feet per year (AFY) of imported water. The main WTP, Quartz Hill WTP, is rated for 90 million gallons per day (mgd) (100,880 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.

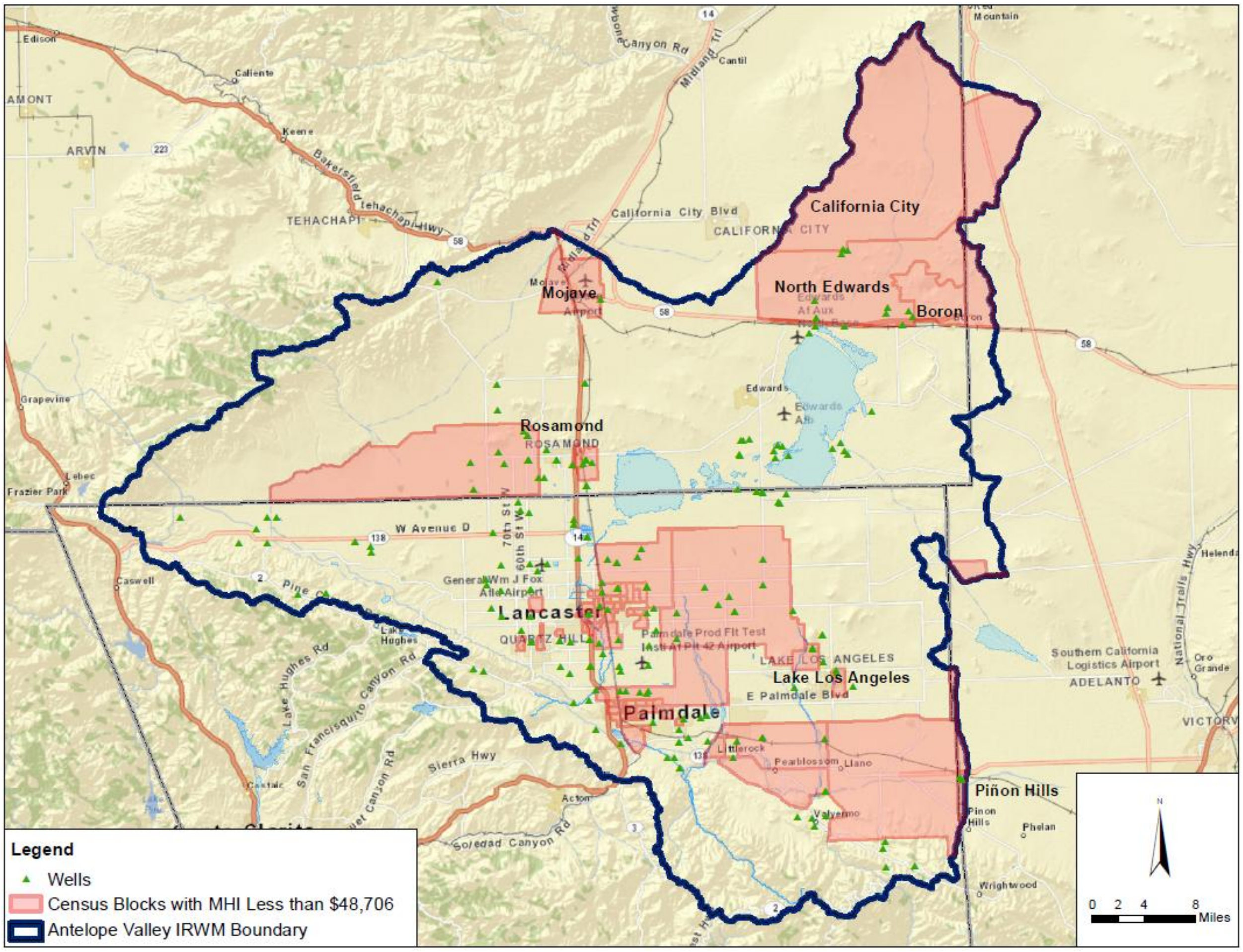
Palmdale Water District's (PWD's) water treatment plant capacity is 35 mgd (39,230 AFY), but it is limited to treating 28 mgd (31,390 AFY) in accordance with the California Department of Public Health (DPH) (formerly the Department of Health Services) requirements to keep one filter offline in reserve (PWD 2001). PWD is also in the preliminary design stage for a new recycled 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.

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.

4.1.2 Groundwater Supply

Groundwater supplies for DAC areas are mainly impacted by water quality and aging well infrastructure. Specific arsenic water quality issues as well as general water quality concerns are described in Section 4.2. The Region relies on groundwater to meet a significant portion of its water demand. Figure 55 shows the locations of groundwater wells throughout the Valley in relation to DAC areas.

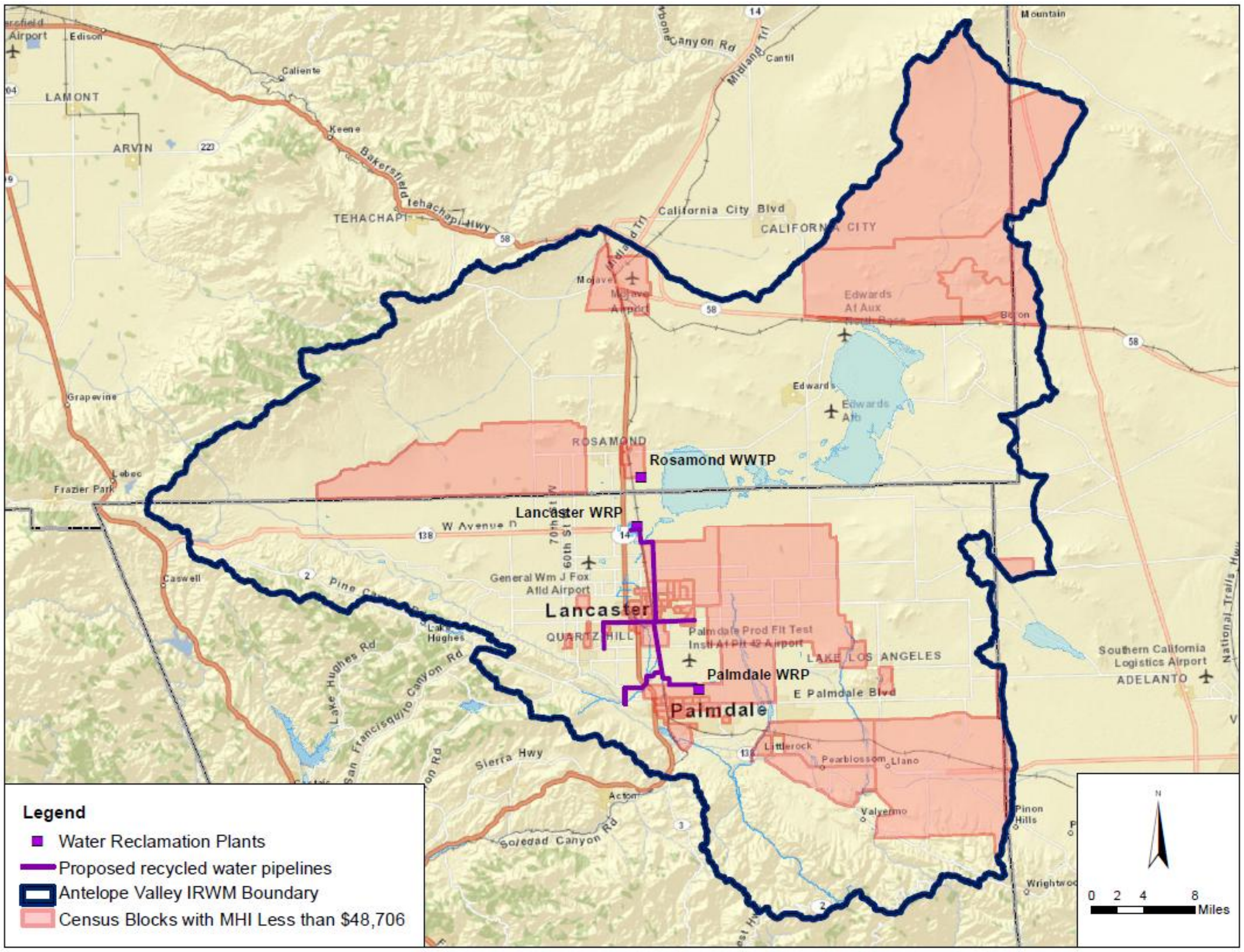
Figure 5: Antelope Valley Groundwater Wells in Relation to DAC Areas



4.1.3 Recycled Water Supply

Recycled water planning is underway in several areas of the Valley to plan for the beneficial use of recycled water supplies to offset imported water use. There are currently three wastewater treatment plants in the Antelope Valley: Lancaster Water reclamation Plant (LWRP), Palmdale Water Reclamation Plant (PWRP) and Rosamond Wastewater Treatment Plant (RWWTP). The LWRP and PWRP provide disinfected tertiary treatment with nitrification. The RWWTP provides tertiary treated effluent as well. As shown in Figure 6, these three treatment plants and proposed recycled water distribution pipelines are located in the southern portion of the Region in the cities of Rosamond, Lancaster and Palmdale. Figure 6 also shows the location of the facilities in relation to DAC areas.

Figure 6: Recycled Water Facilities in Relation to DAC Areas



4.2 Water Quality

To identify water quality issues in each of the DAC areas, the consultant team contacted water agencies that served each area and documented the information using the Geotracker Groundwater Ambient Monitoring Assessment (GAMA) and National Water Quality Monitoring Council (NWQMC) database. The GAMA program is California's comprehensive groundwater quality monitoring program. GAMA collects data by testing untreated, raw water in different types of wells for naturally-occurring and man-made chemicals (State Water Resources Control Board N.D.).[3] The test results are complied with existing groundwater quality data from several agencies into a public accessible database (State Water Resources Control Board). The GAMA program was created by the State Water Board in 2000 and its main goals are to: 1) improve statewide groundwater monitoring and 2) increase the availability of groundwater quality information to the public. The NWQMC is a portal to access stored data in various large water quality databases (NWQMC N.D.). The available databases through this portal are the USGS NWIS and USEPA STORET. The USGS NWIS collects water resource data from approximately 1.5 million sites throughout the United States (NWQMC N.D.). These data are updated every 24 hours (NWQMC N.D.). USEPA STORET is a data warehouse for water quality, biological, and physical data used by state environmental agencies, the Environmental Protection Agency, other federal agencies, universities, private citizens, and others (NWQMC N.D.). STORET data is updated weekly (NWQMC N.D.).

The Antelope Valley IRWM groundwater well water quality data from both the GAMA and NWQMC databases were downloaded into an excel format. The groundwater well water quality data were screened using the California maximum contaminant levels (MCL) for drinking water and national secondary

[3] Source: http://www.waterboards.ca.gov/gama/

drinking water standards (which match California's secondary maximum contaminant levels for the contaminants examined). Table 1 and Table 2 list all the drinking water contaminants screened for groundwater well water quality data (if information was available). All groundwater supply wells and the contaminants exceeding the MCL and/or national secondary drinking water regulations are shown in the tables below. In addition, groundwater wells exceeding selected California MCL and/or the national secondary drinking water regulations located in DAC areas within the Antelope Valley IRWM are mapped in Figures 7 though 10.

Table 1: California Primary MCLs

Contaminant	MCL (mg/L)	Effective Date
	Inorganic	
Aluminum	1	2/25/1989
	0.2[4]	9/8/1994
Antimony	0.006	9/8/1994
Arsenic	0.05	1977
	0.010	11/28/2008
Asbestos	7 MFL[5]	9/8/1994
Barium	1	1977
Beryllium	0.004	9/8/1994
Cadmium	0.010	1977
	0.005	9/8/1994
Chromium	0.05	1977
Copper	1[2]	1977
	1.3[6]	12/11/1995
Cyanide	0.2	9/8/1994
	0.15	6/12/1903
Fluoride	2	4/1998
Lead	0.05[7]	1977
	0.015[4]	12/11/1995
Mercury	0.002	1977
Nickel	0.1	9/8/1994
Nitrate	45	1977
Nitrite (as N)	1	9/8/1994
Total Nitrate/Nitrite (as N)	10	9/8/1994
Perchlorate	0.006	10/18/2007
Selenium	0.01	1977
	0.05	9/8/1994
Thallium	0.002	9/8/1994
	VOCs	
Benzene	0.001	2/25/1989

[4] Secondary MCL
[2] Secondary MCL
[5] MFL = million fibers per liter, with fiber 3enth > 10 microns9/8/94
[6] Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program, replaces MCL.
[7] The MCL for lead was rescinded with the adoption of the regulatory action level described in footnote 4.

Contaminant	MCL (mg/L)	Effective Date
Carbon Tetrachloride	0.0005	4/4/1989
1,2 - Dichlorobenzene	0.6	9/8/1994
1,4 – Dichlorobenzene	0.005	4/4/1989
1,1 – Dichloroethane	0.005	6/24/1990
1,2 – Dichloroethane	0.0005	4/4/1989
1,1 – Dichloroethylene	0.006	2/25/1989
Cis – 1,2 – Dichloroethylene	0.006	9/8/1994
Trans – 1,2 – Dichloroethylene	0.01	9/8/1994
Dichloromethane	0.005	9/8/1994
1,3 – Dichloropropene	0.0005	2/25/1989
1,2 – Dichloropropane	0.005	6/24/1990
Ethylbenzene	0.68	2/25/1989
	0.7	9/8/1994
	0.3	6/12/2003
Methyl-tert-butyl ether (MTBE)	0.005[2]	1/7/1999
	0.013	5/17/2000
Monochlorobenzene	0.03	2/25/1989
	0.07	9/8/1994
Styrene	0.1	9/8/1994
1,1,2,2 – Tetrachloroethane	0.001	2/25/1989
Tetrachloroethylene	0.005	5/1989
Toluene	0.15	9/8/1994
1,2,4 – Trichlorobenzene	0.07	9/8/1994
	0.005	6/12/2003
1,1,1 – Trichloroethane	0.2	2/25/1989
1,1,2 – Trichloroethane	0.032	4/4/1989
	0.005	9/8/1994
Trichloroethylene	0.005	2/25/1989
Trichlorofluoromethane	0.15	6/24/1990
1,1,2 – trichloro – 1,2,2 – Trifluoroethane	1.2	6/24/1990
Vinyl Chloride	0.0005	4/4/1989
Xylenes	1.750	2/25/1989
	Disinfection Byproduct	
Total Trihalomethanes	0.1	3/14/1983
	0.080	6/17/2006
Haloacetic acids (five)	0.060	6/17/2006
Bromate	0.010	6/17/2006
Chlorite	1.0	6/17/2006

Sources: California Department of Public Health – Maximum Contaminant Levels and Regulatory Dates for Drinking Water. November 2008. Available: http://www.cdph.ca.gov/certlic/drinkingwater/Documents/DWdocuments/EPAandCDPH-11-28-2008.pdf

Table 2: Secondary Drinking Water Regulations

Contaminant	Secondary Drinking Water Regulations
Chloride	250 mg/L
Color	15 Colorunits
Manganese	0.05 mg/L
Iron	0.3 mg/L
Sulfate	250 mg/L
TDS	500 mg/L
Turbidity	0.5 NTU (Nephelometric Turbidity Units)

Source: United States Environmental Protection Agency. Drinking Water Contaminants – Secondary Drinking Water Regulations. Last updated June 5, 2012. Available: http://water.epa.gov/drink/contaminants/index.cfm

Table 3: GAMA Groundwater Wells in DAC Areas with Water Quality Exceedances

Well ID	Water Quality Exceedances
ANT-51	Arsenic
W0601500290	Arsenic
W0601500396	Arsenic
W0601500405	Arsenic, Iron, Manganese
W0601500421	Arsenic
W0601500424	Arsenic, Iron, Manganese
W0601500426	Arsenic
W0601500523	Arsenic
W0601502223	Arsenic, Fluoride
W0601510002	Chloride, Iron, TDS
W0601510052	Fluoride, Iron
W0601900751	TDS
W0601900804	Fluoride, Iron
W0601907029	Sulfate, TDS
W0601910138	Iron
W0601910203	Iron, Nitrate, Nitrite
W0601910023	Aluminum, Chromium, Iron, Manganese
W0601910070	Antimony, Chromium, Iron, Manganese, Nitrate,

Table 4: NWQMC Groundwater Wells in DAC Areas with Water Quality Issues

Well ID	Water Quality Issues
USGS-345215118092401	Chloride, Sulfate, TDS,
USGS-345210118090601	TDS
USGS-345151118090201	TDS
USGS-345149118133201	Iron, TDS
USGS-345148118170101	Fluoride
USGS-345147118153201	Fluoride
USGS-345147118133201	Sulfate, TDS
USGS-345144118170201	Fluoride
USGS-345021118144601	TDS
USGS-344538117583101	TDS
USGS-344457117581001	TDS
USGS-344456118012301	TDS
USGS-344429118030201	Sulfate, TDS
USGS-344404117550001	Iron
USGS-344350117535001	Nitrate
USGS-344256118002301	Sulfate, TDS
USGS-344248118074701	Arsenic, Fluoride
USGS-344240118074301	Turbidity
USGS-344239118074601	Turbidity
USGS-344221118083401	Chromium
USGS-344218118083301	Chromium
USGS-344130118075701	Turbidity, Iron
USGS-344123118080001	Turbidity
USGS-344120118081001	Turbidity
USGS-344112118093201	Chromium, Iron, Manganese
USGS-344104118091101	Nitrate, TDS
USGS-344006118082601	TDS
USGS-344005118081801	Manganese, TDS
USGS-344002118074701	Chromium
USGS-344000118130601	Iron, Manganese
USGS-343951118070001	Turbidity
USGS-343903118074801	Chromium, Turbidity
USGS-343553118053201	Iron
USGS-343244118060501	TDS
USGS-343208117583701	Nitrate, TDS
USGS-343204117584101	Nitrate, Sulfate, TDS
USGS-343150117585501	Nitrate, TDS, Iron
USGS-343148117582901	Nitrate, TDS, Iron
USGS-343142117584901	Iron, Nitrate, Sulfate, TDS
USGS-343117117584401	TDS
USGS-343114117585701	TDS
USGS-343007117540201	TDS

Well ID	Water Quality Issues
USGS-343004117462601	Turbidity

Figure 7: Groundwater Wells Exceeding Arsenic MCL in Relation to DAC Areas

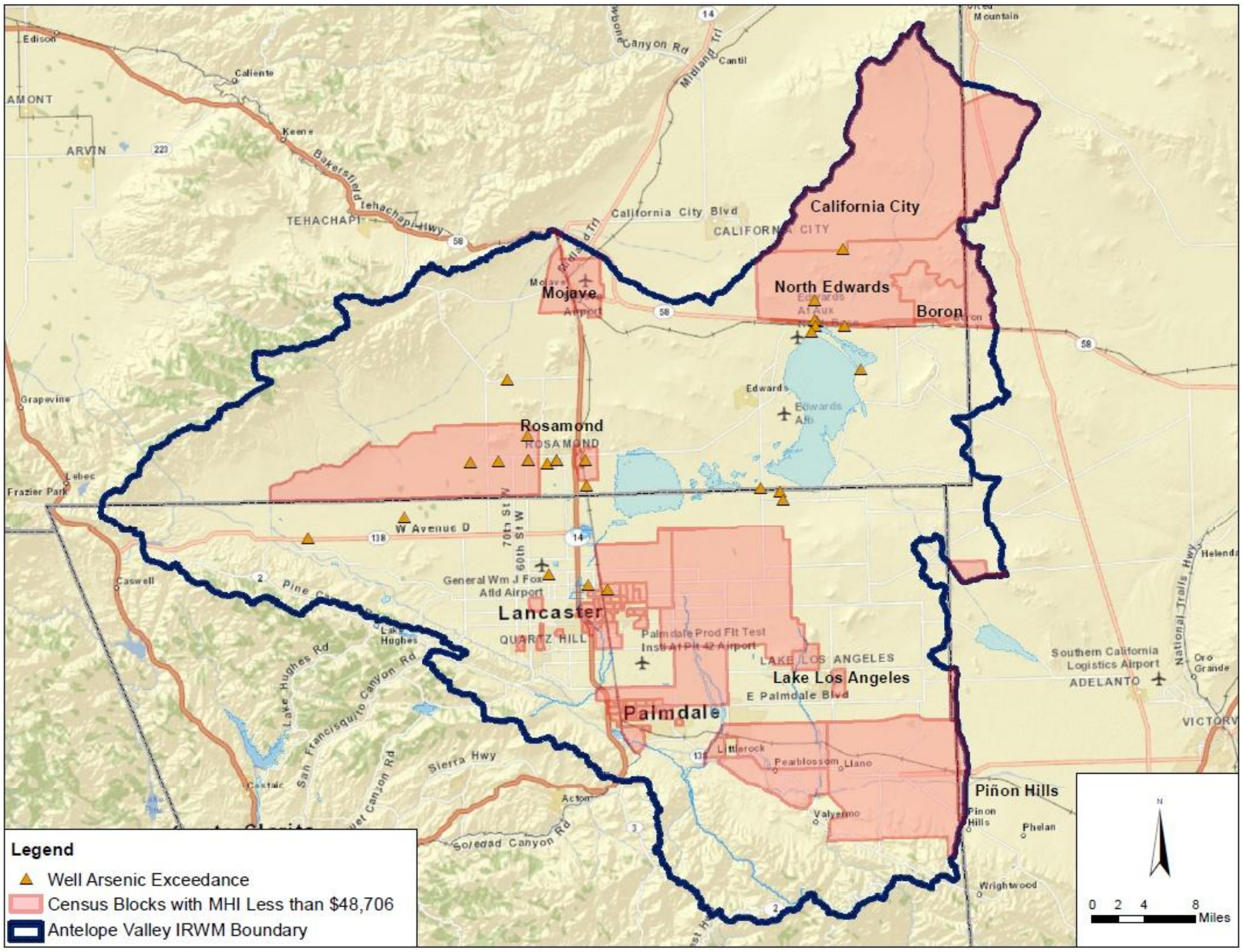


Figure 8: Groundwater Wells Exceeding Metals MCLs in Relation to DAC Areas

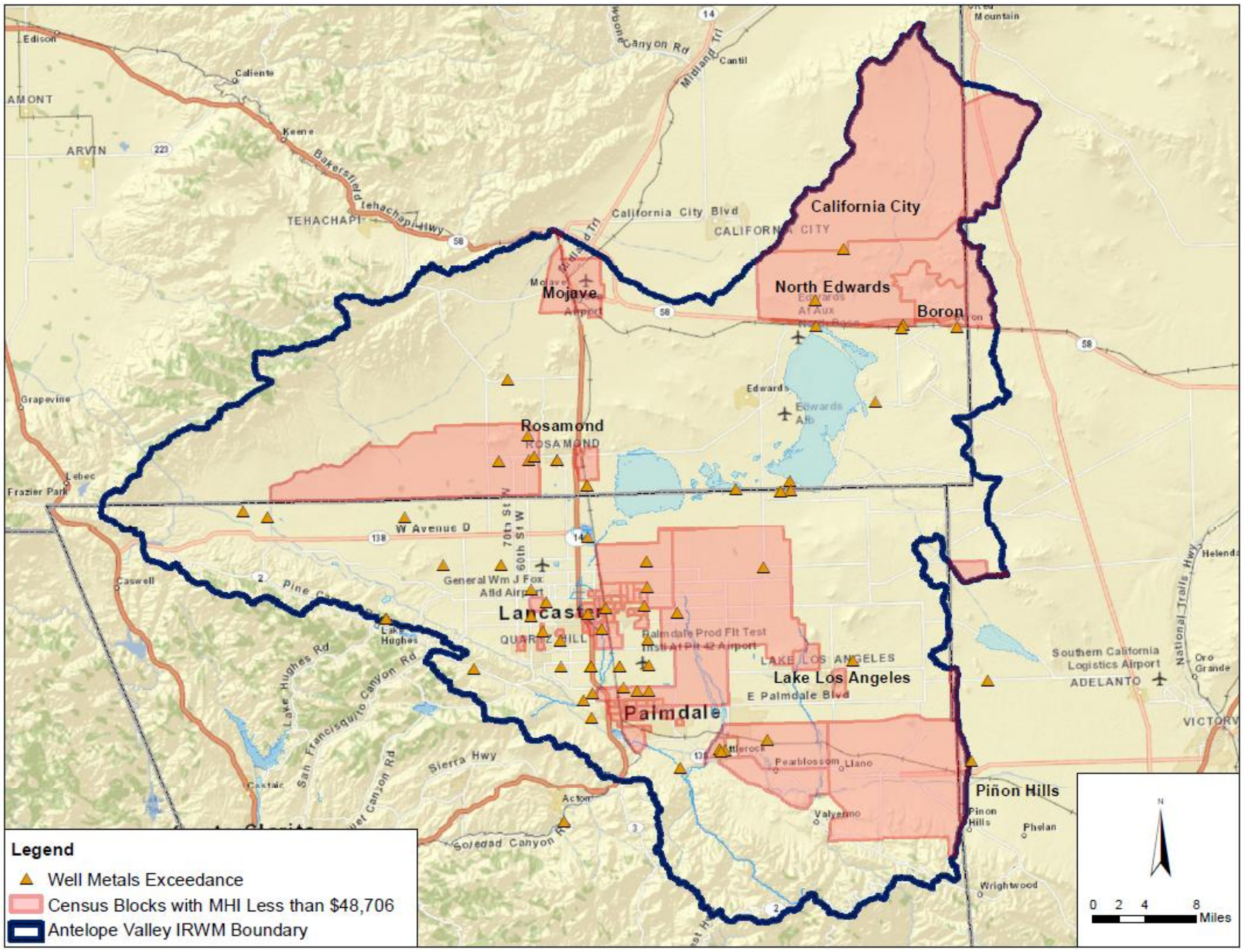


Figure 9: Groundwater Wells Exceeding Nitrate or Nitrite MCLs in Relation to DAC Areas

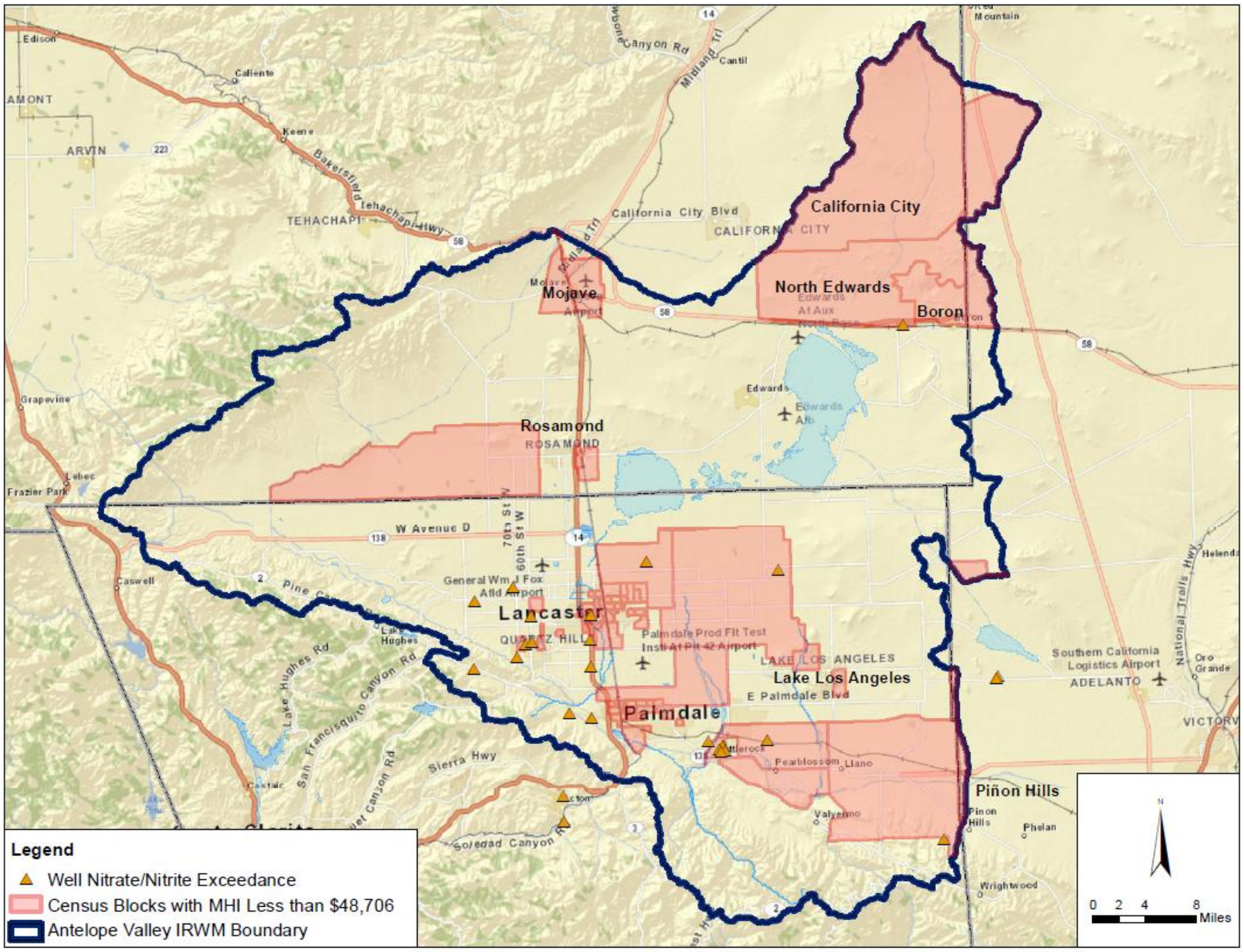
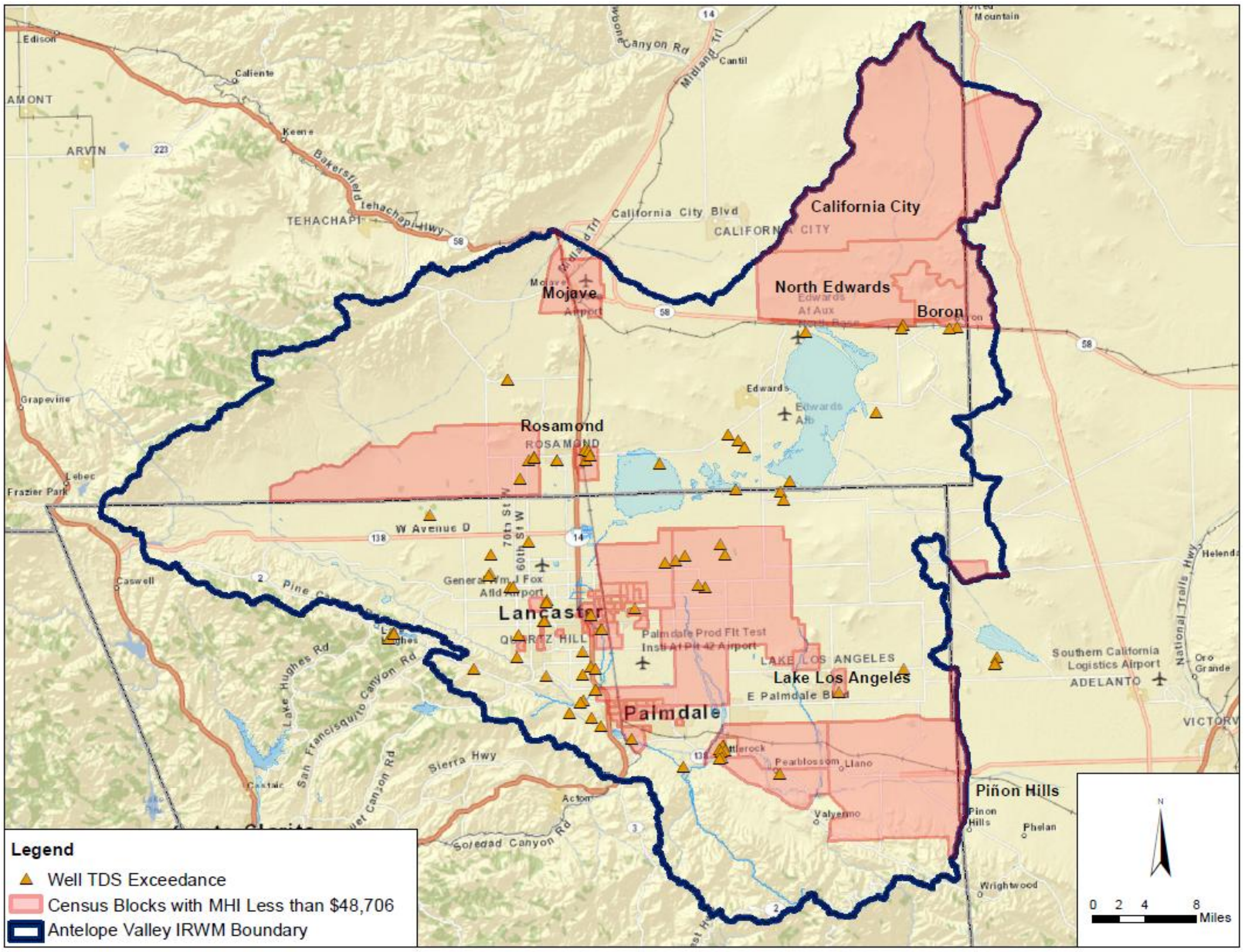


Figure 10: Groundwater Wells Exceeding TDS Secondary MCL in Relation to DAC Areas



A total of 61 groundwater wells located in DAC areas within the Antelope Valley IRWM have documented exceedances of California MCLs and/or the national secondary drinking water standards.

One of the common water quality issues in DAC areas is high arsenic. The Environmental Protection Agency (EPA) replaced the previous standard for arsenic in drinking water of 50 parts per billion (ppb) with a 10 ppb limit (EPA, 2012).[8] This new rule became effective on February 22, 2002 (EPA, 2012). The California Department of Public Health revised the drinking water standard for arsenic (DPH-04-017) and adopted the amended the California Code of Regulations, Title 22, Chapter 15, Section 64431(a) on November 28, 2008 to comply with the new federal MCL of 10 ppb for arsenic (CDPH, 2008).[9] DAC areas in the Antelope Valley IRWM have arsenic concentrations that exceed the maximum contaminant level (mcl) of 10 ppb in much of the groundwater supply and must be reduced by either blending or treatment. Facilities are needed to allow DACs to blend or treat high-arsenic groundwater.

Compliance with the new arsenic standard of 10 ppb has been difficult for Boron Community Services District (BCSD), which serves Boron, a DAC area in the Antelope Valley IRWM region. BCSD is responsible for maintaining and providing customers with provisions of water, sewer, and streetlights. Currently, the local water supply wells have an arsenic concentration that range from 67 ppb to 83 ppb. To address the arsenic MCL violation, BCSD began blending local groundwater well supplies with AVEK water at a 52% AVEK water to a 48% well water ratio. The blended water supply still exceeds the arsenic MCL, with recent arsenic level testing results for blended water at 39 ppb. BCSD cannot come into compliance until it either treats its local groundwater supply to remove arsenic or find a new local water supply with low arsenic concentrations. Compliance with the arsenic MCL has also an issue for

[8] Source: http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/regulations_factsheet.cfm
[9] Source: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Arsenic.aspx

North Edwards Water District and Desert Lake CSD (between Boron and Mojave) and mutual water companies in the vicinity of Rosamond. These water quality issues in specific DAC areas will be documented in a subsequent DAC TM.

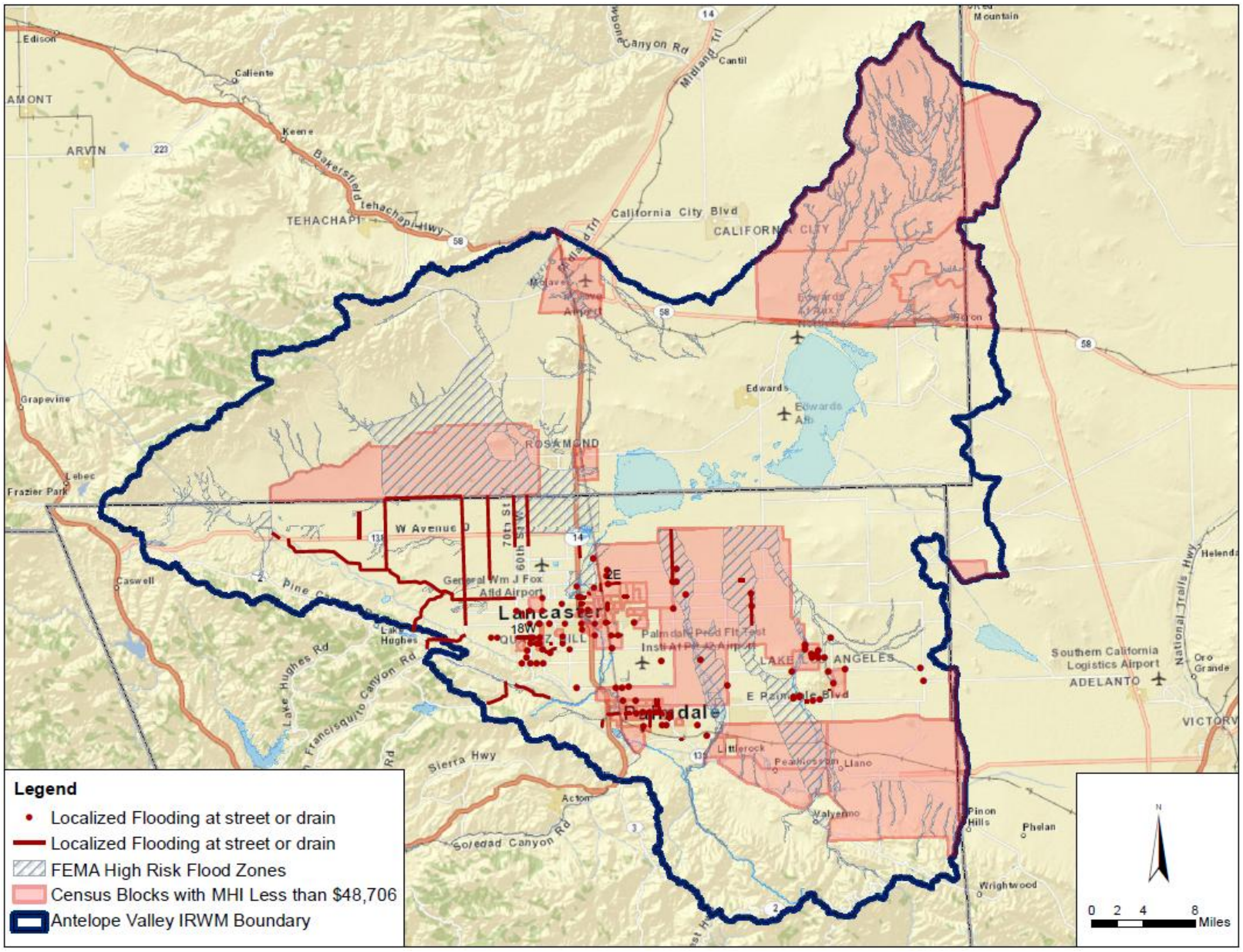
4.3 Flooding

To identify flooding issues in each of the DAC areas, the consultant team contacted water agencies that served each area and substantiated the information with documentation from the State FloodSAFE database as described in the *Flood Protection Needs TM* prepared for the Antelope Valley IRWM Region in 2013. Flooding information was supplemented with localized flood information provided by the City of Lancaster, the City of Palmdale, and the LA County Department of Public Works (LACDPW).

The draft *Flood Protection Needs TM* (RMC, 2013) identifies a number of areas potentially at risk for flooding due to the Valley's unique geographic and meteorologic conditions which are conducive to sudden flooding. As shown in Figure 111, large areas identified as a flood risk, either using FEMA high risk flood zones (areas within the 100-year flood zone) or through local confirmation by LACDPW, overlap with areas identified as DACs. In the southern portion of the Region, the Cities of Lancaster, Palmdale and Lake Los Angeles have many areas identified where localized flooding occurs which may impact areas identified as DACs. In the northern portion of the Region, in California City, Mojave, North Edwards and Boron, FEMA high risk flood zones overlap with areas identified as DACs. As discussed in the draft *Flood Protection Needs TM*, additional studies may be needed in the FEMA high risk flood zones in order to better understand the flood hazard as flooding and sedimentation within the Valley occur in alluvial fans which don't behave as a typical riverine system.

Flooding issues have been problematic for the communities of Littlerock and Lake Los Angeles, both of which experience street flooding in the downstream portions of Littlerock Creek during storm events. These flooding issues in specific DAC areas will be documented in a subsequent DAC TM.

Figure 11: Flood Protection Needs in Relation to DAC Areas



5 Monitoring Studies Needed

This section describes additional monitoring studies that could be performed in DAC areas that would support the implementation of future projects. Studies related to DAC issues are eligible for grant funding under the Proposition 84, Round 2 and 3 Implementation program.

5.1 Water Supply

Monitoring of water supply availability and reliability in DAC areas may be improved by tracking reported supply volumes in the various Urban Water Management Plans (UWMPs) developed for water suppliers that serve 3,000 AFY or more in the Antelope Valley. Water served to DAC areas may be approximated by proportioning the total AFY served inside the various service areas to the percentage of DAC area inside the service areas. For water suppliers that serve less than 3,000 AFY, a survey of supply records may be conducted to approximate the amount of supply provided to DAC areas.

In addition, condition assessments of aging wells, treatment systems, and pipelines may be conducted to determine the needs for new or improved infrastructure to maintain the supply capabilities for service to DAC areas.

5.2 Water Quality

Since the majority of water supplied to DAC areas comes from groundwater, monitoring of water quality issues in DAC areas may be improved by mapping data from the State Water Resources Control Board Groundwater Ambient Monitoring Assessment (GAMA) and National Water Quality Monitoring Council

(NWQMC) databases over time to track changes. These data would provide information about the trends for various water quality parameters in local groundwater supplies.

Water quality data may also be compiled from large and small drinking water purveyors to track the trends in potable water served to DAC customers from both imported and groundwater supplies.

For local surface water supplies, quality may be tracked by agencies already monitoring local surface waters, including PWD (which monitors Littlerock Creek), and the Los Angeles County Watershed Management Division which monitors general surface water quality of surface waters (general minerals).

5.3 Flooding

Monitoring of flooding issues may be improved by developing a Region-wide database of recorded flood incidents that are managed by municipal and county maintenance crews. This type of database could be used to correlate storm intensity to flood locations and flood depths in various parts of the Valley. Maintenance staff at LACDPW, Kern County, and the cities of Lancaster, Palmdale, and Rosamond would need to become partners in this effort. Edwards Air Force Base would also need to be a partner in this effort as this entity has jurisdiction over a large area in the Region and has already collected flood data for storm events that impact activities on the base. Flood management may be improved in DAC areas by incorporating regional integrated flood management strategies, including adaptive management strategies for climate change, into the 2013 IRWMP Update. The Update may also include recommendations for a policy mechanism.

FINAL DRAFT Technical Memorandum

Antelope Valley IRWMP 2007 Update

Subject: **Task 2.1.3 DAC Monitoring Plan**

Prepared For: Antelope Valley State Water Contractors Association

Prepared by: Dawn Flores

Reviewed by: Brian Dietrick

Date: September 25, 2013

1 Purpose

The purpose of this technical memorandum (TM) is to provide an assessment of data gaps that exist in disadvantaged communities (DAC) with regard to water quality, water supply, and flood protection. The document builds upon the information presented in the Task 2.1.2 DAC Water Supply, Quality, and Flooding Data TM. The water resource areas with the most urgent issues are included as a part of this monitoring plan.

2 Background

Historically, the Antelope Valley DAC areas have experienced issues that are similar to other DAC areas throughout the state. Below is a summary of these issues which are described in more detail in the Task 2.1.2 DAC Water Supply, Quality, and Flooding Data TM.

Water Supply

To identify water supply issues in each of the Region's DAC areas, the consultant team contacted water agencies that served each area and verified the information with available 2010 Urban Water Management Plans (UWMPs). In general, DAC areas rely on (1) imported water served from the Antelope Valley East Kern (AVEK) Water Agency, Palmdale Water District (PWD), or Littlerock Creek Irrigation District (LCID); (2) groundwater pumped from wells; or (3) recycled water from water reclamation plants operated by the Los Angeles County Sanitation Districts (LACSD). Water supply issues in specific DAC areas will be documented in a subsequent DAC TM. The outreach and research conducted as part of the Task 2.1.2 DAC Water Supply, Quality, and Flooding Data TM found that the Region faces the following two issues in regards to water supply:

- Suppliers that serve 3,000 AFY or less do not have to submit UWMPs to the state. Therefore, data on supply volumes served to DACs is frequently not readily available.
- Little data is available on the conditions of aging wells, treatment systems, and pipelines, particularly for purveyors in DACs who don't have the staff time or funds to conduct such an assessment

Water Quality

To identify water quality issues in each of the DAC areas, the consultant team contacted water agencies that served each area and documented the information using the Geotracker Groundwater Ambient Monitoring Assessment (GAMA) and National Water Quality Monitoring Council (NWQMC) database. As part of the research conducted under the Task 2.1.2 DAC Water Supply, Quality, and Flooding Data TM, the Antelope Valley IRWM groundwater well water quality data from both the GAMA and NWQMC databases were downloaded into an excel format. The groundwater well water quality data were screened using the California maximum contaminant levels (MCL) for drinking water and national secondary drinking water standards (which match California's secondary maximum contaminant levels for the contaminants examined). This research found that the Region faces the following two issues in regards to water quality:

- Groundwater quality data is available from a number of monitoring efforts, but a mapping analysis of the groundwater quality issues affecting DACs has not been completed
- Analysis of local surface water and imported water quality issues as they relate to DACs has not been conducted

Flood Protection

To identify flooding issues in each of the DAC areas, the consultant team contacted water agencies that served each area and substantiated the information with documentation from the State FloodSAFE database as described in the *Flood Protection Needs TM* prepared for the Antelope Valley IRWM Region in 2013. Flooding information was supplemented with localized flood information provided by the City of Lancaster, the City of Palmdale, and the LA County Department of Public Works (LACDPW). This research found that large areas identified as a flood risk, either using FEMA high risk flood zones (areas within the 100-year flood zone) or through local confirmation by LACDPW, overlap with areas identified as DACs. In the southern portion of the Region, the Cities of Lancaster, Palmdale and Lake Los Angeles have many areas identified where localized flooding occurs which may impact areas identified as DACs. In the northern portion of the Region, in California City, Mojave, North Edwards and Boron, FEMA high risk flood zones overlap with areas identified as DACs. Flooding issues have been problematic for the communities of Littlerock and Lake Los Angeles, both of which experience street flooding in the downstream portions of Littlerock Creek during storm events. In general, this research effort found the following issue in regards to flood protection:

- There is no centralized database of known flooding issues in the Region. Instead, flooding is tracked by municipality.

3 Water Supply Data Collection and Organization

The water supply issues described above have been used to develop two monitoring objectives:

- Track volume of supplies delivered to DACs by water source and supplier
- Assess conditions of aging facilities (wells, treatment systems and pipelines) to determine need for new or improved infrastructure

The data to be collected and analyses performed to achieve these objectives are described below.

3.1 Water Supply Volumes to DACs

Objective: Track volume of supplies delivered to DACs by water source and supplier

Monitoring of water supply availability and reliability in DAC areas may be improved by tracking reported supply volumes in the various Urban Water Management Plans (UWMPs) developed for water suppliers that serve 3,000 AFY or more in the Antelope Valley. Water served to DAC areas may be approximated by proportioning the total AFY served to the various service areas to the percentage of DAC area inside the service areas. For water suppliers that serve less than 3,000 AFY, a survey of supply records may be conducted to approximate the amount of supply provided to DAC areas.

Collection of this data will require tracking of UWMP completion for each water district in Antelope Valley, as well as requests for annual reports submitted to the California Department of Public Health (CDPH) which include the volume of water produced for consumption. The portion of supply delivered to DACs may be estimated by assuming that demand is equivalent to supply delivered, and applying the percentage of demand in DAC areas to total supply. Table X shows the percentage of DAC population making up each water district, as well as supply assumed to be delivered to DAC areas within each district. The DAC populations were estimated based on 2006-2010 American Community Survey data which estimates median household income by block group.

Water supply volumes delivered to DACs could be calculated on an annual basis based on annual CDPH reports, with a more detailed analysis completed every five years based on UWMPs. This data should be organized into a spreadsheet that tracks water supplies delivered to each water district for each year. If possible,

Table 1: Percentage of Population in DAC areas within Region's Water Districts

Water District	2010 Water District Population	2010 DAC Population	Percentage Population in DAC areas
Los Angeles County Waterworks District 40	171,585	57,724	34%
Palmdale Water District	109,395	50,961	47%
Quartz Hill Water District	17,500	3,914	22%
Rosamond CSD	17,700	5,675	32%
Mojave	3,250	3,250	100%
Boron CSD	2,065	823	40%
Littlerock Creek Irrigation District	2,900	2,048	71%

3.2 Water Supply Facility Conditions Assessment

Objective: Assess conditions of aging facilities (wells, treatment systems and pipelines) to determine need for new or improved infrastructure

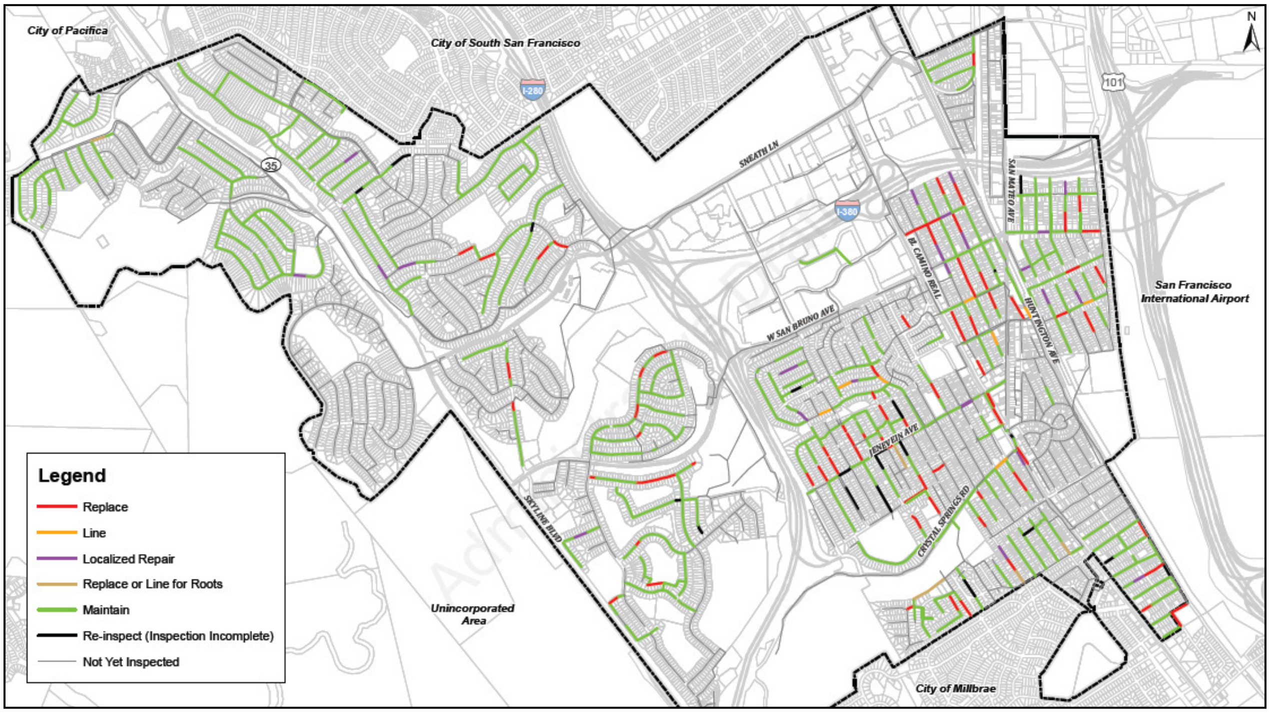
Monitoring of supply facilities can be achieved by conducting condition assessments of aging wells, treatment systems, and pipelines to determine the needs for new or improved infrastructure to maintain the supply capabilities for service to DAC areas. Given that these facilities are managed by individual water suppliers, each supplier will need to complete condition assessments of its own facilities and provide the results to the Region.

Wells and treatment systems can be assessed onsite for their physical condition and functionality. Physical condition relates to the appearance (e.g. apparent wear and corrosion) and operating characteristics (e.g. noise, vibration and temperature) of the facility. Functionality relates to the ability of the piece of equipment to accomplish its purpose.

Pipeline assessment will require CCTV be performed, and the video observed at a later date by a professional trained in pipeline assessment. For example, the National Association of Sewer Service Companies (NASSCO) provides training and standardized methods for assessing sewer pipelines for various structural (e.g. cracks, holes or collapses) operational/maintenance issues (e.g. roots, deposits and infiltration). This same level of assessment can be completed for water supply pipelines.

Once the assessment is completed, the structural and operational/maintenance issues can be prioritized by severity to determine where there is greatest need for new or improved infrastructure. An example of this type of assessment for pipelines is shown in Figure 1. This prioritization can be based on a number of aspects, including: severity of structural issues, severity of operational/maintenance issues, size or flow through the facility, size of area served by the facility, remaining useful life of the facility, and cost to repair or replace.

Figure 1: Sample Pipeline Condition Assessment Map



4 Water Quality Data Collection and Organization

The water quality issues described above have been used to develop two monitoring objectives:

- Track the quality of drinking water delivered to DACs
- Map groundwater quality issues in DACs to determine areas of poor groundwater quality and need for treatment

The data to be collected and analyses performed to achieve these objectives are described below.

4.1 Water Quality Data Tracking

Objective: Track the quality of drinking water delivered to DACs

The quality of drinking water delivered to DACs may be monitored by compiling water quality reports from large and small drinking water purveyors submitted to CDPH on an annual basis. The specific data to be collected is shown in Table 2. The quality data to be collected is based on water supplies (typically groundwater wells) that have exceeded maximum contaminant levels (MCLs) and secondary drinking water standard within the past ten years. It is assumed that the water quality delivered to DACs is equal to the quality of water delivered throughout each water district.

This data should be compiled using a spreadsheet that tracks the quality of finished water delivered to customers, and if possible, the quality of each water supply.

Table 2: Drinking Water Quality Data to be Collected

Constituent concentration data to be collected	MCL or Secondary Standard
Antimony	0.006 mg/L (MCL)
Arsenic	0.010 mg/L (MCL)
Chloride	250 mg/L (secondary standard)
Chromium	0.05 mg/L (MCL)
Fluoride	2 mg/L (MCL)
Iron	0.3 mg/L (secondary standard)
Manganese	0.05 mg/L (secondary standard)
Nitrate	45 mg/L (MCL)
Nitrite	1 mg/L (MCL)
Sulfate	250 mg/L (secondary standard)
TDS	500 mg/L (secondary standard)
Turbidity	0.5 NTU (secondary standard)

4.2 Groundwater Quality Mapping

Objective: Map groundwater quality issues in DACs to determine areas of poor groundwater quality and need for treatment

The data to be collected in order to accomplish the objective of mapping groundwater quality issues involves the collection of the water quality data listed in Table 2 by specific well. The State of California already collects water quality data by well through various databases, and compiles these databases on its GeoTracker GAMA (http://geotracker.waterboards.ca.gov/gama/) website. Detailed instructions for use of this online tool are available on the website, however, the following settings can be used to help narrow the results:

- GIS Layer: "Groundwater Basins"
- Groundwater Basin: "Antelope Valley (6-44)"
- Water quality data: "Wells With Results Above Comparison Concentration" OF "Any Chemical" IN THE PAST "1 YEAR"

The resulting data can then be exported to a .zip file containing a spreadsheet with water quality data available for each well that can then be sorted according to constituent, and mapped using well coordinates also provided in the spreadsheet. Once the well points are mapped, a GIS analysis can be completed using spatial analysis tools available in programs such as ESRI's Spatial Analyst tool that can interpolate data between points to show water quality constituent concentrations across the valley as well as changes in concentration. An example of this type of analysis completed to show changes in groundwater elevation over time is shown in Figure 3.

This level of analysis should be done on an annual basis to track changes in the quality of groundwater. Tracking groundwater quality to this level of detail will allow the Region to create maps of water quality over time throughout the Antelope Valley.

Figure 2: GeoTracker GAMA Sample Query

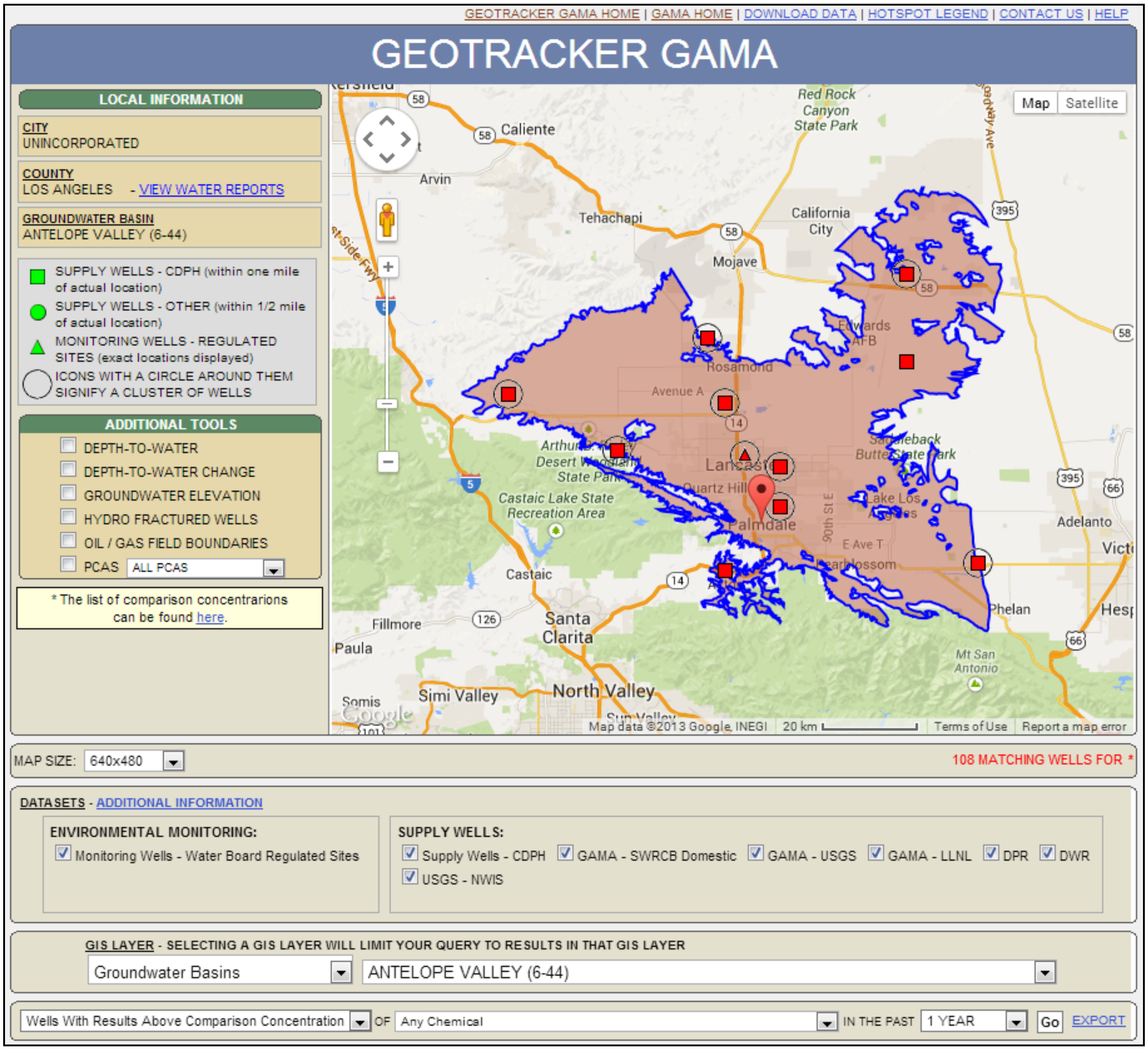
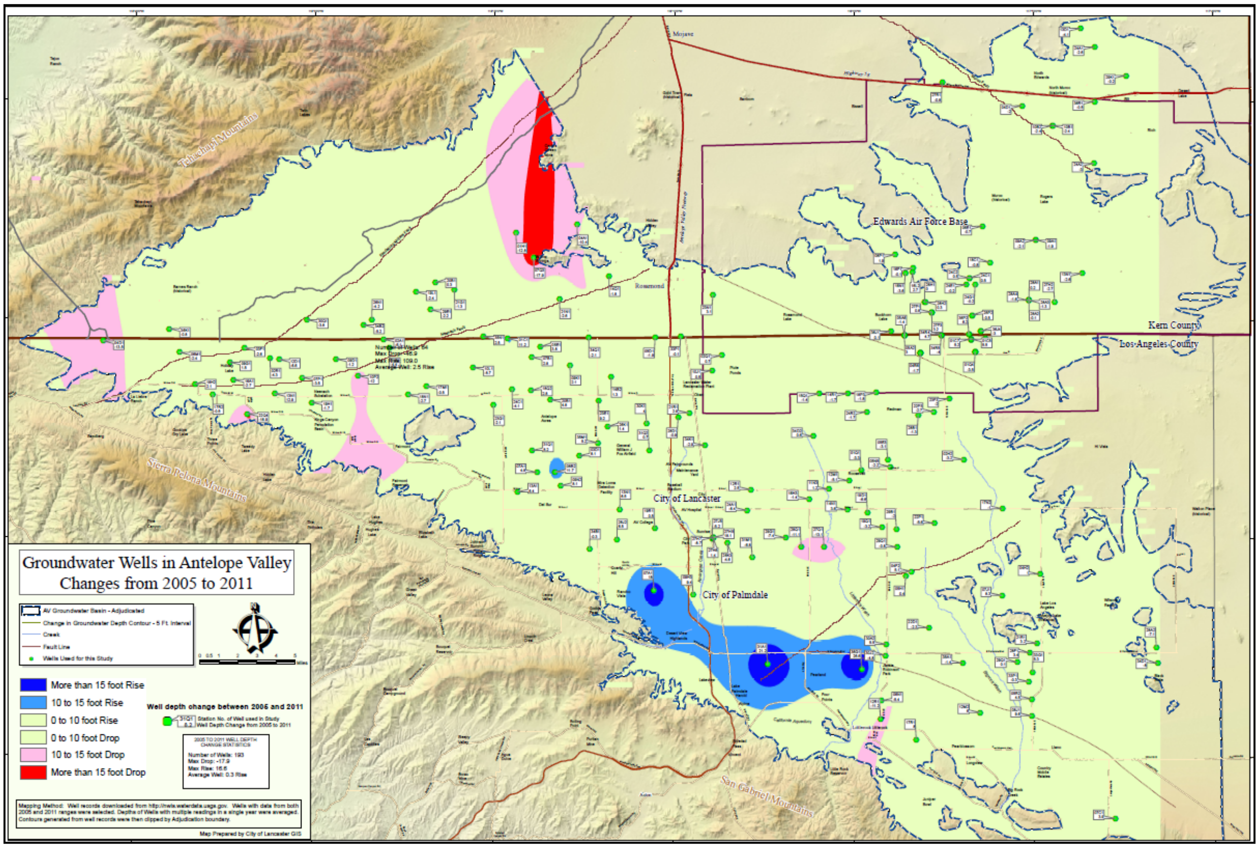


Figure 3: Sample Spatial Analysis of Point Data



5 Flood Monitoring Data Collection and Organization

The flooding issues described above have been used to develop the following objective:

Objective: Track flood incidents in DACs to determine need for flood infrastructure improvements

Monitoring of flooding issues may be improved by developing a Region-wide database of recorded flood incidents that are managed by municipal and county maintenance crews. This type of database could be used to correlate storm intensity to flood locations and flood depths in various parts of the Valley. Maintenance staff at LACDPW, Kern County, and the cities of Lancaster, Palmdale, and Rosamond would need to become partners in this effort. Edwards Air Force Base would also need to be a partner in this effort as this entity has jurisdiction over a large area in the Region and has already collected flood data for storm events that impact activities on the base.

The data collected from each entity would need to include:

- Flood incident date and location
- Storm intensity
- Flood depth, if applicable

It should be noted that there is little to no data available for Kern County, meaning that a part of the flood monitoring effort will involve implementation of a program to track flood issues in the Kern County portion of the Region.

The flood data that is collected can be compiled into a Region-wide database to allow for tracking of incidents over time. Analysis of this data will involve mapping of the flood locations to better understand where the greatest needs are for flood infrasctructure improvements.

6 Data Dissemination and Reporting

The overarching goals of monitoring the above described data is the development of projects to improve the water supply, water quality and flood conditions in DACs, and the incorporation of the analysis results into water resources management. Given these goals, it is important for the Region to make the results of the data analyses available to stakeholders in the Region. The dissemination and reporting of the collected data and associated analyses can be accomplished through the following mechanisms:

- Upload of data and analyses to the AVWATERPLAN.org website (annually)
- Presentation of analysis results at regular stakeholder meetings (annually)
- Incorporation of data into future updates of the Antelope Valley IRWM Plan (every five years)

By disseminating and reporting on the collected data and analyses on an annual basis, water resource management agencies can incorporate the latest regional data into their planning efforts.

Appendix E: Public Comment Matrix

Page Intentionally Left Blank

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Executive Summary Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
ES-5		11/20/2013 Stakeholder meeting			Add footnote to the last sentence of the supply section: "The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process."	Comment is incorporated on p. ES-5.
ES-4	3	A. Jaramillo (LACWD)	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. Imported water comes from the State Water Project, which has historically varied as well.	All water supplies within the Antelope Valley Region come from two sources: (1) local rain and snowmelt that percolate into the groundwater aquifers or are captured in Littlerock Reservoir, or (2) imports of water from outside the Antelope Valley Region via the State Water Project. The amount of water supply available varies considerably due to changes in weather, rain and snow, and other conditions.	The point is that supplies are variable and uncertain, not the estimates.	Comment is incorporated on p. ES-4.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
ES-5	3	A. Jaramillo (LACWD)			See comment in Section 3.1.6.4 re: WSSP2 extraction capacity	Comment is incorporated in Section 3.
ES-10	Table ES-4	T. Chen (LACWD)	Littlerock Creek Groundwater Recharge and Recovery Project		Not an implementation project, feasibility study is expected in 2015. Project is conceptual.	Comment is acknowledged. This project was considered to have sufficient information for a preliminary economic analysis and is therefore identified as an implementation project for the 2013 IRWMP Update.
ES-4	3	W. Deal (EAFB)	The local water supplies come from rainfall and snowmelt that percolate into the groundwater aquifers or are captured in Littlerock Reservoir		Does Amarogsa, 2 Fairmont dams, Big Rock Dam – provide a water source? Or harvesting?	Comment is acknowledged. Littlerock Reservoir is the only significant surface water facility addressed in the Plan.
ES-6	3	W. Deal (EAFB)	In addition, a salt and nutrient management plan is being developed that will help to monitor and maintain water quality conditions in the Antelope Valley groundwater basin.		Suggest moving to end of paragraph – currently stuck between two arsenic sentences.	Comment is incorporated on p. ES-6.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
ES-6	3	W. Deal (EAFB)	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 downstream water bodies, and can create stagnant ponds in places where clay soils beneath the surface do not allow for percolation to occur. At the same time, the Region recognizes that downstream benefits of floodwaters are also important. 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.	Much of the Antelope Valley Region is subject to flooding from natural runoff through alluvial fans in the nearby foothills. As these flood waters move into developed areas, many which of these developed areas lack sufficient proper drainage facilities creating sometimes, severe, impacts to infrastructure. The runoff across impervious developed surfaces can contaminate these flood waters with constituents common in developed areas such as petroleum products. The Region recognizes that downstream habitat benefits of floodwaters are important. The need for regional coordination of flood control efforts integrated with natural habitat protection becomes more readily apparent as urban development and paved surfaces increase throughout the Antelope Valley Region.	Provided suggested rewrite	Comment is incorporated on p. ES-6.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
ES-6	3	W. Deal (EAFB)	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.	The actions identified in the AV IRWM Plan can help to preserve open space and natural habitats in the greater Antelope Valley Region while maximizing surface water and groundwater management efforts.	Delete "the" before Antelope (editorial)	Comment is incorporated on p. ES-6.
ES-6	3	W. Deal (EAFB)	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.	The Antelope Valley Region has many unique environmental features dependent on natural surface flow such as dry lakebeds (Rosamond, Buckhorn,Rogers), Piute Ponds, mesquite bosques, alkali mariposa lily, Joshua tree woodlands, desert tortoise, Le Contes thrasher, tricolored blackbirds, to name just a few. Part of the Antelope Valley wash areas are incorporated into a Significant Ecological Area designated by Los Angeles County intended to provide added protection to the sensitive natural resources within that 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	Fleshed out the environmental features with some specific facts to clarify the challenges.	Comments are incorporated on p. ES-6.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
				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 Antelope Valley Region while maximizing surface water and groundwater management efforts.		
ES-6	3	W. Deal (EAFB)	***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	***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 balance the growing demand for development, and	Expanded last sentence – original didn't seem to address all the issues.	Comment is incorporated on p. ES-6.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
			demand for recreational opportunities while minimizing or avoiding the loss of local culture and values.	recreational opportunities while minimizing or avoiding major impacts to natural resources, agriculture, and the loss of local culture and values.		
ES-8	5	W. Deal (EAFB)	determine what regional water management strategies should be included in the IRWM Plan, the Region considered the RMS listed and defined in Section 5 of the IRWM Plan.	determine what regional water management strategies should be included in the IRWM Plan, the Stakeholders considered the RMS listed and defined in Section 5 of the IRWM Plan.	Replaced "Region" with Stakeholders	Comment is incorporated on p. ES-9.
ES-10	6,7	W. Deal (EAFB)	The projects proposed by stakeholders are expected to help the Region to meet the objectives and targets described in Section 4..	The projects proposed by stakeholders are expected to help the Region to meet the Water Supply Management and some of the Water Quality Management objectives and targets described in Section 4. Development of projects to address the Flood Management, Environmental Resource Management, Land Use Planning/Management objectives and targets need to be a priority in order to provide a true integrated water management effort.	Revised sentence to highlight important needs and weaknesses of the plan lest these issues get lost in all the words. This does not mean the best that could be done wasn't done it's just a recognition that a lot more still needs to happen.	Comment is incorporated on p. ES-10.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
ES-11	8	W. Deal (EAFB)	The Stakeholders and RWMG have chosen these projects because they directly address the objectives and targets to achieve better management of resources within the Antelope Valley Region.	The Stakeholders and RWMG have chosen these projects because they directly address the objectives and targets of what seems to be the most pressing issue and well developed projects to achieve better management of water supply and water quality resources within the Antelope Valley Region.	Clarified why the projects were actually chosen. These projects didn't come from a large pool as the best – they were the best from what was proposed perhaps but nearly all the proposed projects dealt with only two of the objectives.	Comment is incorporated on p. ES-11.

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Section 1 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
1-24	1.3.3	11/20/2013 Stakeholder meeting			Add footnote to Section 1.3.3 either after second sentence or end of paragraph: "The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process."	Footnote has been added to Section 1.3.3.
I-3	1	W. Deal (EAFB)	On November 23, 2009, the Antelope Valley Region successfully completed the Region Acceptance Process (RAP) with the Department of Water Resources (DWR). The RAP was the first step in becoming eligible for Proposition 84 grant funding and helps to define certain aspects of the Region. Specifically, the RAP documents describe contact information, governing structure, RWMG	On November 23, 2009, the Antelope Valley Region successfully completed the Region Acceptance Process (RAP) with the Department of Water Resources (DWR). The RAP was the first step in becoming eligible for Proposition 84 grant funding and helps to define certain aspects of the Region. Specifically, the RAP documents contact information, governing structure, RWMG	Deleted the word describe - note below the RAP documents ~~describe~~ contact information, governing structure, RWMG	This comment is incorporated in Section 1, but the language was changed to "… the RAP provides documentation of contact information …".
I-4	1	W. Deal (EAFB)	Recycled water and stormwater are secondary sources of water supply. A portion of the recycled water from the Antelope Valley Region's two large water reclamation plants, Los Angeles County Sanitation Districts' (LACSD) plants in Palmdale and Lancaster, are used for maintenance of wetlands, agricultural irrigation, landscape irrigation, and a recreational park. The expansion of recycled water use continues in the Region.	Recycled water and stormwater are secondary sources of water supply. A portion of the recycled water from the Antelope Valley Region's two large water reclamation plants, Los Angeles County Sanitation Districts' (LACSD) plants in Palmdale and Lancaster, are used for maintenance of the Piute Ponds wetlands, agricultural irrigation, landscape irrigation, and Apollo Park Lake. The expansion of recycled water use continues in	Specified the name of the "wetlands" and "recreational park"	This comment is incorporated in Section 1.1.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
				the Region.		
	1	W. Deal (EAFB)	Stormwater runoff from the Antelope Valley and the surrounding mountains and hills is usually carried by ephemeral streams. Except during the largest rainfall events, stormwater runoff quickly percolates into the stream bed and recharges the groundwater basin. Runoff that reaches the dry lakes carries sediment and provides soil resurfacing benefits to EAFB. Subsequently the runoff 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 1.17 million people will reside in the Antelope Valley Region by the year 2035, an increase of nearly 161 percent.	Surface flow (storm water runoff) from the surrounding mountains (San Gabriel, Tehachapi) and hills across alluvial fans and through deeply excised washes makes its way from the headwaters filling vernal pool like clay pan depressions, wetlands such as Piute Ponds, percolating into sand dunes where water is sequestered for summer use to the lowest point (Rosamond, Buckhorn, Rogers Lakebeds). As the surface flow makes its way to the lakes it drops the larger sediment and brings silty clay. The surface flow and clay fills in and re-establishes the surface structure which protects the lakes from wind erosion benefitting the Valley and Edwards AFB with cleaner air and sustains the surficial strength of the lakes which is important to the operational mission of Edwards AFB.	Reworded to reflect the natural environment, provide a more accurate perspective on what the surface water flow accomplishes. Stating is quickly percolates and is lost to evaporation leaves the reader with the sense that the runoff has little value. The agricultural portion of this paragraph has nothing to do with surface flow and should be its on paragraph or deleted. The structure of this section seems to be: 1. State Water Project 2. Surface Flow 3. Groundwater	This comment is incorporated into Section 1.1 with wording changes: "Surface flows (i.e., storm water runoff) from the surrounding San Gabriel Mountains, Tehachapi Mountains, and hills cross alluvial fans and flow through deeply excised washes. The flows make their way from the wash headwaters, filling vernal pool clay pan depressions and wetlands such as Piute Ponds, before either percolating into sand dune areas where water is sequestered for summer use or flowing to the lowest points in the Valley at Rosamond, Buckhorn, and Rogers dry lakebeds. As the surface flow makes its way to the lakebeds it allows the larger sediments to settle out first and transports smaller silty clay further into the Valley interior. The surface flow and silty clay helps to fill in and re-establish the soil surface structure, which protects the lakebed areas from wind erosion, sustains the surficial strength of the lakes (important to the operational mission of EAFB), and sustains local habitats. Some surface flows ultimately evaporate. structure, which protects the lakebed area"s

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
						from wind erosion, sustains the surficial strength of the lakes (important to the operational mission of EAFB), and sustains local habitats. Some surface flows ultimately evaporate.
1-10	1	W. Deal (EAFB)	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. Expansion of recycled water use in the Antelope Valley continues.	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 (such as Piute Ponds Complex and Apollo Park), and groundwater replenishment. Expansion of recycled water use in the Antelope Valley continues.	Added names to the wildlife habitat maintenance areas	This comment is incorporated in Section 1.2.1.6 with minor wording changes.
1-2		A. Jaramillo (LACWD)	…. accelerated development of the Antelope Valley Region and were attempting to identify appropriate actions to address the growing pressure on water services.	…. accelerated development of the Antelope Valley Region and were attempting to identify appropriate actions to address the increased need for water services.		This comment is incorporated in Section 1.
1-10	1.2.1.7	A. Jaramillo (LACWD)	LACWWD 40 has designed many of its groundwater wells so that excess treated imported water in the LACWWD 40's distribution system can be injected through the wells and stored until a future time when it is needed. This program is called aquifer storage and recovery.	LACWD 40 has implemented an aquifer storage and recovery program and equipped many of its groundwater wells so that excess treated imported water in the LACWD 40's distribution system can be injected through the wells and stored until a future time when it is needed.	Use new LACWD logo & replace all references to LACWWD 40 with LACWD 40	This comment is incorporated in Section 1.2.1.7.
1-10	1.2.1.7	A. Jaramillo (LACWD)	LACWWD 40 is also working with AVEK to utilize large undeveloped areas in the Antelope Valley to deliver imported water and allow it to infiltrate into the ground where it will be stored.	LACWD 40 is also working with AVEK to store water at their Water Supply Stabilization Project 2 water bank.		This comment is incorporated in Section 1.2.1.7.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
1-10 and 1-11	1.2.1.7	A. Jaramillo (LACWD)	LACWWD 40 also has an agreement with the Los Angeles County Sanitation Districts to use over 13,000 acre-feet of highly treated wastewater produced at their Palmdale and Lancaster Water Reclamation Plants on the North Los Angeles County Regional Recycled Water Project. This recycled water will be made available through construction of a completely separate distribution system for irrigation and other applications that do not require the water to be drinkable.	LACWD 40 also has an agreement with the Los Angeles County Sanitation Districts (LACSD) to purchase up to 13,500 acre-feet of tertiary treated recycled water produced at their Palmdale and Lancaster Water Reclamation Plants. The City of Lancaster and City of Palmdale are currently working with the LACSD on separate purchase agreements and LACWD 40 will subsequently modify their existing agreement. The recycled water will be made available through construction of the North Los Angeles County Regional Recycled Water Project which will be a completely separate distribution system for irrigation and other non-potable uses.	Re-word and add the suggested text	This comment is incorporated in Section 1.2.1.7.
1-12	Table 1-1	A. Jaramillo (LACWD)	LACWWD 40 — Supplies water to portions of Los Angeles County	LACWD 40 — Supplies water to portions of the Antelope Valley region in Los Angeles County		This comment is incorporated in Table 1-1.
1-24	1.3.3	A. Jaramillo (LACWD)	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.	The IRWM Plan's water supply analysis is based on estimates 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 estimates as well as the objectives and planning targets, which may delay implementation of the IRWM Plan.		This comment is incorporated in Section 1.3.3.

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Section 2 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
2-8	2	J. Hoerricks (WVCWD)	Not listed	Map should list our district. 250th West to Three Points Road – from just south of the 138 to Ave A	You see the boundary on 2-29 as a residential rectangle in the extreme west LA County	Comment is incorporated in Section 2.2 and Figure 2-3.
2-24	2.4.2.2	T. Chen (LACWD)	TDS does not pose substantial health risks at drinking water concentrations, but high TDS concentrations can negatively impact sensitive crops and cause corrosion and scaling in pipes.	There are no known health effects associated with the ingestion of TDS in drinking water. However, high TDS concentrations can negatively impact sensitive crops and cause corrosion and scaling in pipes.	Per the World Health Organization (WHO), "no recent data on health effects associated with the ingestion of TDS in drinking-water appear to exist." TDS affects aesthetics only.	Comment is incorporated in Section 2.4.2.2
2-24	2.4.2.2	T. Chen (LACWD)	As with TDS, chloride does not pose substantial health risks at drinking water concentrations. Elevated chloride concentrations do, however, have substantial negative impacts on sensitive crops and cause corrosion in pipes.	As with TDS, there are no known health effects associated with the ingestion of chloride in drinking water. Chloride concentrations in excess of about 250 ppm can affect taste in water. Also, elevated chloride concentrations have substantial negative impacts on sensitive crops and cause corrosion in pipes.	Per WHO, "chloride concentrations in excess of about 250 mg/litre can give rise to detectable taste in water, but the threshold depends upon the associated cations. Consumers can, however, become accustomed to concentrations in excess of 250 mg/litre. No health-based guideline value is proposed for chloride in drinking-water."	Comment is incorporated in Section 2.4.2.2
2-24	2.4.2.2	T. Chen (LACWD)	Arsenic is an 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.	Arsenic is a 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.	Too close to Contaminants of Emerging Concern (CEC) which are unregulated and may be new contaminants or those that may have been present but not detected.	Comment is incorporated in Section 2.4.2.2

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
2-24 to 2-25	2.4.2.2	T. Chen (LACWD)	Drinking water standards have been set to protect consumers served by public water systems from the effects of exposure to chromium. In 2008, the USEPA began a review of chromium-6 health effects and when this human health assessment is finalized EPA will determine if the current chromium standard should be revised.	Drinking water standards have been set to protect consumers served by public water systems from the effects of exposure to total chromium. On August 23, 2013, CDPH proposed an MCL for chromium-6 of 10 ppb. Completion of the rulemaking process may take up to 12 months after the proposal.	The current drinking water standard is for ***total*** chromium. The State proposed a drinking water standard for Cr-6.	Comment is incorporated in Section 2.4.2.2
2-25	2.4.2.3	11/20/2013 Stakeholder meeting			Add footnote (need to change footnote and #): "The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process."	Comment is incorporated in Section 2.4.2.3
2-26	2.4.2.4	11/20/2013 Stakeholder meeting			Add footnote: "The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process."	Comment is incorporated in Section 2.4.2.4
2-29	2	J. Hoerricks (WVCWD)	No text	The residential areas described for our district are zoned A-1 2.5 and some residences have ranch/farm functions.		Comment is incorporated in Section 2.2 and Figure 2-3.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
2-32	2	J. Hoerricks (WVCWD)	2.5.3 Social and Cultural Values	Neenach is 34 miles NW of Lancaster. Neenach residents tend to associate more with the mountain communities than with the AV.	http://en.wikipedia.org/wiki/Neenach,_CA No AV Press delivery. We get the Mountain Enterprise in Neenach.	Comment is acknowledged. No response necessary. WVCWD is added to Figure 2-3.
2-35-2-36	2	J. Hoerricks (WVCWD)	Economics/population/demographics	Sharing a zip code with western Lancaster (93536), we get merged with their data.	Are customers are older and lower in income (fixed income retirees and off-griders) than those in western Lancaster.	Comment is acknowledged. No census data was available for Neenach.
2-37	2	J. Hoerricks (WVCWD)	No listing for Neenach	See above		Comment is acknowledged. No census data was available for Neenach.

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Section 3 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
		W. Deal (EAFB)	Figure 3-1 – surface runoff line (red) goes straight to water leaving	Add box interrupting this line for habitat usage - Piute Ponds, other wetlands, clay pan/vernal pools, sand dune water sequestration, dry lakebed resurfacing	The surface runoff as we have all agreed provides a beneficial use it does not just leave the system	Comment is incorporated in Section 3.1, Figure 3-1.
3-6	3.1.2	D. Chisam (AVEK)	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 leaving about 137,150 AFY available within the Region		Is this refereeing to delivery to AVEK customers outside the plan boundary if so that should be clarified	Comment is incorporated in Section 3.1.2.
3-7	3.1.2	D. Chisam (AVEK)	To accommodate the need to store water during the winter months for use in the dry summer months, AVEK has planned water banking projects to increase their ability to fully use their SWP allotment. AVEK recently completed the Water Supply Stabilization Project (WSSP-2) that allows them to store up to 23,000 AFY of water (35,000 AFY total storage for all of the parties involved) during winter months when M&I demands are low (AVEK 2011).		the actual capacity of wssp 2 is 150,000 af and we have 35,000 in storage at the present time	Comment is incorporated in Section 3.1.2.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-7	3.1.2	D. Chisam (AVEK)	SWP deliveries to AVEK do not incorporate conveyance capacity restrictions in this Plan since SWP reliability reduces delivery estimates to a low quantity. With the addition of the WSSP-2 water banking project, AVEK is able to beneficially use up to 104,750 AFY. This assumes 400 AF/day deliveries from June 15 to September 31 that are limited by conveyance capacity and 150 AF/day deliveries for the rest of the year that are limited by demands. This is equivalent to 81,750 AFY before the addition of the 23,000 AFY that can be stored in the completed WSSP-2 water storage bank. Because the SWP reliability is 60% for an average year, AVEK's estimated average year SWP delivery is only about 83,700 AFY, which is below the maximum conveyance capacity and thus is not affected. Higher SWP allocations may be constrained in wetter years, but such scenarios are not analyzed in this Plan. Future water banking projects will allow AVEK to maximize the amount of SWP deliveries they can put to beneficial use.		150,000 capacity storage and recover is currently 20 MGD that will increase to 50 MGD over the next 10 years	Comment is incorporated in Section 3.1.2.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-11	3.1.3.1	D. Chisam (AVEK)	Table 3-4		this chart is confusing the it would appear that there maybe 85,000 people but most would be using groundwater the the actual imported water per capita water would be closer to .314 I understand what your trying to do but this chart creates more confusion that it solves	Comment is incorporated with new language in Section 3.1.3.1. Population numbers in Table 3-4 do not include private well owners.
3-17	3	W. Deal (EAFB)	Lancaster WRP: ….. Approximately 3 mgd of effluent from the Lancaster WRP is used to maintain wetlands at the Piute Ponds and 0.5 mgd is reused at the Apollo Lakes Regional Park to maintain the water level in the lakes and for irrigation.	Lancaster WRP: ……. It is estimated between 5 and 7 mgd of effluent from the Lancaster WRP is used to maintain wetlands at Piute Ponds. Higher amounts are required in years when flushing than years of maintenance. Note: Amounts needed are in the process of being determined.	3 mgd is inaccurate please change	Comment is incorporated in Section 3.1.4.1.
3-17	3.1.4	Erika deHollan (LACSD)	<u>Distribution Pipeline</u>: As shown in Figure 3-5, the recycled water distribution system in Lancaster, which serves Apollo Lakes and Nebeker Ranch, has been expanded for urban reuse as part of the Division Corridor Project. Figure 3-5 also shows the LACWD 40 Recycled Water Backbone distribution pipeline which is intended to further expand urban reuse in the Antelope Valley Region. This expansion throughout the Antelope Valley Region is a direct result of the substantial coordination and cooperation between Kern and Los Angeles Counties. <u>Lancaster WRP</u>: The Lancaster	<u>Distribution Pipeline</u>: As shown in Figure 3-5, the recycled water distribution system in Lancaster, which serves <u>sites such as</u> Apollo Lakes ~~and Nebeker Ranch~~, has been expanded for urban reuse as part of the Division <u>Street</u> Corridor Project. Figure 3-5 also shows the LACWD 40 Recycled Water Backbone distribution pipeline which is intended to further expand urban reuse in the Antelope Valley Region. This expansion throughout the Antelope Valley Region is a direct result of the substantial coordination and cooperation between Kern and Los Angeles Counties.	3-17	Comments are incorporated in Section 3.1.4.1.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
			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 18.0 mgd, treated an average flow of 14.1 mgd in 2012 to tertiary standards for agricultural irrigation, wildlife habitat, maintenance, and recreation. Approximately 3 mgd of effluent from the Lancaster WRP is used to maintain wetlands at the Piute Ponds and 0.5 mgd is reused at the Apollo Lakes Regional Park to maintain the water level in the lakes and for irrigation. 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 12.0 mgd. The plant treated an average flow of 9.04 mgd in 2012 to tertiary standards. All tertiary treated water is used for agricultural and municipal reuse.	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 18.0 mgd, treated an average flow of 14.1 mgd in 2012 to tertiary standards for agricultural and landscape irrigation, municipal and industrial (M&I) reuse, wildlife habitat, maintenance, and recreation. ~~Approximately 3 mgd of effluent from the Lancaster WRP is used to maintain wetlands at the Piute Ponds and 0.5 mgd is reused at the Apollo Lakes Regional Park to maintain the water level in the lakes and for irrigation.~~ Recycled water produced at the Lancaster WRP and accounted for environmental maintenance and recreation reuse at Apollo Community Regional Park and Piute Ponds is not included in the potential availability (Table 3-11), since these flows will not likely be available for other M&I use in the Antelope Valley. 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 12.0 mgd. The plant treated an average flow of 9.04 mgd in 2012 to tertiary standards. All tertiary		

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
				treated water is used for agricultural and ~~municipal~~ M&I reuse.		
3-17	3.1.4	Erika deHollan (LACSD)	Table 3-11	• Revise Lancaster WRP values: 2012 – 10,000 2015 – 11,000 2020 – 13,000 2025 – 14,000 2030 – 16,000 2035 – 17,000 • "Total Study Area" values will need to be recalculated (as well as references to these values throughout the Plan). • For Lancaster WRP, delete footnote "a" and change "b" to "LWRP water availability excludes water used for environmental maintenance~~includes 3.03 mgd (3,400 AFY) already contracted to users~~."	3-17	Comment is incorporated in Section 3.1.4.1.
3-18	3.1.4	Erika deHollan (LACSD)	Figure 3-15		3-18	Unclear on how to respond to this comment.
3-18	Fig 3-5	A. Jaramillo (LACWD)			The solid line between Ave M and the Palmdale WRP should be dashed since the facilities have not been constructed yet	Comment is incorporated in Figure 3-5.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-19	3.1.4	Erika deHollan (LACSD)	Table 3-12	• Change table title to: Summary of Current and Projected Recycled Water Use Demands (AFY) in the Antelope Valley • Delete lines for Piute and Apollo Park. • For North LA/Kern County Regional Recycled Water Project, 3 AF were used in 2010. • Recalculate "Total Recycled Water Demand" values. • Add footnote: "Demands do not include recycled water use for environmental maintenance."	3-19	Comment is incorporated in Section 3.1.4, Table 3-12.
3-19	3.1.4.2	Erika deHollan (LACSD)	Table 3-12 summarizes the existing and projected recycled water demand as listed in the 2014 Salt and Nutrient Management Plan for the Antelope Valley (Appendix F). While expanded recycled water use in the Antelope Valley Region is highly likely, only current recycled water uses are included in this IRWM Plan's supply and demand calculations to show the need for increased end use of recycled water supply. Current M&I recycled water demand for both the Lancaster and Palmdale WRPs is assumed to be about 5,332 AFY with only about 5,252 AFY in 2010. Current demands for recycled water include: • Apollo Community Regional Park (Apollo Park): Tertiary recycled water produced by	Table 3-12 summarizes the existing and projected recycled water demand as listed in the 2014 Salt and Nutrient Management Plan for the Antelope Valley (Appendix F). While expanded recycled water use in the Antelope Valley Region is highly likely, only current recycled water uses are included in this IRWM Plan's supply and demand calculations to show the need for increased end use of recycled water supply. Recycled water used for environmental and recreational area maintenance at Piute Ponds and Apollo Community Regional Park is not included in demands since it was excluded from the recycled water availability in Table 3-11. Current M&I recycled water ~~demand~~ use for both the Lancaster and Palmdale WRPs is ~~assumed to be about 5,332~~ approximately 82 AFY.	3-19	Comments are incorporated in Section 3.1.4.2.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
			LACSD 14 at the Lancaster WRP is used to maintain a series of lined recreational lakes. Water from the lakes is used for landscape irrigation at the park as well. Apollo Park uses 250 AFY of recycled water. • Piute Ponds: Tertiary recycled water produced by LACSD 14 at the Lancaster WRP is conveyed to the Piute Ponds on the Edwards AFB where it maintains a marsh-type habitat. This includes discharge at the series of shallow impoundments just south of the Piute Ponds that are maintained in the winter for recreational duck hunting. The Piute Ponds use 5,000 AFY of recycled water. • North LA/Kern County Regional Recycled Water Project: To date, only a portion of the recycled water backbone project has been built. The Division Street Corridor uses an average of 2.0 AFY (personal communication with Aracely Jaramillo, LACWD 40) and the Palmdale Regional Recycled Water Authority's water line to McAdam Park in Palmdale using about 80 AFY (personal communication with Gordon Phair, City of Palmdale). The Palmdale water line	Approximately ~~with only about 5,252~~3 AFY was used in 2010. Current demands for recycled water include those for the ~~:~~ ~~Apollo Community Regional Park (Apollo Park): Tertiary recycled water produced by LACSD 14 at the Lancaster WRP is used to maintain a series of lined recreational lakes. Water from the lakes is used for landscape irrigation at the park as well. Apollo Park uses 250 AFY of recycled water.~~ ~~Piute Ponds: Tertiary recycled water produced by LACSD 14 at the Lancaster WRP is conveyed to the Piute Ponds on the Edwards AFB where it maintains a marsh-type habitat. This includes discharge at the series of shallow impoundments just south of the Piute Ponds that are maintained in the winter for recreational duck hunting. The Piute Ponds use 5,000 AFY of recycled water.~~ North LA/Kern County Regional Recycled Water Project: To date, only a portion of the recycled water backbone project has been built. The Division Street Corridor uses an average of 2~~.0~~ AFY (personal communication with Aracely Jaramillo, LACWD 40), with approximately 3 AFY used in 2010. ~~and t~~The Palmdale Regional Recycled Water Authority's water line to McAdam Park in Palmdale ~~using~~ uses about 80 AFY (personal communication with Gordon		

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
			was not built until after 2010.	Phair, City of Palmdale), but ~~. T~~the Palmdale water line was not built until after 2010.		
3-19	3.1.4.2	A. Jaramillo (LACWD)	To date, only a portion of the recycled water backbone project has been built. The Division Street Corridor uses an average of 2.0 AFY (personal communication with Aracely Jaramillo, LACWD 40)	To date, only a portion of the recycled water backbone project has been built. The Division Street Corridor uses an average of 2.0 AFY (Erika DeHollan, LACSD)	Reference primary information source	Comments are incorporated in Section 3.1.4.2.
3-19	3.1.4.2	W. Deal (EAFB)	Piute Ponds: Tertiary recycled water produced by LACSD 14 at the Lancaster WRP is conveyed to the Piute Ponds on the Edwards AFB where it maintains a marsh-type habitat. This includes discharge at the series of shallow impoundments just south of the Piute Ponds that are maintained in the winter for recreational duck hunting. The Piute Ponds use 5,000 AFY of recycled water.	Piute Ponds: Tertiary recycled water produced by LACSD 14 at the Lancaster WRP is conveyed to the Piute Ponds Complex on Edwards AFB where it sustains the wetland area. It is currently estimated that Piute Ponds uses between 5,500 and 6,500 AFY of recycled water depending on flushing requirements. Note: Amounts needed are in the process of being determined.	Deleted shallow impoundments, corrected amounts	Comments from LACSD were incorporated into Section 3.1.4.2 and address this comment as well.
3-19	Table 3-12	W. Deal (EAFB)	5,000	5,500 to 6,500	Changed amounts	Comments from LACSD were incorporated into Section 3.1.4.2 and address this comment as well.
3-22	3.1.6.3	A. Jaramillo (LACWD)	Total sustainable yield (TSY) is composed of natural recharge and return flows	Total sustainable yield (TSY) is composed of natural recharge, supplemental recharge from imported water and associated return flows	Natural recharge and return flow only = Native safe yield	Comment is incorporated in Section 3.1.6.3.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-22	3.1.6.3	A. Jaramillo (LACWD)	These estimates are added to natural recharge to get TSY. As part of the current adjudication proceedings, the TSY has been determined to be 110,000 AFY (i.e., natural recharge and return flows). A list of documents that reference estimates for TSY, natural recharge, and return flows are included in Appendix H.	These estimates are added to recharge to get TSY. As part of the current adjudication proceedings, the TSY has been determined to be 110,000 AFY (i.e., recharge and return flows). A list of documents that reference estimates for TSY, natural recharge, and return flows is listed in Appendix H.	Delete natural from natural recharge, as appropriate	Comment is incorporated into Section 3.1.6.3.
3-23	3.1.6.3	11/20/2013 Stakeholder meeting			Add foot note to last paragraph, first sentence: "The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process."	Comment is incorporated into Section 3.1.6.3.
3-23	3.1.6.3	A. Jaramillo (LACWD)	It is important to note that the value for TSY may be revisited by the Court after a period of monitoring and documentation. If the TSY number is revised in the future for any reason, the IRWMP will be updated to reflect those changes.	Although unlikely, it is important to note that the value for TSY may be revisited by the Court after a period of monitoring and documentation. If a motion is filed with the Court to revise the TSY, the IRWMP will be updated to reflect the subsequent decision.		Comment is incorporated into Section 3.1.6.3.
3-23	3.1.6.4	A. Jaramillo (LACWD)	AVEK's WSSP-2 project was completed in 2010 and can store up to 35,000 AFY. This project is a collaboration between several agencies. AVEK can store up to 23,000 AFY SWP water or water from water transfers with the remainder of the storage distributed between the other agencies	AVEK's WSSP-2 project was completed in 2010 and can store up to 500,000 AF. This project is a collaboration between several agencies. AVEK can recharge up to 23,000 AFY SWP water or water from water transfers with the remainder of the storage distributed between the other agencies	Verify WSSP2 storage volume and recharge capacity. Is 35,000 AFY the extraction capacity? from how many wells and will they all be completed by 2015?	Comment is incorporated into Section 3.1.6.4. Includes updated number from AVEK for WSSP-2 existing capacity of 150,000 AFY and withdrawal capacity of 23,000 AFY.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-23	3.1.6.4	D. Chisam (AVEK)	AVEK's WSSP-2 project was completed in 2010 and can store up to 35,000 AFY. This project is a collaboration between several agencies. AVEK can store up to 23,000 AFY SWP water or water from water transfers with the remainder of the storage distributed between the other agencies.		23,000 annually to a maximum of 150,000	Comment is incorporated into Section 3.1.6.4. Includes updated number from AVEK for WSSP-2 existing capacity of 150,000 AFY and withdrawal capacity of 23,000 AFY.
3-23	3.1.8.2 and 3.1.8.3	A. Jaramillo (LACWD)			Delete 'natural' from 'natural recharge'	Comment is incorporated into Section 3.1.6.3.
3-30	3.1.8.2 and 3.1.8.3	A. Jaramillo (LACWD)			Verify values based on confirmation of storage volume and extraction capacity	Comment is incorporated into Sections 3.1.8.2 and 3.1.8.3 based on input from AVEK.
3-30	3.1.8.3	D. Chisam (AVEK)	This Plan assumes that AVEK's WSSP-2 water bank will be in operation during the planning horizon and that a sufficient amount of wet years or water transfers will have occurred between dry year periods to keep the bank at full capacity prior to a four-year dry period. The full capacity of the bank is 35,000 AFY; therefore it is assumed that approximately ¼ of this amount would be used each year of the 4-year dry period (about 8,000 AFY). It is possible that banked water will not be available during a multi-dry year, in which case the mismatch would be more severe (up to 37,000 AFY).		150,000 a f capacity with a recovery capacity of 20 to 50 MGD	Comment is incorporated into Sections 3.1.8.2 and 3.1.8.3 based on input from AVEK.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-31 to 3-33	Fig 3-11 to 3-13 & Table 3-14 to 16	A. Jaramillo (LACWD)			Reference primary information source	Information sources were identified in Sections 3.1.1 through 3.1.4.
3-33	3.1.8.3	D. Chisam (AVEK)	Figure 3-12		assuming 50 MGD that would mean 56,000af or a 21,000 a f shortage in 3035	The Plan assumes only current projects will be operational, thus explaining the need for additional projects. The impacts of planned projects is discussed in Section 6.
3-35	3.1.9.4	A. Jaramillo (LACWD)	AVEK's Quartz Hill WTP will require an expansion to approximately 97 mgd to treat LACWD 40's projected demands (LACWD 40 1999). Furthermore, as previously mentioned,		Delete. I believe the expansion to 90 mgd was completed	Comment is incorporated in Section 3.1.9.4.
3-35	3.1.9.4	A. Jaramillo (LACWD)	LACWD 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. LACWD 40 is pursuing the use of recycled water as an alternative source for irrigation and recharge purposes.	LACWD 40's facilities improvements will include well efficiency and rehabilitation projects, reservoirs and pipelines throughout its system to meet current and projected water supply requirements. LACWD 40 is pursuing the use of recycled water as an alternative source for irrigation and recharge purposes.	Update.	Comment is incorporated in Section 3.1.9.4.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-35	3.1.9.4	D. Chisam (AVEK)	LACWD 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. LACWD 40 is pursuing the use of recycled water as an alternative source for irrigation and recharge purposes.		Also WW40 and other customers from AVEK could re regulate their water deliveries to use a more consistent annual supply deliveries in the winter months that would allow the use of all the table A water without any storage or recharge.	Comment is incorporated in Section 3.1.9.4.
3-43	3.2.2.1	A. Jaramillo (LACWD)			Add info regarding Quartz Hill WTP expansion to 90 mgd	Comment is incorporated in Section 3.2.2.1.
3-44	3.2.3	T. Chen (LACWD)	Tertiary treated effluent from the Region's three water reclamation plants will be of sufficient quality to meet unrestricted use requirements.		Verify the number of reclamation plants, I know of five: EAFB Main, EAFB Research Lab, LACSD 14, LACSD 20, and RCSD.	This comment is addressed in Section 3.2.3. EAFB plants are not included

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-47	3.3.1	W. Deal (EAFB)	**3.3.1 Regional Flood Management Issues and Needs** 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; Desire of EAFB to receive sediments into the dry lakes to maintain operations area. Baseline flooding and sediment/erosion not well defined No development guidelines for alluvial fans	**3.3.1 Regional Flood Management Issues and Needs** 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; Desire of EAFB to receive sediments into the dry lakes to maintain operations area. Baseline flooding and sediment/erosion not well defined No development guidelines for alluvial fans - Protection of habitat processes and sensitive habitats which rely on surface flow such as Antelope Valley Significant Ecological Areas (SEA), Piute Ponds, clay pans, mesquite woodlands, dry lakes	Added key issue at bottom to keep the downstream habitats on the table. Please add.	Comment is incorporated in Section 3.3.1.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-49	3.3.1.2	W. Deal (EAFB)	Ideally stormwater programs would be developed through stakeholder involvement as part of an integrated program that would identify concepts and projects developed to maximize flood control benefits, water quality benefits, and water supply benefits.	Ideally stormwater programs would be developed through stakeholder involvement as part of an integrated program that would identify concepts and projects developed to maximize flood control benefits, water quality benefits, water supply benefits, and protection of natural surface flow routes and levels thereby protection natural environment downstream.	Added natural environment protection downstream – last sentence	Comment is incorporated in Section 3.3.1.2.
3-49	3.3.1.5	W. Deal (EAFB)	**Desire of Edwards AFB to Receive Sediments into the Dry Lakes to Maintain Operations Area** Sediment carried by stormwater flows eventually ends up on the dry lake beds at EAFB that have been established as emergency landing runways. Flood waters and the resulting siltation act to “resurface” and naturally restore the elevations of the dry lake beds. Flood waters also provide benefits to local habitats and for dust control. The balance between these benefits and periodic flooding is currently being studied by EAFB, and once understood it will provide an indication of the amount of sediment and water needed. The results will provide the downstream constraints that will inform the development of a regional integrated flood management program that optimizes flood control, water quality and water supply benefits. It is also important to note that periodic flood flows	**Habitat and Lakebed requirements to protect natural processes** Stormwater runoff within the Antelope Valley is carried by ephemeral streams. Between 0.36 inches and 0.56 inches of rainfall in the first 24 hours is required to saturate the soils and initiate surface flow runoff. As runoff moves from the headwaters to the lakebeds it percolates into the stream beds recharging the groundwater, flows through well-defined washes changing to braided alluvial fan washes topping the channels and flowing as sheet flow across the lower valley floor filling clay pan depressions (similar to vernal pools and potholes), wetlands (most notable being Piute Ponds), percolating into sand dunes where the water is sequestered for later use, down the valley floor into the dry lakebeds at Edwards	Yes it is imperative to the operational mission at EAFB that the sediment load as well as the surface flow which provides the resurfacing is maintained. However, this should be addressed along with other downstream issues. Rewrote to reflect current issues and take this from an Edwards AFB only issue to reflect the AV issue of which Edwards is part. If these features are not maintained not only will EAFB suffer so will the surrounding communities. This should reflect the natural environment and processes, provide a more accurate perspective on what the surface water flow accomplishes. This could be shortened and tweeked of course but should relay to you the issue to be highlighted. EAFB would like and plans to continue to study how much is needed to keep the lakebeds healthy but that may not happen in the timeframe required by our surrounding communities. The surrounding communities may want to consider also developing a study which would assist in answering the outstanding questions to be used when moving forward with water banking projects and flood control.	Comments are incorporated in Section 3.3.1.5 and in the bullet list at the beginning of Section 3.3.1.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
			can have negative consequences at EAFB. For example, in 1983, stormwater flows were large enough to cause the runways to be out of operation (LADPW 1987).	AFB. The amount of flow depends on the size of the storm, how much rainfall has already occurred recently, etc. It has been documented in "Surface Flow Study Technical Report, Edwards Air Force Base, April 2012" that a 5 year storm (approximately 2.5 inches) is sufficient to provide 946 +/- 189 acre feet of surface water flow to Rosamond Lake with the peak discharge measured at 92 cfs. The total sediment discharge measured was 1,542 metric tons. However the error rate is pretty high at +/- 30%. Rogers and Buckhorn Lake were not measured. Stormwater runoff is important to downstream habitat values throughout the Valley and are seen at Edwards AFB as particularly valuable to sustain the surface structure of the dry lakebeds for their operational missions, the overall air quality of the Antelope Valley for both EAFB and the surrounding communities, and the Piute Pond Complex's wetland functions and values.	As to the LADPW, 1987 quote – this does not relay a true picture of the issue. Yes, in 1983 runways were out of operation but this happens whenever there is a 5 year plus storm, it is recognized at this point the need for this storm flow. It is recognized the negative longterm impacts caused when the flows are cut off. EAFB adjusts to these temporary flooding events for the long term benefit to the overall lakebeds.	

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-50	3.4	W. Deal (EAFB)	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).	However, the Antelope Valley Region is home to numerous desert washes (Little Rock Creek, Big Rock Creek, Amargosa Creek, Cottonwood Creek System), 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, wetland, and alkaline meadow habitat is present within the Piute Pond Complex. Wetland and wash areas are found within the Mesquite woodland. 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).	Added more creeks to the list, reworded Piute sentence and added mesquite wetland/wash.	Comment is incorporated in Section 3.4.
3-53	3.4.1	W. Deal (EAFB)	**3.4.1 Regional Environmental Resource Issues and Needs** 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 among industry, growth, and preservation of open space/Desire to preserve open space;	**3.4.1 Regional Environmental Resource Issues and Needs** 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 among industry, growth, and preservation of natural areas and open space/Desire to preserve open space;	Reworded to add natural areas: Conflict among industry, growth, and preservation of natural areas and open space/Desire to preserve open space	Comment is incorporated in Section 3.4.1.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
3-55	3.5.1.1	W. Deal (EAFB)	**3.5.1.1 Growing Public Demand for Recreational Opportunities** The Antelope Valley Region offers many recreational opportunities. The Antelope Valley Region has over 410 acres of developed park land including 27 parks, 22 softball fields, five baseball fields, 21 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.	**3.5.1.1 Growing Public Demand for Recreational Opportunities** The Antelope Valley Region offers many recreational opportunities. The Antelope Valley Region has over 410 acres of developed park land including 27 parks, 22 softball fields, five baseball fields, 21 soccer fields and 17 tennis courts. In addition there are over 3,000 acres of natural park land, and approximately 5,600 acres of upland and wetland natural areas at Piute Ponds. Antelope Valley Region is also home to the 1,700 acre California Poppy Reserve and the Arthur B. Ripley Desert Woodland State Park.	Added Piute Ponds to the list of areas. These are available to the community for nature based recreational pursuit with easy to obtain access letters to the area.	Comment is incorporated in Section 3.5.1.1.
3-58	3.5.1.4	W. Deal (EAFB)	Other environmental impacts from soil disturbance and vegetation cover loss include increased dust storms and lifestyle disturbance. Dust storms can cause road closures, a decline of populations in rural areas, and loss of utility services among other things. As land use in the Antelope Valley changes impacts to these resources need to be considered and balanced.	Other environmental impacts from soil disturbance and vegetation cover loss include increased dust storms and lifestyle disturbance. Dust storms can cause road closures, a decline of populations in rural areas, and loss of utility services among other things. As land use in the Antelope Valley changes impacts to these resources need to be considered and balanced. As flood control and surface flow runoff diversion is considered impacts to the dry lakebeds need to be considered and balanced as lack of surface water flow to maintain the cryptobiotic surface structure will cause breakdown of the lakebed surface structure and add to the AV dust storm issues.	3-58	Comment is incorporated in Section 3.5.1.4.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
ES-5	3	A. Jaramillo (LACWD)			See comment in Section 3.1.6.4 re: WSSP2 extraction capacity	Comment is incorporated in the Executive Summary.

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Section 4 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
4-9	4.3	Erika deHollan (LACSD)	Objective: Maximize beneficial use of recycled water.		Revise numbers based on revisions to Tables 3-11 and 3-12.	Comment is incorporated in Section 4.3.
4-9	4.4	Wanda Deal (EAFB)	In some areas of the Valley, underlying impervious soils will cause stormwater to pool and become nuisance water until it eventually evaporates. In addition, the Region recognizes that it may be vulnerable to potential increases in flooding due to projected changes in precipitation caused by climate change.	~~In some areas of the Valley, underlying impervious soils will cause stormwater to pool and become nuisance water until it eventually evaporates. In addition,~~ the Region recognizes that it may be vulnerable to potential increases in flooding due to projected changes in precipitation caused by climate change.	This appears to be referring to the clay pan depressions which provide wetland type habitat to many wildlife species. The invertebrates (such as fairy shrimp) depend on the surface flow filling of these areas with impervious soils to exist and subsequently provide food for migrating birds. So although it may eventually evaporate it isn't nuisance water and is providing a beneficial use. In addition sand dunes which exist beside these clay pans also have impervious soils beneath them which pools water and allows the dunes to maintain moist soils (sequestering it) to be used by the vegetation during the dry summers.	Comment is incorporated in Section 4.4.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
4-10	4.4	Wanda Deal (EAFB)	One example of the importance of maintaining natural flood flow areas is Rosamond Dry Lake at the lowest elevation in the watershed. This lake requires significant flooding to maintain the biological crust that protects the lakebed surface from breaking down during high wind events. By protecting the lakebed surface, the air quality in the Antelope Valley is protected, and the operational mission of Edwards AFB is protected by providing a suitable surface to test experimental aircraft and processes, which in turn provides jobs to Antelope Valley residents.	One example of the importance of maintaining natural flood flow areas is Rosamond Dry Lake at the lowest elevation in the watershed. This lake requires significant flooding to maintain the biological crust that protects the lakebed surface from breaking down during high wind events. By protecting the lakebed surface, the air quality in the Antelope Valley is protected, and the operational mission of Edwards AFB is protected by providing a suitable surface to test experimental aircraft and processes, which in turn provides jobs to Antelope Valley residents.	This example was on the money and also applies to Rogers and Buckhorn Dry Lakes.	Comment is acknowledged. No response necessary.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
4-10	4.4	Wanda Deal (EAFB)	None	While optimizing the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses the natural habitats downstream, Piute Ponds as an example, is very dependent on the natural flows. Although sustained through the years by recycled water the dramatic stormflows are still a major component of the system providing more water in 4 days during a 5 year storm than the Sanitation District can in a month. The power of this stormflow provides needed clearing of vegetation, sediment, and water to wetland and wet meadow areas not reached by the Sanitation District but important to sensitive wildlife and plant life. A major alkali mariposa lily population exists in the Piute Pond Complex and requires surface water flow to maintain.	Suggest add Piute as an important natural area which needs to be considered in this equation.	Comment is incorporated into Section 4.4

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Section 5 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
5-7	5.2	D. Chisam (AVEK)	*System Reoperation* – increases reliability and control of water movement between imported water turnouts, surface and groundwater storage supply locations, and demand locations and therefore increases overall reliability of water supplies *Water Transfers* – increase the amount of imported water supplies available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies		Consider using imported water as the first supply to maximize the use of imported water without capital facilities leaving the groundwater for future shortage periods.	Comment is acknowledged. The RMS discussion in Section 5.2 does not prioritize or recommend the order of implementation for the strategies. Maximizing imported water use before transfers or groundwater could be the best strategy for implementation.
5-8	5.2	D. Chisam (AVEK)	*System Reoperation* – increases reliability and ability to move water throughout the Region; greater flexibility allows for increased use of alternate supplies during a SWP disruption *Water Transfers* – may increase access to stored SWP water that could be delivered during a SWP disruption		(Same comment) Consider using imported water as the first supply to maximize the use of imported water without capital facilities leaving the groundwater for future shortage periods.	Comment is acknowledged. The RMS discussion in Section 5.2 does not prioritize or recommend the order of implementation for the strategies. Maximizing imported water use before transfers or groundwater could be the best strategy for implementation.

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
5-9	5.2	D. Chisam (AVEK)	*System Reoperation* – increases reliability and ability to move water throughout the Region; allows greater control of the draw and fill of water banks in relation to demands located throughout the Region and therefore allows for groundwater supplies to be obtained from areas that are managed *Water Transfers* – increases the amount of imported water supply that could be available for groundwater recharge or in-lieu supply		(Same comment) Consider using imported water as the first supply to maximize the use of imported water without capital facilities leaving the groundwater for future shortage periods.	Comment is acknowledged. The RMS discussion in Section 5.2 does not prioritize or recommend the order of implementation for the strategies. Maximizing imported water use before transfers or groundwater could be the best strategy for implementation.

Section 6 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
6-2	6.1	11/20/2013 Stakeholder meeting			Add footnote to 4th sentence of 2nd paragraph (mid paragraph after "Therefore. . . water balance"): "The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process."	Comment is incorporated in Section 6.1.
6-4, 6-5 & 6-14	Table 6-2 Table 6-3	T. Chen (LACWD)	Littlerock Creek Groundwater Recharge and Recovery Project	Status: Conceptual	Feasibility study for this project is expected in 2015. Project status should be conceptual (three locations).	Comment is acknowledged. This project was considered to have sufficient information for a preliminary economic analysis and is therefore identified as an implementation project for the 2013 IRWMP Update.
6-5	6.1	D. Chisam (AVEK)	Table 6-2 – Aquifer Storage and Recovery Project: Injection Well Development (WSSP-2) 12,000 AFY	150,000 AFY		This should refer to LACWD 40's ASR project. A correction was made in Table 6-2.
6-5	6.1	D. Chisam (AVEK)	Table 6-2 Eastside Banking & Blending Project 1,000 AFY	10,000 AFY		Comment is incorporated in Table 6-2.

6-6	6.1	Erika deHollan (LACSD)	The recycled water projects shown in Table 6-1 are classified as recycled water production, recycled water conveyance, recycled water conversion, and recycled water recharge. As discussed in Section 3, 26,000 AFY of recycled water is currently produced at water reclamation facilities. Of this 26,000 AFY, it is assumed that approximately 5,250 AFY are currently used for non-potable reuse, as described in Section 3). After current uses are removed from the 26,000 AFY of production, 20,750 AFY of unused recycled water remains. A number of implementation projects were identified that can utilize this water, including approximately 1,000 AFY of conveyance facilities, 625 AFY of conversion for non-potable reuse, and 5,000 AFY of groundwater recharge… …It is expected that by 2035, an additional 10,000 AFY of recycled water production will be available (as discussed in Section 3)…	The recycled water projects shown in Table 6-1 are classified as recycled water production, recycled water conveyance, recycled water conversion, and recycled water recharge. As discussed in Section 3, approximately 20~~6~~,000 AFY of tertiary-treated recycled water is currently ~~produced~~ available ~~at water reclamation facilities~~for these recycled water projects, and only approximately 82 AFY of this supply is currently used for the completed recycled water use conversions . ~~Of this 26,000 AFY, it is assumed that approximately 5,250 AFY are currently used for non-potable reuse, as described in Section 3).~~ ~~After current uses are removed from the 26,000 AFY of production, 20,750 AFY of unused recycled water remains.~~ A number of implementation projects were identified that can utilize ~~this~~ the available recycled water, including approximately 1,000 AFY of conveyance facilities, 625 AFY of conversion for non-potable reuse, and 5,000 AFY of groundwater recharge. It is expected that by 2035, an additional 11~~0~~,000 AFY of recycled water production will be available (as discussed in Section 3).		Comment is acknowledged and language has been revised in Section 6.1 to reflect most of these changes. Some AFY numbers for recycled water and water banks have also been updated.

6-7		11/20/2013 Stakeholder meeting			Add footnote to bottom of the page: “The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.”	Comment is incorporated in Section 6.1.
6-7	6.1	Erika deHollan (LACSD)	[first paragraph] In total, approximately 2,000 AFY of recycled water projects have been identified…		Should this number match the projected reuse in Table 3-12?	Comment is incorporated in Section 6.1.
6-9	6.1	A. Jaramillo (LACWD)	Actual stabilization of groundwater levels will be assessed from a Watermaster who will be appointed at a later time.	Actual stabilization of groundwater levels is expected to be monitored by the Court through a watermaster or other court appointed agent.		Comment is incorporated in Section 6.1.
6-13	6.1	Erika deHollan (LACSD)	[first paragraph] Since the use of recycled water is limited to landscaping and other non-potable uses, it would be important to identify uses for the water beyond those for which its uses are currently dedicated or planned.	Since the ~~use of~~ recycled water produced in the Antelope Valley is ~~limited~~ currently used only for ~~to~~ landscaping and other non-potable uses, it would be important to identify uses for the water beyond those for which its uses are currently dedicated or planned.	It seems like the intention is to note that there is a small number of actual uses of recycled water implemented in the AV today rather than indicate that there is a limit on what the water can be used for.	Comment is incorporated into Section 6.1.
6-16	6.2	Erika deHollan (LACSD)	[first sentence of last paragraph] Currently, the Region uses 21% of recycled water to meet demand, or 5,300 AFY of recycled water use out of the 26,000 AFY currently available.	Currently, the Region uses ~~21%~~a small amount (82 AFY) of the available 20,000 AFY of recycled water to meet recycled water project demand~~s, or 5,300 AFY of recycled water use out of the 26,000 AFY currently available~~.		Comment is incorporated in Section 6.2.

6-17	6.2	Erika deHollan (LACSD)	[first full sentence in top paragraph] The proposed recycled water conversion and recharge projects shown in Table 6-2 would increase the recycled water used to 12,300 AFY out of the 36,000 AFY recycled water projected to be available in 2035, or 34%. An additional 23,700 AFY of recycled water projects will need to be identified in order to meet this target. Groundwater recharge projects using recycled water are expected to fulfill much of this need.		Revise numbers based on revisions to Tables 3-11 and 3-12.	Comment is acknowledged. This language is deleted from Section 6.2.

6-16	6.2	T. Chen (LACWD)	**Identify Contaminated Portions of the Aquifer.** The planning target, which is provided in order to gauge success on meeting the water quality management objectives, is to identify and prevent migration of contaminated portions of the aquifer. The Salt and Nutrient Management Plan (SNMP) for the Antelope Valley, prepared concurrently with this IRWM Plan update, identified and mapped the concentrations of a number of pollutants present in the Region's aquifer, including TDS, nitrate/nitrite, chloride, arsenic, chromium and boron. Additional monitoring and evaluation efforts may be necessary to further study those contaminants found to be exceeding MCLs in the Region's aquifers. Refer to the SNMP for detailed information about contaminant identification.	**Identify Contaminated Portions of the Aquifer.** The planning target, which is provided in order to gauge success on meeting the water quality management objectives, is to identify and prevent migration of contaminated portions of the aquifer. The Salt and Nutrient Management Plan (SNMP) for the Antelope Valley, prepared concurrently with this IRWM Plan update, identified and analyzed various constituents found in the Region's aquifer. Additional monitoring and evaluation efforts may be necessary to further study those contaminants that jeopardize the Region's water quality objectives. Refer to the SNMP for information about the Region's groundwater quality.		Comment is incorporated in Section 6.2.

6-16	6.2	T. Chen (LACWD)	**Map Contaminated Portions of Aquifer.** The planning target, which is provided in order to gauge success on meeting the water quality management objectives, is to map the contaminated portions of the aquifer and monitor contaminant movement. As described above, the SNMP for the Antelope Valley identified and mapped the concentrations of a number of pollutants present in the Region's aquifer, including TDS, nitrate/nitrite, chloride, arsenic, chromium and boron. Additional monitoring and evaluation efforts may be necessary to further map those contaminants found to be exceeding MCLs in the Region's aquifers. Continued tracking and mapping of constituents may be necessary to better understand the Region's groundwater issues. Refer to the SNMP for detailed information about contaminant mapping.	**Map Contaminated Portions of Aquifer.** The planning target is to map the contaminated portions of the aquifer and monitor contaminant movement. The SNMP mapped the concentrations for select constituents. Additional monitoring, evaluation and mapping efforts may be necessary to better understand the Region's groundwater issues. Refer to the SNMP for available contaminant concentration maps.	May only have concentration maps for TDS, chloride and nitrate.	Comment is incorporated in Section 6.2.

6-17	6.2	T. Chen (LACWD)	**Develop Management Program for Nitrate and TDS.** TDS and nitrate are of particular… • TDS management measures: … • Nitrate management measures: … Development of a management program…	Development of a management program and projects for these pollutants of concern, as well as for other emerging contaminants as they are identified, would contribute to meeting the objective of protecting the aquifer from contamination. Additionally, the SNMP found that, based on the Antelope Valley Groundwater Basin's baseline water quality and project source water quality, managing salt and nutrient loadings on a sustainable basis is feasible with a minimal number of implementation measures.	Move sentence, "The SNMP…" to the end of the paragraph immediately after management measure lists. The current paragraph structure may infer that the TDS and nitrate management measures are suggested in the SNMP.	Comment is incorporated in Section 6.2.
6-18	6.2	T. Chen (LACWD)	A monitoring program was suggested during ongoing SNMP efforts for the Antelope Valley to ensure continuous tracking of dischargers' actions to reduce the impact on groundwater. It is suggested that monitoring wells be placed near existing drinking water wells, and near projects that may impact groundwater quality (such as recharge projects), and suggested a number of constituents to be monitored and reported (i.e., TDS, nitrogen species, chloride, arsenic, chromium, fluoride, boron and constituents of emerging concern).	The SNMP includes a monitoring component to ensure the groundwater quality is consistent with applicable SNMP water quality objectives. Select drinking water wells, near projects that may impact groundwater quality (such as recharge projects), will be used as monitoring locations. Refer to the SNMP for monitoring and reporting details.		Comment is incorporated in Section 6.2.

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Section 7 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
No comments submitted on Section 7						

Section 8 Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
8-8	8.2.6	A. Jaramillo (LACWD)	For example, the RWMG elected LACWD 40 to interface with DWR for the Proposition 84 grant efforts.	For example, the RWMG elected the SWCA to interface with DWR for the Proposition 84 grant efforts.	Isn't this done by SWCA/PWD?	Comment is incorporated in Section 8.2.6.
8-12	Table 8-2	A. Jaramillo (LACWD)	Grant App Funds: 100% RWMG	Grant App Funds: 100% Project proponents or RWMG	Pert the MOU, RWMG only committed to funding grant applications for IRWM Plan updates. Funding project grant applications is voluntary	Comment is incorporated in Section 8.3.2, Table 8-2.
8-18	Table 8-3	A. Jaramillo (LACWD)	Groundwater Safe Yield Estimated range of the potential safe yield of the Antelope Valley Groundwater Basin	Total Sustainable Yield Total Sustainable Yield	Reference Appendix I instead of listed documents; I don't think there is groundwater safe yield discussion within the Plan	Comment is incorporated in Section 8.5, Table 8-3.
8-31	8.6.1	E. deHollan (LACSD)	Table 8-4 (first row on p. 8-31) Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66% by 2025, and 100% by 2035.		Revise numbers based on revisions to Table 3-11.	Comment is incorporated in Section 8.6, Table 8-4.

Antelope Valley Region
Integrated Regional Water Management Plan Update
2013

Appendices Compiled Comments

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
	App J	T. Chen (LACWD)	Multi-Use Wildlife Habitat Restoration Project (Antelope Valley Duck Hunting)	Contact info for Aracely Jaramillo Phone: (626) 300-3353 Email: AJaramillo@dpw.lacounty.gov	Wrong contact number and email. Delete "?" for co-sponsor.	Comment is incorporated (now Appendix K)
	App J	T. Chen (LACWD)	Littlerock Creek Groundwater Recharge and Recovery Project (PWD)		Do not see the similar Lancaster project referred to in the project description. Project should be conceptual, completed feasibility study is anticipated in 2015.	Comment is acknowledged. This project was considered to have sufficient information for a preliminary economic analysis and is therefore identified as an implementation project for the 2013 IRWMP Update.
	App J	T. Chen (LACWD)	Palmdale Power Plant Project (City of Palmdale)		Estimated date listed is 2014. According to Palmdale website, construction will take 27-30 months. Construction has not started.	Comment is incorporated (now Appendix K)
	App J	T. Chen (LACWD)	Solar Power System at K-8 Division	Project Description: The system **is** a 350-kilowatt…	Change sponsor to LACWD 40.	Comment is incorporated (now Appendix K)

Page No.	Section No.	Commenter	Original Text	Suggested Text	Comment	Response
	App J		Quartz Hill Storm Drain (LACDPW)	Construction of a storm drain, including several lateral connections and catch basins, to provide stormwater collection and conveyance. The project connects to existing and new drainage facilities, with the improvements located mainly along 50th Street, from Avenue M-8 to Avenue K-8.	Revise project description	Comment is incorporated (now Appendix K)
	App J		North Los Angeles/Kern County Regional Recycled Water Project – Phase 2 (LACWD 40, City of Palmdale)	The construction of the recycled water supply system would be phased overtime and it is anticipated that all phases of construction would be completed by **2014**.	Revise project description. The Estimated years of construction & start-up is not complete as noted, should be 2014	Comment is incorporated (now Appendix K)
	App J		North Los Angeles/Kern County Regional Recycled Water Project – Division Street Corridor		Change the project sponsor to City of Lancaster.	Comment is incorporated (now Appendix K)
	App J		Avenue K Transmission Main, Phases I-IV		This is an "implementation" project, not conceptual.	Comment is incorporated (now Appendix K)
	App J		North Los Angeles/Kern County Regional Recycled Water Project – Phase 3		Delete project	This will remain as a conceptual project per discussion with LACWD 40 on 12/31/2013 (now Appendix K)
	App J		North Los Angeles/Kern County Regional Recycled Water Project – Phase 4		Delete project	This will remain as a conceptual project per discussion with LACWD 40 on 12/31/2013 (now Appendix K)

Appendix F: Integrated Flood Management Summary Document

Final Draft Technical Memorandum

Antelope Valley IRWMP 2007 Update

Subject: **Task 2.3.7 Integrated Flood Management Summary Document**

Prepared For: Antelope Valley State Water Contractors Association

Prepared by: Paul Glenn

Reviewed by: Brian Dietrick

Date: December 31, 2013

Table of Contents

1 Purpose

The purpose of this technical memorandum (TM) is to compile the previous related TMs into one complete Integrated Flood Management Summary Document. The previous TMs include:

- Task 2.3.1-- Flood Management Document Matrix
- Task 2.3.2--Flood Protection Needs
- Task 2.3.3-- Methodology to Catalog and Prioritize Flood Projects
- Task 2.3.4--Regional Vision for Multi-Benefit Flood Protection - Recommended Actions to Implement Integrated Flood Management
- Task 2.3.5--NFIP Community Rating System (CRS) Participation
- Task 2.3.6--Coordination Between Flood Protection and Stormwater Quality

1.1 Definition of Integrated Flood Management

Integrated Flood Management (IFM) is an integrated approach to flood management that focuses on maximizing the net benefits of a floodplain and infrastructure developed to manage flooding. The integrated approach considers water resources management, land use planning, environmental stewardship, and sustainability along with flooding issues when developing policies, plans and projects. Typical benefits that can be obtained through an integrated approach include improvements in water quality, increases in water supply, and enhancements in riparian habitat and wildlife corridors.

2 Existing Environment

The existing environment consists of a closed groundwater basin that does not discharge to outside receiving water bodies. Within the basin are three counties, three cities and a large U.S. Air Force base, which include:

- Kern County
- Los Angeles County
- San Bernardino County
- City of Palmdale
- City of Lancaster
- California City
- Edwards Air Force Base

This section presents the watershed characteristics, flood mapping, existing and historical flooding, existing projects, and planned projects.

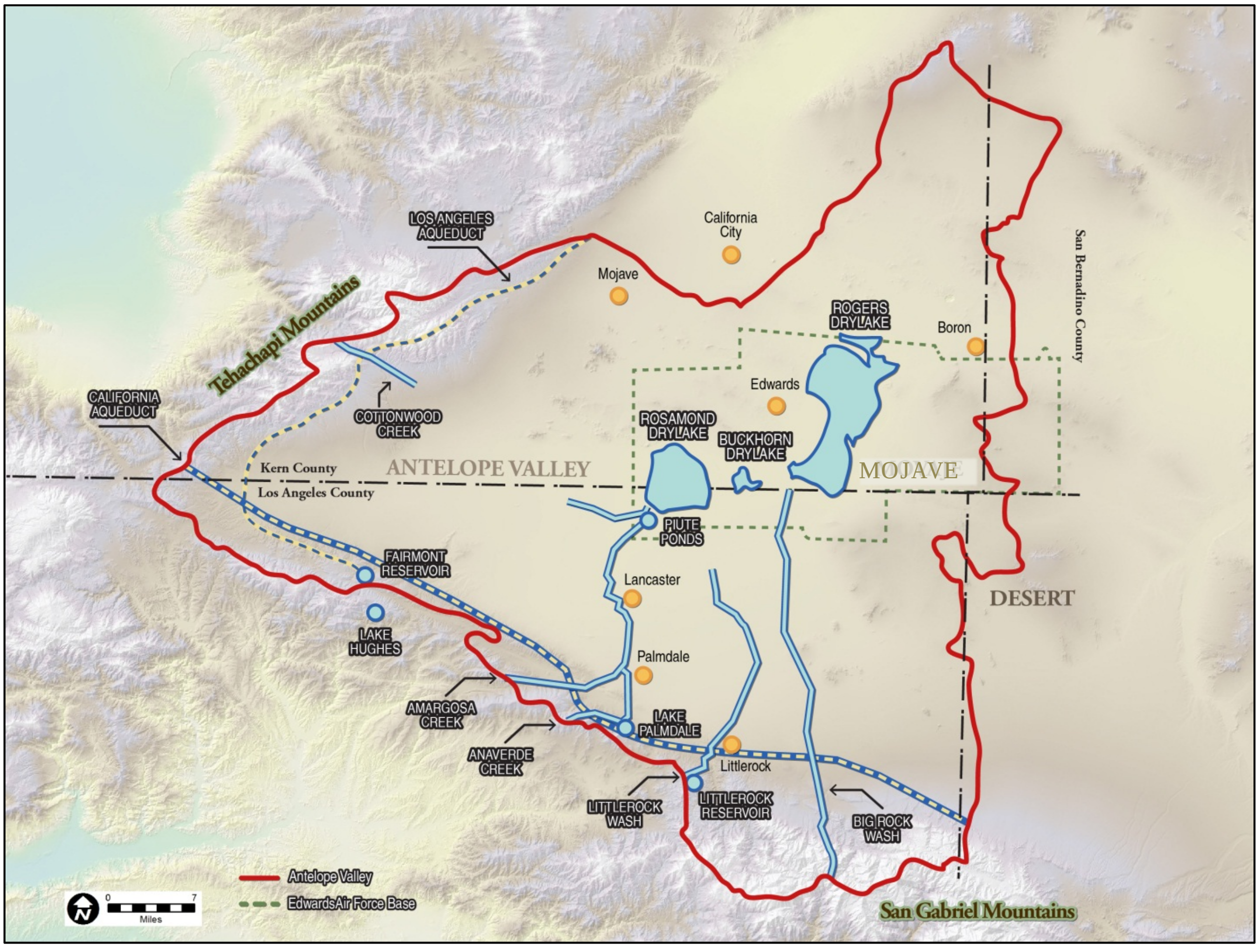
2.1 Watershed Characteristics

Major characteristics of the Antelope Valley Watershed are shown in Figure 2-1 and include:

- Closed basin - encompasses approximately 2,400 square miles; no regional outflow of surface or groundwater
- Bounded by the peninsular Tehachapi Mountains on the Northwest, together with the San Gabriel and the San Bernardino Mountains on the Southwest
- Terminal dry lakes/playas are predominantly clay - little groundwater recharge; significant losses to evaporation
- Four playas are all located on Edwards Air Force Base; the corresponding surface areas include Rosamond (21 square miles), Rich (3 square miles), Buckhorn (10 square miles), and Rogers (35 square miles)
- Approximately 80 percent of watershed is characterized by a low to moderate slope (0-7 percent); and the remaining 20 percent consists of foothills and rugged mountains which reach up to 3,600 feet in elevation
- Watershed boundaries and surface drainage patterns are difficult to define within the low-relief terrain lakebed portions of the watershed
- Mostly rural; sparsely populated in many areas; however the western and southern parts of the Antelope Valley along the foothills/alluvial fan have been urbanized
- High desert climate
- Three major watersheds are tributary to Rosamond Lake including (1) Cottonwood Creek (drainage area = 373 square miles), (2) Amargosa Creek (drainage area = 256 square miles), and (3) Little Rock Wash (drainage area = 144 square miles)
- Watershed area tributary to Rogers Lake is approximately 708 square miles primarily through Big Rock Creek; and the tributary watershed area to Rich Lake is 376 square miles
- Buckhorn Lake tributary area includes portions of Rosamond and Rogers watersheds

- Little Rock Reservoir provides some limited flood storage within the upper portion of the watershed (surface area = 150 acres, elevation 3,200, original storage capacity = 4,300 acre-feet and currently has a useable storage capacity of 3,000 acre-feet of water)

Figure 2-1: Boundary of Antelope Valley Watershed and Major Flood-Related Features

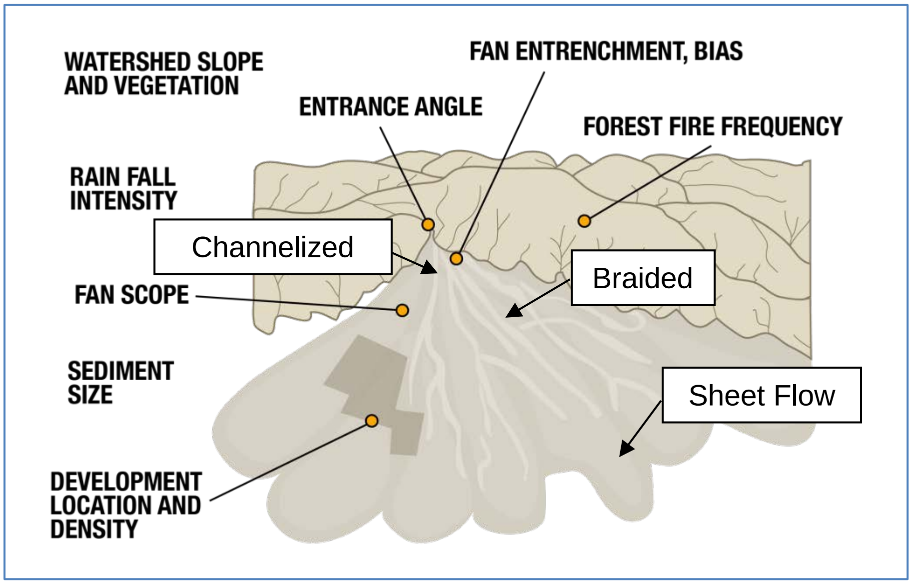


2.1.1 Floodplain/Geomorphology

Details of the floodplain/geomorphology of the watershed include:

- Much of the valley floor is subject to inundation and shallow flooding with unpredictable flow paths
- Floor of the Antelope Valley Watershed is formed by coalescing alluvial fans below the foothills which generally lacks defined natural channels and is subject to unpredictable sheet flow patterns
- Alluvial fans are an erosional feature - unpredictable flow paths/braided patterns; not channelized, difficult to provide control structures, sheet flows are common, development exists on the alluvial fans themselves
- Flood dynamics of an idealized alluvial fan can be characterized by several zones which are defined beginning from the apex as: (1) channelized zone (foothills), (2) braided zone (upstream fan areas), and (3) sheet flow zone (downstream fan areas) as shown in Figure 2-2.

Figure 2-2: Alluvial Fan Geomorphology and Flood Features



- Multiple alluvial fans coalesce or overlap below the foothill canyons (known as bajadas) and create complex flooding patterns
- Most of the surface waters are ephemeral streams due to arid conditions and only flow in direct response to precipitation
- Existing roadways may modify and concentrate flows in the shallow floodplain areas
- Channels experience migration/erosion/sediment deposition
- Location of the stream channel on a fan is often erratic due to the rapid expansion of the width and highly variable sediment load
- Dry lakebeds or playas are essentially flat surfaces with little topographic relief
- Shallow flooding often occurs along highly unpredictable flow paths because the source of the flow may be variable, topographic relief may be low, channels may shift or may be nonexistent, or sediment and debris may be deposited or removed during or after a flood
- Sheet flooding on the lower valley floor (i.e., the lower fringes of the alluvial fans) occurs due to limited topographic relief and this makes it difficult to define the level of flood hazards

2.1.2 Drainage Infrastructure

Details of the drainage infrastructure within the watershed include:

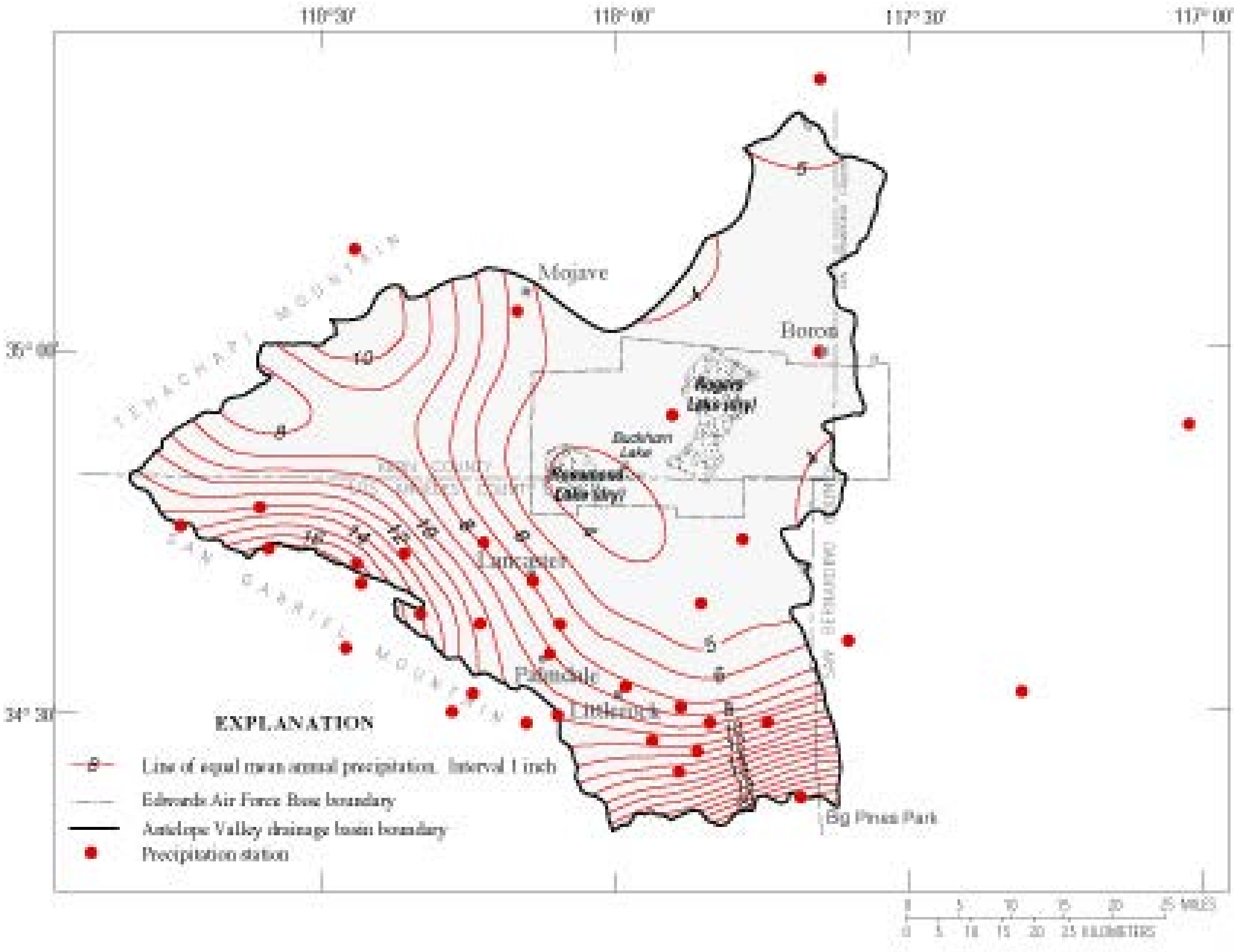
- Not a significant amount of regional flood infrastructure compared with other, more-densely urbanized areas of Los Angeles County; primarily natural drainage paths and patterns
- The limited regional flood control facilities are generally located in urban areas and include some channelized reaches of creeks, stream bank revetments of different types, and localized protective structures
- Urban drainage facilities have limited hydraulic capacity and are not designed to accommodate regional overland flooding that exceeds the smaller urban watershed
- Urban drainage facilities generally consist of local retention/detention basins, street drainage inlets, underground storm drain pipes, and culverts

2.1.3 Meteorologic / Hydrologic Response

Details of the meteorologic/hydrologic response of the watershed include:

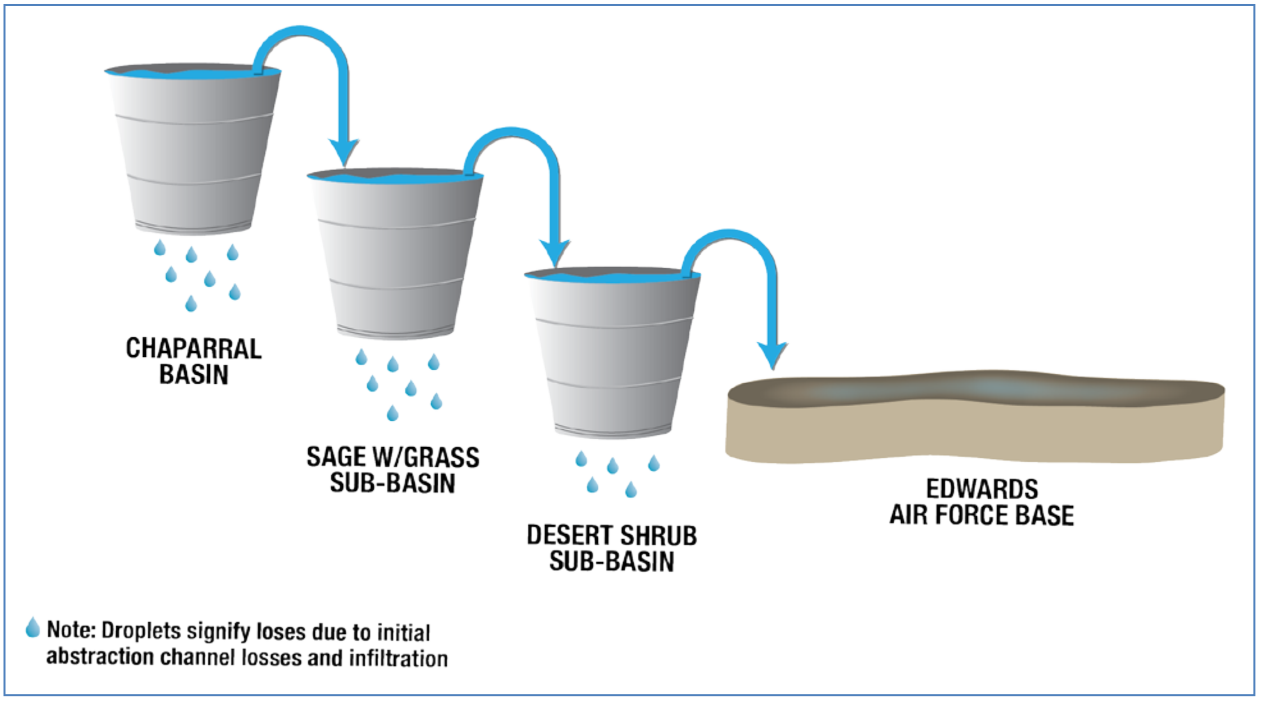
- Precipitation can vary considerably within the watershed based on elevation as shown in Figure 2-3; average annual precipitation in the Antelope Valley ranges from about 20 inches in the mountains to less than 4 inches on the valley floor

Figure 2-3: Average Rainfall (Isopluvial Contours) for Antelope Valley Region



- Rainfall-runoff watershed response varies based on elevation within the watershed and corresponding soil types
- Watershed response is conceptually described as a series of “leaky buckets” representing different elevation intervals which are interconnected and once the threshold amount of rainfall exceeds the initial soil losses then water cascades down to the next level in the watershed, ultimately the lakebed, as shown in Figure 2-4

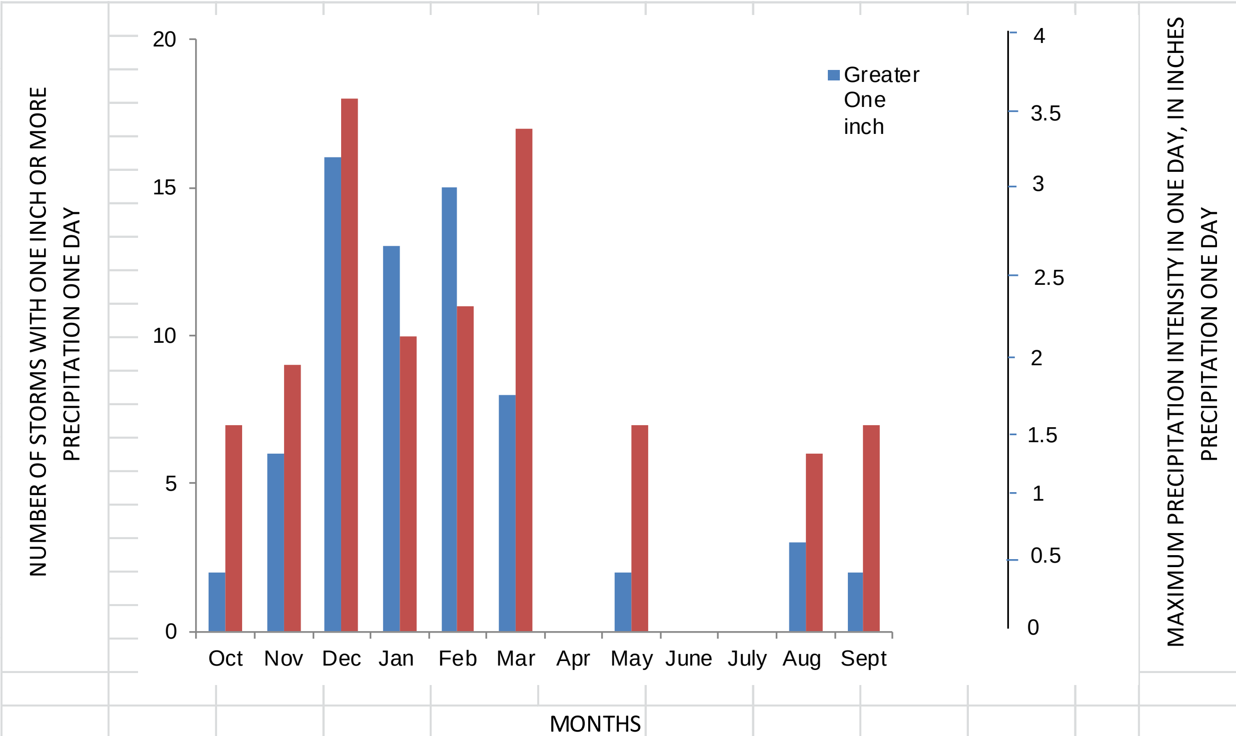
Figure 2-4: "Leaky Bucket" Concept for Antelope Valley Watershed



- Larger storm events may result in magnified flood flows generated from "cascading" watersheds where watershed boundaries may coalesce and combine because of limited hydraulic capacity or undefined floodplains
- It has been previously estimated that 70 percent of the runoff volume to the dry lake beds is generated from the lowest mountain watershed area and 15 percent of the runoff volume is associated with rainfall falling directly on the lake
- Typically, frequent wildfires in Southern California result in burn conditions that can change the surface soil layer and dramatically reduce infiltration while increasing runoff
- Flashy storms occur - high flow volumes, low frequency, high volumes of sediment transfer
- The historical average estimated 100-year 24-hour rainfall varies within the Antelope Valley from 3.55 inches at EAFB to higher amounts in the mountainous area similar to the average rainfall distribution shown above in Figure 2-3. This reflects the orographic lifting effects of the mountains on rainfall as well as west-to-east rain shadow[1] across the valley floor.
- Rainfall is caused by three types of storms in the Valley which include (1) low-pressure systems originating in the Gulf of Alaska or near the Hawaiian Islands, (2) low pressure systems originating from the tropics during the late summer and early fall, and (3) cloudbursts[2] or thunderstorm covering small areas and originating from convective uplifting during the summer and early fall.
    - Most storms greater than 1-inch of precipitation in one day are from frontal or low-pressure systems that are most prevalent during December through March as shown in Figure 2-5.

[1] "Rain shadow" refers to a region in the lee of mountains that receives less rainfall than the region windward of the mountains.
[2] A "cloudburst" is an extreme amount of precipitation, sometimes with hail and thunder, which normally lasts no longer than a few minutes but is capable of creating flood conditions.

Figure 2-5: Seasonal Distribution of Storms in Palmdale (1932-1992)



2.2 Flood Mapping

Regional mapping of the existing flood hazards for the Antelope Valley has been prepared by FEMA as part of the National Flood Insurance Program (NFIP). NFIP requires each community to identify 100-year recurrence interval flood prone areas as part of adopting floodplain management regulations. The minimum federal flood protection goals and requirements are administered by FEMA as part of the NFIP. The NFIP, originally established in 1968, provides low-cost federally subsidized flood insurance to those communities that participate in this program. Participation in the program requires that the community adopt floodplain regulations which meet the requirements of the NFIP defined in 44CFR Chapter 1 Part 59, including mapping of existing flood hazards.

Hydrologic and hydraulic studies are required to analyze the delineation of the 100-year recurrence interval floodplain envelope. However, flooding and sedimentation within the Antelope Valley do not occur in a typical riverine system. These processes occur in alluvial fans that are difficult to simulate numerically. The published FEMA flood hazard maps provide an approximation of the regional floodplain limits based on the standards for FEMA alluvial fan hazards. The mapped flood hazards focus on regional flood hazards and do not evaluate localized flooding, particularly in urbanized areas; so there could be areas that flood in small storm events that are not captured within a mapped flood hazard zone under FEMA.

Alluvial fan flooding presents unique problems in terms of quantifying flood hazards, assessing sediment transport characteristics, devising reliable flood protection schemes, and evaluating impacts of various projects on flow and sediment dynamics. Standard one-dimensional (1-d) methods developed for flow and sediment routing in confined streams with simple channel geometry are usually inadequate for alluvial fan applications. This makes the accuracy of regional flood hazard delineation questionable since the mapping is based on fixed channel geometry without erosion and does not necessarily consider (1) shallow flooding and unknown redistribution of flows, (2) complex hydraulics, (3) loss of channel hydraulic capacity because of sedimentation/deposition, and (4) additional flow contributions from upstream cascading watersheds. These are just a few of the issues that should be understood when reviewing the flood hazard mapping on alluvial fans and desert valley floor areas. However, even with these identified issues, the published flood hazard maps provide an initial approximation of the general flooding boundaries.

2.2.1 Definition of Flood Hazard Risks

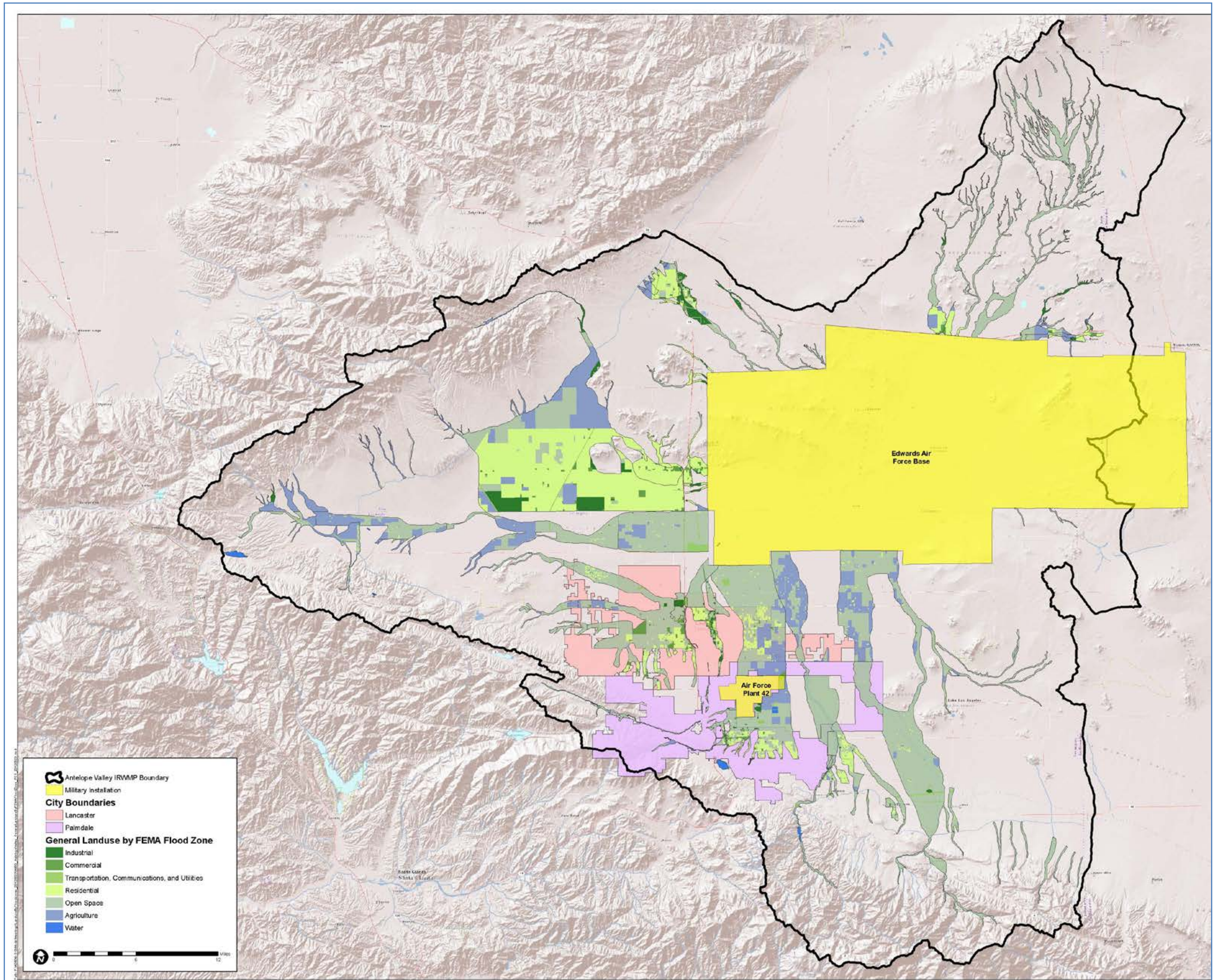
The FEMA flood hazard zones shown represent the areas susceptible to the 1 percent annual chance flood (commonly referred to as the "100-year flood"), and the 0.2 percent annual chance flood ("500-year flood"). The 1 percent annual chance flood has at least a 1 percent chance of occurring in any given year. FEMA designates these areas as Special Flood Hazard Areas (SFHA) and requires flood insurance for properties in these areas as a condition of any mortgage backed by federal funds.

2.2.2 Existing Floodplain Hazard Mapping – Antelope Valley

The existing published FEMA flood hazard mapping illustrates general characteristics of the floodplain and provides an understanding of the extent of the existing flood potential within the valley (Figure 2-6). A key item that is immediately apparent from the floodplain mapping is that the entire EAFB and Air Force Plant 42 areas are not part of the published mapping. This does not mean that the areas are not associated with flood hazards, only that mapping is not provided because it is located on federal lands and those areas are not mapped. Other general trends regarding the floodplain that can be deduced from the mapping include: (1) floodplains are very well-defined in the lower mountains/foothill areas where there are incised streams; (2) valley floor and alluvial fan areas result in wide floodplains with patterns of flow that redistribute and split to other channels downstream; (3) linear floodplain boundaries for locations of shallow flooding are present in several locations, but this appears to be associated with political boundaries and not necessarily with physical boundaries (this reflects different time periods when the mapping was performed); (4) shallow flooding floodplains encompass urbanized portions of Palmdale and Lancaster; (5) all the floodplains illustrate the general surface drainage patterns that are directed to the playas at EAFB. It is apparent that uncertainties and discrepancies exist in the flood hazard mapping, particularly near local government boundaries where there are minimal hydraulic influences. The mapping should be used cautiously because of its approximate nature and because it does not necessarily define the magnitude of flooding.

Page Intentionally Left Blank

Figure 2-6: Antelope Valley General Land Use by FEMA Flood Zone



Page Intentionally Left Blank

2.2.3 Flood Hazard Mapping Compared to Land Use

An initial assessment of the magnitude of the existing "flood risk" (which correlates directly to the potential flood damage) can be developed through quantifying encroachments upon different types of land-use within the floodplain. Any area located within a 100-year floodplain flood hazard area is considered to be at "high risk" of flooding. An overlay of the land use plan with the mapped flood hazard zones is shown in Figure 2-6. This generalized mapping overlay can be utilized as an effective planning tool. The land use areas which have a high dollar value for damages within flood hazard zones represent locations to target and prioritize for projects.

The magnitudes of general land-use designations within the flood hazard zones have been summarized for both Los Angeles County and Kern County in Table 2-1and Table 2-2, respectively. The FEMA flood hazard zone "A" designates the 100-year floodplain, although there are various different types of flood hazards within zone "A" for insurance purposes, some of which are defined by FEMA as follows:

- Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies.
- Zone AE: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods.
- Zone AH: Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet.
- Zone AO: Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone.

The mapping indicates that the majority of the areas have land use zoning that is compatible with the floodplain being zoned primarily for "open space." However, it is important to note the other general land uses within the floodplain, particularly the more urban type of uses which would result in more extensive flood damage.

Table 2-1: LA County Land Use Designations and FEMA Flood Hazard Zones

Los Angeles County – Land Use Designation with Mapped FEMA Flood Hazard Zone		
FEMA Flood Zone	**General Land Use**	**Total (ac)**
1 Pct Annual Chance Flood Hazard Contained in Channel	Commercial	3
	Open Space	13
	Residential	1
	Transportation, Communications, and Utilities	43
	Water	28
1 Pct Annual Chance Flood Hazard Contained in Channel Total		**89**
A	Agriculture	13,459
	Commercial	65
	Industrial	83
	Open Space	53,966
	Residential	802
	Transportation, Communications, and Utilities	1,453
	Water	609
A Total		**70,436**
AE	Agriculture	17
	Industrial	18
	Open Space	3,756
	Residential	19

Los Angeles County – Land Use Designation with Mapped FEMA Flood Hazard Zone		
FEMA Flood Zone	General Land Use	Total (ac)
	Transportation, Communications, and Utilities	7
	Water	4
AE Total		**3,821**
AH	Commercial	5
	Industrial	206
	Open Space	620
	Transportation, Communications, and Utilities	99
AH Total		**930**
AO	Agriculture	25
	Commercial	80
	Industrial	42
	Open Space	2,612
	Residential	93
	Transportation, Communications, and Utilities	92
AO Total		**2,944**
Grand Total		**78,219**

Table 2-2: Kern County Land Use Designations and FEMA Flood Hazard Zones

Kern County – Land Use Designation with Mapped FEMA Flood Hazard Zone		
Flood Zone	General Land Use Category	Total Area (ac)
A	Agriculture	13,476
	Commercial	872
	Industrial	5,657
	Open Space	25,885
	Residential	37,746
	Transportation, Communications, and Utilities	376
A Total		**84,011**
AE	Agriculture	53
	Commercial	12
	Industrial	11
	Residential	74
AE Total		**149**
AH	Agriculture	549
	Commercial	180
	Industrial	5
	Open Space	513
	Residential	708
	Transportation, Communications, and Utilities	2
AH Total		1,958
AO	Agriculture	447
	Commercial	138
	Industrial	486
	Open Space	131
	Residential	381

Kern County – Land Use Designation with Mapped FEMA Flood Hazard Zone		
Flood Zone	**General Land Use Category**	**Total Area (ac)**
	Transportation, Communications, and Utilities	44
AO Total		**1,627**
Grand Total		**87,746**

2.3 Existing and Historical Flooding

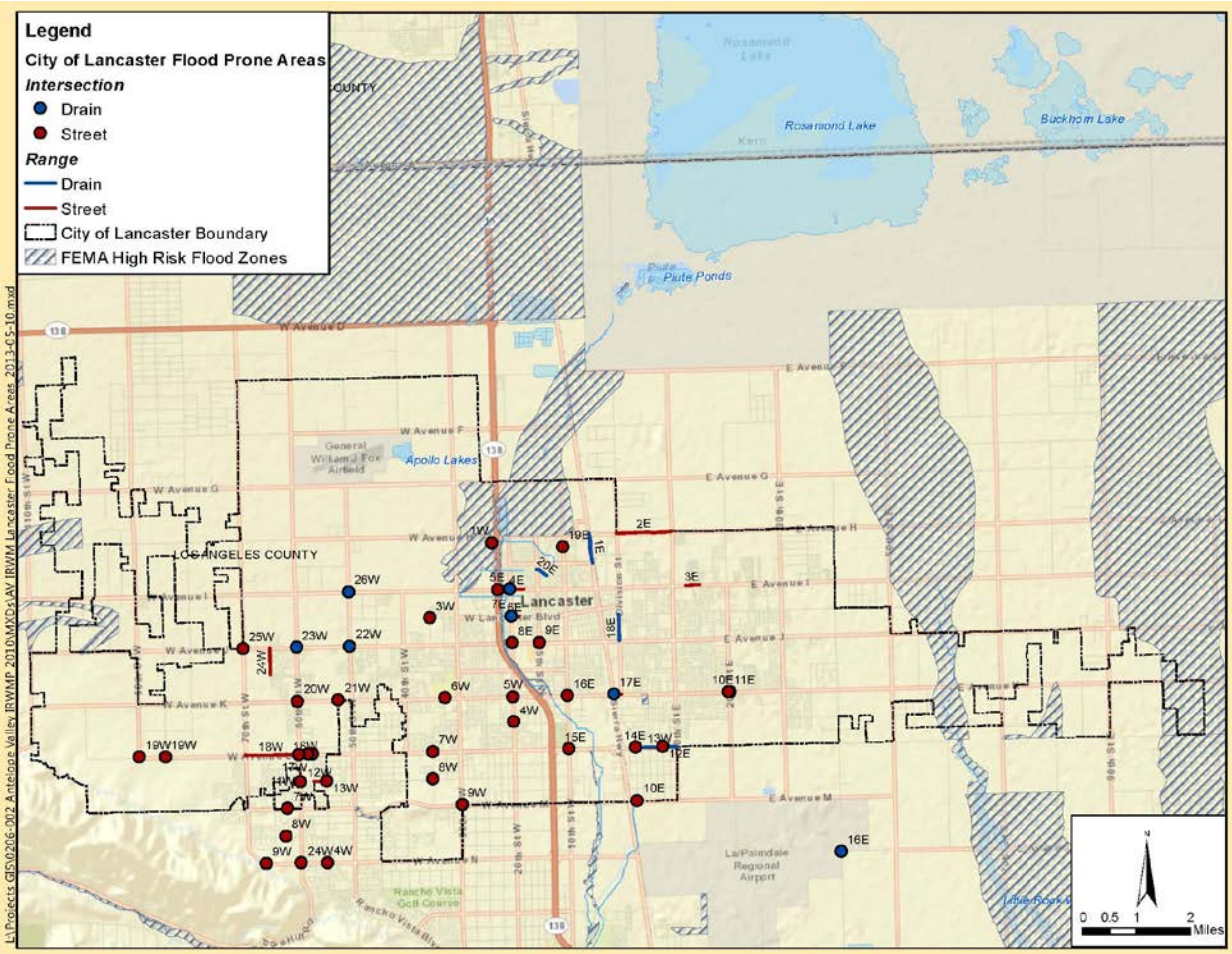
Information was collected on current, ongoing flood problems in the Cities of Lancaster and Palmdale, and in unincorporated areas of Los Angeles and Kern Counties. Each of these areas is discussed below. Information for EAFB, which includes parts of both unincorporated Los Angeles and Kern Counties, was not available at the time of this document.

For the municipalities and unincorporated county areas, localized problems are associated with historical chronic flooding that generally occurs after major storms. They are identified as locations of known flooding which require maintenance, including sediment removal. Generally, these problems occur at locations where existing drainage facilities are insufficient or not present.

2.3.1 Lancaster

Localized flooding areas in the City of Lancaster are shown in Figure 2-7 as documented by city maintenance staff. This figure also indicates the FEMA high risk flood zones (Zone A). It is important to note that areas of local flood concern do not necessarily correlate to FEMA's high-risk flood zones.

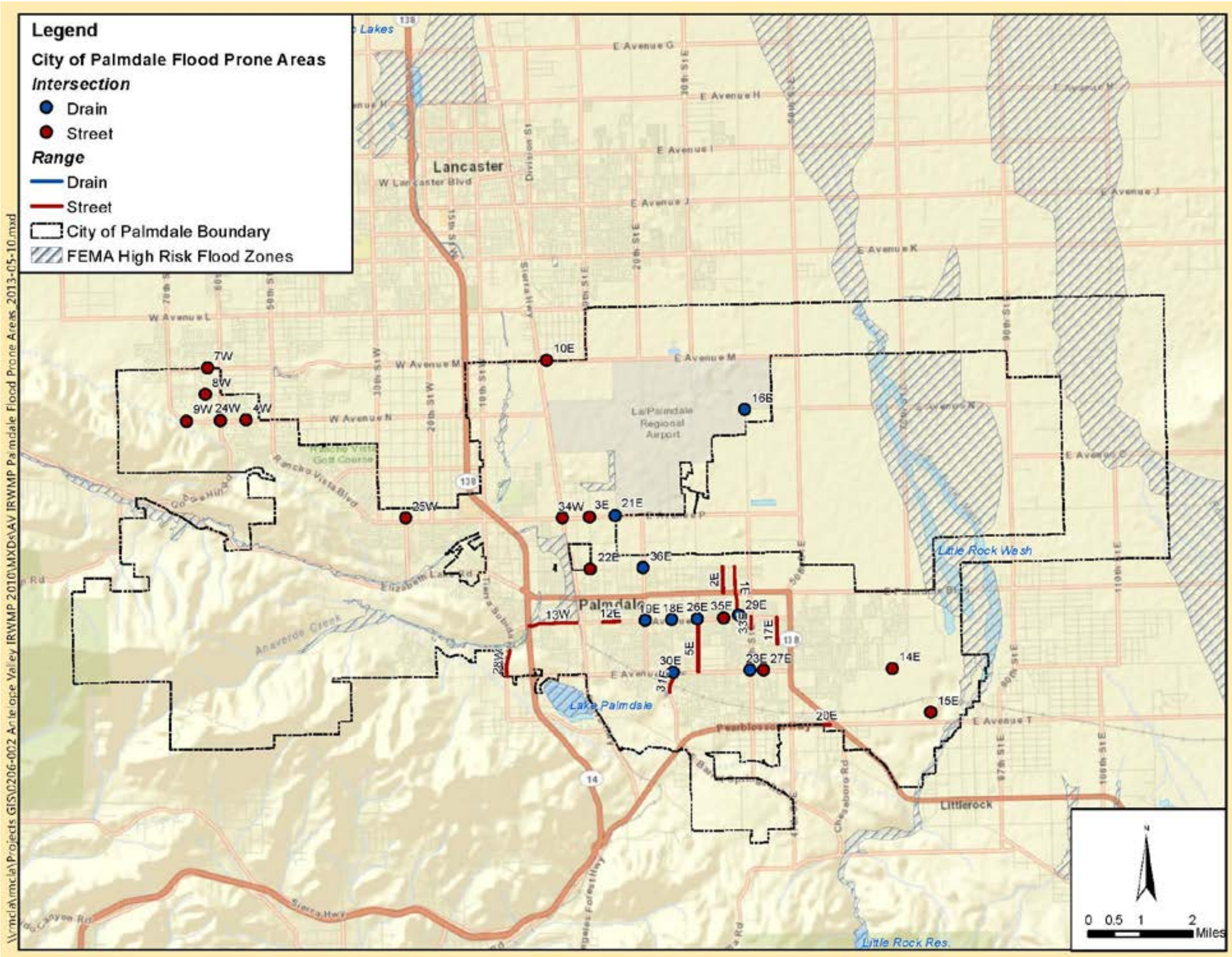
Figure 2-7: Localized Flooding Areas in the City of Lancaster



2.3.2 Palmdale

Localized flooding areas in the City of Palmdale are shown in Figure 2-8 as documented by city maintenance staff. This figure also indicates the FEMA high risk flood zones (Zone A). It is important to note that areas of local flood concern do not necessarily correlate to FEMA's high-risk flood zones.

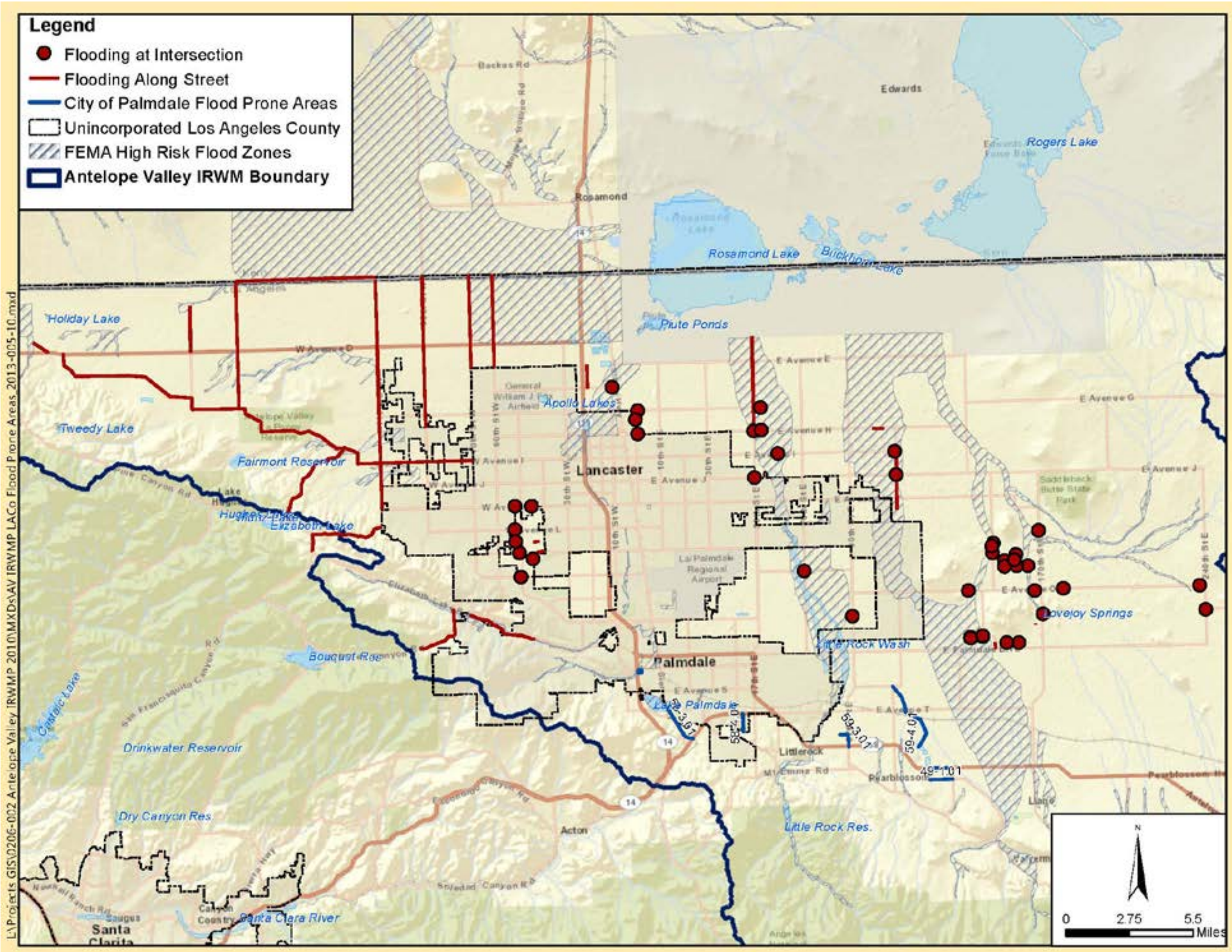
Figure 2-8: Localized Flooding Areas in the City of Palmdale



2.3.3 Unincorporated Los Angeles County

Localized flooding areas in unincorporated Los Angeles County are shown in Figure 2-9 as documented by county maintenance staff. This figure also indicates the FEMA high risk flood zones (Zone A). It is important to note that areas of local flood concern do not necessarily correlate to FEMA's high-risk flood zones.

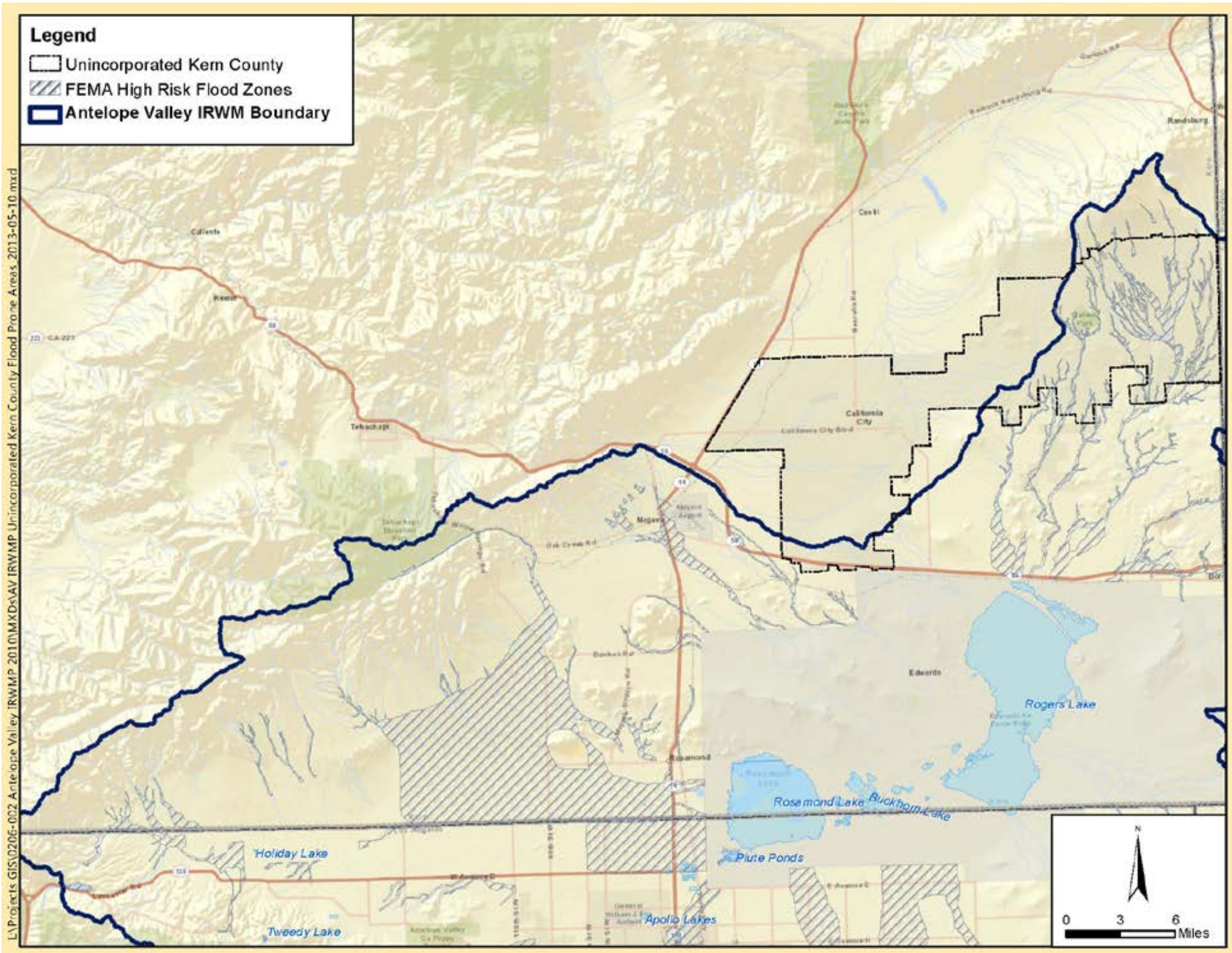
Figure 2-9: Localized Flooding Areas in Unincorporated Los Angeles County



2.3.4 Unincorporated Kern County

Localized flooding areas have not been identified for unincorporated Kern County. Figure 2-10 indicates the FEMA high risk flood zones. Localized flooding areas should be identified for these portions of the Region.

Figure 2-10: Localized Flooding Areas in Unincorporated Kern County



2.4 Existing Plans and Projects

The existing plans and projects in the Region that are considered as IFM are described below.

2.4.1 Existing Plans

Model Water Efficient Landscape Ordinance

The Water Conservation in Landscaping Act of 2006 requires cities, counties, and charter cities and charter counties to adopt landscape water conservation ordinances by January 1, 2010. Pursuant to this law, the Department of Water Resources (DWR) has prepared a Model Water Efficient Landscape Ordinance (Model Ordinance) for use by local agencies. The Model Ordinance became effective on September 10, 2009.

Under the Model Ordinance, all local agencies must adopt a water efficient landscape ordinance by January 1, 2010 or may adopt the state Model Ordinance. In addition, local agencies may collaborate and craft a region-wide ordinance. The adopted ordinance must be as effective as the Model Ordinance in regards to water conservation.

The objectives of the existing DWR Model Water Efficient Landscape Ordinance are:

- Promote the values and benefits of landscapes while recognizing the need to invest in water and other resources as efficiently as possible.
- Establish a structure for planning, designing, installing, maintaining and managing water efficient landscapes in new and rehabilitated projects.
- Establish provisions for water management practices and water waste prevention for established landscapes.
- Use water efficiently without waste by setting a Maximum Applied Water Allowance as an upper limit for water use and reduce water use to the lowest practical amount.

Examples of projects included under DWR's Model Water Efficient Landscape Ordinance are:

- Irrigation weather control/soil moisture sensing irrigation controllers
- Rain shutoff sensors
- Graywater systems
- Rainwater collection--**flood mitigation**
- Green roofs--**flood mitigation**
- Restoration/protection of native vegetation--**flood mitigation**

Existing landscape ordinances in the Region include:

- *City of Palmdale Landscape Ordinances* – The City of Palmdale has a Landscape Ordinance (Ordinance No. 1176) and a Water Conservation Ordinance (Ordinance No. 1362). The Water Conservation Ordinance includes stormwater management. It is highly recommended to implement stormwater best management practices (BMPs) into the landscape, irrigation, and grading design plans to minimize runoff and increase on-site retention and infiltration, **which aid in the reduction of flooding**. The City of Palmdale's Water Conservation Ordinance is provided in Appendix B.
- *Palmdale Water District* **-** The Palmdale Water District currently provides rebates and programs for weather-based irrigation controls and turf removal programs for residential and commercial customers. Additional information is available on their website (http://www.palmdalewater.org/Rebate.aspx).
- *California Water Service Company* – The 2010 California Water Service Company (CWSC) Urban Water Management Plan contains guidelines for Water Efficient Landscapes that CWSC uses at its properties, including renovations. For the efficient use of water, grading of a project site shall be designed to minimize soil erosion, runoff, water waste and follow the grading design criteria, **which aid in the reduction of flooding**. Ordinances for the City of Lancaster portions in the CWSC service area can be found on their website (https://www.calwater.com/conservation/ordinances.php).
- *City of Lancaster* – The City of Lancaster has landscape and water wasting ordinances in place for the efficient use of water in the City.

Informational Websites/Public Outreach

Informational websites and public outreach efforts educate the public about water quality measures that can have an impact on flood control through the encouragement of infiltration and vegetation treatment of runoff. Programs that specifically encourage water conservation improve stormwater quality by preventing stormwater runoff from carrying materials away from irrigation sites. Water quality and water conservation programs within the Region include:

- *Antelope Valley Water Partners Outreach* - The Antelope Valley Water Partners (http://dpw.lacounty.gov/wwd/web/avlinks.aspx) consists of four water districts: Los Angeles County Waterworks District 40, Palmdale Water District, Quartz Hill Water District and

Rosamond Community Services District. The Antelope Valley Water Partners provide information on water savings and water saving improvements to make residential homes and irrigation systems more water efficient. The partners offer the following programs to help customers conserve water throughout the year:

- Rebates for water saving devices (e.g. rain shut-off irrigation sensor)
- Free in-home water use audits
- Free water saving devices at community events
- Free drought tolerant plant guides

- *S/N Management Plan Website and Outreach*
  - The Antelope Valley Integrated Regional Water Management Plan website (www.avwaterplan.org) provides information on projects, stakeholders and outreach. It also includes information specific to the salt and nutrient (S/N) management planning process for the Region. The Antelope Valley Integrated Regional Water Management Plan is a multi-county collaborative effort developed to address regional concerns about water supply reliability, water quality, flood protection, environmental resources, land use management and climate change impacts in the Antelope Valley. The scope of work for the S/N Management Plan is located on the website where the final version of the S/N Management Plan will also be available when complete in 2014.
  - The Association of California Water Agencies (ACWA), a coalition of 450 public water agencies, has launched a statewide public education program, entitled "California's Water: A Crisis We Can't Ignore," to educate Californians about critical challenges now confronting the State's water supply and delivery system. The ACWA website (www.acwa.com) also provides information for salt and nutrient management plans by organizing and posting webinars on S/N information.
- *Council for Watershed Health (CWH) Website and Outreach* - Since 1996, the CWH has been Southern California's hub for essential watershed research and analysis. CWH's programs are focused on four major areas: improving water quality, increasing water supplies through sustainable landscapes and stormwater reuse, facilitating integrated planning and management, and educating decision-makers about water issues. The CWH's urban stormwater program uses research, planning and education to achieve quality and reliability of local water resources through increasing conservation, recycling, and the use of local water resources. Although CWH's focus areas are the Los Angeles River and the San Gabriel River watersheds, CWH's urban stormwater research and studies are applicable to other regions

  (http://www.watershedhealth.org/programsandprojects/urbanstormwater.aspx).
- *Environmental Protection Agency (EPA)* – The EPA's website provides additional stormwater information regarding the NPDES Stormwater Program, urban polluted runoff, managing wet weather with green infrastructure, and LID

  (http://cfpub.epa.gov/npdes/stormwater/swbasicinfo.cfm).

Stormwater Management Plans

Prior to March 10, 2003, Los Angeles County and the Los Angeles County Flood Control District were governed by the Phase I Municipal Separate Storm Sewer Systems (MS4) permit in the Los Angeles Basin Area. The Phase I MS4 permit required all County facilities to comply with the Model Program "Public Agency Activities". This program required specific BMPs for the reduction of stormwater pollutant intrusion to the storm drain system. The County requires all field yards, including those located within the Antelope Valley, to comply with the Phase I requirements that became effective February 1, 2003.

As of August 2003, Stormwater Management Plans (SWMPs)[3] were mandated to be developed to address the requirements of the Phase II General Municipal National Pollutant Discharge Elimination System (NPDES) Permit for regulated small MS4s. According to federal regulations, the purpose of the Phase II permit is to regulate stormwater discharges from small MS4s. The General permit requires regulated small MS4s to develop and implement a SWMP to effectively prohibit non-stormwater discharges and reduce the discharge of pollutants to the "Maximum Extent Practicable".

The City of Palmdale, City of Lancaster and unincorporated Los Angeles County areas were automatically designated as a small MS4 by the U.S. Environmental Protection Agency because they are located within an urbanized area defined by the Census Bureau. Unincorporated Los Angeles County areas that are designated as urbanized are the communities of Littlerock, Pearlblossom and Quartz Hill. Each agency filed a notice of intent to comply with the State Water Resources Control Board Small MS4 General Permit and submitted a SWMP in 2003. Communities in the Kern County portion of the Region were not designated as small MS4s, but instead fall under Kern County's NPDES permit obtained in 2001.

2.4.2 Existing Projects

The Antelope Valley Region has already implemented projects that provide flood protection, groundwater recharge, water supply, and/or habitat restoration benefits. Other potential projects are in development now and are being tracked by the IRWM process. All of these projects provide multiple benefits that include flood protection. Table 2-3 summarizes IFM Projects in the Antelope Valley Region that were previously submitted for acceptance into the IRWM Plan. The list is not intended to be a comprehensive or definitive list, and it reflects projects that are in various stages of development.

Table 2-3: IFM Projects in the Antelope Valley Region

Project Description	Proponents	Benefits
Local retention/detention basins, street drainage inlets, underground storm drain pipes, and culverts	City of Palmdale City of Lancaster Quartz Hill	Flood: peak flow reduction Quality: sedimentation reduction
Wastewater, recycled water, surface water, imported water and groundwater monitoring	Antelope Valley-East Kern Los Angeles County Sanitation Districts Edward Air Force Base Rosamond Community Services District Palmdale Water District	Quality: water quality data collection

[3] http://www.swrcb.ca.gov/water_issues/programs/stormwater/swmp/la_county_swmp.pdf

Project Description	Proponents	Benefits

Adopted Model Water Efficient Landscape Ordinances:
- City of Palmdale
  o Landscape ordinances that require implementation of irrigation weather control, rain shutoff sensors, etc.
- Palmdale Water District
  o ET/Smart, SWAT tested, controller rebate program
- California Water District – City of Lancaster
  o Irrigation design plan (weather based irrigation controllers)
  o Grading design plan (Capture of runoff for 10-year event required for landscape areas greater than 5,000 square feet)
- City of Lancaster
  o Landscape ordinance that require implementation of dedicated landscape water meters, weather-based irrigation controllers, soil management plans, etc.
  o Water wasting ordinance that prohibits irrigation runoff from properties, requires leaks be remedied, etc.
	City of Palmdale
	Palmdale Water District
	California Water Service Company – City of Lancaster
	City of Lancaster
		Flood: peak flow reduction
		Quality: sedimentation, urban runoff loading reduction

Informational Websites/Public Outreach - SNMP website and outreach: www.avwaterplan.org www.acwa.com - Council for Watershed Health website and outreach: http://watershedhealth.org/Default.aspx - EPA: http://cfpub.epa.gov/npdes/stormwater/swbasicinfo.cfm	LA County Waterworks District No. 40 LACSD Council for Watershed Health Environmental Protection Agency	Flood: peak flow reduction Quality: sedimentation, urban runoff loading reduction
Stormwater Management Plans	City of Palmdale City of Lancaster Los Angeles County (Littlerock, Pearlblosson and Quartz Hill)	Flood: peak flow reduction Quality: pollutant reduction

2.5 Planned Projects

Potential projects submitted for acceptance to the 2013 Integrated Regional Water Management Plan (IRWMP) include planned flood control projects for the Region that may provide both flood control and stormwater quality benefits. The projects put forward are summarized in Table 2-4 and are further described after the table.

Table 2-4: Planning Projects that Provide Both Flood Control and Stormwater Quality Benefits

Project Name	Proponent	Description of Benefits
45th Street East Groundwater Recharge and Flood Control Basin	City of Palmdale	Flood: peak flow reduction Quality: sedimentation
Antelope Valley Watershed Surface Flow Study	Edwards Air Force Base	Flood: assess impacts of stormwater and upstream flood management projects Quality: assess impacts of sediment load
Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)	City of Palmdale	Flood: peak flow reduction Quality: sedimentation
Avenue R and Division Street Groundwater Recharge and Flood Control Basin	City of Palmdale	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment
Barrel Springs Groundwater Recharge and Flood Control Basin	City of Palmdale	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment
Big Rock Creek In-River Spreading Grounds	Los Angeles County Department of Public Works (LACDPW)	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment
Hunt Canyon Groundwater Recharge and Flood Control Basin	City of Palmdale	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment
Little Rock Creek In-River Spreading Grounds	LACDPW	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment
Littlerock Creek Groundwater Recharge and Recovery Project	Palmdale Water District	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment
Littlerock Dam Sediment Removal	Palmdale Water District	Flood: peak flow reduction Quality: sedimentation
Lower Amargosa Creek Recharge Project	City of Palmdale	Flood: peak flow reduction Quality: sedimentation, soil aquifer treatment

Project Name	Proponent	Description of Benefits
Stormwater Harvesting	Leona Valley Town Council	Flood: peak flow reduction, volume reduction Quality: urban runoff loading reduction
Upper Amargosa Creek Flood Control, Recha rge, and Habitat Restoration Project	City of Palmdale	Flood: peak flow reduction, channel stabilization Quality: sedimentation, soil aquifer treatment, arsenic reduction

45th Street East Groundwater Recharge and Flood Control Basin

The 45th Street East Groundwater Recharge and Flood Control Basin Project is located in the City of Palmdale and includes the construction of a new approximately 2,083 acre-feet (AF) drainage basin near 45th Street East and Avenue P-8 on property currently owned by Los Angeles World Airports. By reducing contaminated stormwater runoff and capturing peak flows, both flood control and water quality benefits would be provided. The project will also add approximately 208 acres of new wildlife habitat.

Antelope Valley Watershed Surface Flow Study

The Antelope Valley Watershed Surface Flow Study will characterize the Antelope Valley surface water flow from the San Gabriel and Tehachapi Mountains to Rosamond and Rogers Lakes. The study will determine the amount of flow in the tributaries, determine health of lakebeds, and determine how much water is required to either keep them healthy or make them healthy. The study will also determine the impacts of implementing current and future proposed water diversion/removal projects and impacts of continued retention basin development. The study will quantify potential effects of future flood management projects and consider the influence of sediment loads to the dry lake beds. By assessing the impacts of stormwater, upstream flood management projects and sediment loads both water quality and flood control benefits would be provided.

Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)

The Q-West Basin project is located in the City of Palmdale and entails the acquisition and construction of an approximately 1,612 AF detention basin located between Avenue P-12 and Avenue Q from 20th Street East to 30th Street East. This project would create approximately 161 acres of new wildlife habitat and improve water quality as a result of reducing contaminated stormwater runoff. By capturing peak flows and reducing sediment loads, the project would provide both flood control and water quality benefits.

Avenue R and Division Street Groundwater Recharge and Flood Control Basin

The City of Palmdale proposes to construct a 950 AF basin on 93 acres located at the northeast corner of Avenue R and Division St. including all necessary and associated grading, inlet/outlet structures, spillway, and storm drain piping as part of its stormwater collection and conveyance system. The project has the ability to provide for wildlife habitat, conservation, and stormwater capture. By capturing peak flows and reducing contaminated stormwater runoff, both flood control and water quality benefits would be provided.

Barrel Springs Groundwater Recharge and Flood Control Basin

The Barrel Springs Groundwater Recharge and Flood Control Basin Project is located in the City of Palmdale and consists of construction of an 878 AF detention basin in the Barrel Springs area upstream of Old Harold Road and 25th Street East, on a 40-acre, City-owned property. The project would provide flood control and water quality benefits for the City of Palmdale by capturing peak flows, reducing contaminated stormwater runoff and increasing soil aquifer treatment. The project will also create approximately 40 acres of habitat.

Big Rock Creek In-River Spreading Grounds

The Big Rock Creek drainage area is 23 square miles. The creek runs from the San Gabriel Mountains north into the Antelope Valley. The Los Angeles County Flood Control District (part of the LACDPW) proposes to develop a spreading ground facility near the San Gabriel Mountain foothills in order to increase groundwater recharge. The facility will include earthen levees in and adjacent to the creek to capture and recharge stormwater from the creek into the groundwater basin. By capturing peak flows, reducing contaminated stormwater runoff and increasing soil aquifer treatment, both flood control and water quality benefits would be provided.

Hunt Canyon Groundwater Recharge and Flood Control Basin

The Hunt Canyon Groundwater Recharge and Flood Control Basin Project is sponsored by the City of Palmdale and entails construction of a new 3,000 AF detention/ recharge basin, located south of Pearblossom Highway at 57th Street East. The basin would be used to store aqueduct water to allow recharge into the aquifer, and it would act as a detention basin during severe storms thus providing flood control benefits. Approximately 300 acres of new wildlife habitat would be created by construction of this project. The project would also provide water quality benefits by reducing contaminated stormwater runoff.

Littlerock Creek In-River Spreading Grounds

The Littlerock Creek In-River Spreading Grounds is sponsored by LACDPW and consists of a spreading ground facility near the San Gabriel Mountain foothills in order to increase groundwater recharge. The facility will include earthen levees in and adjacent to the creek to capture and recharge stormwater from the creek into the groundwater basin. Developing an in-stream groundwater recharge facility will increase groundwater recharge by an estimated 7,600 AF per wet-year. This project will improve the health and long-term sustainability of the basin, increase local groundwater supplies, reduce the Region's reliance on water imports, and provide flood control and water quality benefits.

Littlerock Creek Groundwater Recharge and Recovery Project

The Littlerock Creek Groundwater Recharge and Recovery Project (LCGRRP) is sponsored by Palmdale Water District and involves groundwater recharge using imported water, local stormwater runoff, and recycled water from the Palmdale WRP. The Littlerock Creek Groundwater Recharge and Recovery Project would be a run-of river recharge project, utilizing the existing active natural channel system and a series of shallow recharge basins in the adjacent floodplain to recharge State Water Project water, stormwater, and recycled water. The recharge and recovery capacities of the project are projected to be about 43,000 AF per year (AFY) and 14,000 AFY, respectively. Preliminary groundwater modeling studies have demonstrated that the LCGRRP will substantially reduce drawdown of the aquifer in the Palmdale Water District's service area and in areas surrounding the project. The recharge project will provide flood control and water quality benefits by capturing peak flows, reducing contaminated stormwater runoff and increasing soil aquifer treatment.

Littlerock Dam Sediment Removal

The Littlerock Dam Sediment Removal Project will remove up to 900,000 cubic yards of sediment that has been accumulated from runoff into Littlerock Reservoir, and up to 40,000 cubic yards on an annual basis after the initial sediment is removed. The project would provide water quality and flood control benefits by reducing sediment and increasing peak flow capture during certain times of year. The project also includes a grade control structure that will protect the identified habitat of the endangered Arroyo toad.

Lower Amargosa Creek Recharge Project

The Lower Amargosa Creek Recharge Project is located in City of Palmdale and consists of development of in-stream recharge of water from the State Water Project blended with recycled water. The project would provide more than 1,000 AF of detention basin. The detention basin will capture peak flows, reduce contaminated stormwater runoff and increase soil aquifer treatment, providing flood control and water quality benefits.

Stormwater Harvesting

The Stormwater Harvesting Project includes the construction of stormwater collection and conveyance facilities, water filtration devices, and cisterns and collection tanks. Through advanced filtration methods, this project can be expanded to create potable water for residential uses. Once fully implemented, it is estimated that water conservation of up to 25 AFY could be realized. The project will provide flood control and water quality benefits by capturing peak flows and reducing urban runoff loading.

Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project

This project’s proposed improvements include: expanding the size and capacity of the natural recharge area; developing and preserving an ephemeral stream habitat; channelization of Amargosa Creek (soft bottom); and providing a grade separation of 20th Street West over Amargosa Creek. The project will increase capture of 14,600 to 53,600 AFY and provide 20 acres of flood protection capacity. The project will also create 25 acres of open space/habitat. By capturing peak flows, providing channel stabilization, reducing stormwater runoff and increasing soil aquifer treatment, flood control and water quality benefits will be provided.

3 Potential Opportunities, Constraints, and IFM Strategies

The characteristics of the region provide background into understanding the potential opportunities as well as constraints for developing IFM solutions for the Region. Flood management projects are planned and implemented to reduce risk to public safety and property while maximizing other benefits like water supply and environmental restoration. For every "problem", which can be thought of as an undesirable condition, there are "opportunities" that offer chances for improvement and "constraints" that limit implementation. The Antelope Valley includes flat valleys with numerous alluvial fans that have urban development surrounded by rainfall-collecting steep terrain. The geographic as well as meteorologic conditions are conducive to sudden flooding. The semi-arid climate, wherein total rainfall is typically concentrated in a few short months, adds to the uncertainty of flood prediction. In addition, the unique issues associated with the watershed conditions limit the application of conventional flood management solutions. The Region's flood management opportunities/constraints may be divided into four major categories: (1) physical conditions, (2) regulatory, (3) land-use, and (4) environmental/biological.

3.1 Valley Opportunities and Constraints

Physical

Different physical features define the types of flooding issues since they greatly influence the response of the watershed. The nature of the flooding created by the topography also results in different constraints and limits the ability to apply different conventional solutions for flood hazard mitigation.

Table 3-1: Physical Flood Management Opportunities and Constraints

Opportunity/Constraint	Relevance
Closed watershed system with no outlet to the ocean such that stormwater is recharged in foothills or evaporated from dry lakebeds	• Limits suitable locations for recharge • Planning is difficult because watershed has a unique response relative to rainfall events that is difficult to predict
Existing roadway and utility crossings create hydraulic conveyance limitations (e.g., California aqueduct, Highway 14, etc.)	• Hydraulic limitations represent potential target areas for fixes that may reduce flooding and sedimentation
Existing facilities and structures are located within the floodplain	• Need to define existing flood risk from existing facilities/uses within the floodplain
Sediment delivery occurs with flood flows from foothill areas	• Excessive sediment delivery causes deposition at downstream locations with flatter slopes • High sediment yields "bulk" the flood waters and increase depth of flooding
Limited topographic relief/slope that limits hydraulic conveyance	• Conveyance channel sizes will increase further downstream within the watershed because of reduced slopes
Soils/geology are primarily alluvial deposits that are highly erodible	• Channel migration routinely occurs • Erosion hazards for development adjacent to channels

Specialized geographic/geomorphic features which include alluvial fans, bajadas, and playas	• Hydraulic conditions are unique (i.e., as compared to riverine systems) and conventional flood management solutions are not applicable
Topographic features result in steep slopes in the mountains/foothills and extremely flat slopes on the valley floors	• Changes in hydraulic conveyance and sediment delivery because of the change in slopes

Regulatory

The existing regulations related to floodplain management and flood control influence the existing level of flood protection provided to the community.

Table 3-2: Regulatory Flood Management Opportunities and Constraints

Opportunity / Constraint	Reference
No regional flood agencies exist other than LA & Kern Counties	• Flooding problems within Antelope Valley are unique to the valley and different from the coastal areas which are influenced primarily by riverine flood sources • Comprehensive master plan required that reflects the regional and integrated thought process for flood management and environmental considerations
FEMA/NFIP requirements for community floodplain regulations apply	• NFIP requirements have the most influence on floodplain restrictions
No specialized design standards for desert drainage or flood protection/flood management	• Different standards are required for the valley types of flood hazards and the potential available solutions • Specialized manual of criteria and standards should be developed for desert drainage which encompasses the hydrology, sediment/erosion, and unique hydraulic conditions (based on design work in similar desert areas of the Southwest)
Accuracy of flood hazard mapping for valley floor and alluvial fans has uncertainty	• Flooding and sedimentation on alluvial fans are complex processes that are difficult to simulate numerically (model) • Alluvial fan flooding presents unique problems in terms of quantifying flood hazards, assessing sediment transport characteristics, devising reliable flood protection schemes, and evaluating impacts of various projects on flow and sediment dynamics
Water quality limitations and restrictions are based on the Basin Plan and identified TMDLs	• Water quality restrictions should be implemented as part of the regional planning solution

Land Use

Existing land use and future proposed development should be closely coordinated with the existing mapped flood hazards. Land use restrictions are one of the primary tools for floodplain management in order to reduce flood risks.

Table 3-3: Land Use Management Opportunities and Constraints

Opportunity/Constraint	Relevance
Various urban/commercial land use and additional manmade encroachments are located within the floodplain	• Limitations of development and land use restrictions are needed within active flood hazard zones

Environmental/Biological

Existing biological resources within the floodplain corridor present an opportunity to integrate the preservation of these resources into regional planning efforts. However, these resources can also represent constraints in terms of the types of solutions that can be used for flood mitigation and in terms of higher costs.

Table 3-4: Environmental/Biological Flood Management Opportunities and Constraints

Opportunity/Constraint	Relevance
Environmental permitting limitations for activities/structures within the floodplain (i.e., endangered species)	• Additional costs and/or limitations on the potential solutions available
An Antelope Valley Significant Ecological Area (SEA) is located within the central portion of the Antelope Valley, primarily east of the cities of Palmdale and Lancaster; it includes the tributary creeks to Little Rock and Big Rock Creeks (partially within U.S. Forest Service land) downstream to the valley floor and northward across the historic floodplain zones to Rosamond, Buckhorn, and Rogers dry lakes on the Los Angeles/Kern County boundary	• Existing floodplains and streams, particularly inside the SEA, are valuable biological resources

3.2 Potential IFM Strategies

Commonly-utilized IFM strategies that are applicable to Antelope Valley are presented below.

Strategy Application No.1 - Watershed Management Planning

IFM Objectives / Principles:

- Land use planning
- LID policies
- Natural resource preservation
- Sustainable development
- Water quality
- Runoff management

Description of Representative Actions / Elements:

Apply core underlying watershed management planning guidelines in developing the proposed strategies and infrastructure for future development. These guidelines would ensure that development (i) mimics existing runoff and infiltration patterns within the project area, (ii) does not exacerbate peak flow rates or water volumes within or downstream of the project area, (iii) maintains the geomorphic structure of the major tributaries within the project area, (iv) maintains coarse sediment yields, storage and transport processes, (v) uses a variety of strategies and programs to protect water quality, and (vi) acknowledges downstream beneficial uses. The principles refine the planning framework and identify key physical and biological processes and resources at both the watershed and sub-basin level. The Watershed Planning Principles focus also on the fundamental hydrologic and geomorphic processes of the overall watersheds and of the sub-basins. These principles can be utilized to guide the initial planning of the development program relative to watershed resources and to minimize impacts thereto through careful planning by integrating the initial baseline technical watershed assessments. Non-structural watershed protection planning principles would include minimization of impervious areas/preservation of open spaces and dependent natural habitats, prioritization of soils for development and infiltration, and establishment of riparian buffer zones. Examples of watershed planning principles that can be used include:

Principle 1 – Recognize and account for the hydrologic response of different terrains at the sub-basin and watershed scale.

Principle 2 – Emulate, to the extent feasible, the existing runoff and infiltration patterns in consideration of specific terrains, soil types and ground cover.

Principle 3 – Address potential effects of future land use changes on hydrology.

Principle 4 – Minimize alterations of the timing of peak flows of each sub-basin relative to the mainstem creeks and important creek tributaries.

Principle 5 – Maintain and/or restore the inherent geomorphic structure of major tributaries and their floodplains.

Principle 6 – Maintain coarse sediment yields, storage and transport processes.

Principle 7 – Protect water quality by using a variety of strategies, with particular emphasis on natural treatment systems such as water quality wetlands, swales and infiltration areas and application of Best Management Practices within development areas to assure comprehensive water quality treatment prior to the discharge of urban runoff into the floodplain corridor

Potential Benefits:

- Integrated land planning process with watershed functions
- Managed runoff from development and commercial watershed activities
- Maintain natural runoff process
- Minimize long term maintenance costs within floodplain
- Protect downstream beneficial natural biological processes

Strategy Application No.2- Floodplain Management
IFM Objectives / Principles: • Integrated land use planning • Natural floodplain corridor preservation • Sediment management / stream stability • Natural streambed groundwater recharge 
Description of Representative Actions / Elements: Facilitating improved alignment and coordination between land use and flood management would result in better understanding of flood risk and potential impacts to proposed developments, as well as improved decision making. Specifically, flood risk information has the potential to influence land use policy decisions related to developing and expanding communities within a floodplain, which would result in reductions to flood damage claims and long-term O&M costs on projects. At the planning stage, additional measures might be incorporated into the initial proposed projects that could provide community benefits, such as setback areas that act as greenways or trails, and greatly reduce the need to retrofit or replace undersized infrastructure in the future. Too often, regional and land use policymakers realize flood risk and economic losses only after a damaging flood event. Some of the additional actions associated with this item include defining increased floodways to limit development along the floodplain fringe, floodplain retreat through purchase of properties within the floodplain, and ensuring that different land uses are compatible with the floodplain risks.
Potential Multiple Water Resource Benefits: • Reduction in flood damage subsidies to chronic flood locations

Strategy Application No.3 – Stream Stabilization

IFM Objectives / Principles:

- Sediment control
- Increased floodplain capacity
- Water quality
- Reduce negative impacts of sediment deposition downstream

Description of Representative Actions / Elements:

Channel erosion, with substantial stream incision, can be a large contributor of sediment to downstream receiving waters and deposition in portions of channels that reduce flood capacity. In addition, increased sediment transport will "bulk" the runoff flows in the channel and further diminish the flood conveyance capacity. Watershed based regional studies/investigations of the fluvial processes and watershed sediment yields as well as geomorphic assessments/monitoring can evaluate those critical locations within the watershed that require stabilization. Stream erosion and sedimentation adversely impact water quality beneficial uses of both the stream and the receiving waters, and sediment TMDL. Stabilization of the natural alluvial channel system to eliminate future erosion of the streambed and streambank will assist in critical channel areas as a major sediment source as well as disrupting the loss of vegetative habitat within the floodplain. Detailed streambed stability assessments provide part of the technical support for the evaluation of the benefits of and opportunities for alternative stream stabilization / restoration techniques to ensure that the natural geomorphic and fluvial processes are maintained in balance. Stream stabilization and sediment control efforts should also recognize beneficial downstream impacts of sediment transport.

Potential Benefits:

- Minimize maintenance in floodplains
- Reduce long term operations costs
- Reduce apparent peak discharge through reduced sediment bulking
- Reduce loss of land
- Improve recharge in streambed
- Reduce sediment deposition in riverine /estuarine habitat areas
- Recognize beneficial downstream impacts of sediment transport

Strategy Application No. 4 – Watershed Sediment Control / Erosion Management

IFM Objectives / Principles:

- Land use planning
- Development sustainability
- Water quality enhancement

Description of Representative Actions / Elements:

Soil is considered a water pollutant because it can significantly affect water used for public consumption, recreation and habitat. Therefore, the most effective way to control soil erosion is at its source. Erosion control best management practices (BMPs) are required on all land disturbance sites to provide a defense against soil erosion in addition to different commercial activities within the watershed. Watershed planning that implements different BMPs can be applied, as well as the modification of commercial activities to minimize sediment disturbances. There are also natural areas which may be de-stabilized and be a significant sediment source which require specialized treatments to reduce the amount of sediment production. Sediment control efforts should also recognize beneficial downstream impacts of sediment transport.

Potential Benefits:

- Receiving waters improved water quality
- Reduce flooding through reduced sediment bulking of flows
- Reduction of sediment deposition in undesirable locations within floodplain
- Recognize beneficial downstream impacts of sediment transport

Strategy Application No.5 – Multi-Function Flood Storage / Recharge Basins

IFM Objectives / Principles:

- Flood reduction
- Groundwater recharge
- Stormwater recycling / alternative water source

Description of Representative Actions / Elements:

Regional watershed evaluation and planning to provide flood peak flow attenuation through either off-channel or adjacent in-channel temporary flood volume storage. The reduction in peak flow rates will minimize downstream flooding. In addition, the stored flood runoff volumes can be recharged into the aquifer to enhance groundwater supplies. Coordination with groundwater management agencies should be performed on a watershed basis to determine the optimum location to ensure that maximum recharge can be provided to the aquifer since different areas of the watershed may not provide any benefit to groundwater supplies. Coordination of both groundwater and flood benefits is necessary as part of advance planning with multiple agencies. In addition, floodplain enlargement can result in increased habitat corridors as well as improving the in-channel flood storage capabilities.

Potential Benefits:

- Reduced flooding downstream

- Stormwater recycling and additional water source capture

Strategy Application No.6 – Urban Water Quality Treatment / Retention
IFM Objectives / Principles: • Water reuse / recycling • Groundwater recharge • Natural floodplain protection • Stream stabilization • Water quality treatment • Urban flood management 
Description of Representative Actions / Elements: Management of urban stormwater runoff and the associated water quality as well as increased runoff quantities impacting the natural floodplain corridors which result in a variety of impacts, not just increased flooding. Projects involving the capture of dry weather flows provide an opportunity to recycle this water source, often considered a waste-stream in the past
Potential Benefits: • Improved water quality and reduced impacts to downstream receiving waters • Restoration of natural floodplain functions • Reduced impacts of urban hydromodification

Strategy Application No. 7 – Floodplain Habitat Corridor Preservation / Buffer	
IFM Objectives / Principles: • Vegetation buffer • Habitat preservation • Stream corridor stabilization	
Description of Representative Actions / Elements: Wetlands and floodplain vegetation can provide a hydrologic buffer to watershed responses through reduced velocity and increased time. The watershed vegetation can buffer the intensity of rainfall events and the corresponding watershed response, which can reduce flooding downstream. The preservation of natural vegetation reduces water flow connectivity by interrupting surface flows of water.	
Potential Benefits: • Reduction of streambank/streambed erosion through natural protection • Enhanced wildlife habitat benefits • Natural water quality biological uptake benefits	

Strategy Application No. 8 - Enhanced Floodplain Storage / Recharge

IFM Objectives / Principles:

- Floodplain preservation
- Flood storage / groundwater recharge
- Peak flow reduction
- Flooding reduction
- Maintenance of natural hydrologic processes

Description of Representative Actions / Elements:
Use of the floodplain to provide temporary in-channel storage to reduce peak flow rates downstream. The identification of potential flood storage areas within the floodplain involves integrating wetland and floodplain beneficial functions into floodplain management planning. Protection of floodplain and wetland vegetation from erosion is particularly important for high velocity areas

Potential Benefits:

- Enhanced groundwater supplies
- New water source
- Habitat enhancement and increased corridor width

Strategy Application No. 9 - Coordination between programs/agencies for water management and flood management planning.

IFM Objectives / Principles:

- Communication between agencies within watershed
- Watershed planning guidance / regulations
- Enhanced water supplies
- Water management

Description of Representative Actions / Elements:
Improving coordination between regional water management and flood management planning is a key strategy to increase implementation of IFM projects. Existing planning groups and forums should be utilized to the extent possible. By coordinating water and flood management planning with balanced representation, a common understanding of flood management, water supply, water quality, environmental stewardship, public safety, and economic sustainability factors may be developed. Where possible, policy changes that promote this holistic approach to IFM should be proposed and sponsored (e.g., changes to existing IRWM legislation). In addition, coordination in the watershed planning process provides the opportunity to optimize the benefits of joint-use regional facilities to maximize water resources as well as flood mitigation benefits.

Potential Benefits:

- Maintaining a natural watershed response
- Increased groundwater replenishment
- Reduced flood damage
- Reduction in flood maintenance

Strategy Application No. 10 - Watershed / floodplain information management and data exchange

IFM Objectives / Principles:

- Communication between agencies within watershed
- Community involvement
- Increased watershed monitoring

Description of Representative Actions / Elements:

Improving the watershed database to ensure that different watershed stakeholders have access to the available information and studies being performed. The sharing and the exchange of data, information, knowledge among experts, general public, policy makers, and floodplain managers in a transparent manner is essential for comprehensive planning and effective management. Significant studies and mapping information are being developed within the watershed with single functions, but they could become a valuable regional, integrated asset if shared with other users and could help to reduce costs. Fragmentation of data is common, and providing a common data repository and manager supports the technical foundation for comprehensive planning.

Potential Benefits:

- Improved tracking and monitoring of watershed characteristics
- Reduction in data acquisition needs
- Enhanced community involvement in watershed, including active participation in data collection

3.3 Community Rating System (CRS) Participation

The National Flood Insurance Program (NFIP) Community Rating System (CRS) is a voluntary program that communities can participate in to encourage implementation of floodplain management activities that exceed the minimum NFIP standards. These minimum standards specify that communities (1) incorporate the requirements into their subdivision, zoning, and other land use ordinances or building codes or (2) adopt a separate floodplain management ordinance. The standards include the following requirements:

- Special Flood Hazard Areas (SFHAs) - development must have a permit from the community.
- V Zones - these are areas along coasts subject to inundation by the 1% annual chance flood with additional hazards associated with storm-induced waves. Development is discouraged, though not prohibited; and it is required that the lowest horizontal structural member be above the Base Flood Elevation (BFE) and be built on piles or columns or otherwise properly anchored to resist erosion. Additionally, areas below the BFE must have break away walls.

The CRS allows numerical scoring of the different floodplain management activities in addition to the above listed requirements. Scores above the minimum NFIP requirements are eligible for reductions in flood insurance premiums. CRS discounts for eligible communities on flood insurance premiums range from 5% to 45%. Those discounts provide an incentive for new flood protection activities that can help protect lives and property in the event of a flood.

Flood insurance premium rates are discounted to reward community actions that meet the three goals of the CRS: (1) reduce flood damage to property; (2) strengthen and support the insurance aspects of the NFIP; and (3) encourage a comprehensive approach to floodplain management. Based on the total number of points earned, the CRS places a community into one of ten "Classes." The discount on flood insurance is based on the Class. A general indication of the points required for each Class designation as well as the corresponding insurance premium reduction is illustrated in **Table 3-5**. For example, if the community earns 4,500 or more points it is placed in Class 1, and qualifying property owners in the floodplain receive a 45% discount. If a community does not apply or fails to receive at least 500 points, it is placed in Class 10, and property owners get no discount. The County of Los Angeles has been a participant in the CRS since 1991 and has qualified for a CRS Class rating of 7, for a 15% discount on flood insurance in SFHAs.

Table 3-5: CRS Class and Insurance Premium Reduction

Credit Points	Rate Class	Premium Reduction SFHA*	Premium Reduction Non-SFHA*
4,500+	1	45%	10%
4,000 – 4,499	2	40%	10%
3,500 – 3,999	3	35%	10%
3,000 – 3,499	4	30%	10%
2,500 – 2,999	5	25%	10%
2,000 – 2,499	6	20%	10%
1,500 – 1,999	7	15%	5%
1,000 – 1,499	8	10%	5%
500 – 999	9	5%	5%
0 – 499	10	0	0

* SFHA = Special Flood Hazard Area

The CRS Classes are based on 19 different creditable flood management activities that are organized under four general categories which include: (1) 300-public information, (2) 400-mapping and regulations, (3) 500-flood damage reduction, and (4) 600-flood preparedness. Credit points are assigned to the different activities as shown in Table 3-6 based upon the extent to which an activity advances the three goals of the CRS. A given community can choose to undertake some or all of the 19 different CRS activities, but the community is required do Activity 310, *Elevation Certificate*, at a minimum; and if the community has designated repetitive losses then it must also do Activity 510, *Floodplain Management Planning*. All the other activities are optional.

Section 401 of the *Coordinator's Manual* is important relative to the specific flood hazards in the Antelope Valley because this section discusses the additional credits for mapping "special flood hazards," recognizing that the mapping and regulatory standards of the NFIP do not adequately address all flood problems. Communities may receive credits for mapping, preserving open space, and regulating new development in areas subject to the following seven special flood-related hazards: (1) uncertain flow paths, (2) closed basin lakes, (3) ice jams, (4) land subsidence, (5) mudflow hazards, (6) coastal erosion, and (7) tsunamis. Locally, the Antelope Valley is subject to the hazard of "uncertain flow paths" due to the existence of alluvial fans in the Region. Table 3-6 indicates the CRS activities and the potential points that may be awarded for implementing these activities.

Table 3-6: CRS Activities and Points Awarded

Activity	Maximum Possible Points[1]	Maximum Points Earned[2]	Average Points Earned	Percentage of Communities Credited
300 Public Information Activities				
310 Elevation Certificates	116	116	46	100%
320 Map Information Service	90	70	63	93%
330 Outreach Projects	350	175	63	90%
340 Hazard Disclosure	80	57	14	68%
350 Flood Protection Information	125	98	33	92%
360 Flood Protection Assistance	110	65	49	41%
370 Flood Insurance Promotion	110	0	0	0%
400 Mapping and Regulations				
410 Floodplain Mapping	802	585	65	50%
420 Open Space Preservation	2,020	1,548	474	68%
430 Higher Regulatory Standards	2,042	784	214	98%
440 Flood Data Maintenance	222	171	54	87%
450 Stormwater Management	755	540	119	83%
500 Flood Damage Reduction Activities				
510 Floodplain Mgmt. Planning	622	273	123	43%
520 Acquisition and Relocation	1,900	1,701	136	23%
530 Flood Protection	1,600	632	52	11%
540 Drainage System Maintenance	570	449	214	78%
600 Flood Preparedness Activities				
610 Flood Warning and Response	395	353	144	37%
620 Levees	235	0	0	0%
630 Dams	160	0	0	0%

1 The maximum possible points are based on the 2013 Coordinator's Manual
2 The maximum points earned are converted to the 2013 Coordinator's Manual from the highest credits attained by a community as of October 1, 2011. Growth adjustments and new credits for 2013 are not included.

3.3.1 Cost and Benefits for Participation in CRS

Although there is no fee charged to apply for participation in the CRS, the community still incurs costs. These costs are associated with implementing creditable floodplain management activities and the staff time needed to document those activities. The costs also include staff time to prepare for and participate in the recertification process and verification visits. These are not insignificant costs. The implementation costs should be evaluated and compared to the benefits achieved through reducing the class rating and the corresponding reduced insurance rates. Few, if any, of the CRS activities will produce premium reductions equal to or greater than the cost of their implementation. In considering whether to undertake a new floodplain management activity, a community must consider all of the benefits the activity will provide (not just insurance premium reductions) in order to determine whether it is worth implementing.

Potential benefits of participation in CRS include:

- Reduction in flood insurance premiums for residents and businesses; the dollar savings varies according to the CRS class, the number of policies, and the amount of coverage.

- Enhanced public safety, reduction in damage to property and public infrastructure, avoidance of economic disruption and losses, reduction in human suffering, and protection of the environment provided by the credited activities.
- Opportunity to evaluate the effectiveness of a community's flood program against state and nationally recognized benchmarks.
- Opportunity to get training and technical assistance in designing and implementing credited flood protection activities.
- Initiation of new public information activities; these activities to build a knowledgeable constituency within the community.
- Development of an effective motivator to continue implementing flood protection programs during the "dry years."
- Mutual support among participating CRS communities.

4 Conclusions and Recommendations

It is clear from the discussions that precede this section that an IFM approach could be implemented in the Antelope Valley that would not only reduce flooding, but improve water quality and increase water supply. A general framework for the application of an IFM approach throughout the Antelope Valley that will maximize water resources benefits is summarized below and more specific recommendations follow.

1. **Increase collaboration/communication between agencies responsible for municipal and regional floodplain management**
    - Develop framework and process for different levels of communication between floodplain managers
    - Provide regional working forum (*Watershed/Floodplain Managers Forum*) for agencies and local government that allows increased collaboration with regular meetings
    - Provide basis for a regional work-group forum of floodplain managers and watershed stakeholders that allows increased collaboration with regular meetings. Utilize existing industry forums or planning groups, such as the Floodplain Mangers Association, to establish these initial working groups.
2. **Improve understanding and accuracy of regional and local flood risks on a watershed basis**
    - Develop understanding of the different types of flooding from both regional and local levels and examine specific flood problems (i.e., inventory common “hot spots” with chronic problems)
    - Provide methodology to define the magnitude of flood risks; this will better prioritize the level of flood risk and potential flood damage
    - Review common recurring flood damage losses and evaluate the sources of these flood problems
3. **Develop regional watershed database to assist in flood management planning that will provide a data exchange of information for all watershed stakeholders**
    - Ensure that different watershed stakeholders have access to the available information and studies being performed
    - Develop community-based watershed groups to provide monitoring of floodplains and reduce costs of performing these services while increasing the active field database
    - Collect and compile watershed mapping information related to flood hazards and watershed information in a GIS format
    - Develop an updated GIS database of the existing flood control and flood management infrastructure
4. **Develop an inclusive “watershed based” planning strategy, which includes collaboration with all stakeholder groups, to minimize conflicts and define specific watershed goals**
    - Develop understanding of the different priority goals of the watershed stakeholders based on the common recurring flooding issues/problems/hazards, not necessarily based on institutional or political boundaries
    - Involve environmental groups and other agencies (e.g., Edwards Air Force Base) in the planning process

5. **Initiate understanding and awareness of IFM**
    - Prepare educational material and information on the background of IFM to foster a better understanding of the approach
    - Provide examples of IFM projects to assist in understanding
    - Provide information to stakeholders to ensure an understanding of watershed processes from the top of the watershed to the bottom.
6. **Identify applicable IFM strategies that may be implemented on a watershed basis**
    - Define common types of IFM strategies which integrate different planning principles on different scales (1) watershed level, (2) city level, and (3) neighborhood/local level
    - Develop regional mapping of both opportunities and constraints related to IFM
    - Develop a specialized GIS based tool which defines the locations of IFM projects at a regional scale, illustrates multiple benefits, and provides a method for prioritizing flood management projects
7. **Develop a watershed planning guidance program for implementing IFM through different land planning regulations**
    - Develop a watershed planning process framework with key planning principles for implementing IFM that focuses on linking sustainability, water resource management, and land use planning to flood management
    - Prepare guidance on integrating “land use planning” as a central element of IFM and explain how it can be utilized for different types of floodplain hazard issues
    - Develop an overall guidance document that provides stakeholders with the basis for watershed planning with IFM

4.1 Recommended Stakeholder Collaboration

The Antelope Valley is unique with regard to floodplain management administration since there are multiple county jurisdictions as well as federal lands (i.e., EAFB and Air Force Plant 42). There are a variety of stakeholders, such as the local cities and other agencies, which are directly involved with implementation of floodplain management policies. The fragmentation of floodplain management responsibility makes watershed scale planning more difficult. It is recommended that a Watershed/Floodplain Managers Forum be established that promotes collaboration with the floodplain managers and with the other water resource agencies. The current work group (i.e., the Flood Committee) established as part of the 2013 IRWMP Updates can be utilized as the initial framework for the forum. This forum would assist in defining the framework and process for different levels of communication of the different levels of flood managers and watershed stakeholders. The process will define different strategies and media for communication; it will also disseminate information about planning and management activities. In addition, the forum can engage the managers and stakeholders with workshops in order to encourage participation in the plan development and execution. This working forum is a critical element that should continue into the future after the initial plan structure has been developed. It can be used as a regular vehicle for communication and collaboration to ensure effective watershed planning and execution.

4.2 Recommendations for CRS Participation

Local communities and other watershed stakeholders in the Antelope Valley can become involved in the CRS program. The County of Los Angeles is already a participant, so many of the regional floodplain management elements are being administered through that agency. The CRS activities and program that the county has developed can be utilized to implement more specific activities that focus directly on the needs of the Antelope Valley. The following are recommendations for participating in CRS activities, based on achieving the maximum benefit to cost ratio in terms of the highest CRS points rating:

Initial Activities:

- Obtain and review the CRS documentation that Los Angeles County has developed as part their community program in the four different categories. Utilize these activities already performed by the county as a guide and foundation to build upon.
- Contact Los Angeles County and the cities of Lancaster, Palmdale, Rosamond, and Mojave to see what CRS activities, if any, are already being implemented.
- Investigate the approximate rating of the community as the scoring baseline to help quantify the benefits from additional flood management activities. A simple way to determine whether the Antelope Valley qualifies for a Class 9 credit (500 credit points) is the CRS "Quick Check," an excel spreadsheet. By using the Quick Check spreadsheet, a community can estimate its potential CRS credit. The Quick Check uses average credits at the element level. It can be found at www.CRSresources.org/200. (The CRS Quick Check spreadsheet is attached to this technical memo for reference)
- Assess "gaps" where additional items could easily be implemented using the Quick Check as an initial inventory of the floodplain management program activities
- Determine if there are any repetitive loss properties within their communities. As a basic requirement for joining the CRS, communities with properties that have received repeated flood insurance claims payments must map the areas affected, and communities with 10 or more properties must prepare, adopt, and implement a plan to reduce damage in repetitive loss areas. These steps are presented below:
    - Review and describe its repetitive loss problems
    - Prepare a map of the repetitive loss area(s)
    - Undertake an annual outreach project to the repetitive loss area(s) and submit a copy of the outreach project with each year's recertification
    - Prepare a floodplain management plan for its repetitive loss area(s)
- Develop a Floodplain Management Plan (FMP) that assesses the flooding hazards, summarizes previous and current management programs, describes potential mitigation strategies, and presents a plan for future action. It is also intended to address concerns with Repetitive Loss (RL) properties. This is a significant work effort to develop this planning document and could result in substantial costs.

Public Information (300 series) Activities:

- Prepare public information brochures that cover the following flood protection topics:
    - Causes and extent of flooding
    - What is being done about flooding
    - What to do during a flood
    - How people can protect their homes
    - Flood insurance
    - Taking care of drainage ways
- Establish a public information outreach strategy team. It need not be a formal organization. The team must have at least three members. At least one team member must be someone familiar with the community's floodplain management program, such as the CRS Coordinator. At least one member must be a representative from outside community government. This could be someone

from the public schools, a neighborhood association, the Red Cross, insurance agencies, utilities, or other offices involved in education or floodplain management.

- Provide the library and other offices with a list of appropriate flood protection references, government publications, internet websites, and maps. The list should include ordering or contact information for each item.
- Prepare news releases and news articles on flood protection measures and the progress of implementing flood management activities for the local newspapers at least once every quarter.
- Prepare a homeowner's property protection manual and make available for interested residents and businesses.
- Hold public outreach meetings with selected groups, including schools and teachers, to help members become familiar with flooding, flood protection measures, natural floodplain and wetland functions, and community services.
- Develop public education campaigns and materials to improve preparedness and awareness; and cooperate with local educational institutions, hospitals, media outlets, and libraries in distributing these materials.
- Meet with the local chapter of the Association of Realtors® to discuss and promote greater understanding of flood risks, flood insurance, available resources, and the importance of disclosing flood risk information to prospective renters and buyers.
- Inform and assist property owners who want to protect themselves from flooding.
    - Provide flood elevation, flood zone, and dam inundation information to inquirers.
    - Conduct site visits to review flooding and drainage problems, and provide advice to owners.

Mapping and Regulations (400 series) Activities

- Perform more detailed floodplain mapping studies of the major washes, particularly the alluvial fans, to provide a more detailed assessment of the flooding patterns. In particular, the alluvial fans result in unconfined flows which require specialized hydraulic models in order to evaluate the distribution or spread of flows. Provide improved floodplain mapping study beyond the minimum performed through the FEMA Flood Insurance Study (FIS).
- Adjust the General Plan to preserve more of the active floodplain or flood hazard areas as open space or park area. Review the different allowed land uses within the flood hazard areas and consider modifying some of these uses to restrict development within the floodplain where appropriate.

Flood Damage Reduction (500 series) Activities

- Develop program to annually or more frequently inspect channels to prevent the deposition of debris.
- Develop ordinance to prevent the dumping of debris within mapped floodplains.

Flood Preparedness (600 series) Activities

- Assist the County to establish an ongoing program to add new gages to the County's ALERT system each year. For maximum credit under the NFIP CRS, a community must have at least one stream gage for each major developed drainage basin or one gage for every 10 square miles.
- Encourage active participation of all municipalities in a countywide system to improve the overall effectiveness of flood warning in this portion of the County.
- Tie flood response actions in the Emergency Operations Plan to flood stages.
- Conduct quarterly drills to test Emergency Operations Center Activation procedures.

- Develop emergency operations and mitigation plans for each critical facility. These plans should identify tasks to be implemented by the facilities, the amount of warning time needed to complete operational and mitigation tasks, and the resources necessary to complete their assigned missions.

4.3 Recommendations for Flood Control and Stormwater Quality Projects

Potential planned flood control and water quality projects that could be implemented are summarized in Table 4-1 and are described in detail following the table. Many of the techniques and BMPs have demonstrated not only water quality improvements, but also documented reductions of flood flows in Los Angeles County.

Table 4-1: Potential Projects that could Provide Flood Control and Stormwater Quality Benefits

Project Description	Potential Proponents	Potential Benefits
Stormwater BMPs Types of projects include: • Alternative Turnarounds • Conservation Easements • Eliminating Curbs and Gutters • Green Parking • Green Roofs • Regional Infrastructure Planning • Low Impact Development (LID) – see below • Open Space Design • Protection of Natural Features • Redevelopment • Riparian/Forested Buffer • Street Medians	Counties Municipalities Water Purveyors Water Retailer Advocacy groups	Flood: peak flow reduction Quality: sedimentation, urban runoff loading reduction
Low Impact Development (LID) Type of projects include: • Bioretention Cells • Rain Gardens • Tree Boxes • Cisterns And Rain Barrels • Green Roofs • Permeable And Porous Pavement • Grass Swales • Depression Grading • Sidewalk Storage • Soil Amendments • Gutter Disconnections (retrofit)	Counties Municipalities Water Purveyors Water Retailer Advocacy groups	Flood: peak flow reduction Quality: sedimentation, urban runoff loading reduction

Stormwater Best Management Practices

The Cities and towns of Lancaster, Palmdale, Littlerock, Pearlblossom and Quartz Hill each have an existing SWMP. Depending on the size of the development, new development and redevelopment projects require the implementation of the most effective combination of BMPs for stormwater/urban runoff pollution control.

BMPs address the increased volume and rate of runoff from impervious surfaces, and the concentration of pollutants in the runoff. BMPs can include site design, source control and structural BMPs such as infiltration devices, ponds, filters and constructed wetlands. Site design and maintenance programs such as LID practices preserve/recreate natural landscape features or minimize effective imperviousness and management measures such as maintenance practices, street sweeping, public education and outreach programs. Examples of BMPs projects include:

- Alternative Turnarounds
- Conservation Easements
- Eliminating Curbs and Gutters
- Green Parking
- Green Roofs
- Regional Infrastructure Planning
- Low Impact Development (LID) – see next section
- Open Space Design
- Protection of Natural Features
- Redevelopment
- Riparian/Forested Buffer
- Street Design and Patterns

Low Impact Development

Low impact development (LID) is an approach to managing stormwater and urban runoff at the source. LID allows stormwater to be captured, filtered onsite, infiltrated into the ground or be reused for landscaping. For new development and redevelopment projects in the Cities of Lancaster, Palmdale, Littlerock, Pearlblossom and Quartz Hill, LID projects can be implemented for stormwater/urban runoff pollution control. LID includes non-structural BMPs which are practices to preserve/recreate natural landscape features or minimize effective imperviousness and management measures such as maintenance practices, street sweeping, public education and outreach programs. Examples of LID projects include:

- Bioretention cells
- Rain Gardens
- Tree boxes
- Cisterns and Rain Barrels
- Green roofs
- Permeable and porous pavement
- Grass swales
- Depression grading
- Sidewalk storage
- Soil Amendments
- Gutter disconnections (retrofit)

A specific example of a successful LID program is the Stormwater Infiltration Retrofit Pilot Program sponsored by Orange County Coastkeeper, a nonprofit clean water organization in Orange County. This Pilot Program converted 10 individual residential parcels into LID demonstrations to reduce water pollution and conserve water. The total stormwater capture capacity for the program was about 15,700 gallons per year.

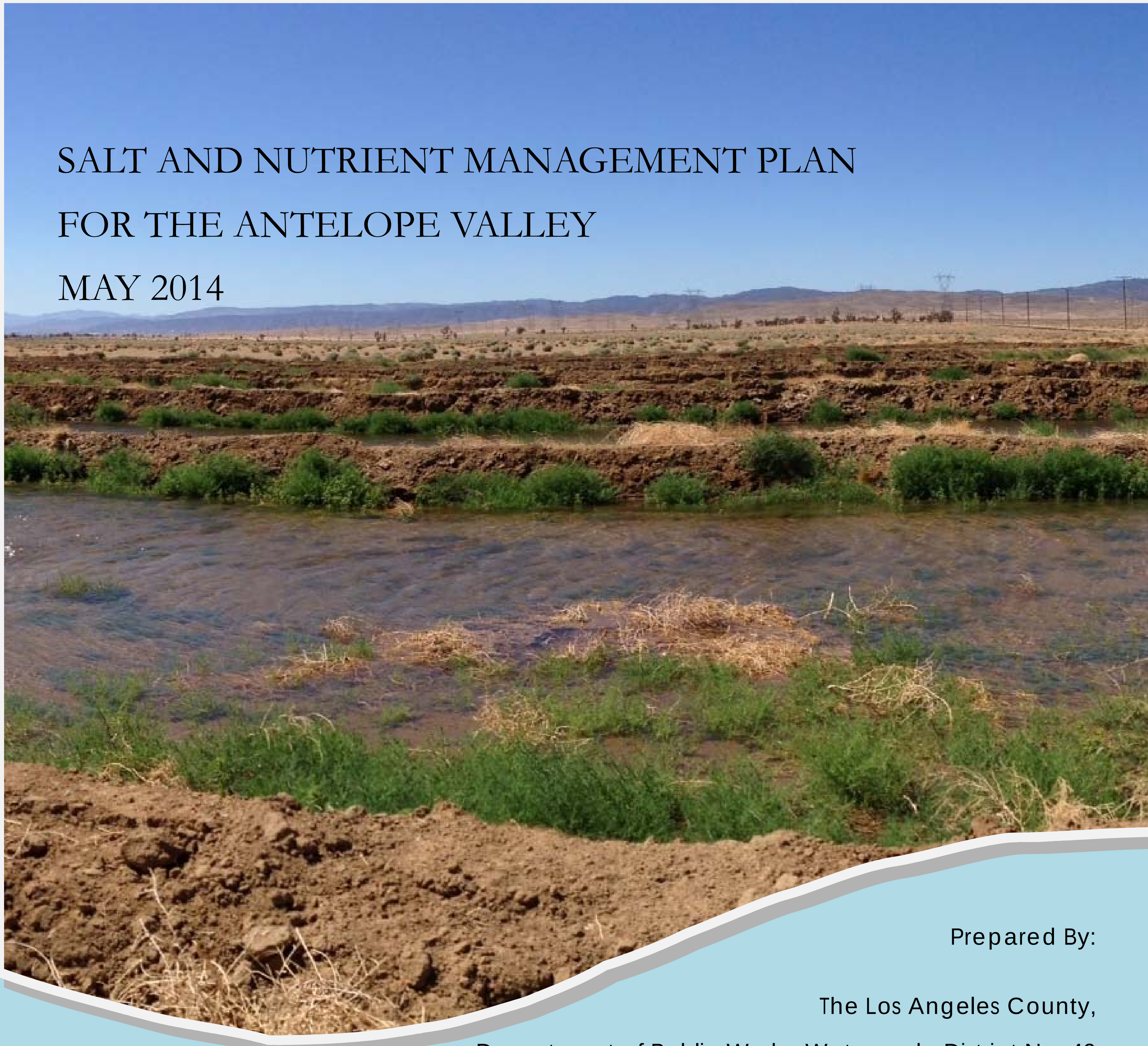
Page Intentionally Left Blank

Appendix G: Salt and Nutrient Mangement Plan

Page Intentionally Left Blank

SALT AND NUTRIENT MANAGEMENT PLAN FOR THE ANTELOPE VALLEY

MAY 2014



Prepared By:

The Los Angeles County,
Department of Public Works Waterworks District No. 40

The Los Angeles County, Sanitation Districts Nos. 14 and 20

Antelope Valley Salt and Nutrient Management Planning Stakeholders Group




THIS PAGE LEFT INTENTIONALLY BLANK

Table of Contents

Section 4: Basin and Antidegradation Analysis

Section 5: Monitoring

Section 6: Implementation Measures

List of Figures

List of Tables

Appendices

Executive Summary

Salt and Nutrient Management Plan Overview

In February 2009, the State Water Resources Control Board (State Board) established a statewide Recycled Water Policy to encourage and provide guidance for the use of recycled water in California. The Recycled Water Policy requires local water and wastewater entities, together with local salt and nutrient contributing stakeholders to develop a Salt and Nutrient Management Plan (SNMP) for each groundwater basin in California. Development of the SNMP is required to get recycled water projects approved and permitted by the Lahontan Regional Water Quality Control Board (Regional Board).

This SNMP was developed for the Antelope Valley (AV) Groundwater Basin through a collaborative effort to manage salts and nutrients (as well as other constituents) from all sources to ensure water quality objectives are met and sustained, and beneficial uses of the groundwater basin are protected.

Existing Groundwater Quality

The SNMP stakeholders, with the Lahontan Regional Board, selected total dissolved solids (TDS), chloride, nitrate, arsenic, boron, fluoride, and total chromium to characterize the water quality in the Antelope Valley Groundwater Basin. These constituents are either associated with recycled water use or detected at elevated levels in parts of the region. The average basin groundwater concentrations of these constituents, measured in samples collected between 2001 and 2010, were used to establish the baseline water quality for the groundwater basin.

Table ES-1 provides the baseline water quality and current assimilative capacity for each constituent in the groundwater basin. The water quality management goals for the Antelope Valley SNMP are based on protecting the Regional Board designated beneficial uses of the Antelope Valley groundwater basin, specifically Agricultural Supply (AGR) and Municipal and Domestic Supply (MUN). Assimilative capacity is the difference between the water quality management goal and the baseline water quality and refers to the capacity of the groundwater basin to receive salts and nutrients without exceeding beneficial use standards. Arsenic and TDS have 0.34 µg/L (3.4% of management goal) and 100 mg/L (22% of management goal), respectively, of assimilative capacity remaining. The other constituents have an assimilative capacity ranging from 56% to 89% of the water quality management goal.

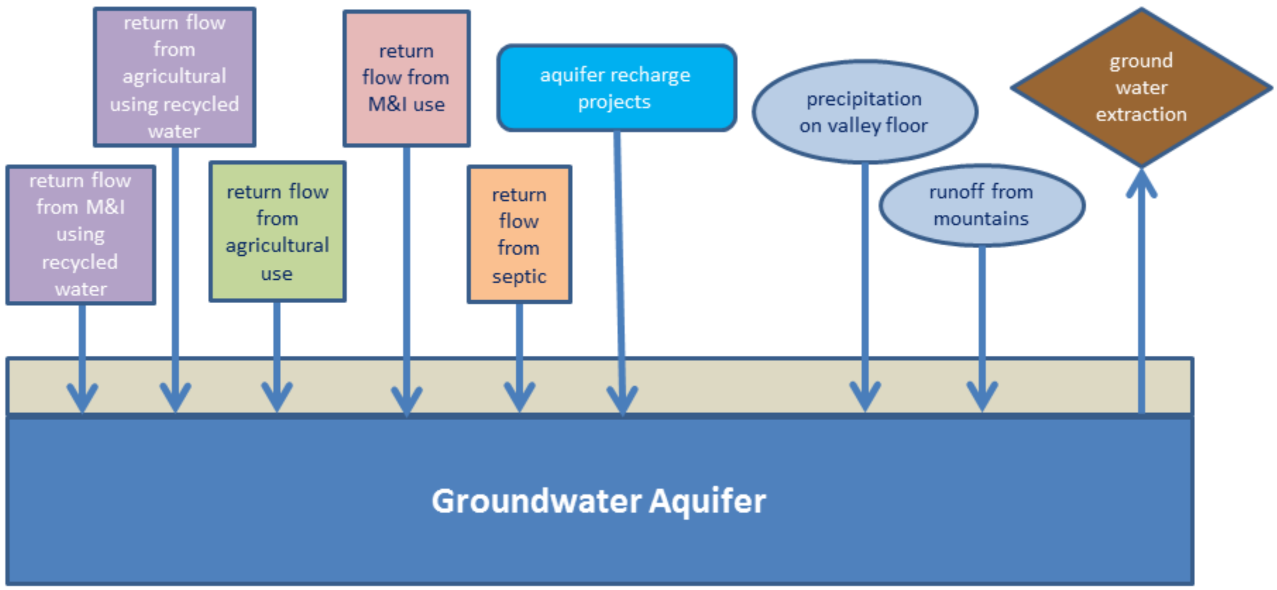
Table ES-1: Water Quality for Antelope Valley Groundwater Basin

	Arsenic (µg/L)	Boron (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate as N (mg/L)	Total Chromium (µg/L)	TDS (mg/L)
Goal	10	0.7	238	1	10	50	450
Baseline Water Quality	9.66	0.17	38.4	0.44	1.97	5.5	350
Assimilative Capacity	0.34	0.53	199.6	0.56	8.03	44.5	100

Future Groundwater Quality

Salt and nutrient loading from surface activities to the Antelope Valley Groundwater Basin are due to various sources, including agricultural irrigation, outdoor municipal and industrial water use, and on-site waste disposal systems. Natural recharge from precipitation and mountain runoff are also sources of salt and nutrient loading. The Antelope Valley is a closed basin and the only major groundwater outflow is groundwater pumping. Figure ES-1 depicts the direct loading and unloading of water, salts, and nutrients in and out of the groundwater basin.

Figure ES-1: Salt and Nutrient Balance



To better understand the significance of the various loading factors, a spreadsheet-based mixing model was developed. TDS and arsenic water qualities were incorporated into the model because of their potential to exceed SNMP water quality management goals. The mixing model calculated impacts of the identified projects that may contribute TDS and arsenic to the groundwater over the 25-year planning period (2011-2035) of the SNMP (see Table ES-2 and Figure ES-2). The model was used to predict future water quality and water quality trends.

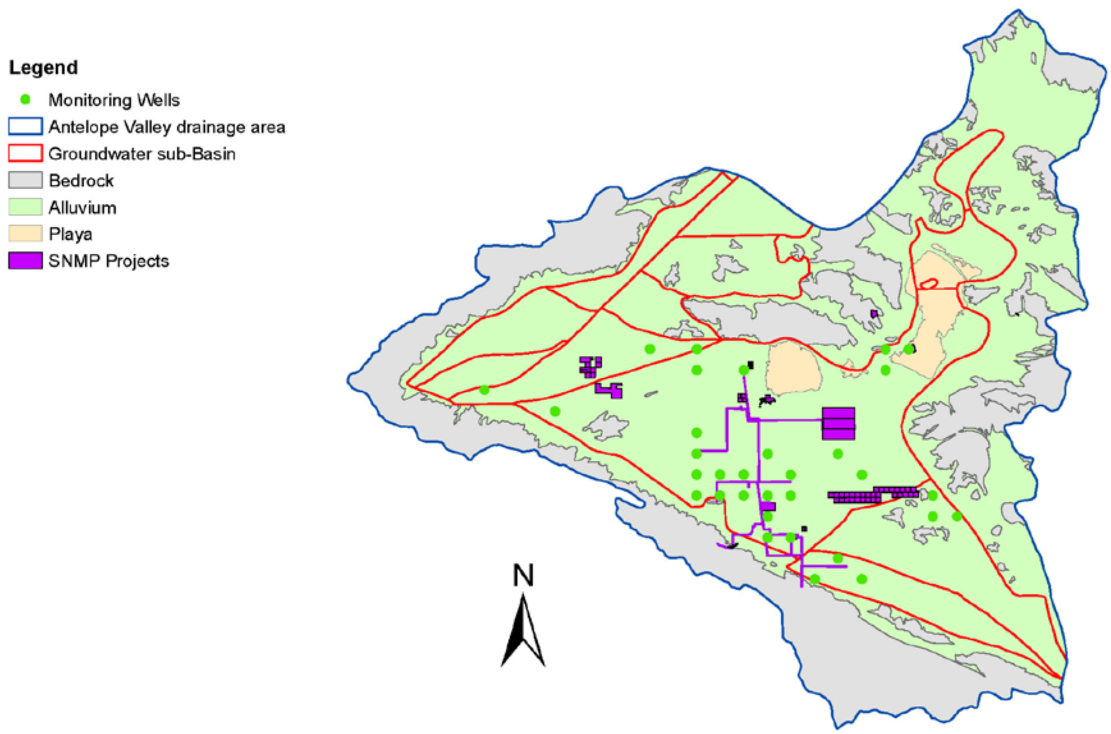
Six future scenarios were simulated:

- Scenario 1 (Base Case): Assumes no SNMP projects will be implemented.
- Scenario 2: Assumes all SNMP projects will be implemented.
- Scenario 3: Assumes only recycled water projects and none of the groundwater recharge projects will be implemented.
- Scenarios 4: Assumes all recycled water and half of the artificial groundwater recharge projects will be implemented.
- Scenario 5: Assumes all recycled water and a quarter of the artificial groundwater recharge projects will be implemented.
- Scenario 6 (Extreme Drought): Assumes no groundwater recharge projects will be implemented and annual natural recharge is decreased by 25% for planning period.

Table ES-2: Concentration Projections

Scenario	Concentration in 2035		Concentration by 2110		Years to Reach SNMP Water Quality Management Goal	
	TDS	arsenic	TDS	arsenic	TDS	arsenic
	mg/L	µg/L	mg/L	µg/L	450 / 500 mg/L	10 µg/L
1	364	9.78	404	10.13	184 / 276	72
2	371	9.79	438	10.19	113 / 170	64
3	366	9.78	416	10.14	151 / 227	70
4	369	9.79	427	10.17	129 / 194	66
5	368	9.79	422	10.15	139 / 209	69
6	368	9.84	422	10.38	139 / 208	47

Figure ES-2: SNMP Projects and Monitoring Locations



In scenario 2, the projected TDS increase is 21 mg/L by 2035 and will take 113 years to reach the TDS water quality management goals of 450 mg/L. In scenario 6, the projected arsenic increase is 0.18 µg/L and will take 47 years to reach the arsenic water quality management goal of 10 µg/L.

Considering the baseline groundwater quality and assimilative capacity, arsenic has the potential to exceed the water quality management goal before the other constituents. The arsenic load to the groundwater is largely naturally occurring. Arsenic levels are not expected to increase due to anthropogenic activities because municipal water supply wells, recycled water, treated State Water Project (SWP) water, and stormwater are not significant contributors of arsenic. Recycled water, treated SWP water, and stormwater have arsenic concentrations below detectable levels (less than 2 µg/L). The mixing model projects an increase in arsenic concentration, but actual loadings from these sources may be lower considering that overly conservative assumptions were used in the model.

Monitoring Plan

A monitoring plan is proposed to track the water quality in the basin. Results will be used to determine whether the concentrations of salt and nutrients over time are consistent with the SNMP predictions and the applicable SNMP water quality management goals. The monitoring program includes 32 municipal water supply wells that are currently monitored by the California Department of Public Health. The results from these existing monitoring programs will be downloaded from the State Board's Geotracker Groundwater Ambient Monitoring and Assessment (GAMA) database and included in the monitoring report prepared by the SNMP stakeholders or the appointed Antelope Valley Groundwater Basin Watermaster, if applicable. Imported, recycled, and treated potable water supply to the region will also be monitored and results included in the report. Updates to the SNMP model and relevant project list will be made to reevaluate water quality projections. The monitoring report will be prepared and submitted to the Lahontan Regional Board every three years. The monitoring locations are depicted in Figure ES-2.

Results of the monitoring will be used to determine whether future mitigation, or implementation measures, are necessary to maintain the SNMP water quality management goals. Monitoring report results that indicate the ambient groundwater quality exceeding 50% of the baseline assimilative capacity or significant increases may require additional modeling and/or evaluation to determine what mitigation action, if any, is necessary and appropriate.

Conclusion

The findings from the SNMP indicate that overall groundwater quality in the basin is stable and below the water quality management goals. On a sub-basin level, there are cases of water quality management goal exceedances, but the constituents are naturally occurring (i.e., arsenic, boron, fluoride, and TDS) and there are no current or projected projects identified in these areas. Analysis of future water quality (through 2035), with implementation of various recycled water and groundwater recharge projects, indicates good water quality and stable trends and that the basin groundwater will continue to be able to support the designated beneficial uses.

Section 1: Introduction

The Salt and Nutrient Management Plan (SNMP) for the Antelope Valley (AV) has been prepared in cooperation with the water and wastewater agencies, the cities of Lancaster and Palmdale, Edwards Air Force Base, private home owners, and other stakeholders in the Antelope Valley. It fulfills the State Water Resources Control Board (State Board) requirements of the Recycled Water Policy (SWRCB 2009) and its amendment (SWRCB 2013), which encourages every region in California to develop an SNMP to address long-term groundwater basin sustainability.

1.1 The Salt and Nutrient Management Plan

In February 2009, the State Board adopted the Recycled Water Policy to provide direction to the Regional Water Quality Control Boards, proponents of water use and recycled water projects, and the public regarding the appropriate criteria to be used by the State and Regional Boards in issuing permits for recycled water projects. The Recycled Water Policy includes State Board goals for statewide increases in the use of recycled water, which is considered a drought-proof, reliable, and sustainable water resource. The State Board addresses the concern for protecting the beneficial uses of groundwater basins by its intention for every groundwater basin in California to have a SNMP. The Recycled Water Policy expects salt and nutrient loading in groundwater basins/sub-basins to be addressed through the development of a management plan by the collaborative stakeholder process rather than imposing requirements on individual recycled water projects by the regional regulating agency.

In response to the adoption of the Recycled Water Policy, Los Angeles County Waterworks Districts and Sanitation Districts of Los Angeles County, with support of the Lahontan Regional Water Quality Control Board (Regional Board) staff, initiated efforts to organize a stakeholder group to develop a regional SNMP for the Antelope Valley. Stakeholders include, but are not limited to, water importers, purveyors, stormwater management agencies, wastewater agencies, the Regional Board, and other significant salt/nutrient contributors, in addition to the recycled water stakeholders. Stakeholder participation is described in Section 1.3. This SNMP is a result of stakeholder collaborations and meets the intentions of the Recycled Water Policy.

1.2 Purpose and Goals of the Salt and Nutrient Management Plan

The purpose of developing a regional SNMP for the Antelope Valley is to address the management of salts and nutrients (and possibly other constituents of concern) from various sources within the basin to maintain water quality objectives and support beneficial uses of the region's groundwater. The intention is to involve all users of water in the Antelope Valley basin to participate in efforts to minimize the anthropogenic accumulation of salt and nutrients that would degrade the quality of water supplies in the Antelope Valley to the extent that it may limit their use.

Additionally, the SNMP is developed to satisfy the Recycled Water Policy, and thus allow for a streamlined process in getting recycled water projects approved and permitted by the Regional Board. The Antelope Valley is an arid region that requires careful management of its water supplies to meet the needs of its residents. Increasing recycled water use will allow for increased available potable water supplies for the people of the Antelope Valley.

One goal of the SNMP is to address salt and nutrient loading to the Antelope Valley groundwater basin region through the development of a management plan by the collaborative stakeholder process rather than the regional regulating agency imposing requirements on individual water projects. The AV SNMP has been prepared to be included as an appendix to the updated 2013 Antelope Valley Integrated Regional Water Management Plan[1] (AVIRWMP) and for acceptance by the Regional Board. The involvement of local agencies in developing an SNMP may lead to more cost-effective means of protecting and enhancing groundwater quality, quantity, and availability.

Another goal is to assess impacts with potential long-term basin-wide effects on groundwater quality that result from activities such as projects involving surface water, groundwater, imported water, and/or recycled water, as well as other salt/nutrient contributing activities, through regional groundwater monitoring. The design and implementation of a regional groundwater monitoring program shall involve the stakeholders.

The completion and implementation of the SNMP may lead to the potential for enhanced partnering opportunities and potential project funding between water and wastewater agencies, or other stakeholders, for developing and protecting water supplies.

1.3 Stakeholder Participation

The collaborative stakeholder process is an essential method to ensure that this SNMP reflects the needs of the Antelope Valley region, promotes the formation of partnerships, and encourages coordination with agencies. One of the benefits of this process is that it brings together a broad array of groups into a forum to discuss and better understand shared needs and opportunities.

Over twenty stakeholder meetings were held periodically, since August 2009, to raise awareness and engage stakeholders and other interested parties on salt and nutrient issues and management plan development efforts in the Antelope Valley region. The meetings were open to the public and were geared toward water, groundwater, and wastewater agency representatives, regulators, and community stakeholders. Neither a financial contribution nor agency status are required to be part of the collaborative SNMP development process. Copies of the meeting agendas, minutes, and presentations are available online and accessible via the AVIRWMP website[2].

The Antelope Valley SNMP development efforts were led by the Los Angeles County Waterworks District No. 40 (Waterworks) and the County Sanitation Districts Nos. 14 and 20 of Los Angeles County (Sanitation Districts). Both agencies are interested in increasing recycled water use in the region. For the most part, staff from these two agencies led the stakeholder meetings and prepared the meeting agendas, minutes, and presentations.

The stakeholders assisted in the development of the SNMP in addition to helping with data collection. Data compilation and analysis was conducted by staff from Waterworks and the Sanitation Districts and presented to stakeholders at the SNMP meetings. Stakeholders provided feedback, upon which revisions were made by the Waterworks and the Sanitation Districts staff. This SNMP document was prepared by Waterworks and Sanitation Districts staff. An initial draft was prepared in early 2013 and made available on the AVIRWMP website in July 2013. Stakeholder and Regional Board comments on the July 2013 draft SNMP are incorporated, as appropriate and applicable, into this Final SNMP.

[1] The Antelope Valley IRWMP was updated in December 2013, prior to completion of the SNMP. A draft version of this plan is included in Appendix G of the 2013 IRWMP update.
[2] http://www.avwaterplan.org/

The following is a list of roles and responsibilities in developing the SNMP:

Stakeholders:

- Attend SNMP stakeholder meetings
- Review meeting materials and other documentation
- Provide comments and feedback
- If applicable, provide data or other information related to the SNMP

Lead Agencies Staff (Waterworks and Sanitation Districts):

- Lead SNMP stakeholder meetings
- Ensure that meetings were announced to a broad distribution list via e-mail and related meeting materials were made available on the AVIRMP website
- Prepare meeting agendas, minutes, and presentations
- Prepare Scope of Work for presentation to Regional Board
- Compile and analyze data
- Prepare SNMP document
- Address comments from stakeholders and Regional Board staff

Regional Board Staff:

- Attend SNMP stakeholder meetings
- Provide guidance on regulatory issues
- Ensure that regulatory compliance standards and goals are adequately addressed
- Review meeting materials and other documentation
- Provide comments and feedback
- Consider SNMP for acceptance

Members of the stakeholder group have included:

Association of Rural Town Councils (ARTC)
Antelope Acres Town Council
Antelope Valley Building Industry Association (BIA)
Antelope Valley Board of Trade
Antelope Valley Resource Conservation District
Antelope Valley United Water Purveyors/White Fence Farms Mutual Water Co.
Antelope Valley-East Kern Water Agency (AVEK)
Boron Community Services District
Bureau of Reclamation
California Department of Water Resources (DWR)
California Department of Public Health (CDPH)
California Water Services Company
City of California City
City of Lancaster
City of Palmdale
Edwards Air Force Base (EAFB)
GEI Consultants (on behalf of Rosamond Community Services District)
General public and residents of the Antelope Valley
Kennedy Jenks
Kern County Farm Bureau
Los Angeles County Farm Bureau
Los Angeles County Waterworks District No. 40 (Waterworks)
County Sanitation Districts Nos. 14 and 20 of Los Angeles County (Sanitation Districts)
California Regional Water Quality Control Board, Lahontan Region (Regional Board)

Lake Los Angeles Park Association
Lakes Town Council
Leona Valley Town Council
Littlerock Creek Irrigation District
National Water Research Institute (NWRI)
Palmdale Water District
Quartz Hill Water District
Rosamond Community Services District (RCSD)
RMC Water and Environment
Sundale Mutual Water Company
US Bureau of Reclamation (USBR)

1.4 Scope of Work

AV SNMP stakeholders and Regional Board staff developed a Scope of Work detailing tasks to be completed in developing a SNMP for the Antelope Valley (see Appendix A). The Scope of Work was developed using elements described in the State Board's "SNMP Suggested Elements"[3] and Recycled Water Policy.

The Regional Board distributed the draft Scope of Work for public comment on August 29, 2011 and no comments were received. Regional Board staff and stakeholder representatives updated Members of the Regional Board on the Antelope Valley SNMP development efforts at the October 2011 Regional Board meeting. Regional Board Members provided positive feedback on the proposed Scope of Work, finding it acceptable, and praised the SNMP development process. As a result, the Regional Board issued an acceptance letter (see Appendix B) for the Scope of Work, which the stakeholders then finalized in the January 24, 2012 stakeholder meeting.

1.5 SNMP Definitions

The following definitions were accepted by the AV SNMP stakeholder group.

Salts: The dissolved ions in water. Salts are observed by measuring total dissolved solids (TDS).

Nutrients: Constituents in the environment that an organism needs to live and grow. While nutrients may include a variety of substances, nitrate specifically was considered in the SNMP because it may be detected at significant levels in groundwater. Substances such as potassium, phosphorous or ammonia are not found at concerning levels, or often times are not even detected, in the Antelope Valley groundwater. This plan expresses nitrate concentration in units of milligrams per liter as nitrogen (mg/L as N).

Constituents of Emerging Concern (CECs): A class of unregulated substances, such as pharmaceuticals and personal care products (PPCPs) and perfluorinated compounds (PFCs), that previously had not been detected or are being detected at levels that may be significantly different than expected. A "blue ribbon" science advisory panel, convened by the State Board, prepared a report titled, "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water", which presented recommendations for monitoring CECs in municipal recycled water used for groundwater recharge. Future monitoring of CECs will be incorporated, as applicable, under the direction of the State Board.

[3] http://www.swrcb.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/SNMP_Elements.pdf

SNMP Water Quality Management Goal: Goal(s) set at a level for a particular constituent in groundwater for the purposes of this plan. The water quality management goal take into consideration the water quality objectives established by the Regional Board for the reasonable protection of the area's beneficial use(s) of water.

Baseline Conditions: Average concentration of a particular constituent measured in the water (e.g., surface or groundwater) from 2001 to 2010. This is also referred to as the historical condition.

Current Ambient Conditions: Average concentration of a particular constituent measured in the water (e.g., surface or groundwater) for the most recent 5-year averaging period.

Assimilative Capacity: Difference between the SNMP water quality management goal and the ambient condition of a particular constituent is the amount of assimilative capacity available for a particular basin, sub-basin, or sub-area. If the ambient water quality is the same or poorer than the water quality goal, then assimilative capacity does not exist. If the ambient condition is better than the water quality goal, then assimilative capacity exists.

The assimilative capacity is a moving figure, as water quality may change over time. The baseline assimilative capacity (see Section 4) is the difference between the SNMP water quality management goal and an established baseline condition, whereas the current assimilative capacity is based on the current condition.

Assimilative Capacity = (SNMP Water Quality Management Goal) – (current or baseline ambient condition)

Antidegradation: Defined by the State Board's Antidegradation Policy (SWRCB 1968), which is aimed at maintaining high quality waters to the maximum extent possible. The Antidegradation Policy requires the quality of California's waters be maintained until it has been demonstrated to the State that any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses and will not result in water quality lower than applicable standards.

Future Planning Period: A 25-year planning period (2011-2035) was used to simulate current and future basin activities and their impacts to the Antelope Valley Basin. The planning period is consistent with the future planning period in the AVIRWMP. The Recycled Water Policy requires at least a ten year planning period be used.

Per Regional Board suggestion, the following definitions are included:

Pollution: Defined in the California Water Code, section 13050(l) to mean that beneficial uses of water are unreasonably affected.

Degradation: Condition in which the natural water quality is adversely altered, but still satisfies water quality objectives to support beneficial uses.

1.6 List of Acronyms:

AF	Acre-Feet
AFY	Acre-Feet per Year
AV	Antelope Valley
AVEK	Antelope Valley East Kern Water Agency
AVIRWMP	Antelope Valley Integrated Regional Water Management Plan
CDPH	California Department of Public Health
CECs	Constituents of Emerging Concern
DPR	Department of Pesticide Regulation
DWR	Department of Water Resources
EIR	Environmental Impact Report
GAMA	Groundwater Ambient Monitoring & Assessment
LACSD	Los Angeles County Sanitation Districts
LACWD	Los Angeles County Waterworks Districts
LCID	Littlerock Creek Irrigation District
LLNL	Lawrence Livermore National Laboratory
MCL	Maximum Contaminant Level
µg/L	Micrograms per Liter
mg/L	Milligrams per Liter
mg/L as N	Milligrams per Liter as Nitrogen
MG	Million Gallons
MGD	Million Gallons per Day
M&I	Municipal and Industrial
MWC	Mutual Water Company
ND	Non-Detect
NL	Notification Level
NWIS	National Water Information System
PWD	Palmdale Water District
SMCL	Secondary Maximum Contaminant Level
SNMP	Salt and Nutrient Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WRP	Water Reclamation Plant

Section 2: Characterization of the Basin

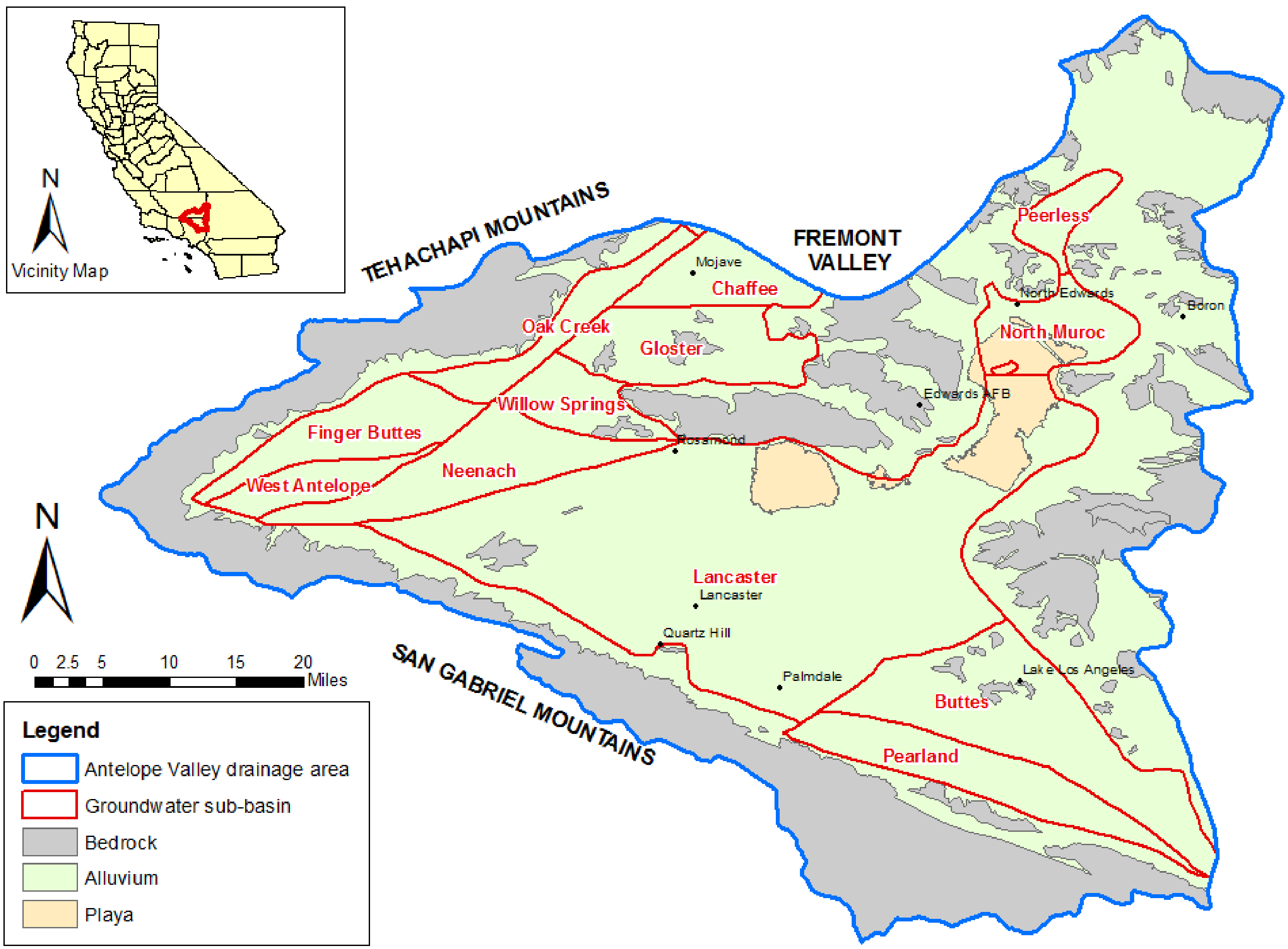
2.1 Antelope Valley Groundwater Basin

The Antelope Valley Region is located in the southwestern part of the Mojave Desert in Southern California and is approximately 40 miles north of the center of the City of Los Angeles. The Antelope Valley Groundwater Basin is 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. The basin boundaries are based on reports by the United States Geological Survey (USGS 1987) and the California Department of Water Resources (DWR 2004).

The groundwater basin is divided into twelve subbasins: Finger Buttes, West Antelope, Neenach, Willow Springs, Gloster, Chaffee, Oak Creek, Pearland, Buttes, Lancaster, North Muroc and Peerless (see Figure 2-1). Subbasin boundaries are based on faults, consolidated rocks, groundwater divides, and, in some cases, arbitrary boundaries (USGS 1998). General descriptions of the sub-basins are as follows (USGS 1987):

- *Finger Buttes:* A large part of the subbasin is range or forest land. Water use is mainly agricultural. Recharge comes from the surrounding Tehachapi Mountains. Groundwater moves generally from the northwest to the southeast into the Neenach subbasin. Depth to water varies, but is commonly more than 300 feet.
- *West Antelope:* Water use in this area is for agricultural purposes. Groundwater flows southeasterly into the Neenach subbasin. Depth to water ranges from 250 to 300 feet.
- *Neenach:* Water use is for agricultural purposes. Groundwater flows mainly eastward into the Lancaster subbasin. Depth to water ranges from 150 to 350 feet.
- *Willow Springs:* Water use is made up of agricultural and urban land uses. Recharge comes from intermittent streams of the surrounding mountain areas. Groundwater flows southeast and ultimately enters the Lancaster subbasin, although this flow is considered negligible (USGS 2003). Depth to water ranges from 100 to 300 feet.
- *Gloster:* Water use is confined to urban and mining (quarry pits) activity. Groundwater flows mainly to the southeast and east into the Chaffee subbasin. Depth to water for the southeast area of the subbasin ranges from 50 to 100 feet; other water level data is sparse.
- *Chaffee:* Water use in this area is mainly for the town of Mojave. Groundwater moves into the Chaffee subbasin from Cache Creek, adjacent alluvial fans to the west and, in lesser amounts, from the Gloster subbasin. Groundwater moves eastward in the western part and northward in the southern part of the subbasin, generally toward the town of Mojave. Any outflow would move north to the Koehn Lake area. Depth to water ranges from 50 to 300 feet.
- *Oak Creek:* Water use in the area is nominal except for the mining activity in the central part of the subbasin. Recharge comes from the Tehachapi Mountains. Groundwater flow is generally southeastward, with some outflow moving northeasterly to the Koehn Lake area. Water depth data is not available.

Figure 2-1: Groundwater Sub-Basin Boundary Map



- *Pearland:* Water use is attributed to urban and irrigation activity. Substantial recharge occurs to the Pearland and Buttes subbasins from Little Rock and Big Rock Creeks. Groundwater generally flows from the southeast to the northwest, with outflows to the Lancaster subbasin. Depth to water ranges from 100 to 250 feet.
- *Buttes:* Water use includes urban and agricultural. Imported California State Water Project water became available for irrigation to the subbasin in 1972. Groundwater generally flows from the southeast to the northwest into the Lancaster subbasin. Depth to water ranges from 50 to 250 feet.
- *Lancaster:* This subbasin is the largest in both water use and size, and the most economically significant in terms of population and agriculture. Water is used for agricultural, urban and industrial applications. Groundwater flows to several pumping depressions and partially towards Rosamond and Rogers dry lakes. Due to agricultural, urban and industrial water use, depth to water varies widely, but in general is greatest in the south and west. The area includes Lancaster, Palmdale, Quartz Hill, Rosamond, Antelope Acres and other smaller communities.
- *North Muroc:* Water use is for urban and military purposes. Sewage disposal ponds are within and near this subbasin. These disposal ponds are of much less concern than similar ponds in the Antelope Valley because the soil structure allows for little percolation. The suggested monitoring networks were designed for this consideration. Groundwater flows north and west to a pumping depression located near North Edwards. North of this depression, the direction of flow is generally north into the Fremont Groundwater Basin and possibly into the Peerless subbasin.
- *Peerless:* Water is used for agricultural and municipal purposes. The general movement of groundwater is toward a pumping depression in the center of the subbasin. Little information is available on this subbasin.

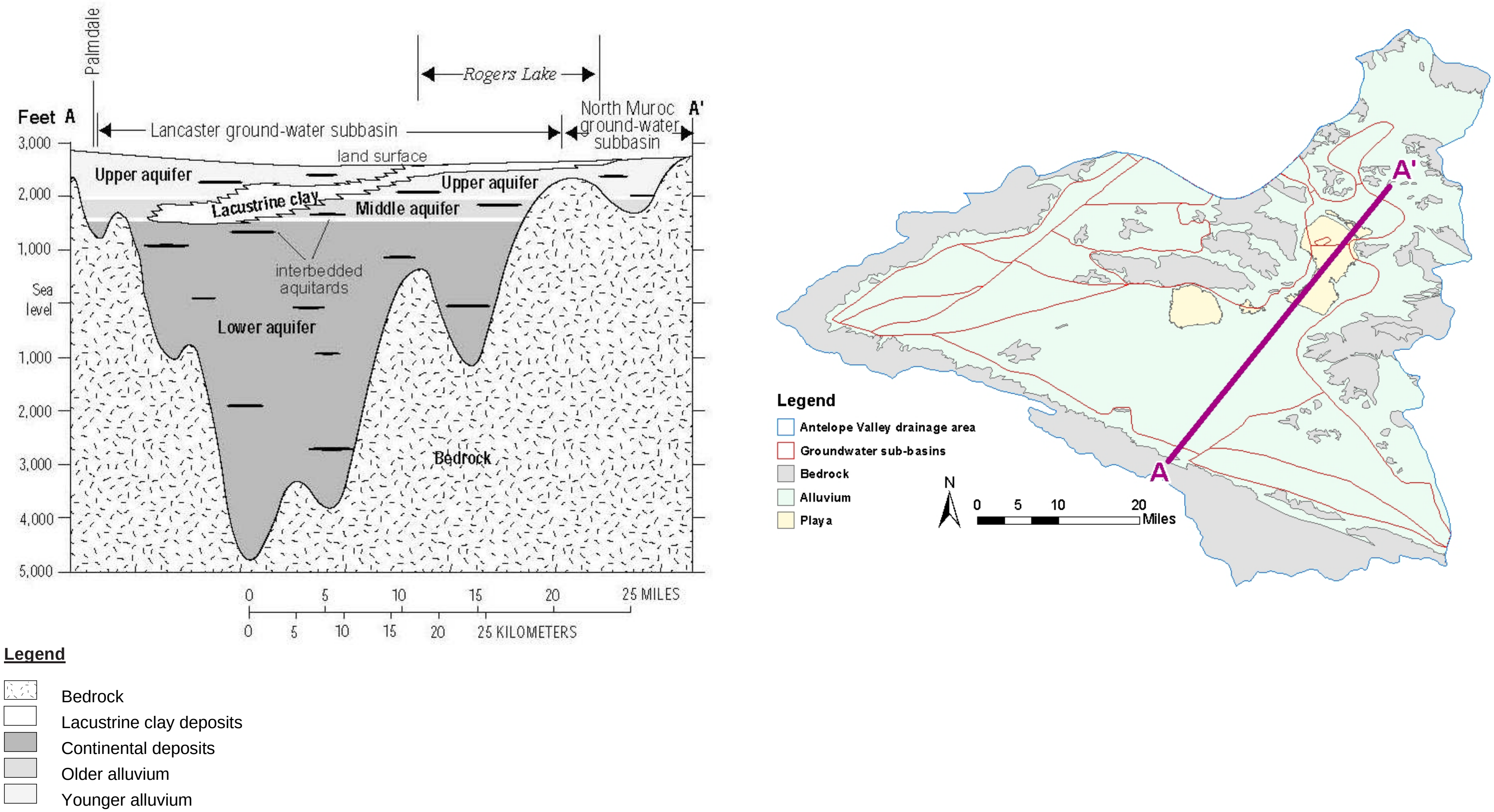
The Antelope Valley Basin is comprised of three primary aquifers: (1) the upper, (2) the middle and (3) the lower aquifer. The upper aquifer varies from unconfined, in the south part of the Lancaster sub-basin from Palmdale to Littlerock Wash, to confined, north of Littlerock Wash, depending on the presence and vertical position of the thick lacustrine deposits. The upper aquifer yields most of the current groundwater supplies, and therefore is the primary focus of this SNMP. Due to the overlying lacustrine deposits and interbedded aquitards, the middle aquifer is assumed to be confined. The deep aquifer is generally considered to be confined by the overlying lacustrine deposits and discontinuous interbedded aquitards (USGS 2003). A schematic geologic cross-section of the Antelope Valley is depicted in Figure 2-2.

In general, groundwater in the Antelope Valley Basin flows northeasterly from the mountain ranges to the dry lakes. The basin is principally recharged by infiltration of precipitation and runoff from the surrounding mountains and hills in ephemeral stream channels. However, precipitation over the valley floor is generally less than 10 inches per year and evapotranspiration rates, along with soil moisture requirements, are high; therefore, recharge from direct infiltration of precipitation below the root zone is deemed negligible (Snyder 1955; Durbin 1978; USGS 2003). Other sources of recharge to the basin include artificial recharge and return flows from agricultural and urban irrigation. Depending on the thickness and characteristics of the unsaturated zone of the aquifer below a particular site, these sources may or may not contribute to recharge of the groundwater.

Figure 2-2: General Geologic Cross-Section of the Antelope Valley Basin

(a) Cross Section

(b) Line of Cross-Section



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 region; since 1972, it has provided between 50 and 90 percent (USGS 2003). Groundwater pumping in the region peaked in the 1950s and 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 water for municipal and industrial (M&I) uses 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.

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 and rising in the rural western and far northeastern areas of the 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 region may have reduced rising groundwater trends in these areas (LACSD 2005).

According to the USGS (2003), groundwater extractions have exceeded the estimated natural recharge of the basin since the 1920s. 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 region (USGS 2003). Extractions in excess of the groundwater recharge can cause groundwater levels to drop and associated environmental damage (e.g., land subsidence).

Annual 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 California State Water Project (SWP) water, which is imported from Northern California, 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 the groundwater basin is not currently adjudicated, the adjudication process is underway. There are no existing restrictions on groundwater pumping. However, pumping may be altered or reduced as part of the adjudication process. The adjudication aims to provide clarity for the groundwater users regarding management of groundwater resources.

2.2 SNMP Area Boundaries

Figure 2-1 depicts the groundwater basin and sub-basin boundaries for the SNMP. The planning area of the SNMP is the same as that of the AVIRWMP, which was defined as the drainage area because of its use in several studies and inclusion of key agencies dealing with similar water management issues. Each sub-basin in the Antelope Valley Basin has been addressed in some manner with information and data provided in this SNMP. . Further detail and analyses for any of the sub-basins may be provided in the future, contingent on the availability of sufficient data for analysis and the presence of projects that have the potential to impact salt/nutrient concentrations in the basin.

2.3 Surface Water

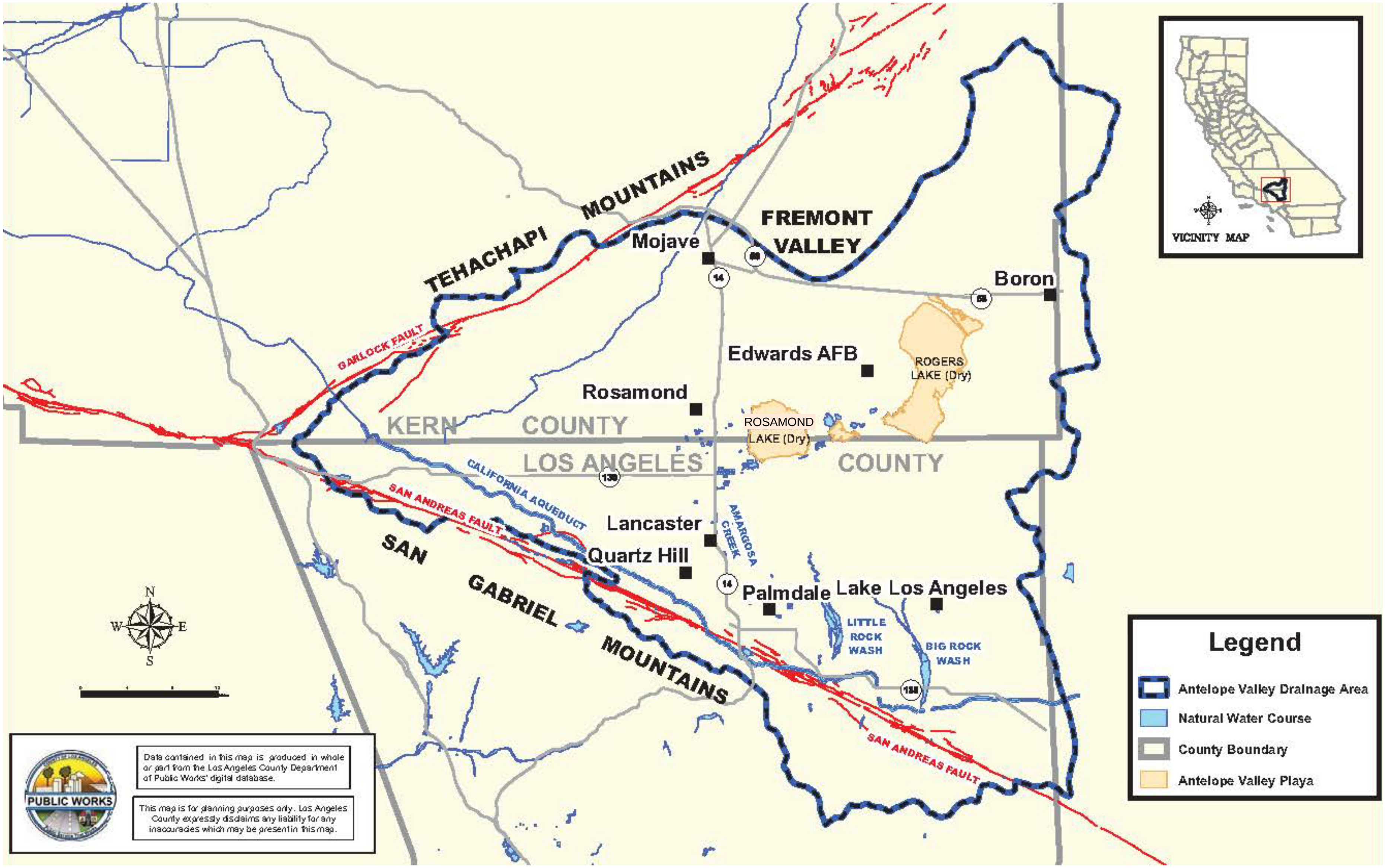
Comprising the southwestern portion of the Mojave Desert, the Antelope Valley ranges in surface elevation from approximately 2,300 feet to 3,500 feet above sea level. The Antelope Valley is a closed basin with no outlet to the ocean. Water that enters the Valley either infiltrates into the groundwater basin, evaporates, or flows toward the three dry lakes on Edwards Air Force Base—Rosamond Lake, Buckhorn Lake, and Rogers Lake. In general, water flows northeasterly from the mountain ranges to the dry lakes.

Surface water from the surrounding hills and from the Antelope Valley floor flows primarily toward the three dry lakes. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley from the surrounding mountains, quickly percolates into the stream beds, and recharges the groundwater basin. 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). It appears that little percolation occurs in the Antelope Valley other than near the base of the surrounding mountains due to low permeability soils overlying the groundwater basin.

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 and include Big Rock Creek, Littlerock Creek and Amargosa Creek. Oak Creek begins in the Tehachapi Mountains. The hydrologic features are shown on Figure 2-3.

Littlerock Creek is the only developed surface water supply in the Antelope Valley. The Littlerock Reservoir collects runoff from the San Gabriel Mountains and is jointly owned by Palmdale Water District (PWD) and Littlerock Creek Irrigation District (LCID). Historically, water stored in the Littlerock 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.

Figure 2-3: Antelope Valley Hydrologic Features



Source: 2007 Antelope Valley Integrated Regional Water Management Plan

2.4 Water Resources

Two major sources contributing to the Antelope Valley Region water supply are imported water via the SWP (or California Aqueduct) and natural recharge (precipitation). These sources may eventually become another water source for the region, such as infiltrated groundwater (including return flows from water use activities), recycled water from wastewater treatment, and surface water flow from precipitation, run-off, and subsurface flow.

Potable water supply in the Antelope Valley comes from three primary sources. Historically, the main water source in the region has been groundwater from well extraction (i.e., pumping). However, the groundwater in the Antelope Valley is not currently managed and is susceptible to overdraft, which could cause land subsidence and thereby decrease the region's groundwater storage capacity. Most Antelope Valley residents are familiar with the SWP, a surface water source beginning in Northern California at Oroville Reservoir with water flowing into the Sacramento River Delta and pumped south to serve, amongst others, the urban and agricultural centers in Southern California. Water from the SWP may be used directly for agricultural use or treated at one of the region's water treatment plants for potable supply. The availability of SWP supply is known to be variable and fluctuates from year to year depending on precipitation, regulatory and legislative restrictions, and operational conditions, and is particularly unreliable during dry years. The third source of potable water is surface water supplied by Littlerock Reservoir, which is fed by natural run-off from snow packs in the local San Gabriel Mountains and from precipitation. Further stress to the Antelope Valley's water supply management is due to recent lower than average precipitation levels and mountain snowpack.

Recycled water is a supplemental source of water used for non-potable applications such as landscape and agricultural irrigation, construction activities, and commercial and industrial processes. Recycled water can also be used for indirect potable uses through groundwater replenishment. Recycled water is assumed to be 100 percent reliable and practically drought-resistant since it is derived from consistent water use. Maximizing recycled water use helps increase the region's water reliability by augmenting local supplies and reducing dependence on imported surface water, which has varying and recently decreasing reliability. By 2035, the Los Angeles County Sanitation District's (LACSD) Lancaster and Palmdale Water Reclamation Plants are projected to produce 36,000 acre-feet per year of tertiary treated water. The regional goal is to fully utilize the recycled water for beneficial uses.

Development demands on water supply, coupled with the potential curtailments of SWP deliveries due to environmental constraints and prolonged drought periods, have intensified the competition for available water resources. Consequently, the Antelope Valley Integrated Regional Water Management Plan (AVIRWMP) was developed by stakeholders as a strategy to sustainably manage water resources and address the needs of the M&I purveyors to reliably provide the quantity and quality of water necessary to serve the expanding Antelope Valley Region, while concurrently addressing the need of agricultural users and small pumpers to have adequate supplies of reasonably-priced water.

2.5 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. The 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. Groundwater sub-basins are often divided by faulted bedrock that influences groundwater flow between the basins.

During the depositional history of the Antelope Valley, 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. Figure 2-4 depicts a soil map of the Antelope Valley Region.

2.6 Land Use

Figure 2-5 depicts the major existing land use categories within the Antelope Valley Region that are characterized and grouped together according to broad water use sectors. The map was created with City of Lancaster, City of Palmdale, Los Angeles County, and Kern County Geographic Information System (GIS) parcel level data. Table 2-1 depicts the colors used to indicate each land use category. Each major land use category is identified below, including the types of "like water uses" assigned to each category. Additional descriptions for the land use categories provided by the agencies are detailed in Appendix C.

- *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.
- *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.

Figure 2-4: Antelope Valley Soils

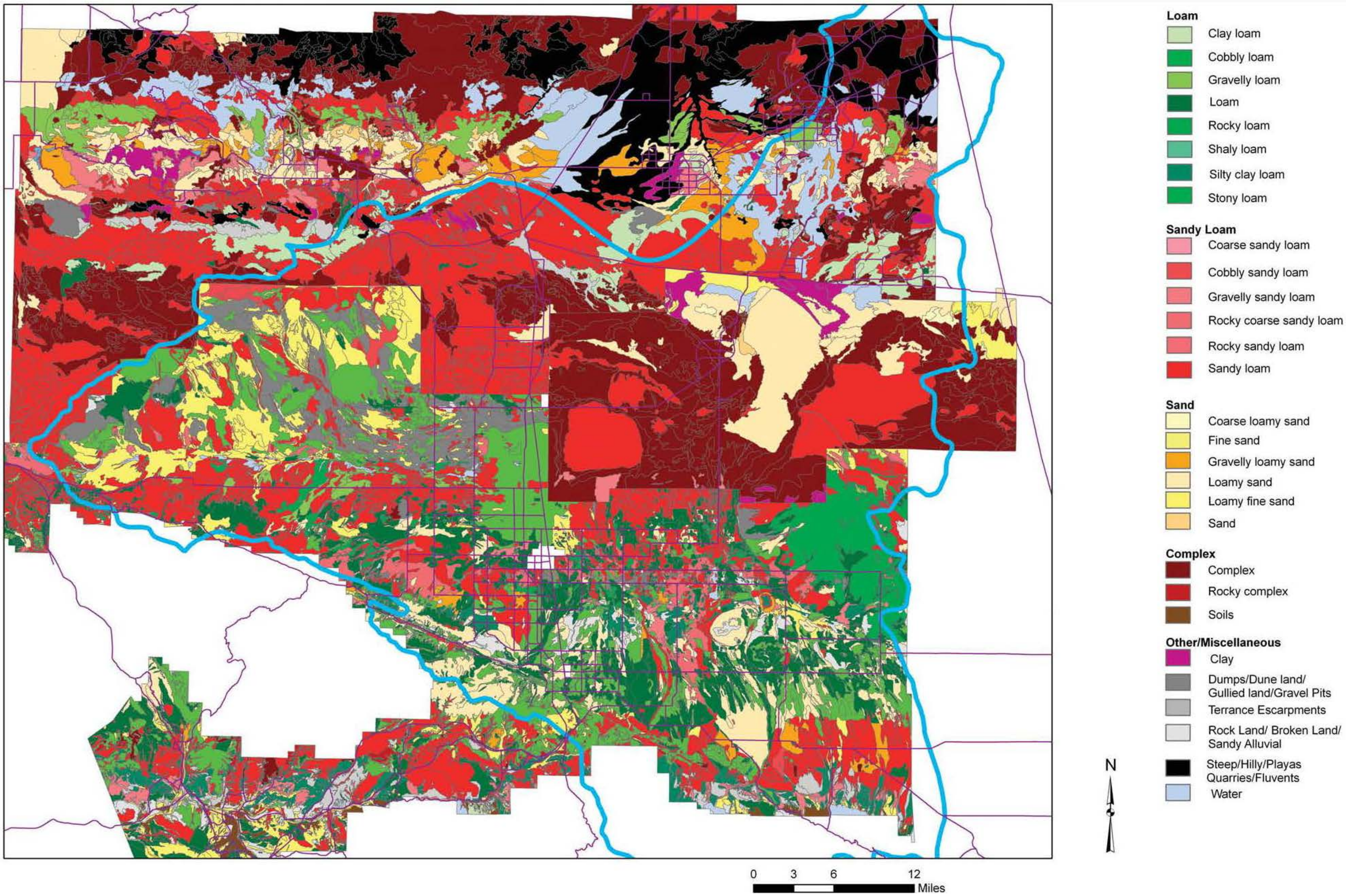
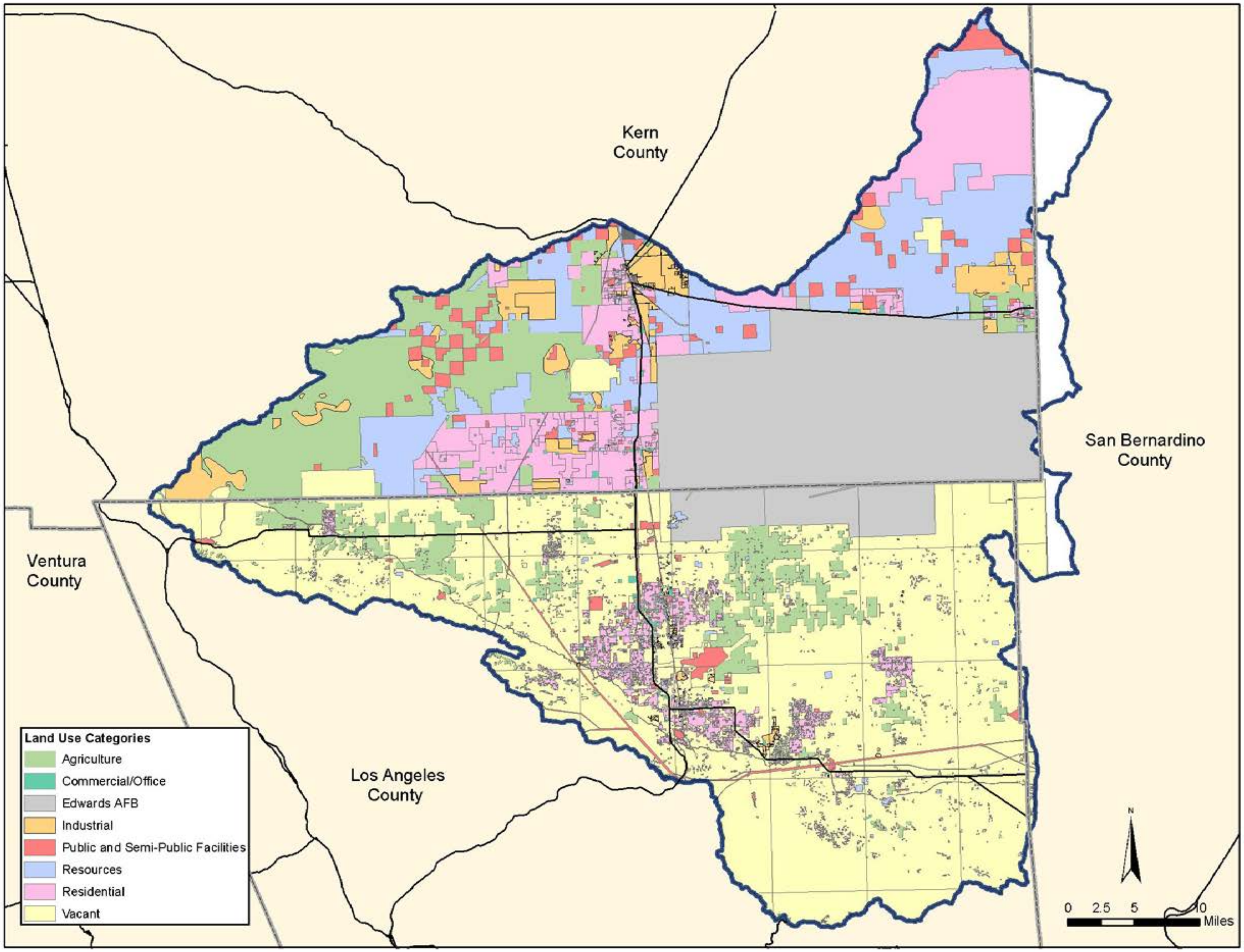


Figure 2-5: Antelope Valley Land Uses



2.7 Groundwater Quality

Groundwater quality is excellent within the upper or "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 nitrate concentrations have been measured in some areas of the basin. Arsenic is a concern in parts of the region and has been observed in some water supply wells. Research conducted by Waterworks and USGS has shown the problem to reside primarily in the deep aquifer. It is not anticipated that the existing arsenic concentrations will lead to future loss of groundwater as a water supply resource for the region. Portions of the basin have experienced nitrate levels above the maximum contaminant level (MCL) of 10 mg/L as N.

Most, if not all, water supply wells in the Antelope Valley draw groundwater from the principal aquifer. The SNMP and future monitoring plan will focus on the groundwater quality in the principal aquifer. The basin's groundwater quality is discussed further in Section 3 and 4.

2.8 Water Quality Control

The primary responsibility for ensuring the highest reasonable quality for waters of the State has been assigned by the California legislature to the State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards. The mission of the Regional Boards is to develop and enforce water quality objectives and implementation plans that will best protect the beneficial uses of the State's waters, recognizing local differences in climate, topography, geology and hydrology.

The Antelope Valley Region falls within the jurisdiction of the Lahontan Regional Water Quality Control Board (Regional Board), the regulatory agency whose primary responsibility is to protect water quality within the Lahontan Region. The Regional Board adopted and implemented the "*Water Quality Control Plan for the Lahontan Region*" (Basin Plan; Regional Board 1995), which, among other functions, sets forth water quality standards for the surface and groundwater within the Regional Board's jurisdiction. The Basin Plan includes the designated uses of water and the narrative and numerical objectives which must be maintained or attained to protect those uses. The Regional Board has not established water quality objectives specific to the Antelope Valley Region. However, water quality objectives have been established that apply to all groundwaters in the Lahontan Region. These objectives are aimed to be protective of the beneficial uses assigned to the groundwater basins. Further discussion on the water quality objectives examined in this SNMP is included in Section 4.

2.9 Antelope Valley Regulatory Groundwater Cleanup Sites

The State Board's Site Cleanup Program regulates and oversees the investigation and cleanup of non-federally owned sites where recent or historical unauthorized releases of pollutants to the environment, including soil, groundwater, surface water, and sediment, have occurred. Sites in the program include, but are not limited to, pesticide and fertilizer facilities, rail yards, ports, equipment supply facilities, metals facilities, industrial manufacturing and maintenance sites, dry cleaners, bulk transfer facilities, and refineries. The types of pollutants encountered at the sites are numerous and diverse and may include substance such as solvents, pesticides, heavy metals, and fuel constituents.

GeoTracker is the State Board's data management system for managing sites that impact groundwater, especially those that require groundwater cleanup as well as permitted facilities such as land disposal sites. Information relating to the groundwater cleanup sites is available on the GeoTracker website [1].

At the request of the Regional Board, a discussion of the Antelope Valley cleanup sites is included in the SNMP. The list of cleanup sites was obtained with Regional Board assistance. The list can be downloaded using the following steps and search parameters:

1. Website: http://geotracker.waterboards.ca.gov/
2. Use the "advanced search" link.
3. County: Los Angeles, Kern (separate runs are needed for both)
4. Site/Facility Type: Uncheck the "Leaking Underground Storage Tank (LUST) Cleanup Sites"
5. Regional Board: Lahontan
6. Use latitude and longitude coordinates to determine which sites are within the basin

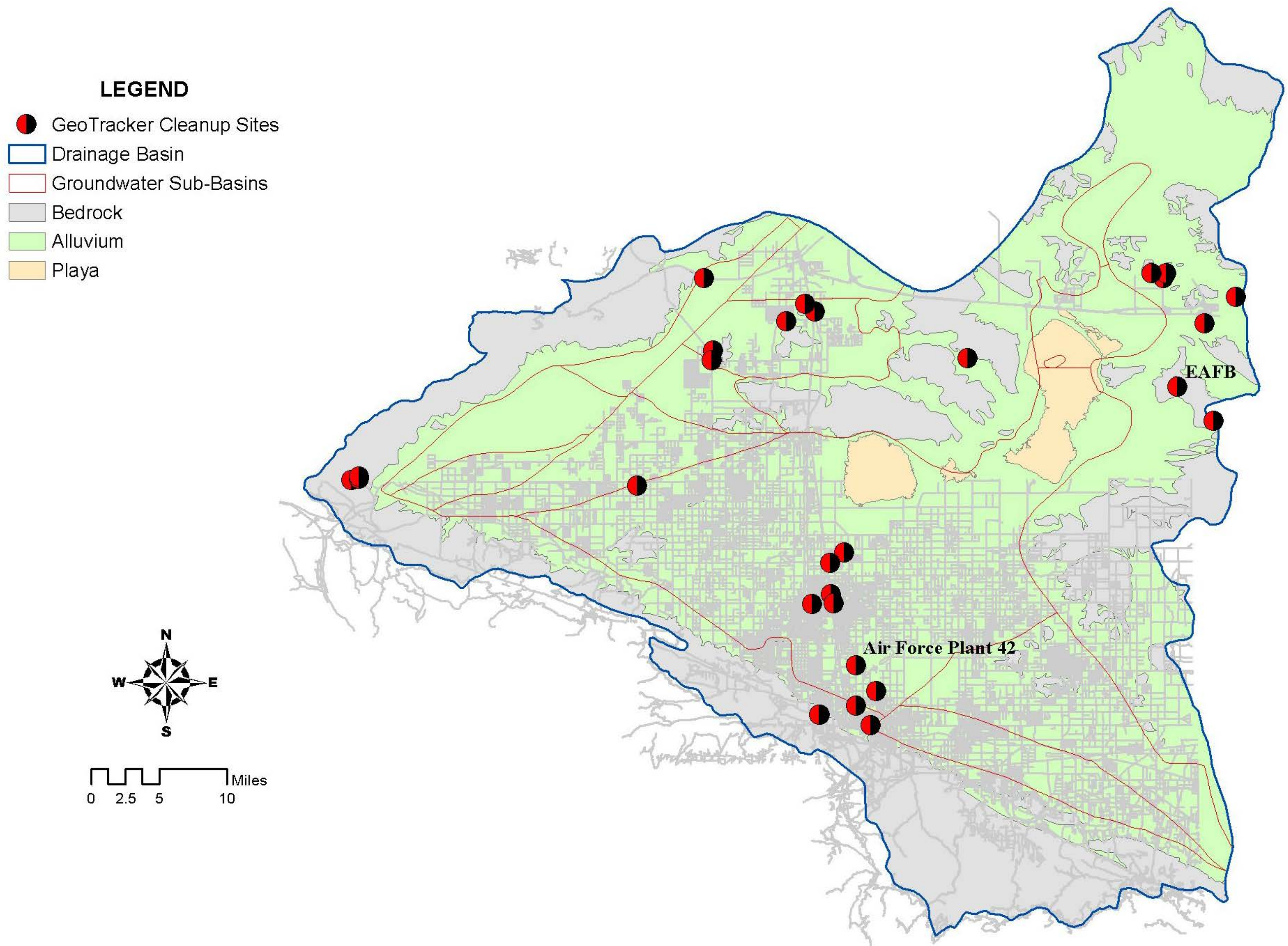
According to GeoTracker, there are currently 548 cleanup sites on Edwards Air Force Base, 36 cleanup sites on Air Force Plant 42 and 30 non-military cleanup sites in the Antelope Valley. All but 29 of the Edwards Air Force Base and Air Force Plant 42 sites are open cases. 22 of the 30 non-military sites are open cases. Of the 614 total cases, 9 are cleanup program sites, 21 are land disposal sites and 584 are military cleanup sites. The cleanup sites are listed in Appendix D and depicted in Figure 2-6.

For the sites that have a listed potential contaminant(s) of concern, the majority of the contaminants are gasoline and diesel from gas stations. Only one site, the eSolar Sierra SunTower Power Plant, has listed potential contaminants in GeoTracker that are relevant to the SNMP. The potential contaminants are listed as "Nitrate, other inorganic / salt, arsenic, chromium, other metal." This site is listed as a land disposal site; however, it is a power generating location using solar power. The cleanup case is also listed as inactive, meaning that it is a site that has ceased accepting waste but has not been formally closed or is still within the post closure monitoring period, and the site is not considered a significant threat to water quality.

This SNMP includes a monitoring plan, as discussed later in Section 5. If in the future, the SNMP monitoring network detects a high concentration of a monitored constituent, the stakeholders may use this map or updated information from GeoTracker to see if there are any known cleanup sites in the vicinity of the well that may be contributing to the high concentration.

[1] http://geotracker.waterboards.ca.gov/

Figure 2-6: GeoTracker Groundwater Cleanup Sites



THIS PAGE LEFT INTENTIONALLY BLANK

Section 3: Salt & Nutrient Characterization

3.1 Salts and Nutrients – What are they and where do they come from?

The purpose of the SNMP is to address the management of salts and nutrients from various sources within the basin. This section explains how the appropriate constituents were selected to be addressed in this SNMP. Identification of existing and future sources of salts and nutrients is necessary for assessing constituent loads and analyzing impacts on basin groundwater quality.

The stakeholders developed a list of relevant salts, nutrients, and other constituents. The list includes total dissolved solids, chloride, and nitrate as they are typically associated with recycled water use. Arsenic, boron, and fluoride were included because these constituents have been detected at elevated concentrations in parts of the region. Chromium was added to the list at the request of Regional Board staff because of the incident involving hexavalent chromium groundwater contamination in the town of Hinkley, a community in the Mojave Desert. Phosphorous, nitrogen, and potassium were considered since agriculture is important in the Antelope Valley and these nutrients are associated with fertilizers and livestock waste. However, only nitrogen, in the form of nitrate, is found in the local groundwater. Each constituent is discussed below.

3.1.1 Total Dissolved Solids

Salinity in groundwater is typically characterized by measuring the water's electrical conductivity or the total dissolved solids (TDS) level. TDS represents the overall mineral content and is considered the more accurate indicator of salinity in water. Most TDS sources are anthropogenic in nature and include, but are not limited to, agricultural runoff, point source water pollution, and industrial and sewage discharge. Inorganic sources include minerals commonly found in nature through the weathering and dissolution of rocks and organic material from decaying organisms, plants, and animals.

There are no known health effects associated with the ingestion of TDS in drinking water. However, high TDS concentrations can negatively impact sensitive crops and cause corrosion and scaling in pipes. In California, TDS has secondary maximum contaminant levels (SMCL) and are regulated under Title 22 of the California Code of Regulations, particularly Secondary Drinking Water Standards, which are intended to control the aesthetic qualities (taste, odor and color) of drinking water. The TDS SMCL is made up of a range of consumer acceptance levels and includes a 500 mg/L "recommended" level, a 1,000 mg/L "upper" level, and a 1,500 mg/L "short term" level.

Based on available data between 2001 and 2010, average TDS concentrations in the Antelope Valley groundwater basin ranges from 122 mg/L to 1380 mg/L. Of the 58 wells analyzed in the Lancaster sub-basin, seven exceeded the recommended SMCL and only one well exceeded the upper SMCL. SMCLs are not enforceable standards and, as previously stated, are not health-threatening and are only set to protect the aesthetics of water.

3.1.2 Chloride

Chloride is widely distributed in nature as salts of sodium ($NaCl$), potassium (KCl), and calcium ($CaCl_2$). Chloride is essential for metabolism (the process of turning food into energy) and help keep the body's acid-base balance.

Chloride in groundwater is naturally occurring from weathering of rocks, atmospheric deposition, and human uses and resulting wastes. As with TDS, many sources of chloride are anthropogenic. Sources of chloride from human use include food condiment and preservative, potash fertilizers, animal feed additive, production of industrial chemicals, dissolution of deicing salts, and treatment of drinking water and wastewater. Release of brines from industrial processes, leaching from landfills and fertilized soils, discharge of treated water from wastewater treatment facilities, infiltration from septic tank systems and irrigation activities, and other consumptive uses affect chloride in groundwater.

One commonly discussed source of chloride to the environment is from self-generating water softeners that use rock salt or potassium chloride pellets to treat hard water. These types of water softeners discharge a brine consisting of concentrated chloride levels. This briny waste may be discharged into the sewer system and then treated by a process that does not remove the chloride. Therefore, the salty waste may be released into the treatment plant's discharge location. Although the imported water to the Antelope Valley is considered only moderately hard (between 60 and 120 mg/L as CaO_3), it is possible that the use of self-generating water softeners exists in the region. Between 2009 and 2013, average chloride levels in imported water and the Lancaster Water Reclamation Plant (WRP) was 74 and 97 mg/L, respectively. The 23 mg/L increase in chloride concentration is within the 20 to 50 mg/L range expected for typical domestic water use. Based on these results, it is presumed that chloride-releasing water softeners are not widely used in the Antelope Valley at present.

As with TDS, there are no known health effects associated with the ingestion of chloride in drinking water. However, chloride concentrations in excess of 250 mg/L can affect taste. Elevated chloride concentrations have substantial negative impacts on sensitive crops and cause corrosion in pipes. Chloride is regulated under the Secondary Drinking Water Standards and has SMCLs consisting of a 250 mg/L "recommended" level, a 500 mg/L "upper" level, and a 600 mg/L "short term" level.

Based on available data, average chloride concentrations in the groundwater basin ranges from 3.17 mg/L to 180 mg/L. No wells exceeded the recommended SMCL standard.

3.1.3 Nitrate

Nitrate is a naturally occurring form of nitrogen. Nitrogen is essential to all life, including many crop plants which require large quantities to sustain high yields. Nitrate is found in groundwater and is a principal by-product of fertilizers. Other sources of nitrate include land use activities such as irrigation farming of crops, high density animal operations, wastewater treatment, food processing facilities and septic tank systems.

Nitrate is regulated under the Primary Drinking Water Standards and has a maximum contaminant level (MCL) of 10 mg/L as nitrogen (N). Nitrate in drinking water at levels above the MCL is a health risk for infants of less than six months of age. Such nitrate levels can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin (methemoglobin or "blue baby syndrome"). High nitrate levels may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies.

Based on available data, average nitrate concentrations in the groundwater basin ranges from non-detect (ND) to 3.69 mg/L as N. ND levels for nitrate are concentrations below the nitrate DLR (Detection Limit for purposes of Reporting) of 0.4 mg/L as N. About half of the wells analyzed had nitrate concentrations below the DLR. No wells exceeded the MCL standard.

3.1.4 Arsenic

Arsenic is an odorless and tasteless semi-metal element. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices. Higher levels of arsenic tend to be found more in groundwater sources than in surface water sources (i.e., lakes and rivers) of drinking water. The demand on ground water from municipal systems and private drinking water wells may cause water levels to drop and release arsenic from rock formations.

Arsenic has an MCL of 10 µg/L and is known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems. The arsenic drinking water standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water.

Based on available data, average arsenic concentrations in the groundwater basin ranges from ND (less than 2 µg/L) to 78 µg/L. Nineteen of the 55 wells within the Lancaster sub-basin exceed the arsenic MCL. Twelve of these high arsenic wells, including the 78 µg/L arsenic concentration, are located outside the more populated urbanized areas in the Antelope Valley.

Elevated arsenic levels are localized and are not a widespread problem in the region. Most drinking water wells with arsenic concentrations above 10 µg/L have been shut down and/or abandoned. Other options for high arsenic wells also include wellhead treatment for removing arsenic and implementing blending plans with lower arsenic concentration sources to decrease the arsenic level to below eighty percent of the MCL or 8 µg/L.

3.1.5 Chromium

Chromium is an odorless and tasteless metallic element. Chromium is found naturally in rocks, plants, soil and volcanic dust, and animals. The most common forms of chromium that occur in natural waters in the environment are trivalent chromium (chromium-3) and hexavalent chromium (chromium-6).

Chromium-3 is an essential human dietary element and is found in many vegetables, fruits, meats, grains and yeast. Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits, and it can also be produced by industrial processes (e.g., electroplating and metal finishing operations). There are demonstrated instances of chromium being released to the environment by leakage, poor storage or inadequate industrial waste disposal practices.

Chromium-6 has been known to cause cancer when inhaled and has also been linked to cancer when ingested. Chromium-6 is regulated under the State Primary Drinking Water Standard for total chromium, which has a State MCL of 50 µg/L. The State standard is more health protective than the National standard of 100 µg/L. The State total chromium MCL was established in 1977 to address the non-cancer toxic effects of chromium-6, and also includes the chromium-3 form. On August 23, 2013, the California Department of Public Health (CDPH) proposed a specific chromium-6 drinking water standard of 10 µg/L. On April 15, 2014, CDPH submitted the chromium-6 regulations package to the Office of Administrative Law for review. If approved, the regulations are transmitted to the Office of the Secretary of State. The proposed MCL is one-fifth the level of the current total chromium MCL and is expected to reduce the theoretical cancer risk statewide from exposure to chromium-6.

Based on available data, average total chromium concentrations in the groundwater basin ranges from ND (less than 10 µg/L) to 13 µg/L. No wells exceeded the MCL standard for total chromium.

3.1.6 Fluoride

Fluoride compounds are salts that form when the element, fluorine, combines with minerals in soil or rocks. Some fluoride compounds, such as sodium fluoride and fluorosilicates, dissolve easily into ground water as it moves through gaps and pore spaces between rocks. Most water supplies contain some naturally occurring fluoride. Fluoride also enters drinking water in discharge from fertilizer or aluminum factories. Also, many communities add fluoride to their drinking water to promote dental health.

Exposure to excessive consumption of fluoride over a lifetime may lead to increased likelihood of bone fractures in adults, and may result in effects on bone leading to pain and tenderness. Children aged 8 years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects to teeth.

Based on available data, average fluoride concentrations in the groundwater basin ranges from 0.13 mg/L to 5.5 mg/L. Two wells exceeded the fluoride MCL of 2 mg/L.

3.1.7 Boron

Boron is a naturally-occurring element found in rocks, soil, and water. Human causes of boron contamination include releases to air from power plants, chemical plants, and manufacturing facilities. Fertilizers, herbicides and industrial wastes are among the sources of soil contamination. Contamination of water can come directly from industrial wastewater and municipal sewage, as well as indirectly from air deposition and soil runoff. Boron compounds are used in the manufacture of glass, soaps and detergents and as flame retardants.

The general population obtains the greatest amount of boron through food intake, as it is naturally found in many edible plants. Boron is taken as health supplements to build strong bones, treat osteoarthritis, use as an aid for building muscles and increasing testosterone levels, and improve thinking skills and muscle coordination.

Boron has a State Notification Level (NL) of 1 mg/L. CDPH established these health-based advisory levels to provide information to public water systems and others about certain non-regulated chemicals in drinking water that lack MCLs. Based on available data, average boron concentrations in the groundwater basin ranges from ND (less than 0.1 mg/L) to 1.52 mg/L. Only one well exceeded the NL.

3.2 Historical Salt and Nutrient Characterization of the Groundwater Basin

The salt and nutrient characterization is based on the historical water quality or baseline conditions of the Antelope Valley groundwater basin. The baseline condition is the average concentration of each constituent in groundwater during the ten year period between 2001 and 2010. At the recommendation of the Regional Board, the State Board's GeoTracker Groundwater Ambient

Monitoring and Assessment[1] (GAMA) and the USGS National Water Information System[2] (NWIS) online databases were used to download the historical monitoring results to establish the baseline conditions. GAMA was used to obtain municipal water supply well data. NWIS was used to obtain USGS monitoring well data. Refer to Sections 3.2.1 and 3.2.2 for additional information about GAMA and NWIS.

Many private well owners were reluctant to share their groundwater well information. Many well owners have serious concerns regarding privacy issues, although assurances could be made that the well information would remain anonymous and used solely for the purpose of baseline water quality determinations. The stakeholder group determined that it would be more practical to use water quality information from the publicly available GAMA and NWIS databases.

The first draft of this SNMP, sent to stakeholders in June 2013, included two separate analyses for the baseline groundwater conditions. The first analyzed USGS monitoring well results from the NWIS database and the second, utilizing results from the GAMA database, considered both municipal water supply and USGS monitoring wells. During the draft SNMP review process, it was discovered that the GAMA database was missing some USGS monitoring data from the northerly (Gloster) and westerly (West Antelope) areas of the groundwater basin. This inconsistency was found to be due to a discrepancy between the Federal (USGS 1987) and State (DWR 2004) groundwater basin boundaries. The data from the two database sources was subsequently combined and the results are included in this report.

Table 3-1 provides a well count summary organized by constituent, sub-basin, and data source. This includes wells in areas of the region that are not considered part of the USGS established sub-basins. Much of these areas are located over bedrock and do not have separate sub-basin analysis. These areas, however, are within the SNMP study area and are included in the overall basin analysis. Seven of the sub-basins have less than three wells for some or all of the constituents. A significant portion of the region is sparsely or not populated and, therefore, has limited well data available on GAMA and NWIS. Per the Regional Board, three wells per sub-basin are preferred for statistical significance. The last two rows of the table are the number of GAMA and NWIS sourced wells for each constituent. For both sources, the well count differs for each constituent because each well was monitored for a different set of constituents.

As mentioned earlier, the constituents investigated in the SNMP include TDS, nitrate, chloride, arsenic, chromium, fluoride and boron. The average concentrations, or baseline conditions, of each constituent were determined for each sub-basin and for the groundwater basin as a whole, see Table 3-2. No data from the 2001-2010 timeframe was available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.

There are distinct water quality differences presented between sub-basins. Water quality for wells can also vary by depth. A discussion regarding vertical partitioning of water quality was requested by the Lahontan Regional Board. However, the data available from the GeoTracker GAMA or USGS NWIS databases is insufficient for water quality analysis by vertical partitioning.

Most of the water quality data for the investigated constituents were measured at levels that were well below the DLR, a parameter set by CDPH for most regulated analytes. The DLR parameters are not laboratory specific and are independent of the analytical methods used. Most State certified laboratories are capable of achieving a detection limit that is lower than or equal to the DLR. Chloride and TDS do not have a DLR.

[1] http://geotracker.waterboards.ca.gov/gama/
[2] http://waterdata.usgs.gov/nwis

Figures 3-1 through 3-14 illustrate the mean concentration of each constituent by well and by sub-basin. The well locations were mapped using approximate latitude and longitude coordinates downloaded from the GAMA and NWIS databases. Many coordinate locations represent a cluster of wells (multiple wells using the same coordinates).

The groundwater basin has generally good water quality. The overall basin concentration of each constituent meets the SNMP water quality management goals. Compared to the other sub-basins, North Muroc and Peerless generally have higher concentrations of TDS, chloride, chromium, fluoride, and boron. This is not a concern, however, as the concentrations for these constituents meet all drinking water regulations. As discussed in the previous section, these constituents are naturally occurring.

Arsenic is a concern in the Antelope Valley. The elevated arsenic concentrations in the Gloster, Neenach, North Muroc, Peerless, and Willow Springs sub-basins exceed the regulatory drinking water and SNMP water quality management goals. High arsenic in groundwater is naturally occurring, resulting from dissolution of rocks and minerals. Arsenic concentrations above the MCL of 10 µg/L are not used for potable applications. Wells with concentrations above the MCL are typically treated to remove arsenic, blended to dilute arsenic concentration, or shut down.

Table 3-1: Total Number of Wells Organized by Constituent, Sub-Basin, and Data Source

	Arsenic	Boron	Chloride	Fluoride	Nitrate as N	Total Chromium	TDS
Buttes	10	10	10	10	10	9	10
Chaffee	-	-	-	-	-	-	-
Gloster	2	2	2	2	-	-	2
Finger Buttes	-	-	-	-	-	-	-
Lancaster	223	178	218	220	184	171	220
Neenach	5	1	4	4	7	6	4
North Muroc	5	5	5	5	8	7	6
Oak Creek	-	-	-	-	-	-	-
Pearland	24	23	25	24	25	22	22
Peerless	2	2	2	2	2	2	2
West Antelope	1	1	1	1	1	-	1
Willow Springs	5	4	5	5	6	4	5
No Sub-Basin (a)	62	36	53	52	57	50	46
AV Groundwater Basin	339	262	325	325	300	271	318
GAMA (b)	262	195	255	256	283	253	249
NWIS (c)	77	67	70	69	17	18	69

(a) These wells are located in areas that are not considered part of the established sub-basins.
(b) GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) database
(c) USGS National Water Information System (NWIS) database

Table 3-2: Baseline Water Quality Concentrations in the Antelope Valley Groundwater Basin (2001 - 2010)

Sub-Basin	Arsenic (µg/L)	Boron (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate as N (mg/L)	Total Chromium (µg/L)	TDS (mg/L)
MCL	10	1 (a)	500 (b)	2	10	50	1000 (c)
DLR	2	0.1	N/A	0.1	0.4	10	N/A
Buttes	1.32	0.07	19.1	0.38	1.42	8.77	301
Chaffee	-	-	-	-	-	-	-
Gloster	50.65	0.20	12.2	0.51	-	-	404
Finger Buttes	-	-	-	-	-	-	-
Lancaster	8.88	0.14	35.2	0.43	1.53	6.10	325
Neenach	13.24	0.20	51.9	0.46	1.84	7.64	446
North Muroc	55.15	0.87	201.9	0.68	2.18	10.17	858
Oak Creek	-	-	-	-	-	-	-
Pearland	0.76	0.07	17.5	0.19	4.06	1.91	256
Peerless	27.46	0.87	68.8	1.48	2.72	4.17	547
West Antelope	8.93	0.77	19.7	0.35	3.69	-	403
Willow Springs	12.43	0.04	22.1	0.21	1.81	4.00	301
AV Groundwater Basin	**9.66**	**0.17**	**38.4**	**0.44**	**1.97**	**5.53**	**350**

(a) Boron NL is 1 mg/L. There is no drinking water standard (MCL) for Boron
(b) Chloride SMCL: Consists of a 250 mg/L recommended level, a 500 mg/L upper level, and a 600 mg/L short-term level.
(c) TDS SMCL: Consists of a 500 mg/L recommended level, a 1,000 mg/L upper level, and a 1,500 mg/L short-term level.

Figure 3-1: TDS Concentration Range by Well

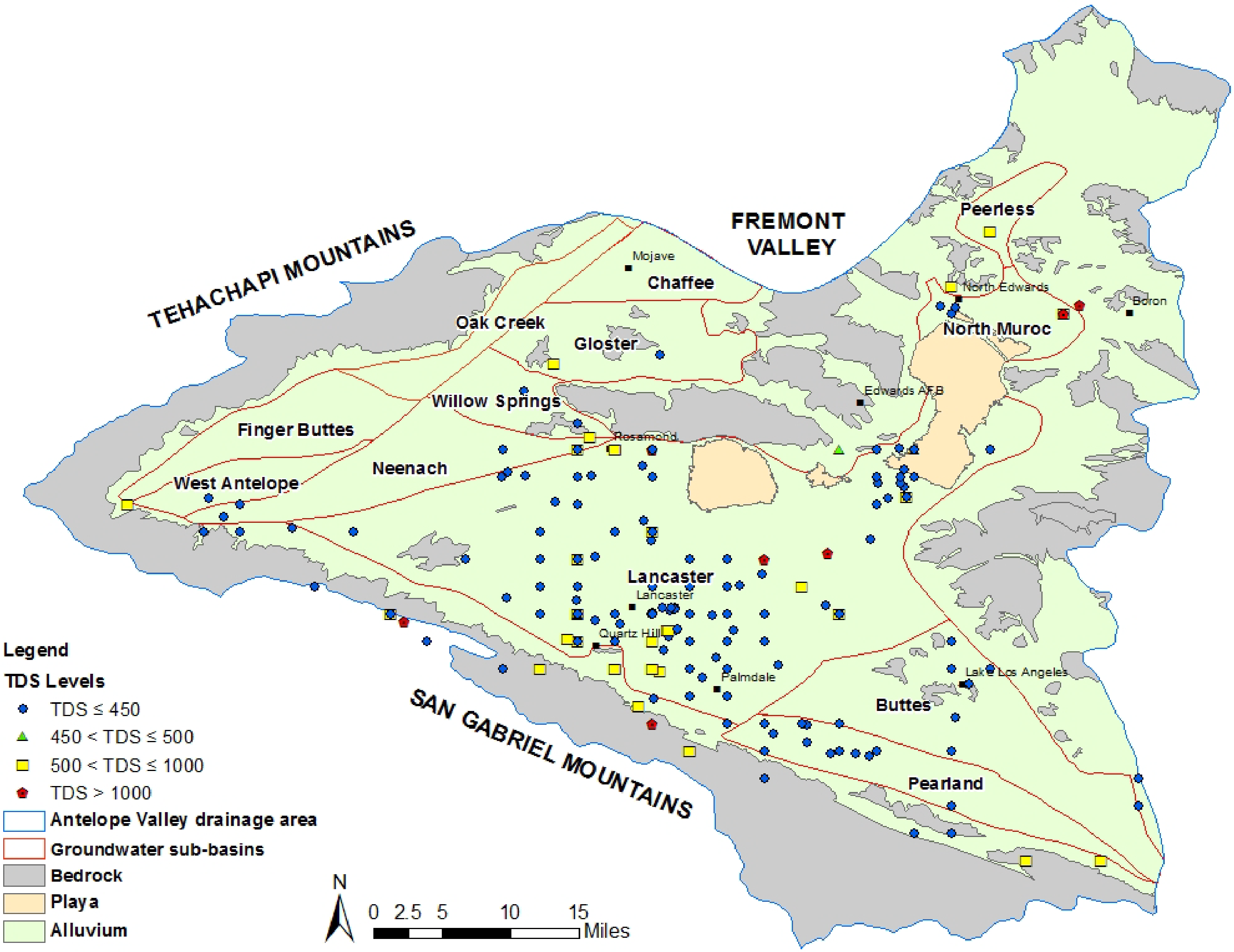
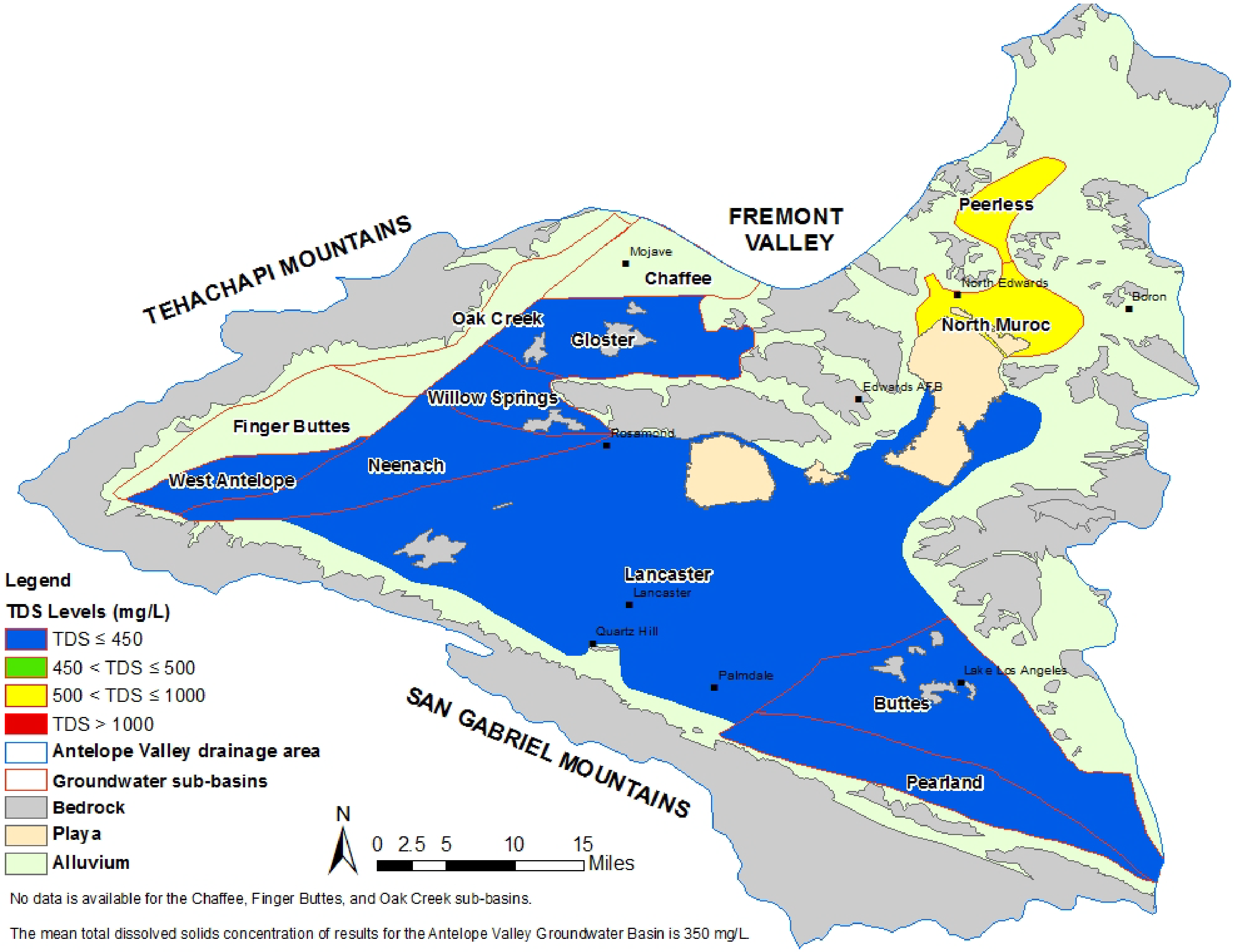


Figure 3-2: TDS Concentration Range by Sub-Basin



No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.

The mean total dissolved solids concentration of results for the Antelope Valley Groundwater Basin is 350 mg/L.

Figure 3-3: Chloride Concentration Range by Well

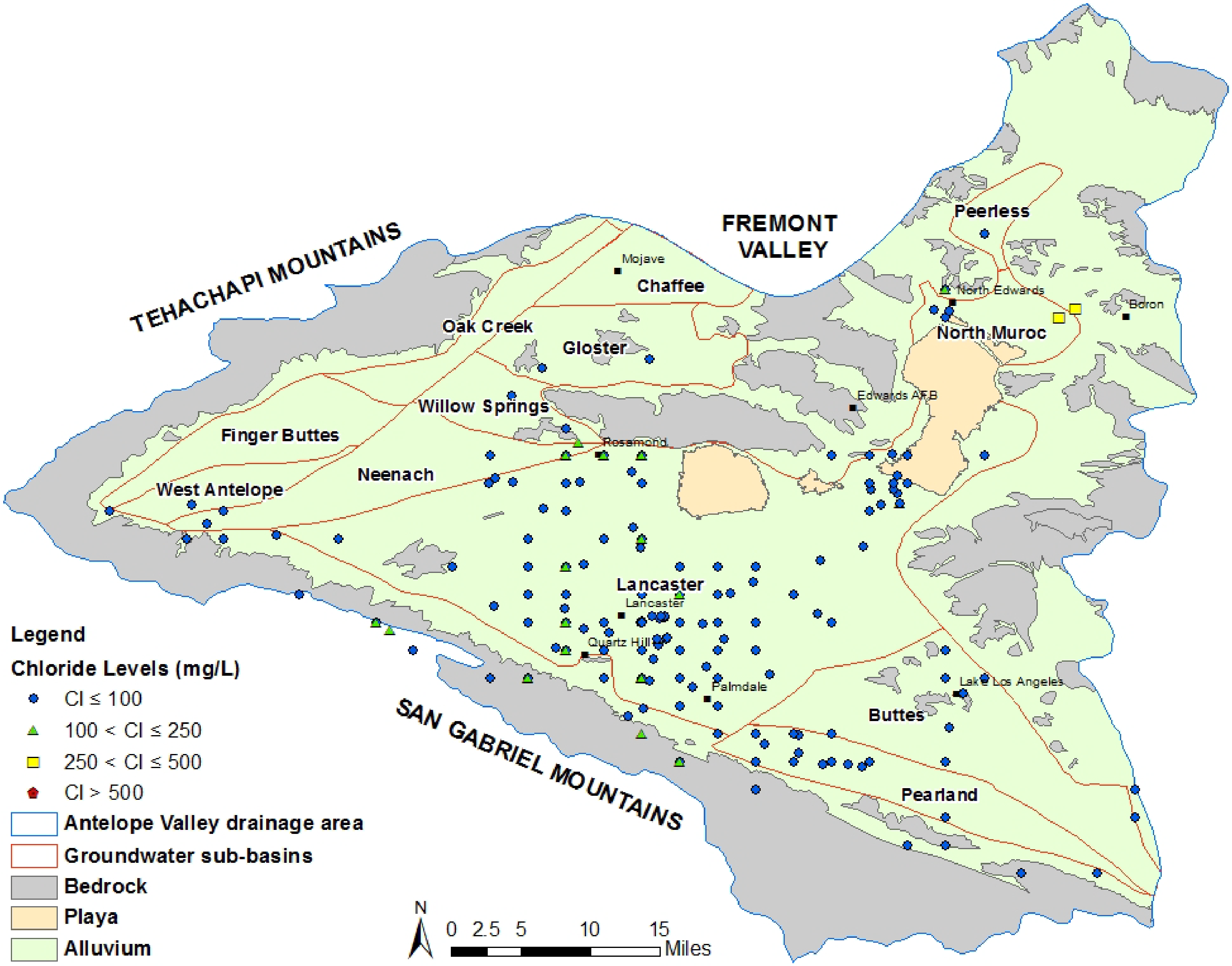
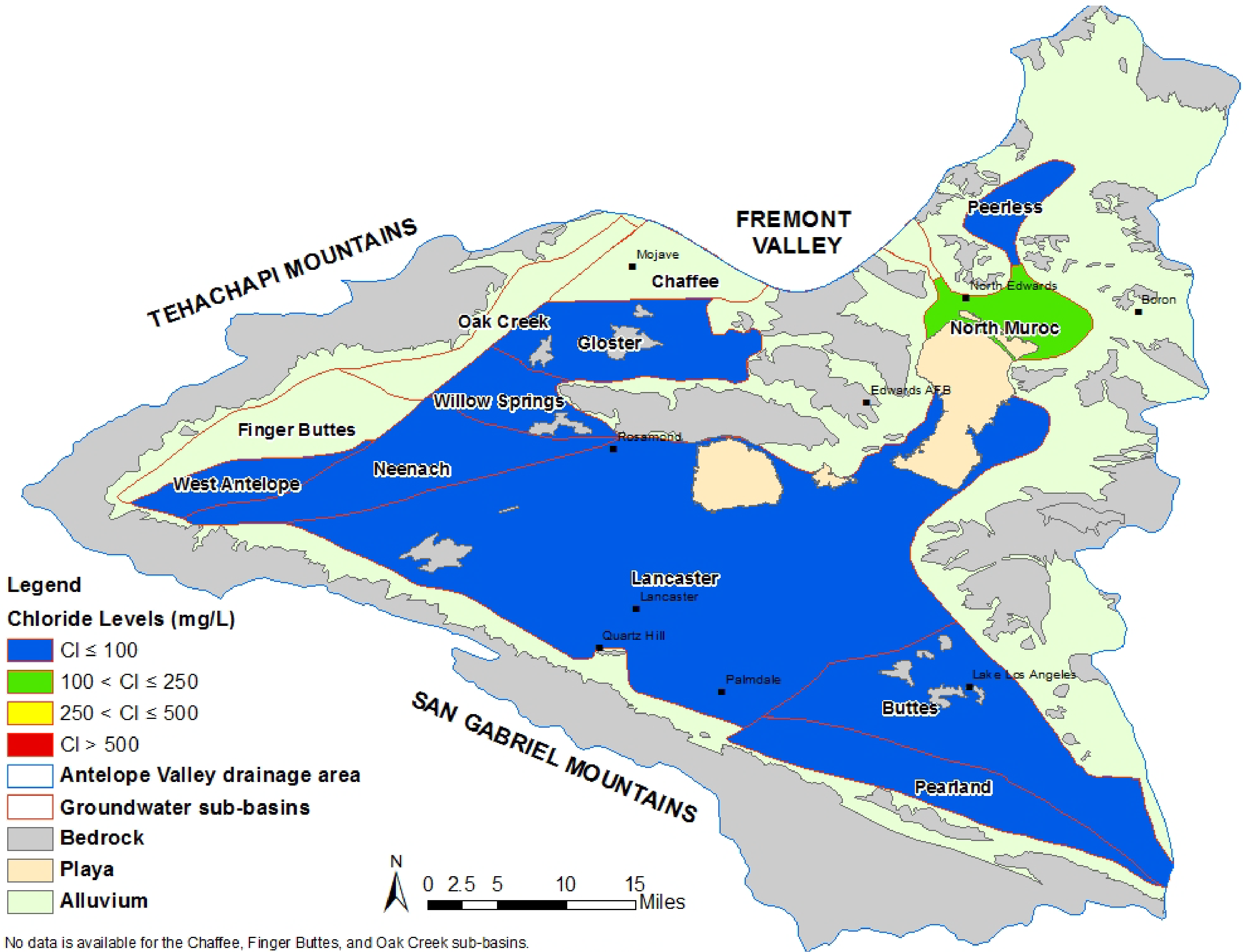


Figure 3-4: Chloride Concentration Range by Sub-Basin



No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean chloride concentration of results for the Antelope Valley Groundwater Basin is 38 mg/L.

Figure 3-5: Nitrate Concentration Range by Well

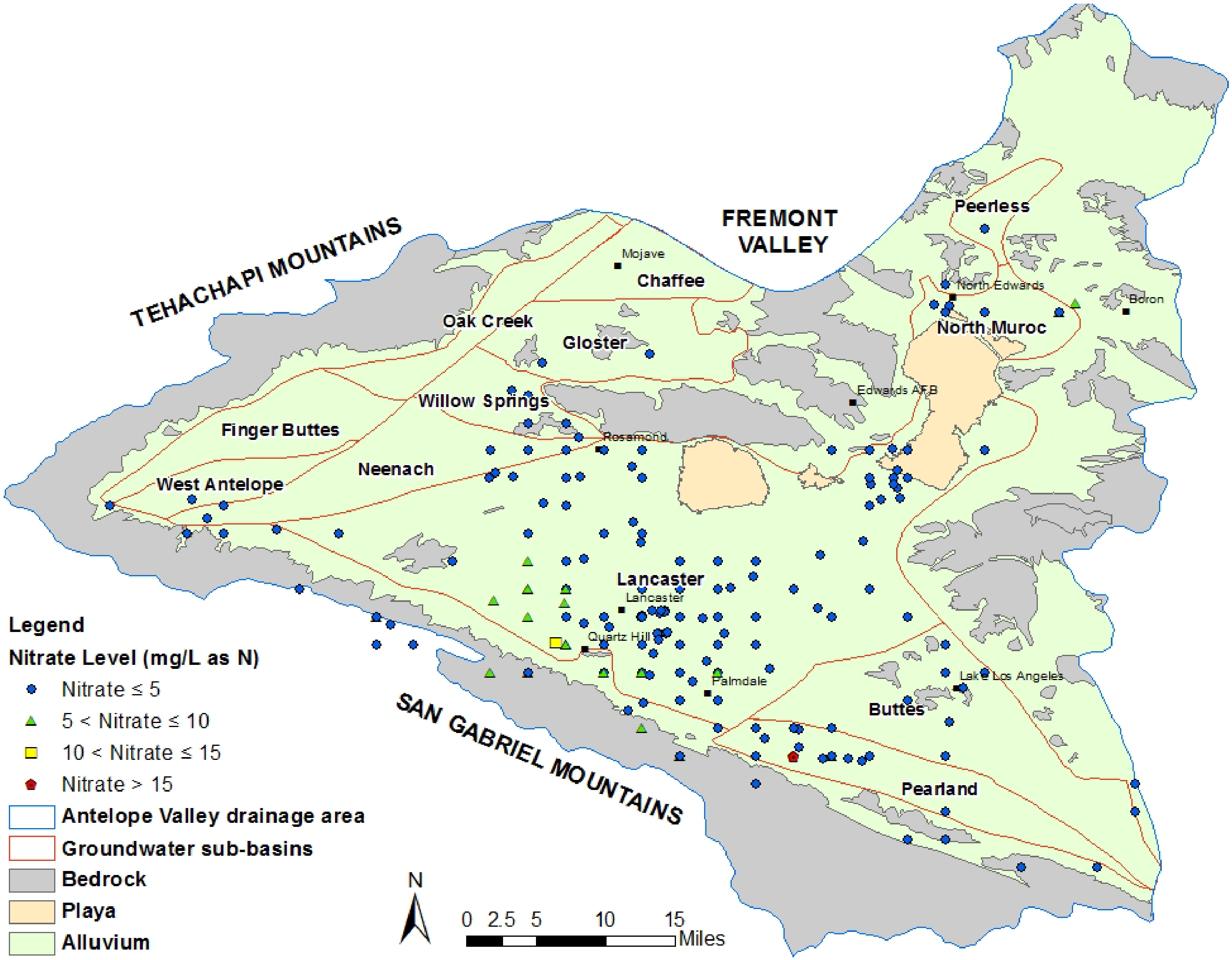
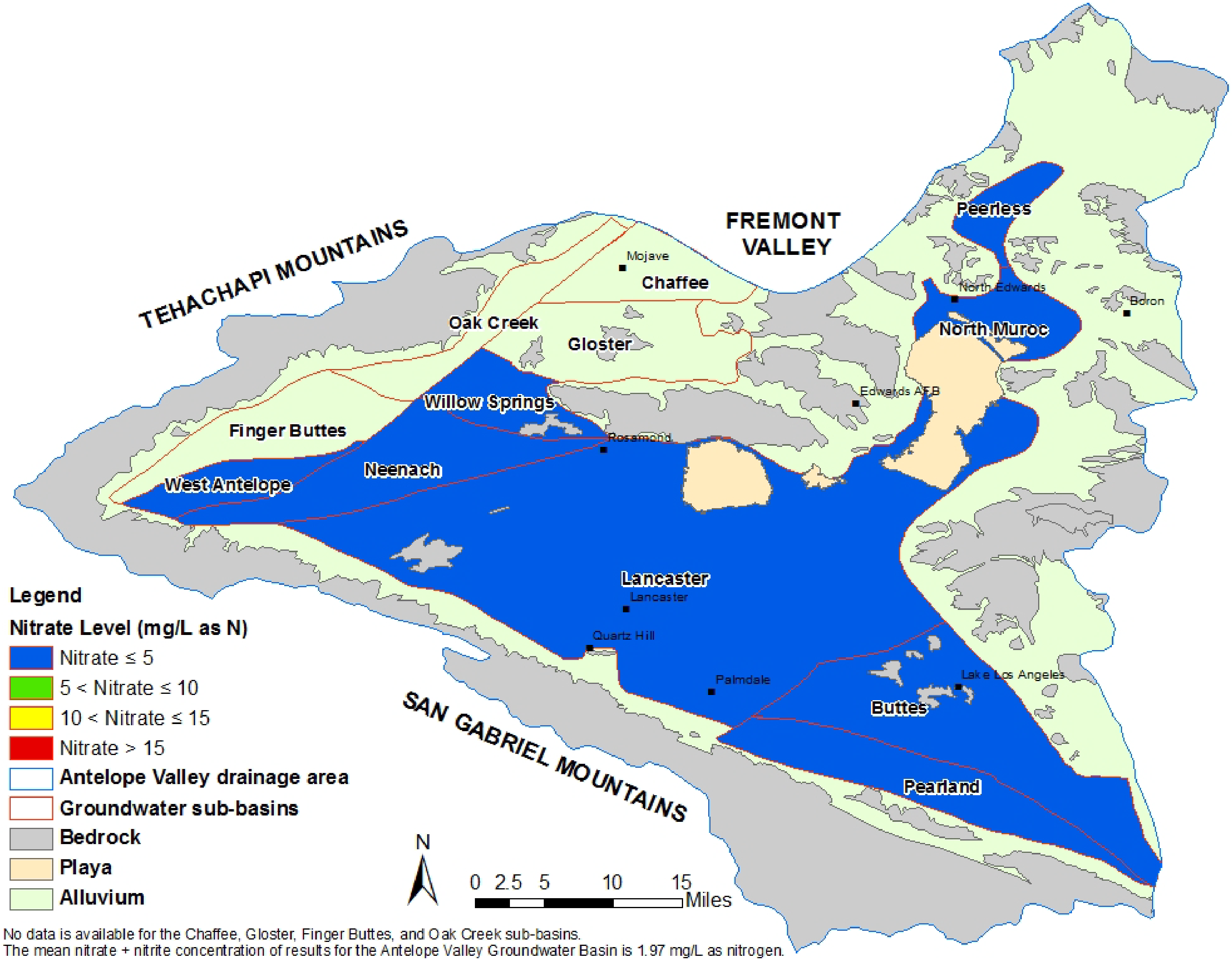


Figure 3-6: Nitrate Concentration Range by Sub-Basin



No data is available for the Chaffee, Gloster, Finger Buttes, and Oak Creek sub-basins.
The mean nitrate + nitrite concentration of results for the Antelope Valley Groundwater Basin is 1.97 mg/L as nitrogen.

Figure 3-7: Arsenic Concentration Range by Well

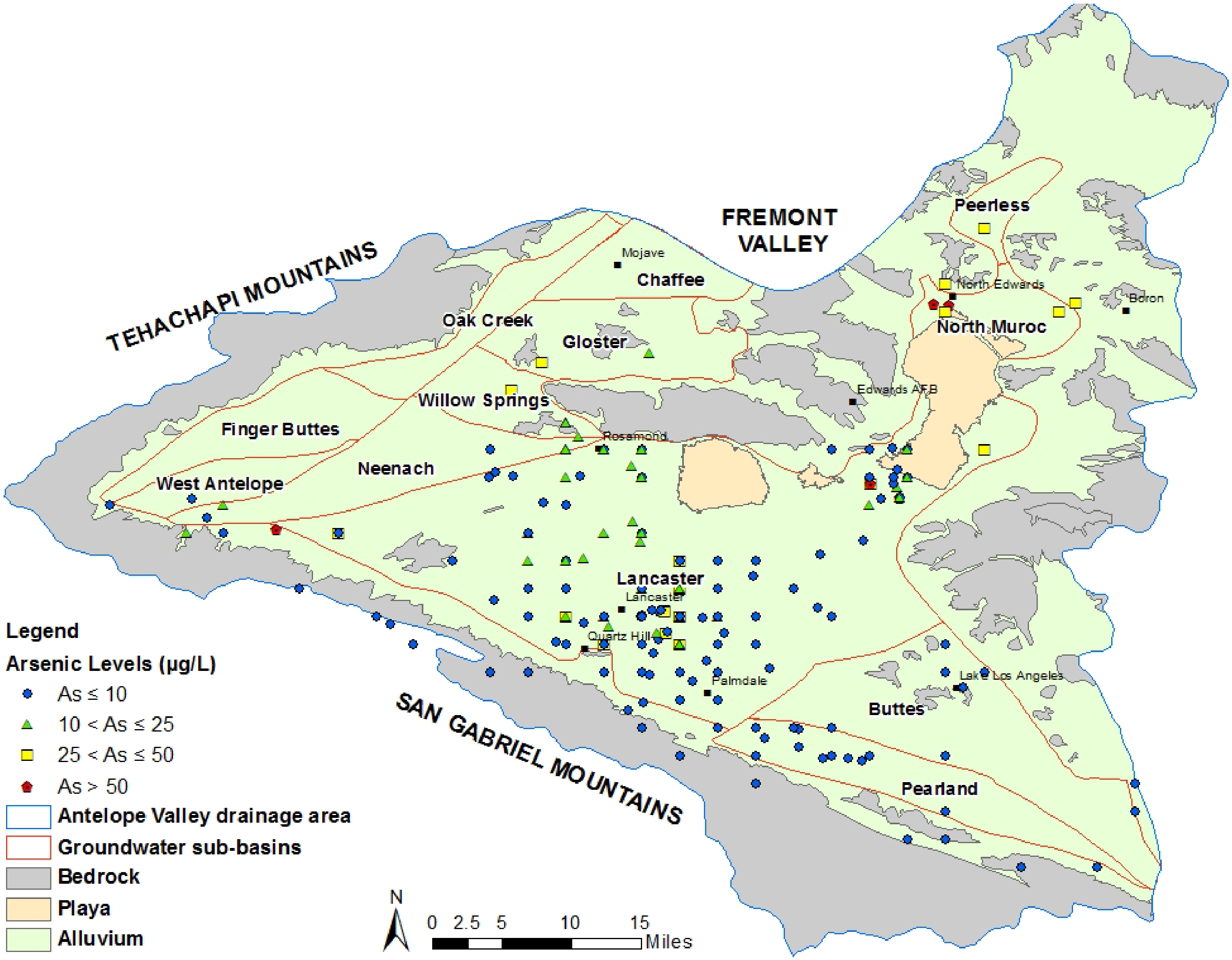


Figure 3-8: Arsenic Concentration Range by Sub-Basin

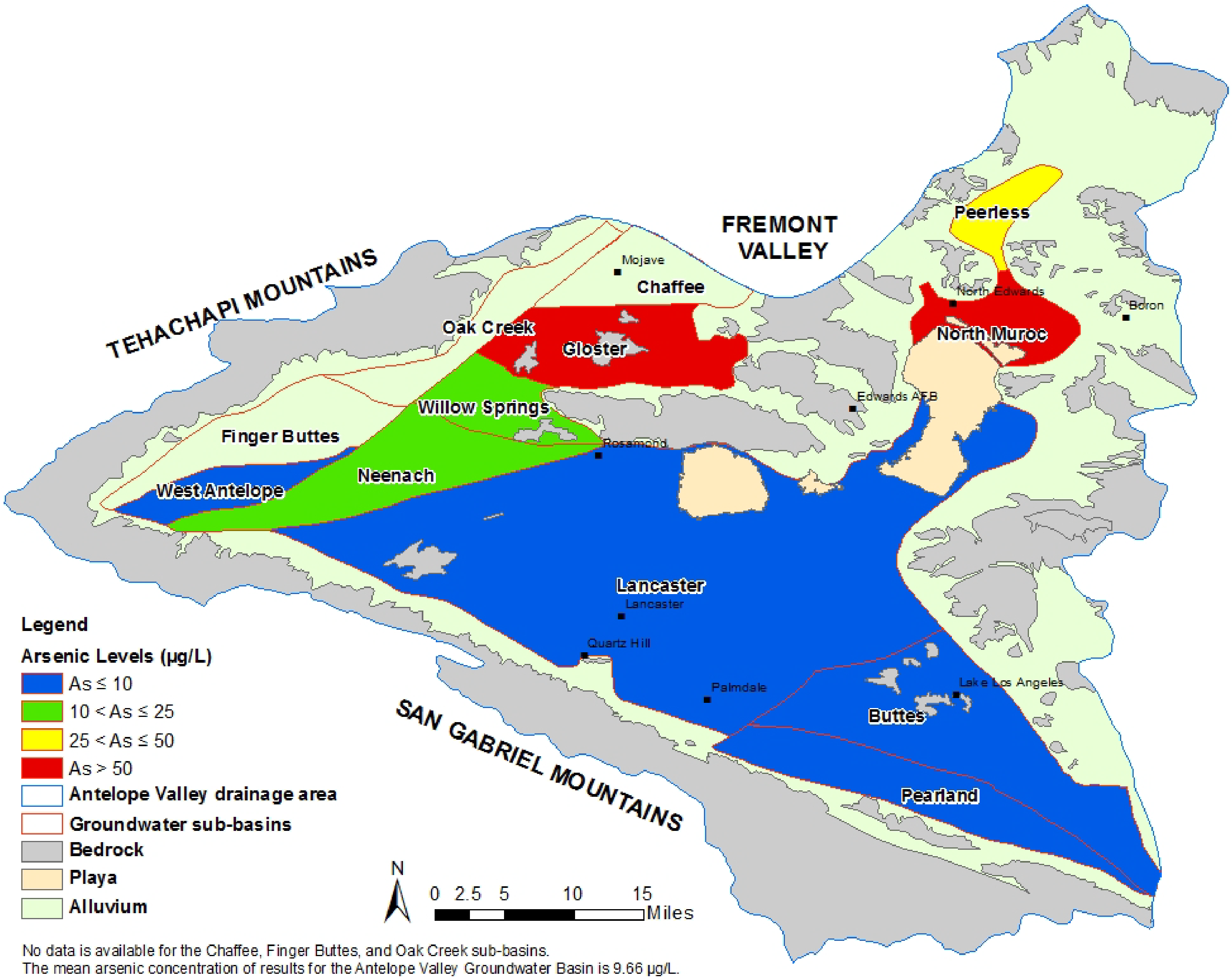


Figure 3-9: Total Chromium Concentration Range by Well

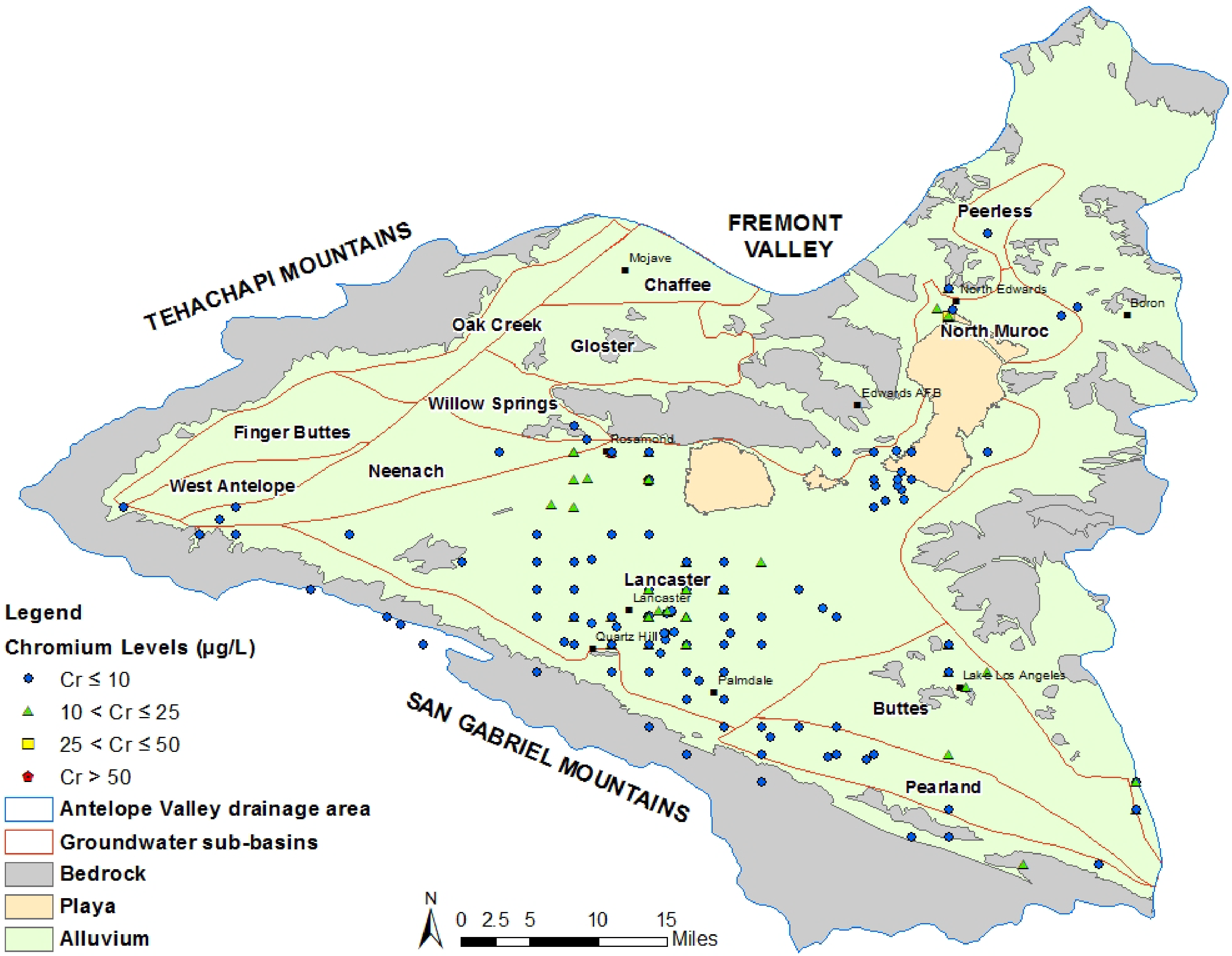
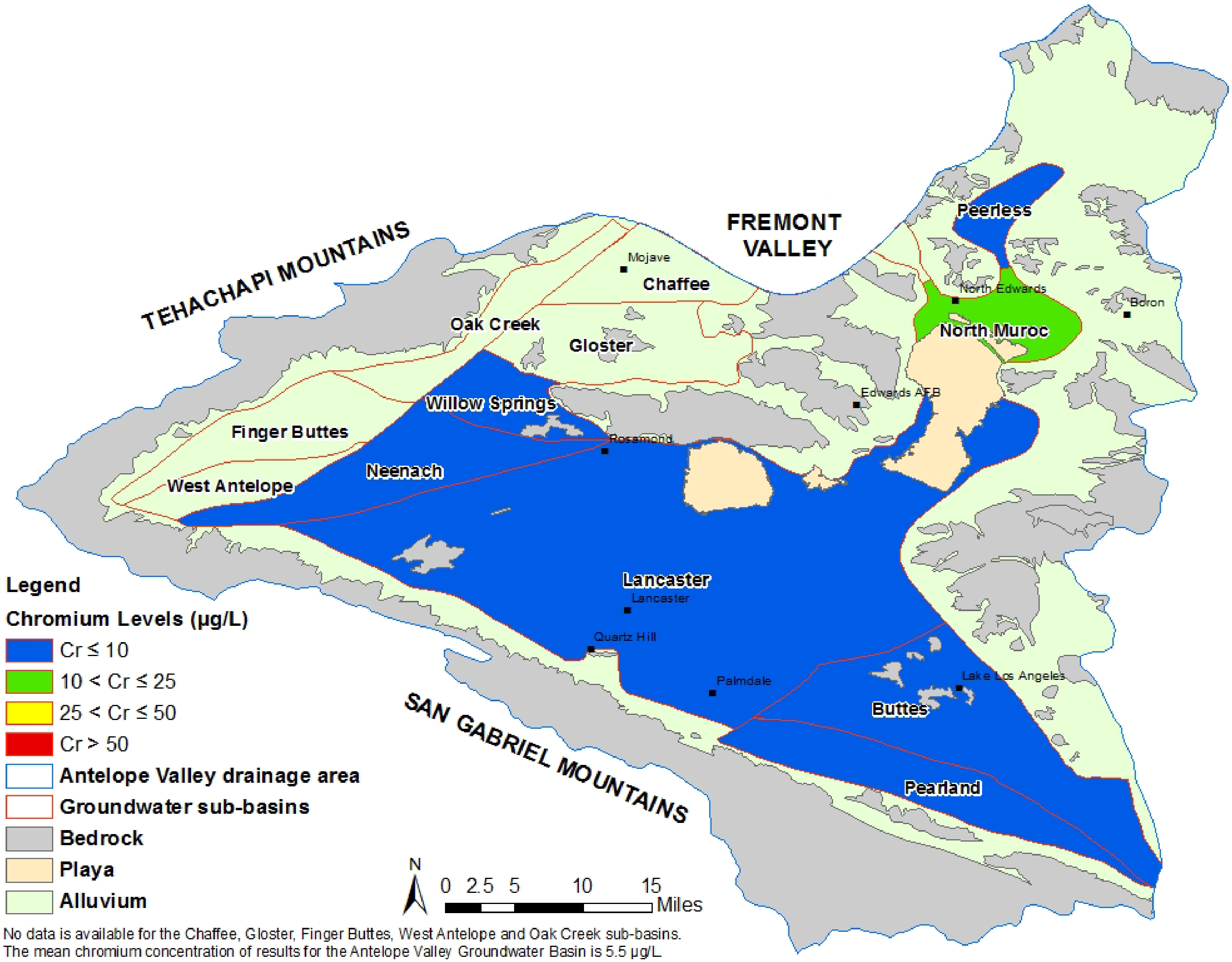


Figure 3-10: Total Chromium Concentration Range by Sub-Basin



No data is available for the Chaffee, Gloster, Finger Buttes, West Antelope and Oak Creek sub-basins.
The mean chromium concentration of results for the Antelope Valley Groundwater Basin is 5.5 µg/L.

Figure 3-11: Fluoride Concentration Range by Well

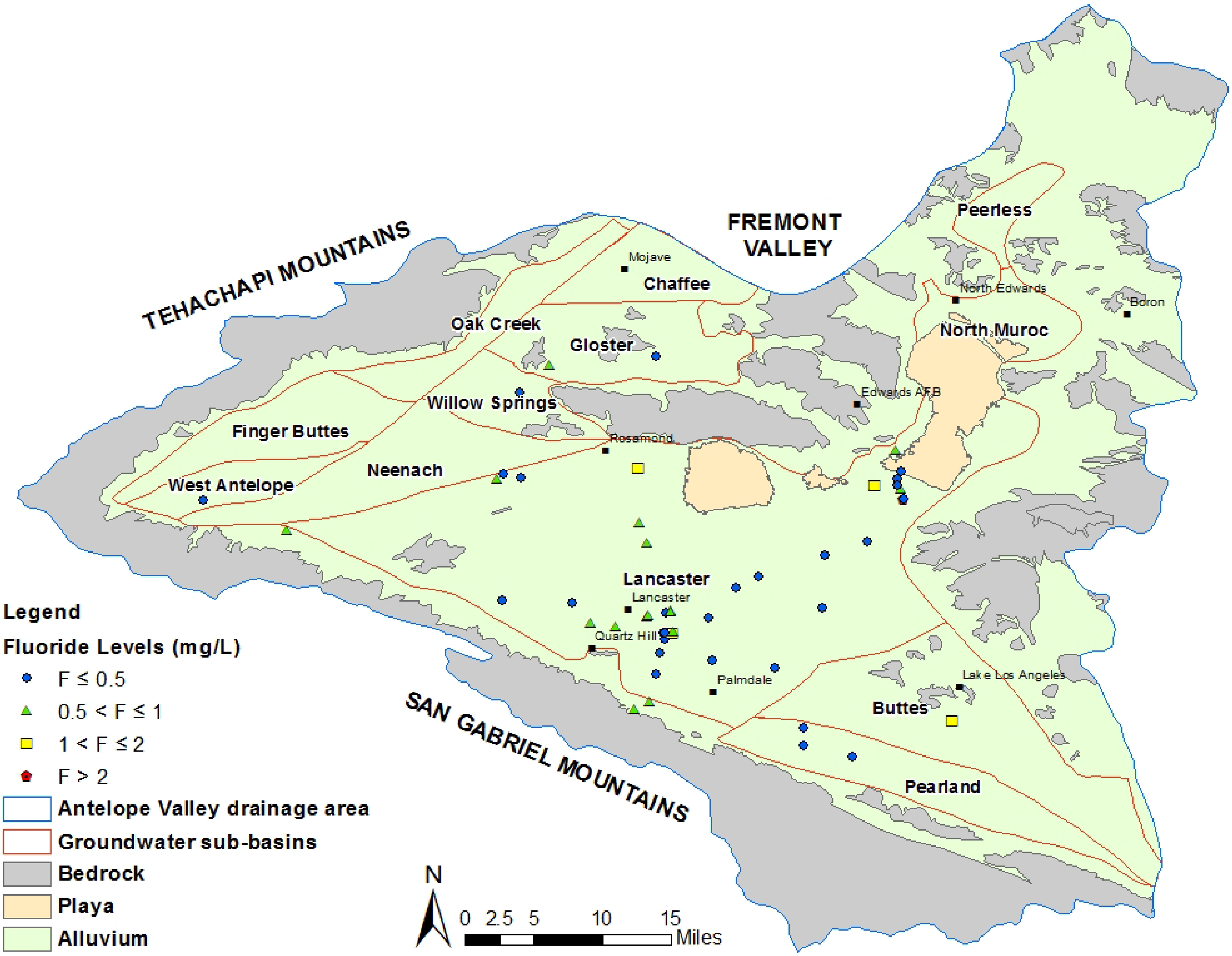


Figure 3-12: Fluoride Concentration Range by Sub-Basin

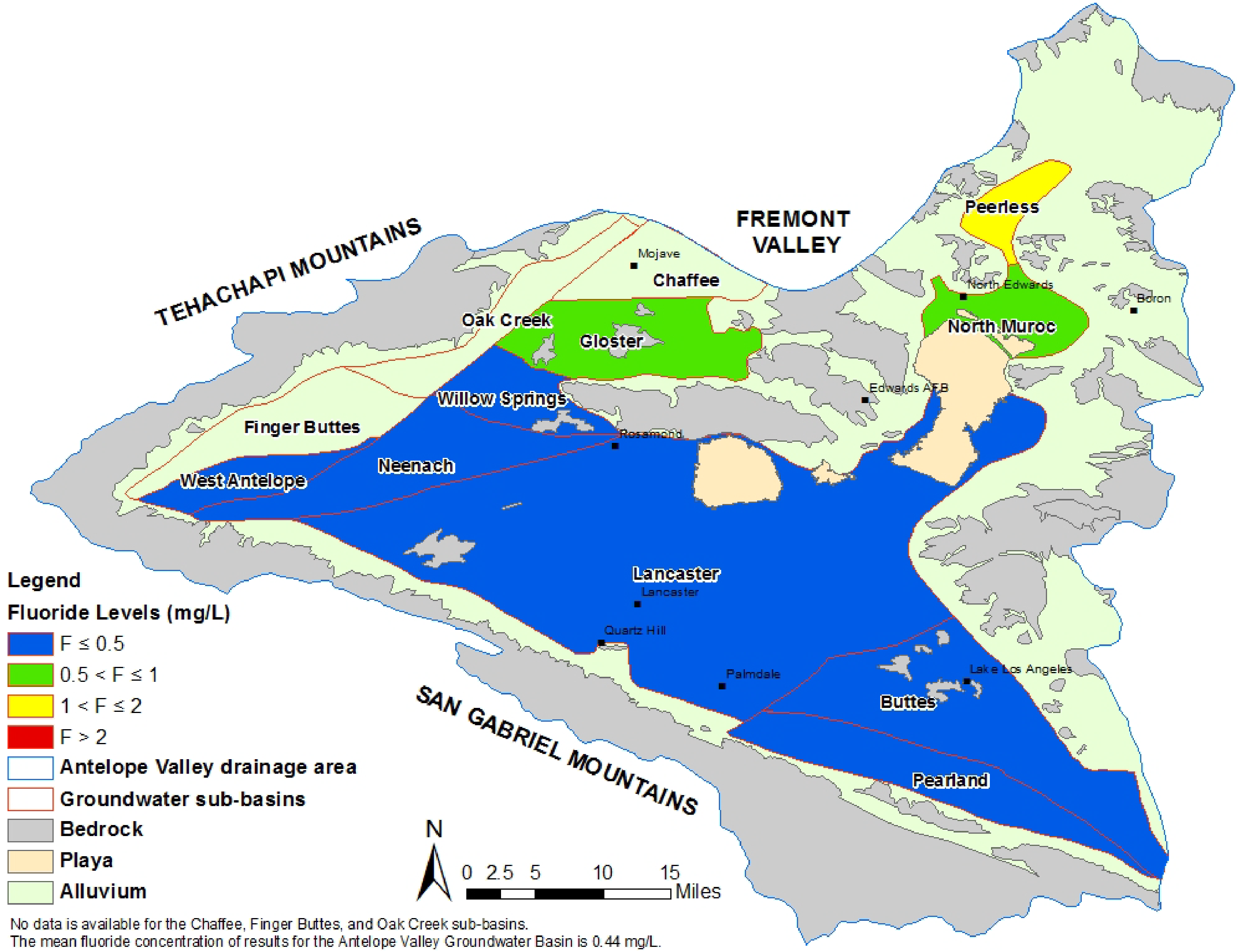


Figure 3-13: Boron Concentration Range by Well

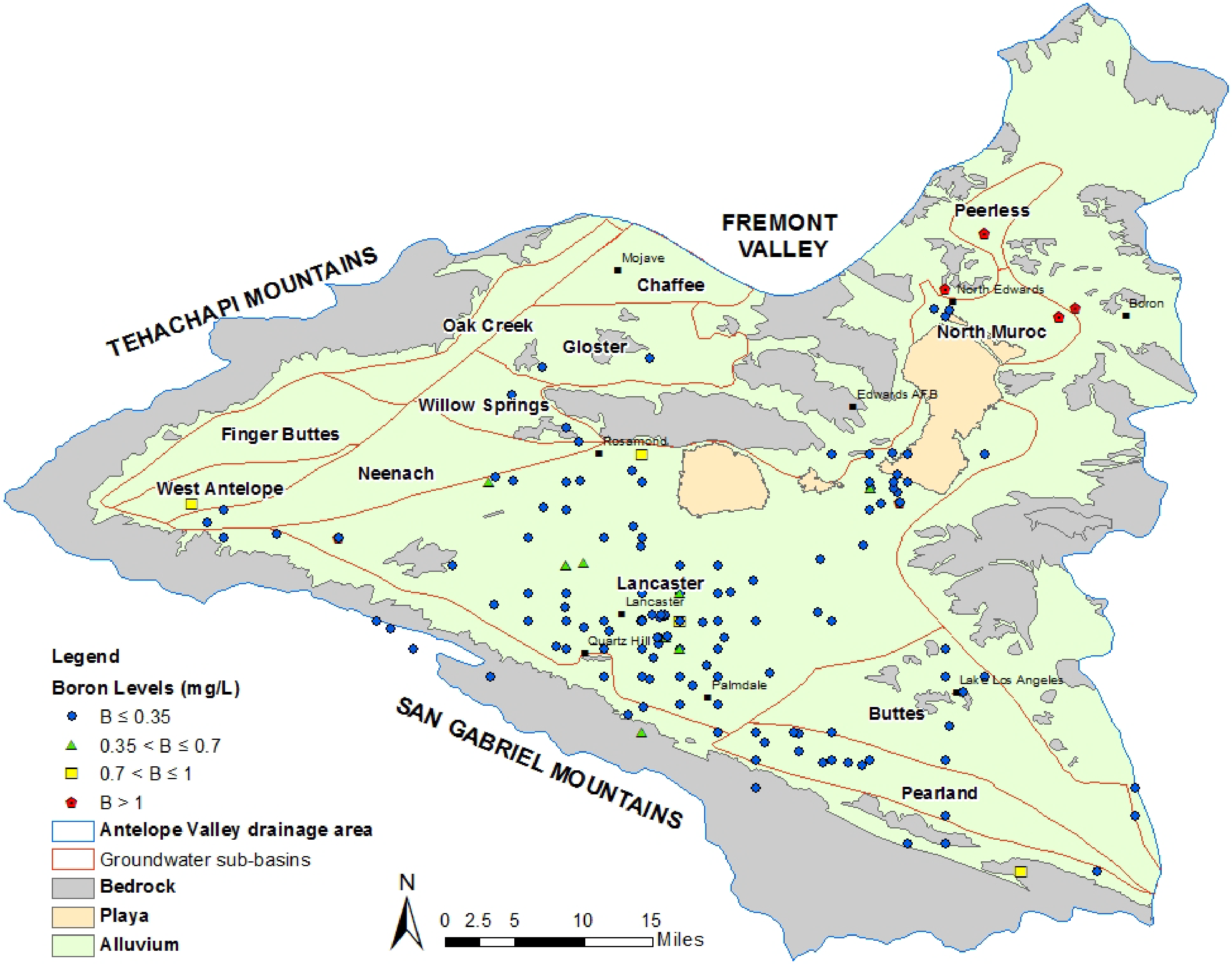
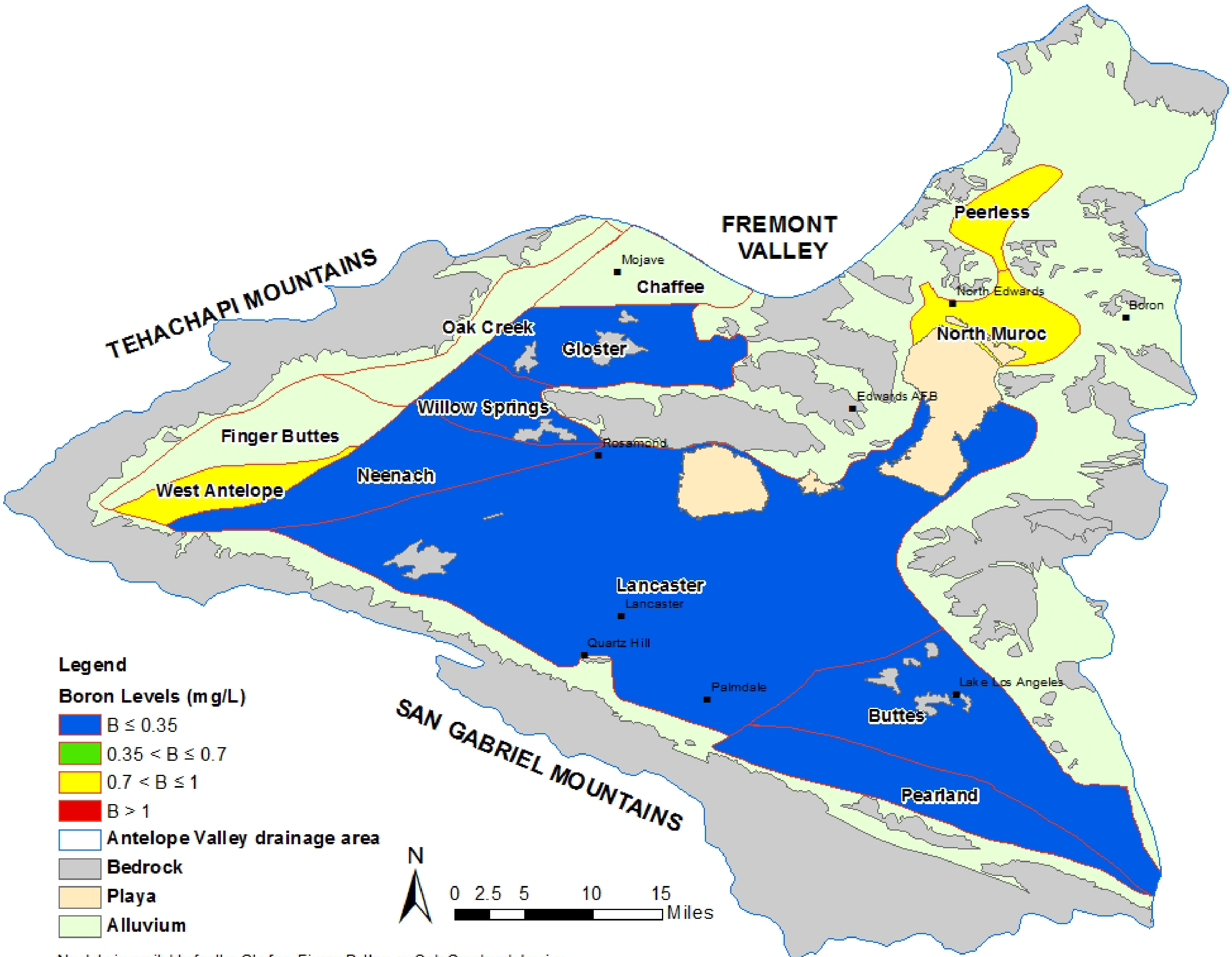


Figure 3-14: Boron Concentration Range by Sub-Basin



No data is available for the Chafee, Finger Buttes, or Oak Creek sub-basins.
The mean boron concentration of results for the Antelope Valley Groundwater Basin is 0.17 mg/L.

3.2.1 GeoTracker Groundwater Ambient Monitoring and Assessment Database

The State Board's GeoTracker GAMA database integrates data from State and Regional Boards, CDPH, Department of Pesticide Regulation (DPR), Department of Water Resources (DWR), USGS, and Lawrence Livermore National Laboratory (LLNL). The GAMA database was used to download historical water quality data for municipal water supply wells in the Antelope Valley.

The search parameters were selected based on the following criteria:

1. Datasets: Supply Wells – CDPH
2. GIS Layer: Groundwater Basins
3. Groundwater Basin: Antelope Valley (6-44)
4. Well Type: Wells With Results
5. Constituents: Arsenic (MCL=10 µg/L), Boron (NL=1 mg/L), Chloride (SMCL=500 mg/L), Chromium (MCL=50 µg/L), Fluoride (MCL=2 mg/L), Nitrate as NO_3 (MCL=45 mg/L) and Total Dissolved Solids (SMCL = 1000 mg/L)
6. Timeline: All Years

A data file for each constituent was exported separately. The data included the following fields: well ID, well name, approximate latitude, approximate longitude, chemical, qualifier, result, units, date, dataset category, dataset source, county, regional board, groundwater basin name, assembly district and senate district.

The approximate latitude and longitude coordinates of the CDPH supply wells are within one mile of the actual locations. Each set of well coordinates is a cluster of wells. The wells depicted in Figures 3-1 through 3-14 may represent multiple water supply wells. The location of each well in terms of sub-basin was determined by mapping the coordinates with ArcGIS software.

The downloaded data was then verified and filtered. The units for each sample entry were verified to ensure that they were consistent for the same chemical. Only samples tested within the 10-year baseline period of 2001-2010 were selected. Samples tested before and after the 10-year window were excluded. Future GAMA data should be reviewed to correct any errors in reported values due to incorrect units or values.

Nitrate as NO_3 data is available from GAMA. This data was converted to nitrate as nitrogen (N) by dividing each number by the molecular weight ratio of NO_3 to N (approximately 4.4).

3.2.2 USGS National Water Information System Database

As part of the USGS program for disseminating water data within USGS, to USGS cooperators, and to the general public, the USGS maintains a distributed network of computers and fileservers for the acquisition, processing, review, and long-term storage of water data. This distributed network of computers is called the NWIS. Many types of data are stored in NWIS, including comprehensive information for site characteristics, well-construction details, time-series data for gage height, streamflow, groundwater level, precipitation, and physical and chemical properties of water. Additionally, peak flows, chemical analyses for discrete samples of water, sediment, and biological media are accessible within NWIS.

USGS data is obtained on the basis of category, such as surface water, groundwater, or water quality, and by geographic area. Further refinement is possible by choosing specific site-selection criteria and by defining the output desired. The data originates from all 50 states, plus border and territorial sites, and include data from as early as 1899 to present. Of the over 1.5 million sites with NWIS data, the vast majority are for wells; however, there are thousands of sites with streamflow data, many sites with atmospheric data such as precipitation, and about 10,900 of the sites provide current condition data. The groundwater observations used in this plan were obtained for the Antelope-Fremont Valleys hydrologic unit, designated by the code 18090206 by USGS.

Individual well location coordinates were determined using the USGS site number for each well. The USGS well site-numbering system is based on the grid system of latitude and longitude and provides the geographic location of the well and a unique number for each site. The number consists of 15 digits: the first 6 digits denote the degrees, minutes, and seconds of latitude; the next 7 digits denote degrees, minutes, and seconds of longitude; and the last 2 digits are a sequential number for wells within a 1-second grid. In the event that the latitude-longitude coordinates for a well are the same, a sequential number such as "01," "02," and so forth, would be assigned as one would for wells.

The location of each well in terms of sub-basin was determined by using the well coordinates given by the site numbers and identifying the sub-basin location in a map created using ArcGIS software. Only data from the 2001 to 2010 baseline period were considered in the analysis.

3.3 Current Salt and Nutrient Characterization of the Groundwater Basin

For the initial analysis of this plan, the current water quality of the groundwater basin is assumed to be equivalent to the average water quality during the baseline period between 2001 and 2010 (see Table 3-2). In future analyses as part of the monitoring plan (see Section 5 regarding the SNMP monitoring plan), the current water quality will be determined by calculating the average water quality concentrations for the most recent 5-year period.

3.4 Salt and Nutrient Characterization of the Source Water

Imported and surface water used for potable supply may undergo treatment at one of the region's four water treatment plants. Recycled water may originate from five different wastewater treatment plants in the Antelope Valley. Table 3-3 provides source water quality information for the constituents identified in Section 3.1. Along with water quantity projections, this information was used in determining the basin's salt/nutrient loadings for the 25-year projection period.

The water imported to the Antelope Valley is of high quality and the average concentrations calculated for each of the SNMP constituents meet drinking water standards. Stormwater is considered a high quality water, because it contains low concentrations of most constituents, including salts and nutrients. Because of its high quality, it is desirable to maximize the use of stormwater for groundwater recharge to lower constituent concentrations in the basin. Thus, the Antelope Valley IRWMP stakeholders have identified projects that utilize stormwater to augment groundwater recharge. For the most part, the recycled water available in the Antelope Valley is also high quality and meets most drinking water standards. Recycled water produced by the Edwards Air Force Base tend to be higher in salt and nutrient concentration (e.g., TDS, nitrate, and chloride) which is probably due to source water coming from higher concentration supplies. The groundwater used in that area is typically pumped from the lower aquifer, which has a much higher mineral content than the middle and upper aquifers of the southern regions. Rosamond Community Services District treats wastewater to secondary standards and is undergoing treatment plant upgrades and expansion to produce tertiary treated recycled water. The first phase of the upgrades has been completed, but the reuse expansion is still underway.

Table 3-3: Source Water Quality

Constituent	Average Concentration (mg/L)										
	State Water Project (California Aqueduct)					WRP/WWTP (Recycled Water)					Stormwater
	Raw (a)	Treatment Plant (potable)									
		Acton (a)	Eastside (a)	Quartz Hill (a)	Rosamond (b)	Palmdale (c)	Lancaster (d)	Air Force Research Lab (e)	Main Base (f)	RCSD (g)	Littlerock Reservoir (h)
TDS	300	274	284	293	290	489	444	430	815	-	152
Chloride	85	83	83	86	84	158	128	50	330	-	3.7
Nitrate as N	0.90	0.90	0.97	0.91	0.92	3.07	6.31	3.3	16	6	0.08
Arsenic	3.8	1.4	1.2	1.2	1.2	ND	ND	7.2	2.3	-	ND
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
Fluoride	0.1	0.1	0.1	0.1	0.1	-	-	-	0.36	-	0.3
Boron	0.162	0.240	0.180	0.170	0.160	-	-	0.25	0.67	-	ND

Table Notes

(a) Antelope Valley-East Kern Water Agency Annual Water Quality Report (2001-2010) - Los Angeles County System. Boron was only tested in 2009.
(b) Antelope Valley-East Kern Water Agency Annual Water Quality Report (2001-2010) - Kern County System. Boron was only tested in 2009.
(c) Average 2013 water quality for tertiary treated effluent at LACSD 20 Palmdale WRP. The detection limit for arsenic is 1 µg/L.
(d) Average 2013 water quality for tertiary treated effluent at LACSD 14 Lancaster WRP.
(e) 2011 Annual Monitoring Report for EAFB Air Force Research Laboratory (AFRL) Treatment Plant.
(f) 2012 Annual Report for EAFB Main Base WWTP.
(g) Water quality in May 2013 for RCSD WWTP. Additional water quality testing after RCSD obtains permit from the Lahontan Regional Board.
(h) Water quality (2001-2010) provided by Palmdale Water District. Used as stormwater water quality.

3.5 Fate and Transport

Historically, groundwater in the basin generally flows north from the San Gabriel Mountains and south and east from the Tehachapi Mountains toward the Rosamond, Buckhorn, and Rogers dry lakes (DWR 2004). The general direction of groundwater flow is illustrated with groundwater level contours in Figure 3-15. In the Neenach sub-basin, groundwater flows to the northeast. In the Pearland sub-basin, groundwater generally moves from the southeast to northwest. In the Lancaster sub-basin, groundwater flows from areas of natural recharge to the low water altitude areas in the south-central part of the sub-basin.

Fate and transport refers to the way constituents move through the environment, from the source to how they arrive at their ultimate destinations.

The fate and transport of TDS and chloride in groundwater is influenced by groundwater flow which is governed by hydraulic gradients. Average TDS concentrations in the Antelope Valley Groundwater Basin are below the recommended SMCL. Chloride is soluble in water and moves freely with water through soil and rock. Chloride is not readily consumed by microorganisms, so it is more persistent than nitrate and likely to leach into groundwater (USGS 2004). Average chloride levels in the Antelope Valley Groundwater Basin are well below the recommended SMCL.

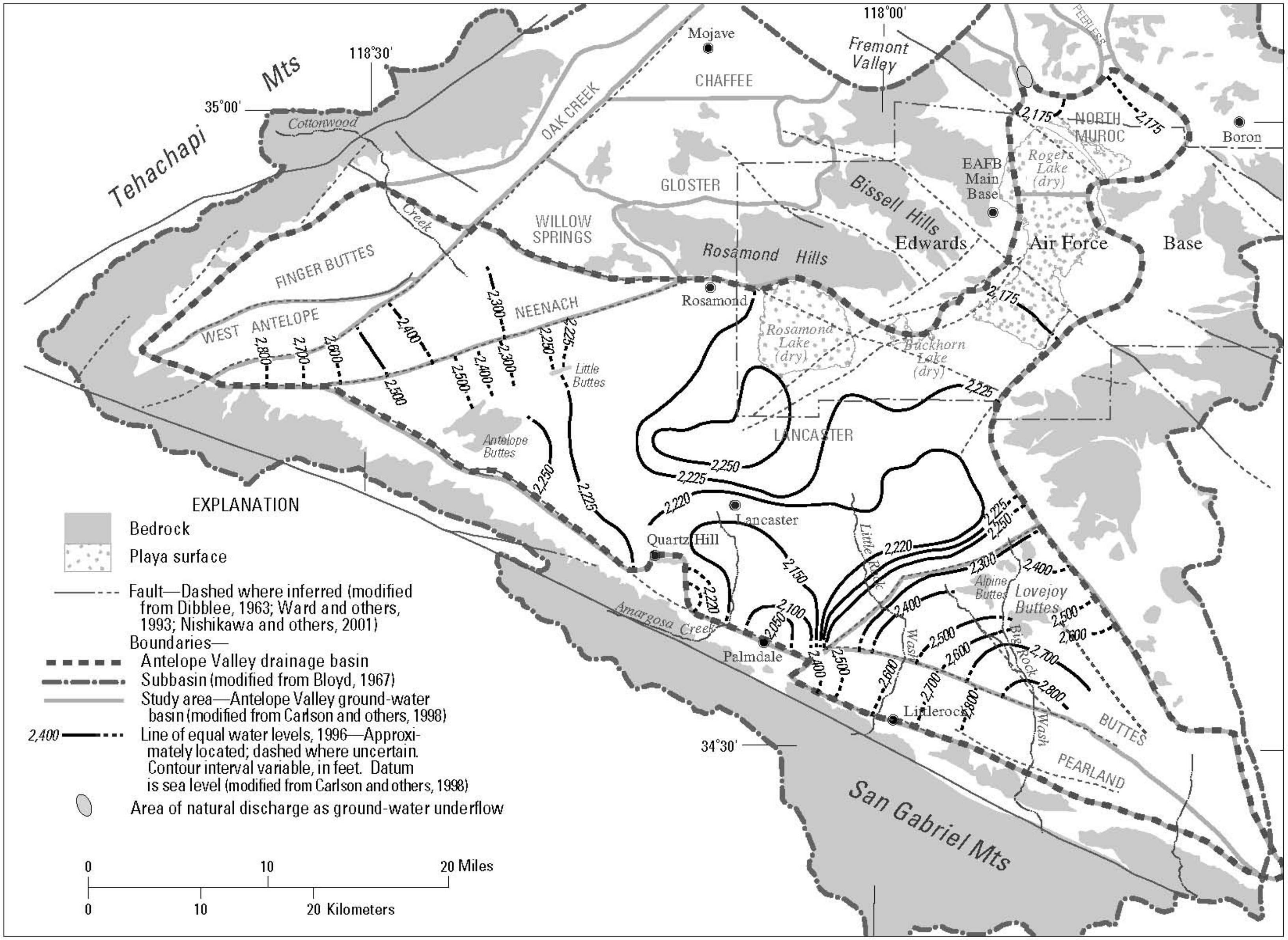
Elevated concentrations of nitrate are commonly found at shallow water-table depths. However, studies show that water and nitrate transport from the root zone to the water table follow preferential flow paths with potential to reach deeper portions of the soil vadose zone and the water table, with limited denitrification. Geologic and hydraulic parameters vary substantially causing high spatial variability of nitrate transport. But in general, nitrate is soluble and mobile at the concentrations typically found in soil and may leach into groundwater. Ammonium (NH_4^+) is strongly adsorbed by most soils and thus is not a concern.

Although movement of nitrate with percolating water through the unsaturated zone may take many years to reach groundwater, long-term increases are possible where aquifers are recharged by nitrate-rich water such as recycled water. In the saturated zone, groundwater movement is generally slow and there is little mixing. For that reason, nitrate contamination is generally localized and can possibly continue for decades after nitrate contaminant sources are eliminated because of the slow rate of movement and lack of dilution.

Fortunately, nitrate levels in the groundwater basin are well below the MCL.

Arsenic, boron, fluoride, and chromium in the region's groundwater mainly originate from natural sources, such as rock and soil, as water moves through the ground and dissolves minerals and salts from the rock formations.

Figure 3-15: Antelope Valley Groundwater Levels (USGS 2004)



3.6 Current and Future Projects

To assess salt and nutrient impacts in the Antelope Valley, current and future projects having the potential to significantly contribute to salt and/or nutrient impacts to the Antelope Valley Groundwater Basin were identified. Details of these projects are described below. Initially, projects having the potential to impact the salt and nutrient content of Antelope Valley Groundwater Basin were identified from the projects listed in the 2007 AVIRWMP. The SNMP stakeholder group added and deleted projects to and from the project list, as necessary and as a result of meeting discussions. A project was deleted from the list if it was deemed irrelevant to this SNMP due to the project's implementation date occurring after the SNMP future planning period (2011-2035) or the project was not expected to impact the basin salt and/or nutrient levels. At the time of development of this SNMP, some projects were in the early stages of development, such as the concept phase, and were not included due to insufficient information to assess impacts. Inclusion of additional projects in future updates to the SNMP necessitates evaluation of project details for relevance, such as those listed in the SNMP "Project Identification Form". The blank and completed project identification forms are included in Appendix E.

Figure 3-16 is a map showing the locations of the identified SNMP projects within the Antelope Valley groundwater basin. Figure 3-17 shows the SNMP project locations within the Lancaster sub-basin.

3.6.1 Project Summary Descriptions

1. *Amargosa Creek Recharge Project*
   Proposed by the City of Palmdale, this project consists of multiple proposed improvements (overall project is the Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project), one of which includes expanding the size and capacity of spreading grounds to increase the natural recharge of the underlying aquifer. The recharge component includes eight basins to recharge groundwater using raw State Water Project water and stormwater runoff from the Amargosa Creek Watershed. Recharge volumes are dependent on available supply and annual precipitation, anticipated averages are listed below in Table 3-4.

2. *Antelope Valley Water Bank*
   The project is owned by the Valley Mutual Water Company, which operates the bank within the structure of the Semitropic-Rosamond Water Bank Authority (SRWBA). At full build-out, the water banking project will provide up to 500,000 acre-feet of storage and the ability to recharge and recover up to 100,000 AFY of water for later use when needed. The project recharges water from the State Water Project into storage using recharge basins and will use new and existing wells and regional conveyances to recover water for delivery. The project is being constructed in phases and currently has 320 acres of operational percolation pond capacity.

3. *Eastside Banking and Blending Project*
   Operational water recharge and recovery site providing a supplemental potable source of water for the AVEK Eastside Water Treatment Plant. The project will involve State Water Project water spread over local recharge basins, storing water for future recovery during dry or drought years. This alternative potable water supply will be used for periodic substitution or supplementation to the Eastside plant.

4. *Edwards Air Force Base Air Force Research Laboratory Treatment Plant*
   The Edwards Air Force Base (EAFB) Air Force Research Laboratory (AFRL) Treatment Plant produces secondary effluent. The effluent is discharged to onsite evaporation ponds.

5. *EAFB Main Base Wastewater Treatment Plant*
   The EAFB Main Base Wastewater Treatment Plant (WWTP) discharges treated domestic wastewater. The facility collects, treats and disposes of a design 24-hour daily average flow of 2.5 million gallons per day (MGD) and a design peak daily flow of 4.0 MGD from the housing, main base, north base and south base areas. The facility is designed to produce tertiary treated effluent and has the capacity to hold up to 3,000 gallons per day of seepage. For three months of the year during winter, the effluent is discharged to onsite evaporation ponds. The effluent is used to irrigate the golf course for the remainder of the year.

6. *EAFB Evaporation Ponds*
   The evaporation ponds receive effluent from the EAFB AFRL Treatment Plant and the EAFB Main Base WWTP.

7. *EAFB Golf Course Irrigation*
   The golf course is the largest user of recycled water at the EAFB. It receives the tertiary effluent from the EAFB Main Base WWTP as irrigation water during the warmer months of the year.

8. *Lancaster WRP Upgrade and Expansion*
   The upgrade and expansion project was completed in 2012. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

9. *Lancaster WRP Eastern Agricultural Site*
   Existing agricultural site using recycled water produced by the Lancaster WRP. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation from the root zone to the groundwater table of the applied recycled water.

10. *Lancaster WRP Environmental Maintenance Reuse*
    Disinfected tertiary recycled water produced by the Lancaster Water Reclamation Plant (WRP) is used for environmental maintenance at Apollo Community Regional Park (Apollo Park) and Piute Ponds. Since 1972, Apollo Park has been using recycled water to fill a series of lakes that are used for recreational fishing and boating. Piute Ponds are located on Edwards Air Force Base Property and uses recycled water to maintain marsh-type habitat. Flows below do not include water from Apollo Park lakes that is used for landscape irrigation within the park.

11. *Multi-use/Wildlife Habitat Restoration Project*
    Duck Hunting Club (Wagas Land Company) in both Kern and Los Angeles County, started in 1925. The Antelope Valley region is a flyaway zone for many migratory birds flying south and the Club has been preserving habitat. The Club is coordinating with Waterworks to replace their groundwater use with recycled water. The Club would also allow Waterworks to use a portion of the property for banking.

12. *North Los Angeles/Kern County Regional Recycled Water Project*
The recycled water project is the backbone for a regional recycled water distribution system in the Antelope Valley. The proposed system is sized to distribute recycled water for irrigation and other approved uses throughout the service area and also deliver recycled water for recharge areas. Construction is phased over time and portions are already complete. The first phase was implemented in 2009. The flow projection below is based on project components being complete and excludes flows to the Palmdale Hybrid Power Plant (3,400 AFY) and groundwater recharge.

13. *Palmdale Hybrid Power Plant Project*
Construction of a 570 Mega-Watt electricity generating facility. The power plant will be a hybrid design, utilizing natural gas combined cycle technology and solar thermal technology. The plant is projected to use approximately 3,400 AFY of recycled water and will employ "zero liquid discharge" design.

14. *Palmdale Recycled Water Authority Recycled Water Project*
The recycled water project is the recycled water distribution system for the Palmdale Recycled Water Authority (PRWA). Construction is phased over time and the first portion to serve McAdam Park was completed and implemented in 2012.

15. *Palmdale WRP Upgrade and Expansion*
The upgrade and expansion project was completed in 2011. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

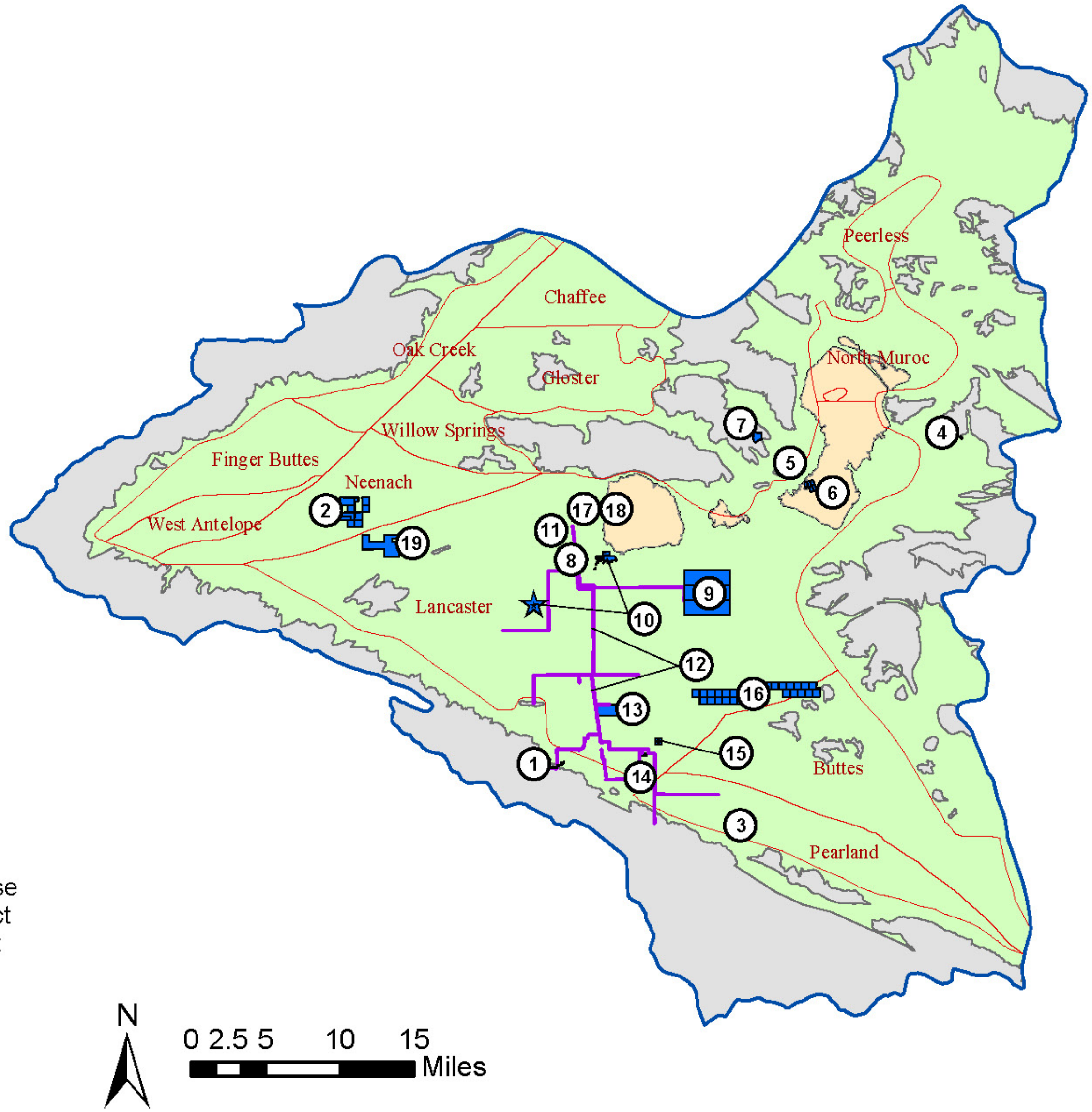
16. *Palmdale WRP Agricultural Site*
Existing agricultural site using recycled water produced by the Palmdale WRP. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation of the applied recycled water from the root zone to the groundwater table. Additional land was acquired for future agricultural operations. Infrastructure is in place, but not is currently used.

17. *Rosamond Community Services District (RCSD) WWTP*
The plant, owned and operated by RCSD, produces both secondary and tertiary treated recycled water. The capacity of the secondary treatment is 1.3 MGD, while the tertiary capacity is 0.5 MGD. The design to upgrade the tertiary treatment capacity to 1.0 MGD is complete. However, the construction is on hold indefinitely due to lack of funding.

18. *RCSD WWTP Evaporation Ponds*
The evaporation ponds receive effluent from the RSCD WWTP.

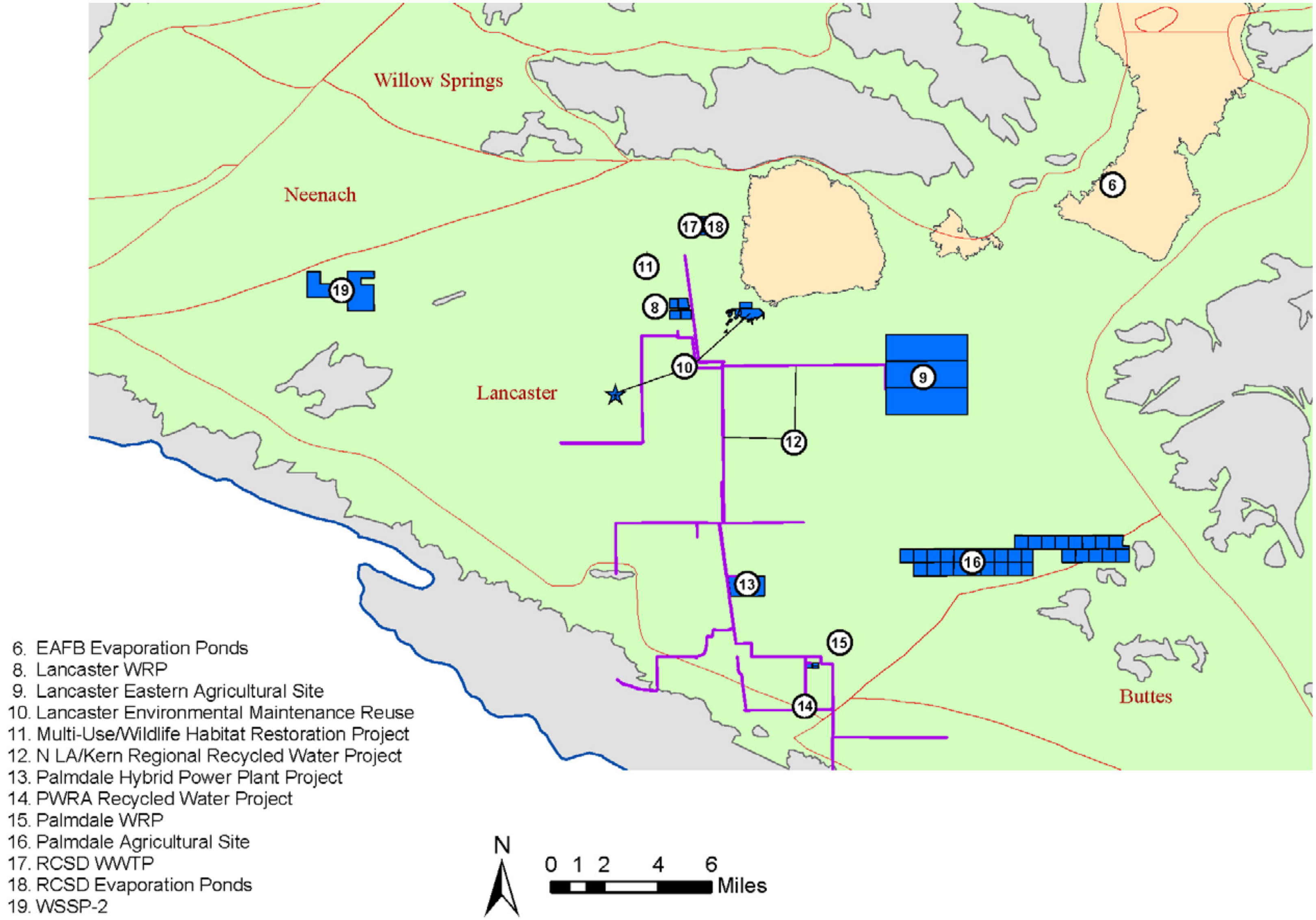
19. *Water Supply Stabilization Project (WSSP-2)*
Imported water stabilization program that utilizes State Water Project (SWP) water delivered to the Antelope Valley Region's west side for groundwater recharge during wet years for supplemental supply during dry years and to meet peak summer demand. This project includes facilities necessary for the delivery of untreated water for indirect recharge (percolation basins) and wells and pipelines for raw water and treated water extraction and conveyance.

Figure 3-16: SNMP Projects in the Antelope Valley Basin



1. Amargosa Creek Recharge Project
2. Antelope Valley Water Bank
3. Eastside Banking and Blending Project
4. EAFB AFRL Treatment Plant
5. EAFB Main Base WWTP
6. EAFB Evaporation Ponds
7. EAFB Golf Course
8. Lancaster WRP
9. Lancaster Eastern Agricultural Site
10. Lancaster Environmental Maintenance Reuse
11. Multi-Use/Wildlife Habitat Restoration Project
12. N LA/Kern Regional Recycled Water Project
13. Palmdale Hybrid Power Plant Project
14. PWRA Recycled Water Project
15. Palmdale WRP
16. Palmdale Agricultural Site
17. RCSD WWTP
18. RCSD Evaporation Ponds
19. WSSP-2

Figure 3-17: SNMP Projects in the Lancaster Sub-Basin



Additional projects were considered, but had implementation dates after the 2035 SNMP planning horizon or had insufficient project details. The projects include:

- *Amargosa Water Banking and Stormwater Retention Project*
  This project would recharge a blend of recycled water from the Lancaster WRP with stormwater and/or treated imported water at a 100-acre stormwater basin in the City of Lancaster. The pilot project would allow extraction of 2,500 AFY. Ultimately, this recharge project would recharge 50,000 AFY of blend water, consisting of 40,000 AFY of imported water and 10,000 AFY of recycled water. The project would extract an average of 48,000 AFY of recharged water via a new well field and deliver the water to wholesaler/retailer distribution system(s) and private agricultural users.

- *Barrel Springs Detention Basin and Wetlands*
  Proposed by the City of Palmdale, this project will provide flood control for the City of Palmdale and provide for wetland enhancement and habitat protection. The project includes the construction of an 878 AF detention basin in the Barrel Springs area.

- *Hunt Canyon Groundwater Recharge & Flood Control Basin*
  Proposed by the Palmdale Water District, this project entails construction of a new 3,000 AF detention/recharge basin. The basin would be used to store raw aqueduct water to allow recharge into the aquifer and would act as a detention basin during severe storms.

- *Littlerock Creek Groundwater Recharge and Recovery Project*
  This project would involve groundwater recharge using a blend of recycled water, from the Palmdale Water Reclamation Plant, imported water and local stormwater. Completion of a feasibility study is expected in 2015.

3.6.2 Project Water Volume Projections

Table 3-4 shows the water volume projections, associated with current and future projects, for the 25-year planning period (2011-2035). This planning period parallels the planning horizon for the Antelope Valley IRWMP, 2013 Update, and the 2010 Integrated Regional Urban Water Management Plan for the Antelope Valley (LACWD, June 2011). These projections will allow the stakeholder group to analyze the salt and nutrient impacts the projects may have on the basin.

Table 3-4: Water Volume Projections for Current and Future Projects

Project Name	Source	Implementation Date	Water Quantity Projection (AFY)					
			2010	2015	2020	2025	2030	2035
Treatment Plants								
EAFB Air Force Research Laboratory Treatment Plant	Recylced	Implemented	46	46	46	46	46	46
EAFB Main Base WWTP	Recylced	Implemented	511	511	511	511	511	511
Lancaster WRP Expansion	Recylced	2012	-	17,000	18,500	20,000	21,500	23,000
Palmdale WRP Expansion	Recylced	2011	-	11,000	12,000	12,000	13,000	13,000
RCSD WWTP	Recylced	Implemented	560	560	560	560	560	560
Reuse								
EAFB Golf Course Irrigation	Recylced	Implemented	383	383	383	383	383	383
Lancaster WRP Eastern Agricultural Site	Recylced	Implemented	1,000	10,500	11,500	11,200	11,700	10,900
Landcaster WRP Environmental Maintenance Reuse	Recylced	Implemented	-	5,700	5,700	5,700	5,700	5,700
Multi-Use Wildlife Habitat Restoration Project	Recylced	2016	-	-	2,000	2,000	2,000	2,000
North LA/Kern County Regional Recycled Water Project	Recylced	2009	3	700	1,800	3,600	4,700	7,100
PRWA Recycled Water Project	Recylced	2012	-	80	1,000	1,000	2,300	3,500
Palmdale WRP Agricultural Site	Recylced	Implemented	7,600	10,200	6,400	7,400	4,100	800
Evaporation/Export								
EAFB Evaporation Ponds (Main Base & AFRL)	Recylced	Implemented	174	174	174	174	174	174
Palmdale Hybrid Power Plant Project	Recylced	2016	-	-	3,400	3,400	3,400	3,400
RCSD WWTP Evaporation Ponds	Recylced	Implemented	560	560	560	560	560	560
Groundwater Recharge/Banking								
Amargosa Creek Recharge Project	Imported	2015	-	24,300	24,300	24,300	24,300	24,300
	Stormwater		-	400	400	400	400	400
Antelope Valley Water Bank	Imported	2010	1,300	22,000	22,000	22,000	22,000	22,000
Eastside Banking and Blending Project	Imported	2015	-	5,000	10,000	10,000	10,000	10,000
Water Supply Stabilization Project (WSSP-2 Project)	Imported	Implemented	10,000	25,000	25,000	25,000	25,000	25,000

Section 4: Basin and Antidegradation Analysis

4.1 Antidegradation Policy

In 1968, the State Board adopted Resolution No. 68-16, "*Statement of Policy with Respect to Maintaining High Quality of Waters in California*," establishing an Antidegradation Policy for the protection of water quality in California. The Resolution states that whenever the existing quality of a water is better than the applicable established water quality objectives, such existing quality shall be maintained until it has been demonstrated to the State that any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use(s) of such water and will not result in water quality less than that prescribed by the respective Regional Board.

In order to determine whether the projects, identified in Section 3, if implemented, will satisfy the Antidegradation Policy, the following were performed:

1. Identified the Beneficial Uses of the Antelope Valley Groundwater Basin
2. Identified the water quality objectives established by the Regional Board and other criteria to protect the beneficial uses of the Antelope Valley Groundwater Basin
3. Projected whether the identified projects, if implemented, will significantly change the water quality of the Antelope Valley Groundwater Basin
4. Determined whether any projected changes to the groundwater would exceed water quality objectives or unreasonably affect beneficial uses of the groundwater
5. Demonstrated whether any projected change would be consistent with the maximum benefit to the people.

The State Board determined that the use of recycled water, in accordance with the Recycled Water Policy, which supports the sustainable use of groundwater and/or surface water, which is sufficiently treated so as not to adversely impact public health or the environment and which ideally substitutes for use of potable water, is presumed to have a beneficial impact. The Recycled Water Policy also discusses State mandates to increase recycled water use while protecting water quality. Increased use in the region is especially critical given the basin's limited supply, potential climate change impacts, and threatened imported water supply. Recycled water produced and used in the Antelope Valley is regulated by the Regional Board and must meet environmental and health standards established for its intended use. As discussed in the AV IRWMP and Water Plans of the Antelope Valley Region's water and municipal agencies, there are plans to increase recycled water use in the Antelope Valley in order to decrease the demand for potable supplies while potentially increasing their availability and reliability.

To satisfy the Antidegradation and Recycled Water Policies, the basin background groundwater quality and the potential water quality impacts of the projects, identified in Section 3, on the Antelope Valley Groundwater Basin were examined. In order to assess the groundwater and the impacts of these projects, the basin's water quality goals, with respect to the SNMP constituents of concern, were selected based on protecting the groundwater's beneficial uses, as discussed later in this Section. To assess the magnitude of the basin's need for water quality protection, the baseline "assimilative capacity" for each SNMP constituent of concern was determined by subtracting the baseline concentrations established in Section 3 from the SNMP water quality management goals. Constituent balances for those constituents with a significant potential to exceed water quality management goals (i.e., TDS and arsenic) were created and projections were calculated using an instantaneous mixing model for the groundwater basin. Included in the model are calculated impacts of the identified projects in various scenarios, including simulated drought conditions, over the 25-year planning period (2011-2035). The results from the 25-year scenarios were used to predict results over longer periods. Then, the groundwater quality projections that were calculated using the model were compared to the assimilative capacities for each SNMP constituent of concern to determine whether significant degradation of the water would occur if the SNMP projects are to be implemented as planned. In addition, future salt and nutrient concentrations will be monitored (as described in Section 5) to evaluate actual water quality and predictions as compared to the SNMP water quality management goals to ensure consistency with the Antidegradation Policy.

4.2 Beneficial Uses

As a regulatory agency, the Lahontan Regional Board's primary responsibility is to protect water quality within its jurisdiction, under which the Antelope Valley falls. The Regional Board adopted and implemented the "*Water Quality Control Plan for the Lahontan Region*" (Basin Plan; Regional Board 1995), which, among other functions, sets forth water quality standards for the surface and groundwater within the Regional Board's jurisdiction. The Basin Plan includes the designated uses of water within the Lahontan Region and the narrative and numerical objectives which must be maintained or attained as a means to protect those uses.

The Regional Board has designated the following beneficial uses to the Antelope Valley Groundwater Basin (Basin Unit 6-44):

- *Agricultural Supply (AGR):* Beneficial uses of waters used for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, and support of vegetation for range grazing.
- *Freshwater Replenishment (FRSH):* Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).
- *Industrial Service Supply (IND):* Beneficial uses of waters used for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.
- *Municipal and Domestic Supply (MUN):* Beneficial uses of waters used for community, military, or individual water supply systems including, but not limited to, drinking water supply.

The beneficial uses for groundwater listed in the Basin Plan are for each groundwater basin or sub-basin as an entirety. The Regional Board recognizes that, in some areas, useable groundwater occurs above or below an aquifer of highly mineralized groundwater, which can contain concentrations of dissolved solids and metals, such as arsenic, unsuitable for drinking water. Therefore, a beneficial use designation in the Basin Plan does not indicate that all of the groundwaters in that particular location are suitable (without treatment) for a designated beneficial use. However, all waters in the Lahontan Region are designated as MUN unless they have been specifically exempted by the Regional Board through adoption of a Basin Plan amendment after consideration of substantial evidence to exempt such water. A MUN exemption has not been adopted for the Antelope Valley Groundwater Basin or any of its sub-basins.

4.3 Water Quality Objectives and Other Criteria

Water quality objectives are the allowable limits or levels of water quality constituents established for the beneficial uses of water or the prevention of nuisance within a specified area. Therefore, the Regional Board established water quality objectives for the waters within the Lahontan Region that it considers protective of the designated beneficial uses. The general methodology used in establishing water quality objectives involves, first, designating beneficial water uses, and second, selecting and quantifying the water quality parameters necessary to protect the most vulnerable (sensitive) beneficial uses. As additional information is obtained on the quality of the Lahontan Region's waters and the beneficial uses of those waters, certain water quality objectives may be updated to reflect the levels necessary to protect those beneficial uses. Revised water quality objectives would then be adopted as part of the Basin Plan by amendment.

The Regional Board has not established water quality objectives specific to the Antelope Valley Region. However, water quality objectives have been established that apply to all groundwaters in the Lahontan Region. These objectives are aimed to be protective of the beneficial uses assigned to the groundwater basins.

The water quality objectives that apply to groundwater designated as MUN are based on drinking water standards specified in Title 22 of the California Code of Regulations (CCR). Table 4-1 lists the water quality objectives associated with salts and nutrients that are applicable to the MUN designated groundwaters. The MUN water quality objectives for arsenic, chromium, fluoride, and nitrate are based on the Title 22 CCR drinking water primary Maximum Contaminant Levels (MCLs), which are health-based. While there are primary MCLs for nitrite and nitrate plus nitrite, only nitrate is examined in this SNMP because nitrite is not typically observed above detection levels in samples from the Antelope Valley groundwater. The MUN water quality objectives for total dissolved solids (TDS) and chloride are based on the Title 22 CCR Secondary Maximum Contaminant Levels (SMCLs) determined for "Consumer Acceptance," although no fixed consumer acceptance contaminant level has been established. According to Title 22 CCR, constituent concentrations lower than the "Recommended" contaminant levels are desirable for a higher degree of consumer acceptance. Constituent concentrations ranging up to the "Upper" contaminant levels are acceptable if it is neither reasonable nor feasible to provide more suitable waters. Constituent concentrations ranging to the "Short Term" contaminant level are acceptable for community water systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources or on a case-by-case basis.

Table 4-1: Lahontan Basin Plan MUN Water Quality Objectives

Constituent	Units	MUN Water Quality Objective
Arsenic	µg/L	10
Chromium, total	µg/L	50
Fluoride	mg/L	2
Nitrate	mg/L as N	10
Total dissolved solids	mg/L	500 (recommended)/1000 (upper)/1500 (short term)
Chloride	mg/L	250 (recommended)/500 (upper)/600 (short term)

In California, boron is not regulated in drinking water and therefore, there is no established drinking water MCL for boron. However, the California Department of Public Health (CDPH) has established a health-based advisory level, or "notification level," for boron at 1000 µg/L. An exceedance of the notification level does not pose a significant health risk but may, in certain cases, warrant notification to the local governing bodies pursuant to the California Health & Safety Code. Notification levels are non-regulatory and are established by CDPH as precautionary measures for constituents that may be considered candidates for establishment of MCLs, but have not yet undergone or completed the regulatory standard-setting process prescribed for MCL development and are not drinking water standards.

To examine the appropriate water quality to protect AGR uses, Regional Board staff suggested using the State Board's online searchable database of water quality based numeric thresholds.[1] These thresholds may be used to assess whether beneficial uses of surface water or groundwater are likely to be impaired or threatened. The thresholds listed under "Agricultural Water Quality Goals" in the database are based on the paper, "*Water Quality for Agriculture*," published by the Food and Agriculture Organization of the United Nations in 1985, and containing guidelines on water quality protective of various agricultural uses of water, including irrigation of various types of crops and stock watering. Information on each of SNMP constituents was retrieved from the database and the thresholds listed under "Agricultural Water Quality Goals" were compiled. The listed thresholds for each constituent are listed in Table 4-2.

Crop information for the Antelope Valley Region was found in Los Angeles County Annual Crop Reports and Kern County Annual Pesticide Use Reports (Beeby et al. 2010). According to the reports, the following crops are grown in the region:

- Alfalfa, hay & other grains
- Apples
- Carrots
- Cherries
- Grapes
- Miscellaneous nursery
- Nectarines
- Onions
- Peaches
- Pears
- Plums
- Potatoes
- Pumpkins
- Squash
- Watermelons

"*Water Quality for Agriculture*" suggests that a maximum chloride concentration of 106 mg/L will not restrict the use of water as agricultural supply, especially if the water used is for irrigation of avocadoes, strawberries, or Indian Summer raspberries, which are sensitive to high concentrations of chloride. These crops are not commercially grown in the Antelope Valley and are not expected to be grown in the future. The next most chloride sensitive crops listed in "Water Quality for Agriculture" and that are grown in the Antelope Valley region are a variety of grapes, stone fruits, and citrus crops, which have a chloride tolerance maximum of 238 mg/L. The chloride threshold level of 238 mg/L is comparable to the recommended drinking water standard of 250 mg/L.

"*Water Quality for Agriculture*" indicates that the guideline provided for fluoride reflects the then-current information available and is supported by only limited, long-term field experience. The value is conservative, meaning that if the suggested limit is exceeded, toxicity to the plant may not occur.

The IND beneficial use by definition does not depend primarily on water quality, so water quality objectives do not apply. The FRSH beneficial use option for the groundwater is currently not being

[1] Accessible at http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/.

utilized and there are presently no related established water quality objectives for this use in the Antelope Valley.

Table 4-2: Recommended AGR Water Quality Thresholds

Constituent	Units	Recommended AGR Water Quality Thresholds
Arsenic	µg/L	100
Chromium, total	µg/L	none
Fluoride	mg/L	1
Nitrate	mg/L as N	none
Total dissolved solids	mg/L	450
Chloride	mg/L	238
Boron	µg/L	700

4.4 SNMP Water Quality Management Goals

As mentioned earlier, the purpose of developing the AV SNMP is to address the management of salts and nutrients to maintain water quality objectives and support beneficial uses. Considering the regulations and recommendations discussed and the purpose of this SNMP, certain water quality objectives and other levels were assigned as the SNMP water quality management goals. These levels are listed in Table 4-3 below. The SNMP water quality management goals are meant to serve as a management and planning tool for groundwater quality and not to serve as a basis for regulatory or discharge limits.

The SNMP water quality management goals for arsenic, chromium, and nitrate are based on the primary drinking water MCLs. The goal for boron is based on the AGR beneficial use threshold and the CDPH notification level. The goal for fluoride is based on the AGR beneficial use threshold and the MCL.

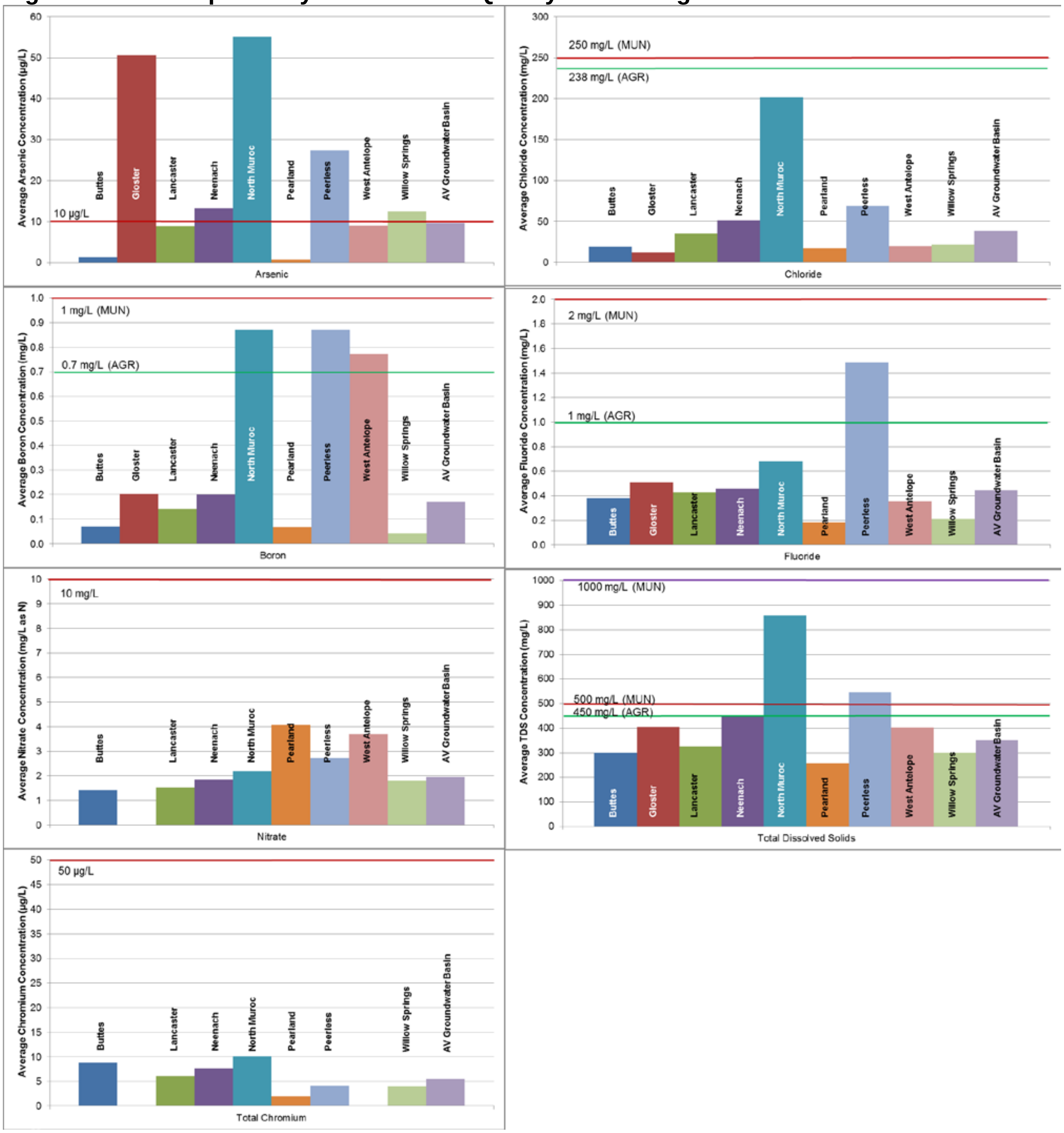
Per direction from the Regional Board, the goals for chloride and TDS are based on the baseline basin or sub-basin groundwater quality. If the basin's baseline groundwater quality is below the TDS or chloride constituent's respective AGR water quality threshold, the AGR threshold is assigned as the SNMP water quality management goal for that particular constituent in the basin. If the basin's baseline groundwater quality exceeds the AGR threshold, the recommended SMCL, or the upper SCML in the case that the recommended SCML is exceeded, is assigned as the SNMP water quality management goal for that particular constituent in the basin. The same strategy is used for assigning SNMP management goals to the sub-basins. Comparisons of the SNMP water quality management goals with the sub-basin average water quality are depicted in Figure 4-1. All of the SNMP water quality management goals are consistent with the Basin Plan.

Table 4-3: SNMP Water Quality Management Goals

Constituent	Units	SNMP Water Quality Management Goals
Arsenic	µg/L	10
Chromium, total	µg/L	50
Fluoride	mg/L	1[a]/2[c]
Nitrate	mg/L as N	10
Total dissolved solids	mg/L	450[a]/500[c]/1000[c] (depending on baseline groundwater quality)
Chloride	mg/L	238[b]/250[c]/500[c] (depending on baseline groundwater quality)
Boron	mg/L	0.7[a]/1[c]

[a] Based on non-restricted agricultural use
[b] Based on Antelope Valley agricultural crops.
[c] Based on municipal drinking water use.

Figure 4-1: Antelope Valley Groundwater Quality and Management Goals



4.5 Assimilative Capacity

The Recycled Water Policy defines assimilative capacity for a constituent as the difference between a water quality objective and the mean concentration of the basin or sub-basin. Because specific numerical water quality objectives are not established for the Antelope Valley Groundwater Basin, the baseline assimilative capacity in this SNMP is calculated as the difference between the SNMP water quality management goal for a particular constituent and the mean baseline concentration of the basin or sub-basin. The SNMP constituents' baseline concentrations, as discussed in Section 3, are based on the water quality data from GAMA and NWIS for the period from 2001 through 2010. Baseline water quality was presented in Table 3-1 and baseline assimilative capacities for the Antelope Valley basin and sub-basins are shown in Table 4-4. A negative calculated value for assimilative capacity indicates that the baseline water quality already exceeds the SNMP water quality management goal and there is no assimilative capacity at this time for that particular constituent.

The magnitude of assimilative capacity for the sub-basins can be visualized in Figure 4-1 as the amount between the bar graph value and the SNMP water quality management goal. For the four sub-basins with planned projects (Lancaster, Neenach, Buttes, and Pearland), the only absence of assimilative capacity is with arsenic in the Neenach sub-basin. A small amount of arsenic assimilative capacity is available for the Antelope Valley Groundwater Basin and the Lancaster sub-basin and a small amount of TDS assimilative capacity is available for the Neenach sub-basin.

In regards to the remainder sub-basins, while some of the sub-basins lack assimilative capacity for certain constituents, it is important to note that none of the projects identified in Section 3 are expected to affect these groundwaters due to proximity and because these sub-basins' groundwaters are upstream of the projects. Also, much of the groundwater quality exceedances are due to natural causes, such as with arsenic and boron, and meeting water quality goals would most likely require treatment.

Gloster, North Muroc, Peerless, and Willow Springs sub-basins have groundwater quality exceeding the arsenic SNMP water quality management goal, and therefore, have no assimilative capacity with regards to arsenic. The high arsenic values have been known in the area to be naturally occurring, due to the movement of water through the basin rocks and soils.

North Muroc, Peerless, and West Antelope sub-basin average concentration of boron exceeded the level that "*Water Quality for Agriculture*" (Ayers & Westcot 1985) suggested for non-restricted agricultural use. Thus, these sub-basin areas may not be suitable or preferable for some boron-sensitive crops. However, all the sub-basins have assimilative capacity with respect the CDPH notification level for boron.

All the sub-basins have assimilative capacity with regards to chloride. However, the North Muroc sub-basin has an average groundwater quality of approximately 200 mg/L chloride and an assimilative capacity with respect to chloride of only approximately 36 mg/L. The remaining sub-basins have over 165 mg/L of chloride assimilative capacity, which is much greater than the ambient concentrations and thus considered ample.

All the sub-basins have assimilative capacity with regards to nitrate. The Pearland sub-basin has the highest average nitrate groundwater quality, calculated as over 4 mg/L as nitrogen. The assimilative capacity is slightly greater than this concentration, calculated at approximately 6 mg/L as nitrogen, and thus considered ample. Very localized exceedances of the nitrate SNMP water quality management goal have been known to occur within the Antelope Valley and these situations are mitigated by individual clean-up and remediation programs overseen by the Regional Board. Average conditions of the sub-basins do not exceed these goals.

Only the Peerless sub-basin has an average fluoride concentration that exceeds the level listed in the State Board's online searchable database of water quality based numeric thresholds for non-restricted agricultural use. So, this sub-basin area may not be suitable or preferable for some fluoride-sensitive crops. However, all the sub-basins have assimilative capacity with respect to fluoride and the drinking water MCL.

With respect to TDS, the North Muroc and Peerless sub-basins have average concentrations that do not meet the TDS-sensitive agricultural use level of 450 mg/L or the drinking water recommended SMCL of 500 mg/L, but have assimilative capacity with respect to the upper SMCL of 1000 mg/L. The rest of the sub-basins have assimilative capacity with respect to the 450 mg/L level.

Table 4-4: Antelope Valley Basin Baseline Assimilative Capacities

	Arsenic (µg/L)	Boron (mg/L)		Chloride (mg/L)		Fluoride (mg/L)		Nitrate (mg/L)	Total Chromium (µg/L)	Total Dissolved Solids (mg/L)		
SNMP water quality mgmt. goal	10	0.7	1	238	250	1	2	10	50	450	500	1000
Buttes	8.7	0.63	0.93	219	231	0.6	1.6	8.6	41	149.5	200	700
Gloster	-40.7	0.50	0.80	226	238	0.5	1.5	(no results)	(no results)	45.8	96	596
Lancaster	1.1	0.56	0.86	203	215	0.6	1.6	8.5	44	124.7	175	675
Neenach	-3.2	0.50	0.80	186	198	0.5	1.5	8.2	42	3.6	54	554
North Muroc	-45.1	-0.17	0.13	36	48	0.3	1.3	7.8	40	-408.2	-358	142
Pearland	9.2	0.63	0.93	221	233	0.8	1.8	5.9	48	194.5	244	744
Peerless	-17.5	-0.17	0.13	169	181	-0.5	0.5	7.3	46	-96.7	-47	453
West Antelope	1.1	-0.07	0.23	218	230	0.6	1.6	6.3	(no results)	47.5	98	598
Willow Springs	-2.4	0.66	0.96	216	228	0.8	1.8	8.2	46	148.9	199	699
AV Groundwater Basin	0.3	0.53	0.83	200	212	0.6	1.6	8.0	44	99.8	150	650

4.6 Salt and Nutrient Balance

To assess the salt and nutrient impacts of current and future projects and water uses within the Antelope Valley, projected constituent loadings and unloadings, with respect to the SNMP constituents of concern were determined. Further extensive calculations were performed for predicting TDS and arsenic impacts. Other constituents were not further examined because the assimilative capacities of the basin with respect to those constituents are large proportions of their respective SNMP water quality management goals and impacts from water use are not expected to significantly increase the basin concentrations. Further discussion on the selection process is presented later in this section.

Conceptual mass balance and concentration models were developed for the constituents of concern by taking into consideration the use of water within the Antelope Valley Groundwater Basin and by making reasonable assumptions of the constituent concentrations and loadings.

Figure 4-2 depicts the direct loading and unloading of water, salts, and nutrients in and out of the groundwater aquifer. Return flows from agricultural irrigation, outdoor municipal and industrial (M&I) water use, and on-site waste disposal systems (such as septic tanks and leach fields), along with natural recharge from precipitation and mountain runoff are considered sources of direct loading to the groundwater. Aquifer recharge projects may also directly load salts and nutrients to the groundwater aquifer. Since the Antelope Valley is a closed basin, the only major outflow is groundwater pumping. Subsurface inflow from other basins and subsurface outflow of the aquifer are considered insignificant.

Figure 4-2: Aquifer Loading/Unloading

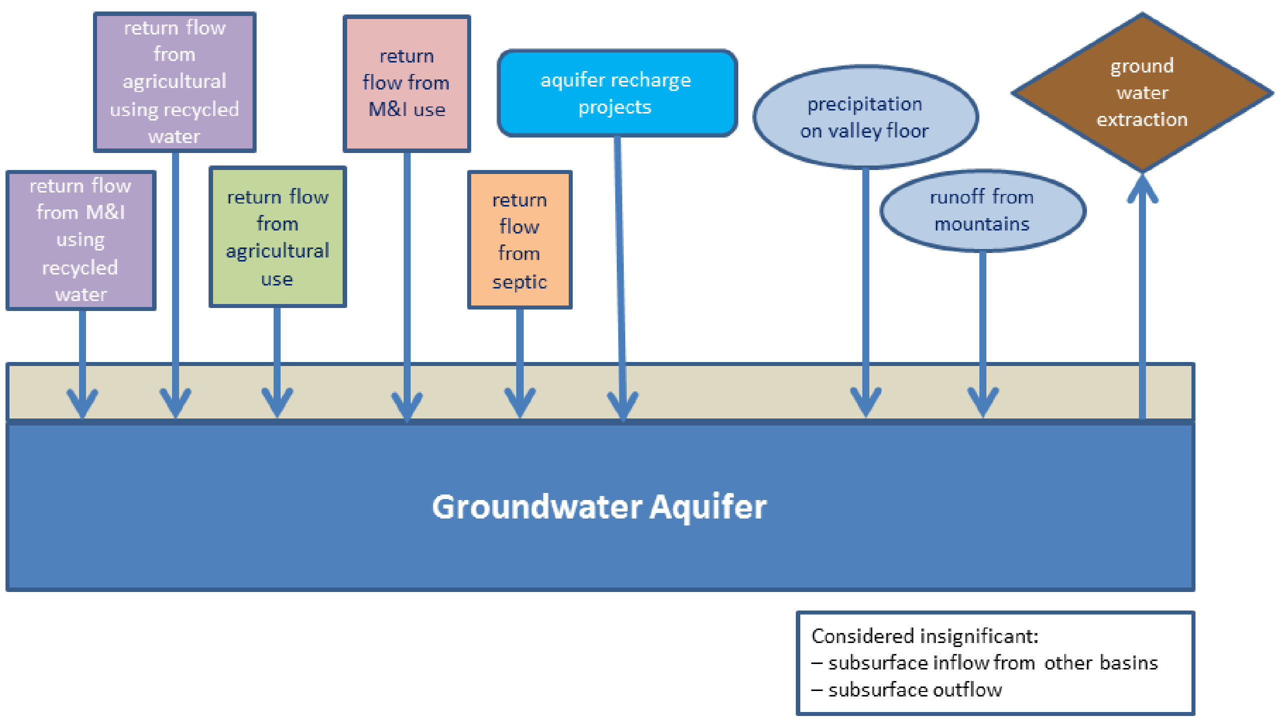
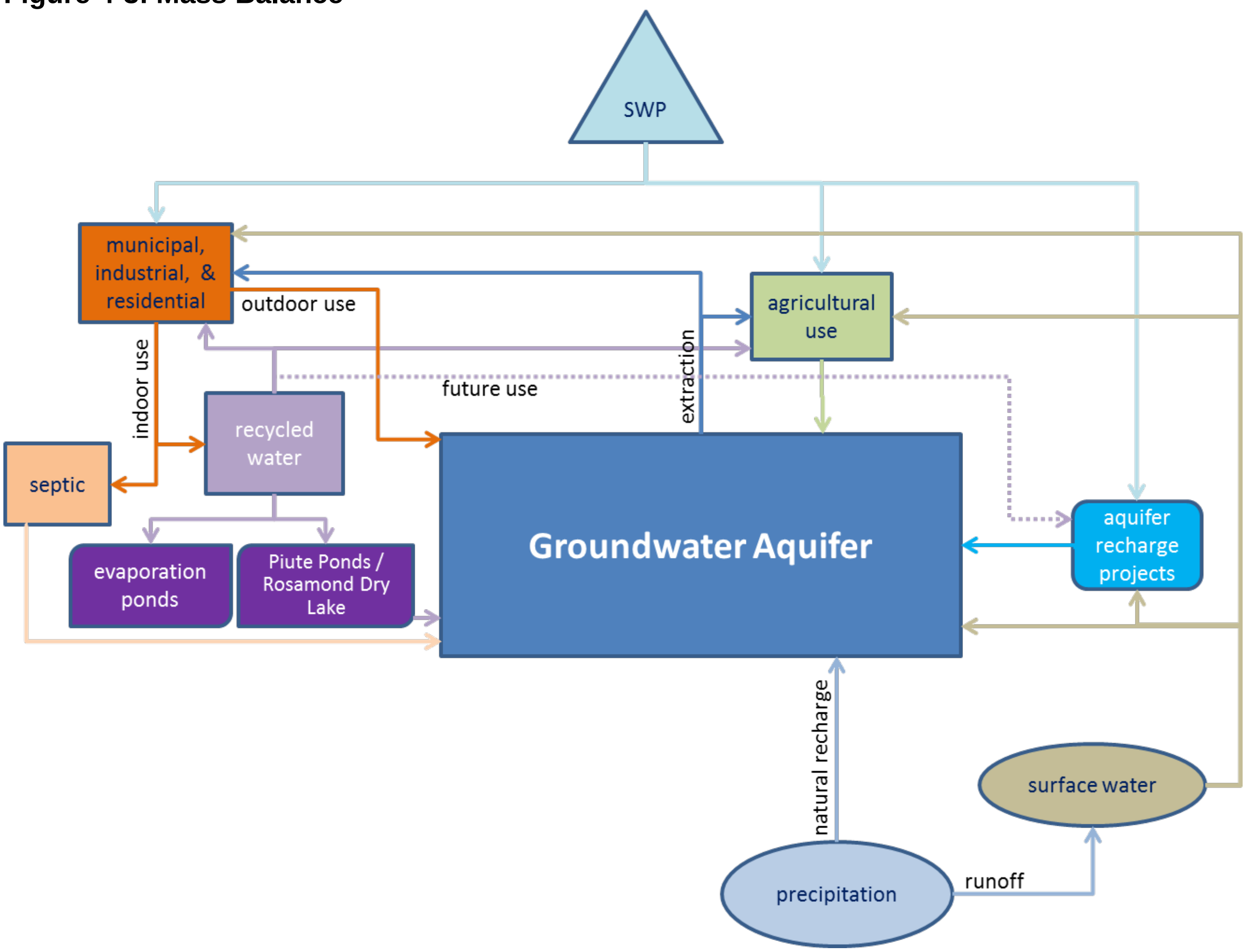


Figure 4-3 depicts the conceptual model of the constituent balance, which takes into consideration the water balance of the various types of water entering and exiting the groundwater basin. The two major outside sources of water to the basin include imported water via the California State

Water Project (SWP) and precipitation, which is represented in the model by natural recharge. The other major sources of water that are used within the Antelope Valley region include groundwater from extraction (i.e., pumped groundwater), recycled water from wastewater treatment, and surface water flow. The major uses of water are M&I and agricultural uses, which contribute to return flows to the groundwater basin. M&I is further broken down into indoor and outdoor use. Outdoor use includes activities, such as landscape irrigation, that contribute to return flows to the groundwater aquifer. After water is used indoors, it typically either goes to the local sewers or to an on-site waste disposal system (i.e., septic tanks with leach fields). On-site waste disposal systems also contribute to percolating flows to the groundwater aquifer. Wastewater collected from the sewers are processed by wastewater treatment plants and the resulting effluent may be used as recycled water for M&I uses (indoor and outdoor), agricultural irrigation, or for aquifer recharge projects in the future. Artificial aquifer recharge projects may use imported, recycled, or stormwater to augment water in the aquifer.

Figure 4-3: Mass Balance



Taking the conceptual models into consideration, a completely mixed model of the principal aquifer was developed to evaluate and predict the effects of salt and nutrient loading on overall groundwater quality of the Antelope Valley groundwater aquifer for the planning period (through 2035). The spreadsheet model was created to predict the impact of current and future water use in the Antelope Valley on the groundwater basin's salt and nutrient load. The model allows for improvements and addition of more details as additional data is collected for validation and verification. As such, the model presented here should be viewed as a tool that will be refined and improved over time. A short description of the methods used is provided below and summarized in Table 4-5.

A general water budget was developed that incorporated findings from the Antelope Valley Groundwater Adjudication Case Summary Expert Report for Phase 3 – Basin Yield and Overdraft (Summary Expert Report; Beeby et al. 2010). Specifically, the model uses the same flow assumptions as the subject report and arrives at the same sustainable yield, which is based on pumping of locally derived ("native") waters and supplemental pumping of return flow from imported water use. It is important to note that the model is intended for planning purposes only and nothing in this model shall be interpreted to interfere in any way with the ongoing adjudication actions, settlement process, or rulings of the Court. The Summary Expert Report describes the basin's sustainable yield as the rate of pumping that will produce return flows in combination with other recharge that will result in no long-term depletion of groundwater storage and no purposeful increase in storage. In general, imported water and pumped groundwater are used to meet agricultural and M&I water demands, each demand producing differing amounts of return flows and recharge to the aquifer via deep percolation. These flows combine with natural recharge for a total quantity of water that may be pumped on a sustainable basis with no long term-depletion of groundwater storage. Through a series of calculations, the Summary Expert Report concludes that the average sustainable yield of the basin is 110,500 acre-feet per year (AFY). The SNMP model assumes that the average annual pumped groundwater supply is equal to the basin's sustainable yield (110,500 AFY) and that the groundwater volume is 55 million acre-feet (AF; DWR 1980). These assumed flows could be refined as additional information is obtained in the future to improve the model.

In order to estimate sustainable yield, return flows and recharge of water to the groundwater from natural recharge and water use were determined. Water demands and sources were identified. Land uses in the basin include agricultural and several municipal-type uses (also termed "municipal and industrial" or "M&I"). The Summary Expert Report describes two independent analyses as a basis for using 60,000 AFY as an estimate of average long-term natural recharge. Return flows were then estimated, taking into consideration agricultural and M&I uses, as well as return flow from recycled water usage, as 50,500 AFY.

Based on historical average rates, the Summary Expert Report assumes 25% for the average agricultural return flow rate. Of the water utilized for M&I uses, about 44% is consumptively used, 11% becomes return flow through outside irrigation, and the remaining 45% is used indoors and goes either to a sewer or to an on-site waste disposal system. It is assumed that all of the water going to an on-site waste disposal system is returned to the groundwater. Of the water that is applied outdoors, the model assumes that 20% flows to the groundwater.

The Summary Expert Report estimates that approximately 70% of the urban areas in the Antelope Valley are sewered and the remaining areas are served by on-site waste disposal systems (e.g., septic tanks). The Summary Expert Report also estimates that the mutual and small water companies' customers make up about 4.4% of the Antelope Valley's M&I demand and the customers all use on-site waste disposal systems. Rural residential areas make up about 7.1% of the M&I demand and all of these areas utilize on-site waste disposal systems. As a result, approximately 28% of the Antelope Valley's M&I water utilized is conveyed to one of the water reclamation plants (WRPs) and approximately 17% is of the M&I flow is conveyed to on-site waste disposal systems and ultimately reaches the groundwater. The Summary Expert Report also estimated that approximately 500 AFY of the water conveyed to the WRPs becomes return flow during treatment (e.g., through treatment pond percolation).

The SNMP model uses the estimates of sustainable yield calculated in the Summary Expert Report that use imported water deliveries and land use present in 2005. Land use was divided into approximately 51.5% agricultural and 48.5% M&I. Imported deliveries were comprised of 9,300 AFY for agricultural use and 64,200 AFY for M&I uses. These land use and imported delivery levels were assumed the same throughout the planning period, but may be adjusted if additional data becomes available.

As with the Summary Expert Report, average annual flow conditions were assumed in the baseline model throughout the planning period. As such, inflow to and outflow from the aquifer are assumed equal so there is no change in storage. The model, however, allows for volume changes, which were applied to some of the scenarios tested. Also, for conservative planning purposes, the model assumes an instantaneous mixing of waters and constituents added on a yearly basis, rather than assuming it typically may take months to years for the applied water to travel through soil and reach the aquifer.

Table 4-5: Antelope Valley SNMP Groundwater Model Flow Assumptions

Flows	Assumed Quantities
Imported Water	73,5000 AFY total Agriculture: 9,300 AFY M&I: 64,200 AFY (2005 levels, assumed same throughout planning period)
M&I Use	Of the total flow to M&I: 44% is consumptively used, 11% becomes return flow from outdoor use, and 45% is subsequently conveyed to WRPs (sewered; 28% of total M&I) or on-site waste disposal systems (unsewered; 17% of total M&I) from indoor use Of the urban areas: 70% sewered, 30% unsewered Mutual and small water companies deliver about 4.4% of M&I demand and customers all use on-site waste disposal systems Rural residential makes up about 7.1% of M&I demand and customers all use on-site waste disposal systems
Natural recharge	60,000 AFY: Infiltration of stormwater (precipitation and mountain runoff), no inflow from adjacent aquifers
Return Flow	Of the amount applied to each use, the percentage returned: M&I outdoor = 20%, Agr. = 25%, recycled water for M&I outdoor use = 20%, on-site waste disposal systems = 100% WRP return flow = 500 AF (from treatment pond percolation) Calculated total inflow to groundwater = 110,500 AFY
Total Groundwater pumped	110,000 AFY at steady conditions, but may vary Agriculture = 45,000 AFY; M&I = 65,000 AFY
Aquifer volume	55,000,000 AF
Land Use	Agriculture = 51.5 %, M&I = 48.5% (2005 levels, assumed same throughout planning period); used for determining “native” sustainable yield

Note: Assumptions and numbers found herein are selected strictly for long-term planning purposes (e.g., develop the constituent model) and are not intended to answer the questions being addressed within the adjudication process.

Before further development of the model, the SNMP constituents to incorporate into the model were selected. To determine which constituents have a potential to significantly impact the basin and beneficial uses, a simplified and highly conservative set of calculations were performed. The calculations assume that the entire volume of State Water Project imported water contracted to the

Antelope Valley (165,000 AFY) and the entire average sustainable yield (110,500 AFY) are converted to recycled water. Assuming that the entire mass of salts and nutrients calculated for this flow instantaneously enters and mixes with the aquifer (55 million AF) on a yearly basis for 25 years, TDS and arsenic are the only SNMP constituents expected to exceed a concentration greater than the baseline plus 20% of the assimilative capacity (the Recycled Water Policy discusses an allowance of multiple projects using 20% of the basin's assimilative capacity over the course of a decade). The remaining constituents were calculated to not have a significant potential to impact the basin's beneficial uses. Note that this is an overly conservative calculation that assumes only the mass of constituents and not the accompanying water enters the basin. In other words, the calculations assume no consumption of the constituents (e.g., uptake by plants, attenuation, or chemical transformation) and 100% consumption of the water above ground with no return flows (e.g., via evaporation). The calculations also ignore changes in the basin volume and naturally occurring processes (such as attenuation to the substrate during infiltration through unsaturated zone or dissolution from rocks and soil, as is the case with arsenic), as well as other processes that would reduce the mass of salts entering the basin. To be conservative, recycled water concentrations were assumed because constituents were measured highest in that source water (see Table 3-3). Even though chromium in recycled water was either not detected or measured at concentrations below the reporting limit, the detection limit concentration was used in the calculations. Nitrate loadings may be higher than calculated due to nitrification or lower due to denitrification and plant uptake. However, the available nitrate baseline assimilative capacity is a wide margin since it is more than half of the total SNMP management goal of 10 mg/L as N. Table 4-6 includes the calculation results. Real world applications of water are expected to yield lower impacts to the basin than these conservative calculations assume.

Table 4-6: Simplified SNMP Constituent Impacts

Constituent	Recycled Water Concentration[1] (mg/L)	Total Mass to Basin Over 25 Years[2] (tons)	Baseline Average Antelope Valley Basin Concentration (mg/L)	Baseline Basin Mass[3] (tons)	Resulting Basin Concentration After 25 Years[4] (mg/L)	Baseline Assimilative Capacity (mg/L)	Percent Assimilative Capacity Used[5]
Arsenic	0.0055	52	0.0097	720	0.0103	0.00034	>100
Boron	0.6	5,600	0.17	13,000	0.25	0.5	14
Chloride	167	1,600,000	38.4	2,900,000	59	200	10
Fluoride	0.36	3,400	0.44	33,000	0.5	0.6	8
Nitrate as N	7	66,000	1.97	150,000	2.8	8	11
Chromium	0.01[6]	94	0.0055	410	0.006	0.044	3
TDS	545	5,100,000	350	26,000,000	418	100	68

[1] Recycled water concentration is the calculated average of the recycled water concentrations provided in Table 3-3.
[2] Assume mass from entire volume of contracted imported (165,000 AFY) and sustainable yield (110,500 AFY). Values displayed have been rounded to two significant figures.
[3] Assume volume of the aquifer is 55 million acre feet. Values displayed have been rounded to two significant figures.
[4] Calculated by adding the total mass load over 25 years and the baseline mass of the basin and dividing by the aquifer volume of 55 million acre feet.
[5] Calculated by dividing the increase in constituent concentration (the resulting concentration minus the baseline concentration) by the baseline assimilative capacity available.
[6] Although chromium in recycled water was either not detected or measured at concentrations below the reporting limit; the detection limit concentration is used.

The analysis above demonstrates that TDS and arsenic necessitate further detailed evaluation due to their significant potential to impact the basin's beneficial uses, so these constituents were incorporated into the model. The model assumes that the entire mass of each of these constituents in the applied water will enter the groundwater with the respective return flow, and will instantaneously mix with the groundwater in the aquifer. This is a conservative assumption and could be lowered for well managed/regulated projects. In reality, there may be some uptake by the irrigated vegetation, retention within the soil, or some other method of consumption. Recycled water projects are regulated so that water must be applied at agronomic rates so that deep percolation of the applied water, and accompanying constituents, is minimized. If more information becomes available, the model allows for refinement of each use's constituent mass contribution to the groundwater basin. Similar enhancements can be made to the model if certain practices are put in place to manage the constituent contribution of water use activities (e.g., irrigating at agronomic rates with respect to the constituent). Note that both arsenic and TDS are naturally occurring within the basin soil and rock, but these impacts are difficult to determine and, therefore, are not incorporated into the model. It is unlikely that the SNMP water quality management goal for arsenic will be achievable in the groundwater given the high natural occurrence of the compound in the Antelope Valley, and a more likely scenario is management applied to the drinking water prior to supply (e.g., supply well head treatment). Nevertheless, arsenic was incorporated into the model to understand the potential effects of the SNMP projects.

This is a conservative assumption and could be lowered for well managed/regulated projects. The following source water concentrations were used in the SNMP model. Based on observations at Littlerock Reservoir, which is fed by natural run-off from snow packs in the local mountains and from rainfall, water entering the groundwater by means of natural recharge was assumed to contain 150 mg/L of TDS and no detectable arsenic (see Table 3-3). For a conservative projection, one half of the detection level (2 µg/L) was used in the model. The initial groundwater concentrations were based on the calculations performed in Section 3 and are 350 mg/L TDS and 9.66 µg/L arsenic. The imported water concentrations were provided in Section 3 and are 300 mg/L 3.8 µg/L arsenic. Recycled water values were calculated as the weighted average, based on the projected contribution of each recycled water facility to the overall recycled water volume and their respective constituent concentrations provided in Section 3, and rounded up – 500 mg/L TDS and 1 µg/L arsenic.

Typical TDS increases from domestic water use range from 150-380 mg/L (Metcalf & Eddy 2003) and the model assumes an increase of 175 mg/L, which is consistent with actual values measured in the Lancaster and Palmdale WRPs influent (LACSD 2013a and 2013b) as compared to the water treatment plant effluent (see Table 3-3). Arsenic is not typically increased due to domestic water use, which is consistent with actual values measured in the Lancaster and Palmdale WRPs influent as compared to the water treatment plant effluent. However, to be conservative, the model assumes one half of the detection level (1 µg/L) increase in arsenic due to domestic use. A summary of the constituent concentrations is listed in Table 4.7.

Table 4.7: Constituent Concentrations Used in Salt Balance Model

Parameter	TDS (mg/L)	Arsenic (µg/L)
Natural Recharge	150	1
Imported Water	300	3.8
Recycled Water	500	1
Aquifer Baseline	350	9.66
Increase from Domestic Indoor Use	175	0.5

Several scenarios were tested with the model, the first being no project or base case, where groundwater extraction is consistent with the sustainable yield, so that there is no change in groundwater storage, and no new projects are implemented. The second scenario incorporates the projects listed in Section 3 to the base case. The third scenario incorporates just recycled water usage without the artificial aquifer recharge projects (i.e., water banking projects). Note that the model assumes that 90% of the return flows from recycled water use and the banking/recharge projects becomes pumped water supply. The fourth and fifth scenarios consider recycled water usage and a fraction of the flows for the artificial recharge projects. A sixth scenario considers an increased incidence of dry years for the region and no groundwater recharge during those years.

Population growth is accounted for in the recycled water availability projections, which are derived using population growth forecasts. In contrast, potable water supplies are not expected to change significantly, even with increased population growth.

Linear regressions were performed using the 25-year planning period results to predict: 1) in which year water quality could potentially reach or exceed the SNMP management goals, and 2) the water quality levels in 2110 (after 100 years).

Scenario 1: Base Case

As mentioned earlier, the base case condition (Scenario 1) assumes that the 25-year planning period will remain status quo with groundwater extraction rates consistent with the sustainable yield and that no new projects identified in Section 3 will be implemented. This scenario results in no change in aquifer storage, because inflow is assumed to be equal to outflow. According to the model and considering Scenario 1, the average TDS concentration in the groundwater basin will increase by 14 mg/L by 2035 or by 54 mg/L in one hundred years, and will reach 450 mg/L in approximately 184 years. The model's Scenario 1 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.12 µg/L by 2035, will be 10.1 µg/L in 2110, and will reach 10 µg/L in 72 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5. The top charts in Figures 4-4 and 4-5 are set to encompass constituent concentrations starting at zero units (mg/L or µg/L, as appropriate). Since it is difficult to discern the individual concentration increases for each scenario, the bottom charts are set at a narrower concentration range to provide better detail.

Scenario 2: Incorporation of All Future Projects

The second scenario is one in which all the projects identified in Section 3 are assumed be implemented by the projected dates within the 25-year planning period. This scenario considers the water inputs and return flows resulting from the new projects in addition to the conditions presented in Scenario 1. It is assumed that 90% of the return flows from recycled water use and the banking/recharge projects becomes pumped water supply, and 10% of the flows remain in the basin. For projecting further in the future than the planning period, the linear regressions assume no additional projects other than the ones included in the 25-year planning period. According to the model for Scenario 2, the average TDS concentration in the groundwater basin will increase by 21 mg/L by 2035 or by 88 mg/L in a hundred years, and will reach 450 mg/L in 113 years. The model's Scenario 2 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.13 µg/L by 2035, will be 10.1 µg/L in 2110, and will reach 10 µg/L in 64 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Scenario 3: Recycled Water Projects Only

To assess the potential effects of the recycled water projects alone without the potential dilution from the recharge projects, the third scenario tested is one in which only the recycled projects and none of the recharge projects identified in Section 3.5 are assumed to be implemented by the projected dates within the 25-year planning period. For projecting further in the future than the planning period, the linear regressions assume no additional projects other than the recycled water projects included in the 25-year planning period. According to the model and considering Scenario 3, the average TDS concentration in the groundwater basin will increase by 16 mg/L by 2035 or by 66 mg/L in a hundred years, and will reach 450 mg/L in 151 years. The model's Scenario 3 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.12 µg/L by 2035, will be 10.1 µg/L in 2110, and will reach 10 µg/L in 70 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Scenario 4 and 5: Recycled Water and Partial Groundwater Recharge Projects

Because it can take a considerable amount of time to get recharge projects implemented, it is possible that the projections presented in Section 3 of this report may not be met. Therefore, the fourth and fifth scenarios include all of the recycled projects and some fraction of the recharge projects identified that are assumed to be implemented by the projected dates within the 25-year planning period. To avoid assigning a likelihood of one project being implemented over another, a fraction of the total flows for all the recharge projects were assumed to be implemented. Scenario 4 assumes half of the projected inflow for the recharge projects will be implemented, whereas Scenario 5 assumes a quarter (25%) of inflow of the recharge projects will be implemented. To project further in the future than the planning period, the linear regressions assume no additional projects will be implemented after the 25-year planning period.

According to the model and considering Scenario 4, the average TDS concentration in the groundwater basin will increase by 19 mg/L by 2035 or by 77 mg/L in a hundred years, and will reach 4500 mg/L in 129 years. The model's Scenario 4 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.13 µg/L by 2035, will be 10.2 µg/L in 2110, and will reach 10 µg/L in 66 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

According to the model and considering Scenario 5, the average TDS concentration in the groundwater basin will increase by 18 mg/L by 2035 or by 72 mg/L in a hundred years, and will reach 450 mg/L in 139 years. The model's Scenario 5 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.12 µg/L by 2035, will be 10.2 µg/L in 2110, and will reach 10 µg/L in 69 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Scenario 6: Extreme Drought

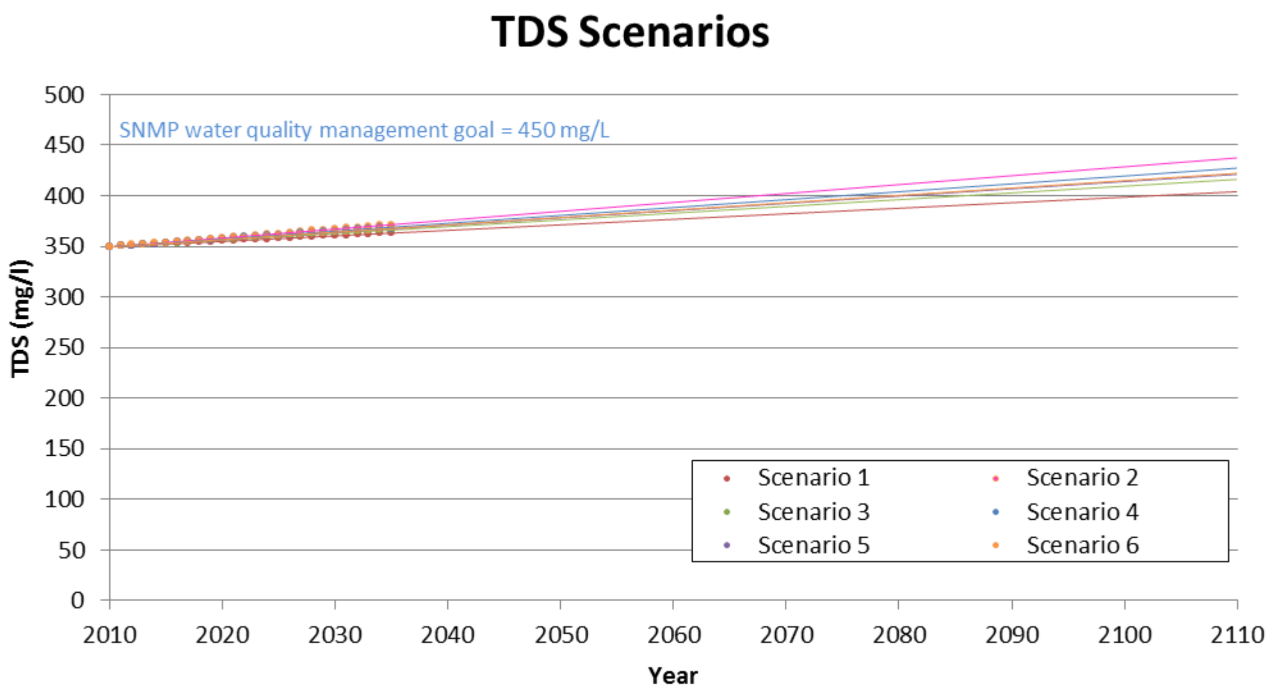
The scenarios mentioned above take into consideration average conditions, where periodic dry and wet years are averaged over the planning period to generate an average annual condition. Because the Antelope Valley is susceptible to drought conditions and decreases to imported water availability, an extreme drought scenario was examined where the annual natural recharge was decreased by 25% during the entire 25-year planning period. It is expected that any drought will not be this persistent, but this scenario can be viewed as an extreme case that provides a lower bound for natural recharge. In addition, the imported water rate was left unchanged, but no recharge projects were included. The groundwater extraction was not reduced, which resulted in the aquifer losing storage over the 25-year planning period. Due to limitations of the model, total sustainable yield findings of Summary Expert Report were ignored and the flow adjustments were made to the overall planning period rather than each individual year. This was accomplished by reducing the natural recharge by 25% for the entire planning period, while keeping imported water constant and including recycled water. These assumptions resulted in an increase after 25 years of only 1.5 mg/L TDS when compared with a similar scenario without drought conditions (Scenario 3). Moreover, the Scenario 6 TDS results are similar to the Scenario 5 (recycled water and 25% of recharge projects implemented) results. The model's Scenario 6 calculations indicate a steeper increase in arsenic concentrations than with the other scenarios tested. According to the model, the groundwater basin arsenic concentration will increase by 0.18 µg/L by 2035, will be 10.4 µg/L in 2110, and will reach 10 µg/L in 47 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Table 4.8: Concentration Projections

Scenario	Concentration in 2035		Concentration by 2110		Years to Reach SNMP Water Quality Management Goal	
	TDS	Arsenic	TDS	Arsenic	TDS	Arsenic
	mg/L	µg/L	mg/L	µg/L	450 / 500 mg/L	10 µg/L
1	364	9.78	404	10.13	184 / 276	72
2	371	9.79	438	10.19	113 / 170	64
3	366	9.78	416	10.14	151 / 227	70
4	369	9.79	427	10.17	129 / 194	66
5	368	9.79	422	10.15	139 / 209	69
6	368	9.84	422	10.38	139 / 208	47

Note: The baseline Antelope Valley Groundwater Basin concentrations are 350 mg/L of TDS and 9.66 µg/L of arsenic.

Figure 4-4: TDS Model Predictions



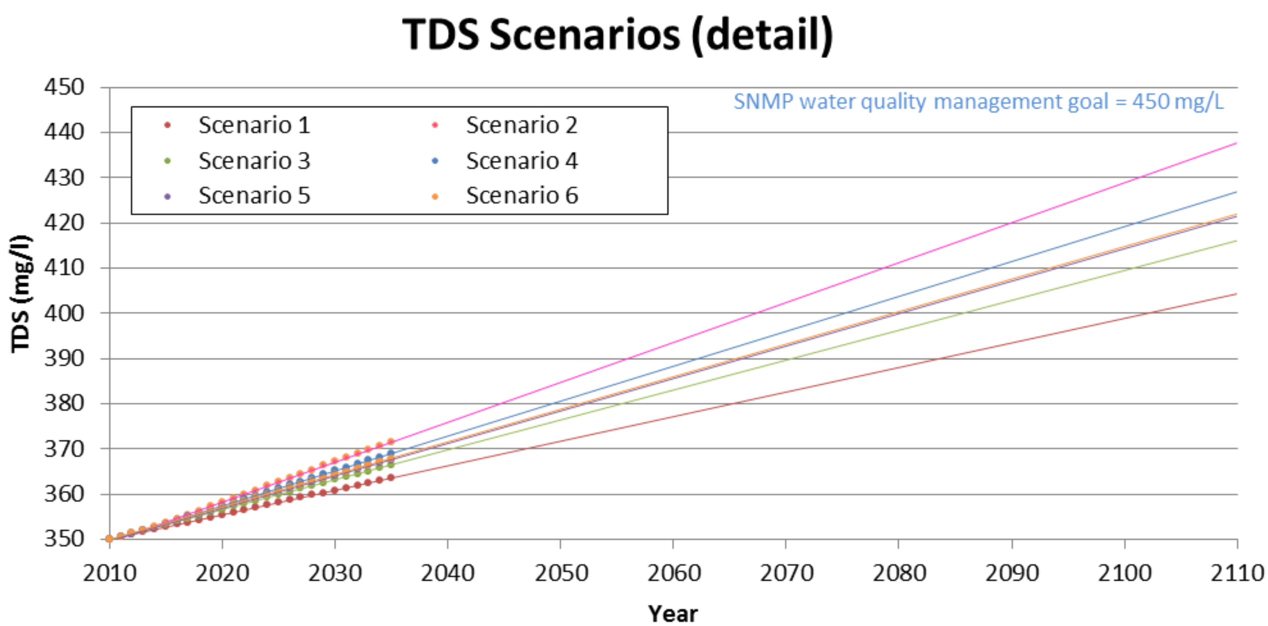
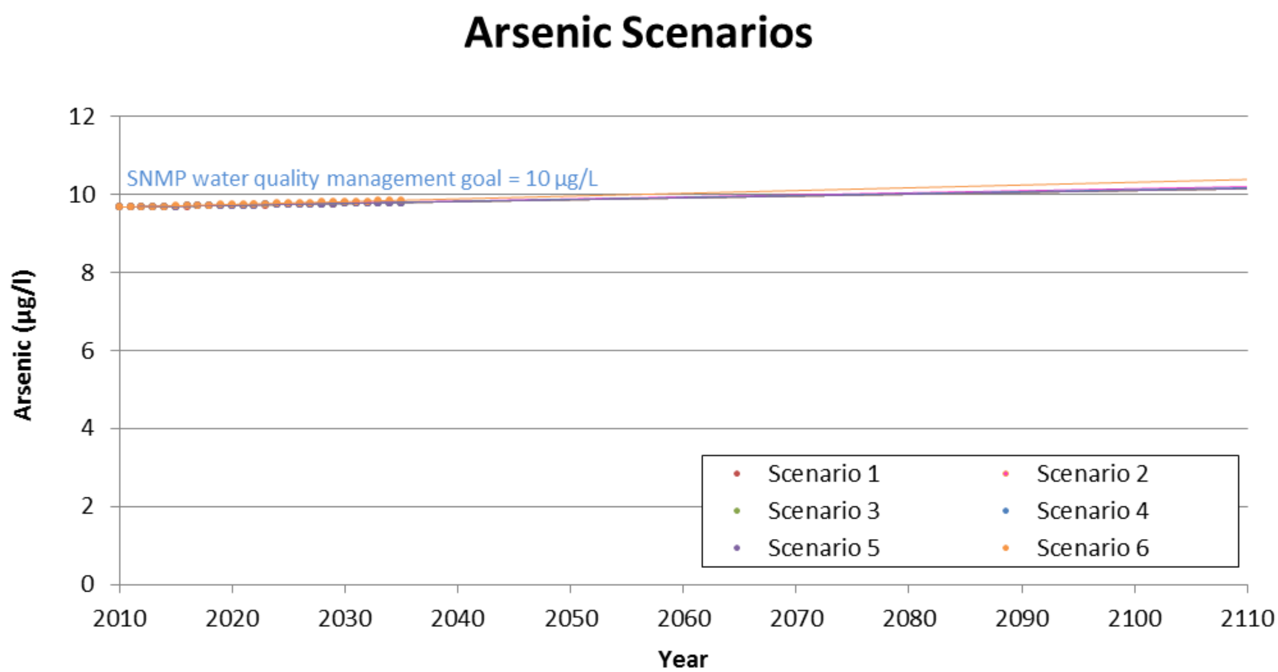
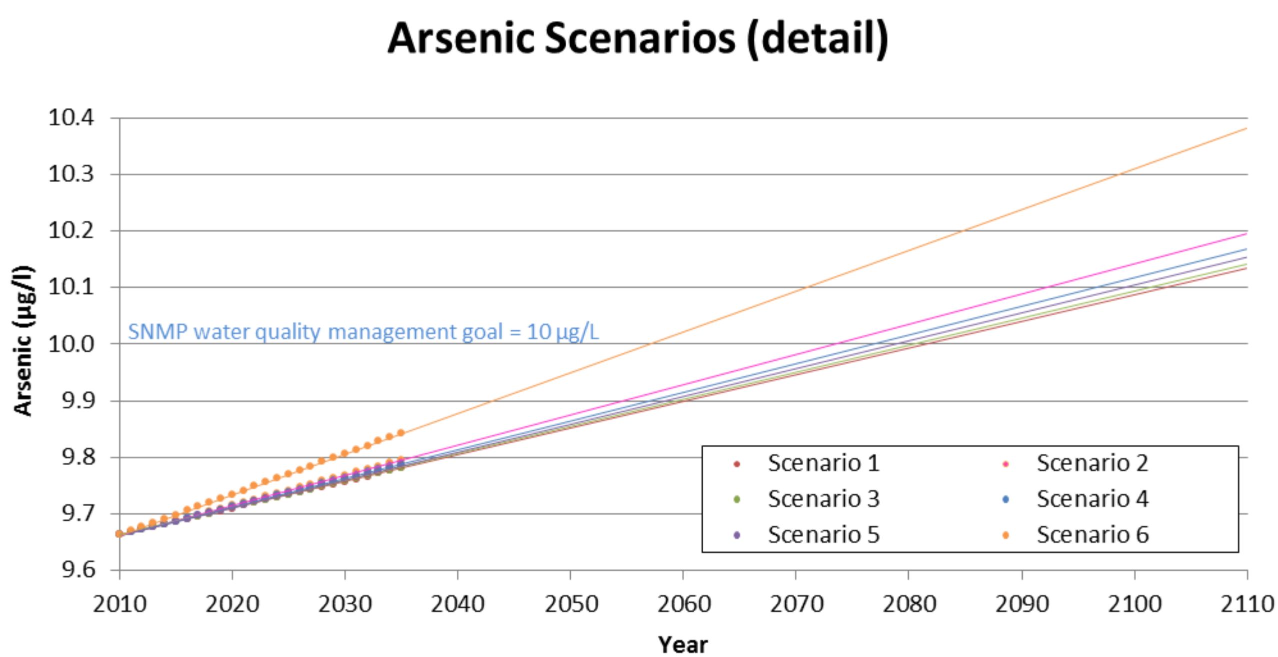


Figure 4-5: Arsenic Model Predictions





The model predicts that for each Scenario, the average Antelope Valley Basin groundwater condition with respect to TDS will not exceed the management parameters until at least 110 years. This is ample time to plan for salt management measures before a critical situation arises, although that does not appear to be necessary within the 25-year planning period. Arsenic, on the other hand, could potentially exceed the SNMP water quality management goal in as early as 47 years, but not within the 25-year planning period. It should be mentioned that there has been sub-basin average and localized exceedances of the management parameter, but these have been attributed to naturally occurring arsenic in the basin. It is understood in the region that arsenic concentrations may continue to be a concern and efforts are underway, such as well head treatment or natural attenuation projects, to ensure that the drinking water supplied to the public meets drinking water quality standards.

The Recycled Water Policy discusses an allowance of using 20% of the basin's assimilative capacity for multiple projects, over the course of a decade (10 years), to streamline the permitting process where no SNMP has been developed. A summary of basin assimilative capacity usage with respect to TDS and arsenic, calculated using the SNMP model, is included in Table 4-9. According to the model, the projects in the SNMP would be able to meet this criterion, except in the case where there are extreme drought conditions, in which the arsenic concentration increase would use 21% of the assimilative capacity. As discussed in the next sub-section, it is reasonable to assume that recycled water use despite the potential increase in arsenic concentration, which would be slight and still remain under the 10 µg/L SNMP water quality management goal, would be preferable to not having that recycled water available to meet demands during drought conditions. Also, it is important to keep in mind that many of the assumptions in the model are conservative, including the assumption that natural recharge water and domestic use of water adds arsenic equal to half the detection level. If a lower value is assumed, say one quarter of the detection level, Scenario 6 would meet the 20% criterion for 10 years.

The model predicts that after 25 years for each scenario, the water quality will not be degraded past 21% of the assimilative capacity for TDS. However, arsenic concentrations have the potential to use up much more assimilative capacity, but would not reach a 10 µg/L average basin concentration. However, given that in-lieu recycled water use in the regional would allow for potable supplies to be available for use, the increases would be offset by the benefit of having an increase in reliability of the potable supply for the residents of the water supply strapped region.

Table 4.9: Assimilative Capacity Usage

Scenario	Concentration increase in 10, 25 Years				Assimilative capacity used			
	TDS (mg/L)		Arsenic (µg/L)		TDS		Arsenic	
	10 years	25 years	10 years	25 years	10 years	25 years	10 years	25 years
1	5	14	0.05	0.12	5%	14%	14%	35%
2	8	21	0.05	0.13	8%	21%	15%	39%
3	7	16	0.05	0.12	7%	16%	14%	35%
4	8	19	0.05	0.13	8%	19%	15%	37%
5	7	18	0.05	0.12	7%	18%	14%	36%
6	7	18	0.07	0.18	7%	18%	21%	53%

Model sensitivities to the constituent concentrations used for the source waters (see Table 4-7) were examined by increasing the TDS and arsenic concentrations by 25%. Increasing these concentrations had the greatest effect on Scenario 2, which has the greatest loading to the groundwater. Table 4-10 lists the increased concentration results over the original Scenario 2 25-year projection (see Table 4-8). 50% increases were also tested and were at most double that of the 25% increase results. Increasing the imported water concentration had the greatest impact on the projections. Increasing the TDS content of the waters, except the imported water, by 50% in the model still resulted in over a century before the groundwater basin would be expected to exceed the SNMP water quality management goal. The imported water TDS 50% increase resulted in an 80-year period before the groundwater basin would be expected to exceed the SNMP water quality management goal. Because arsenic concentrations in the source waters are low or below detection levels, increasing the arsenic content yielded similar results as originally projected.

Table 4-10: SNMP Model Result Variations for Source Water Concentrations 25% Increase

Parameter	Concentration Increase to Initial Scenario 2 Projections	
	TDS (mg/)	Arsenic (µg/L)
Natural Recharge	2	0.01
Imported Water	5	0.06
Recycled Water	1	0.01
Increase from Domestic Indoor Use	1	0.01

Agricultural land use has seen a decreasing trend in the Antelope Valley. Changing the land use assumptions and imported flows to either all agricultural or all municipal did not have much effect on the initial model projections. If the assumptions were changed to all municipal, an extreme case, the greatest effects were 1 mg/l TDS and 0.04 µg/L arsenic decreases over the initial 25-year projections results in Table 4-8. If the assumptions were changed to all agricultural water use, which is an unlikely case, the greatest effects were 1 mg/l TDS and 0.06 µg/L arsenic increases over the initial 25-year projections results in Table 4-8.

Model sensitivities to the imported water deliveries assumptions were examined. Changes in deliveries were applied to annual average of the whole 25-year period (no single year differences) and the average sustainable yield was altered due to limitations on the model. An increase in deliveries by 25% resulted in at most 3 mg/L TDS and 0.03 µg/L arsenic increases over the initial 25-year projections results in Table 4-8, while decreasing deliveries by 25% resulted in the same concentration decreases over the initial 25-year projections results. These results are consistent with the expectation that additional imported water to the basin will result in an increased load.

4.7 Antidegradation Analysis

The SNMP antidegradation analysis relies on the assessment of observed and future simulated groundwater concentrations compared to the baseline groundwater concentrations and SNMP water quality management goals, in consideration of projects that have the potential to affect the groundwater salt and nutrient concentrations. Groundwater monitoring will be used to confirm model and other predictions. Model improvements may be made based on new information, such as monitoring results.

The SNMP antidegradation analysis found that, in most cases, there will be no significant degradation of groundwater quality associated with the implementation of the SNMP projects as described in the initial constituent impact calculations (Table 4-6) and the SNMP model scenarios. The exception is with arsenic, but this is a naturally occurring constituent in the basin and it is typically not detected in stormwater and is measured at low levels in the imported and recycled water. To be protective, the projections are an overestimation of arsenic loading to the basin because of the conservative assumptions used in the model. One such assumption is that all of the applied arsenic associated with each use will reach the groundwater, whereas in reality natural attenuation typically occurs, thereby reducing the amount of arsenic that reaches the groundwater. It may be that return flows from water use in the basin cause dilutive effect to the groundwater with respect to arsenic.

It is not anticipated that future concentrations of the SNMP constituents of concern will be significantly increased with implementation of the recycled water and recharge projects. The average concentrations of the SNMP constituents in the Antelope Valley groundwater basin do not currently exceed SNMP water quality management goals and are not predicted to exceed these goals in the 25-year planning period. All of the SNMP water quality management goals are consistent with the Basin Plan. It is proposed that any change in groundwater quality associated with the projects with respect to the SNMP constituents of concern is consistent with the Antidegradation Policy for the following reasons:

The water quality changes will not result in water quality less than prescribed in the Basin Plan.

According to the initial constituent impact calculations and the SNMP model, current observed average SNMP salt and nutrient constituent concentrations in the Antelope Valley groundwater basin and simulated future concentrations through 2035 do not and will not exceed SNMP water quality management goals if the identified projects are implemented. All of the SNMP water quality management goals are consistent with the water quality prescribed in the Basin Plan. In the case of some Antelope Valley sub-basins, average baseline water quality may already exceed the SNMP water quality management goals. However, none of the projects identified are located within those sub-basins or considered to have an impact on them since the projects are located downstream.

The water quality changes will not unreasonably affect present and anticipated beneficial uses.

Recycled water use and aquifer recharge projects are not expected to affect present or anticipated beneficial uses. While TDS concentrations in the recycled water are higher than in background groundwater, the average concentration in the Antelope Valley groundwater basin is projected to remain below the SNMP water management goal in the future. Because TDS concentrations in the groundwater are projected to remain below 450 mg/L, local groundwater can be used for municipal use and all other beneficial uses defined in the Basin Plan (i.e. agricultural supply, industrial service supply, and freshwater replenishment) with no restrictions. Future water use is expected to increase TDS concentrations in the groundwater above existing background levels in the 25-year planning period, but not significantly, and the basin average will remain within an acceptable range that will not unreasonably affect present and anticipated beneficial uses. In the case of some sub-basins (e.g., North Muroc and Peerless) average baseline water quality already exceeds 450 and 500 mg/L, but the concentrations are all under the upper SMCL of 1000 mg/L, and thus meet MUN objectives. Furthermore, none of the projects identified are located within those sub-basins or considered to have an impact on them.

Arsenic concentrations in the recycled, imported, and natural recharge water are lower than in background groundwater and the average concentration in the Antelope Valley groundwater basin is projected to remain below the SNMP water management goals in the 25-year planning period. Because arsenic concentrations in the groundwater are projected to remain below 10 µ/L, local groundwater can be used for municipal use and all other beneficial uses defined in the Basin Plan with no restrictions. Under conservative assumptions, future water use is projected to increase arsenic concentrations in the groundwater above existing background levels in the 25-year planning period, but the basin average will remain within an acceptable range to protect present and anticipated beneficial uses. However, this is a conservative projection and it may be that return flows from use of waters with very low arsenic concentrations would cause dilutive effects to the groundwater with respect to arsenic. There are localized exceedances of arsenic in the groundwater, but they are attributed to dissolution of arsenic in basin rocks and soils and, thus, are naturally occurring. Public supply wells with arsenic concentrations above the MCL are typically shut down and/or abandoned. Other options include arsenic removal treatment at the wellhead and blending with lower arsenic concentration sources to decrease the arsenic level to below the MCL.

The remaining SNMP constituents have been projected to remain below their respective SNMP water quality management goals within the 25-year planning period if the identified projects are implemented. The constituent levels are not projected to change significantly and, thus, these water quality changes will not unreasonably affect present and anticipated beneficial uses. In the case of some sub-basins, average baseline water quality already exceeds the SNMP water quality management goal to protect the AGR beneficial use with respect to boron and fluoride, but the constituent concentrations are all under the SNMP water quality management goal to protect the MUN beneficial use. So, there may be some restrictions on the cultivation of boron or fluoride sensitive crops in these areas, which most likely has been the case historically since these constituents are naturally occurring in these areas. In any case, none of the projects identified are located within those sub-basins or considered to have an impact on them.

The water quality changes are consistent with the maximum benefit to the people of the state.

Recycled water is considered a valuable resource and is suitable for various beneficial uses. Implementation of the recycled water projects identified will increase the water supply available to the Antelope Valley Region and therefore reduce the Regional gap between supply and demand. The recycled water available to the Region is equal to the supply for over 20,000 average single-family households in the Antelope Valley. As identified in the AV IRWMP, recycled water is a much needed sustainable and reliable water supply option for the region. The recycled water projects have the potential to increase availability of supplies during SWP disruption and decrease the long-term costs of water. Recycled water use also supports adaptation to climate change impacts that increase overall demands and/or reduce supplies, as well as mitigates against climate change by reducing greenhouse gas emissions associated with the energy to import water. By using locally produced recycled water, and therefore reducing the demand for imported water from other parts of the State, the amount of recycled water that could be used in the 25-year planning period has the potential to annually save the equivalent of over 35,000 to 52,000 barrels of oil and reduce greenhouse gas emissions and other air pollutants by 48,000 to 71,000 tons annually.

Aquifer recharge projects allows for the capture of otherwise unused imported water and stormwater, as well as recycled water and increases the amount of overall supplies. Like recycled water, aquifer recharge reduces the regional gap between supply and demand and supports adaptation to climate change impacts that increase overall demands and/or reduces supplies.

Despite the potential to increase the arsenic concentration of the basin's groundwater, which nevertheless would remain under the 10 µg/L SNMP water quality management goal unless increased by naturally occurring causes, implementation of the identified projects is preferable to not having the increased supply reliability available, especially during drought conditions. Increased use of recycled water and artificial recharge projects are benefits to the people of the Antelope Valley and contribute to the goals prescribed by the Recycled Water Policy for California.

The projects are consistent with the use of best practicable treatment or control to avoid pollution or nuisance and maintain the highest water quality consistent with maximum benefit to the people of the state.

Pollution is defined in the California Water Code, section 13050(l), to mean that beneficial uses of water are unreasonably affected. As demonstrated above, implementation of the projects identified in this SNMP will not cause an exceedance of the SNMP water quality management goals and therefore will not unreasonably affect the basin's beneficial uses. This SNMP includes an implementation measures roadmap that incorporates, as needed, the best practicable treatment or control to avoid pollution or nuisance and maintain the highest water quality consistent with maximum benefit to the people of the state. The SNMP monitoring plan results will be used to compare future groundwater quality to applicable SNMP water quality management goals and determine whether additional measures to manage constituent load to the basin are needed for implementation.

THIS PAGE LEFT INTENTIONALLY BLANK

Section 5: Monitoring

5.1 Monitoring Plan Development

The AV SNMP monitoring plan is designed to determine water quality in the basin and focus on the water quality in water supply wells and areas proximate to large water projects, as discussed in the Recycled Water Policy. Results will be used to determine whether the concentrations of salt and nutrients over time are consistent with the SNMP predictions discussed in Section 4 and the applicable SNMP water quality management goals. The monitoring program will be used to determine whether implemented measures to manage the SNMP constituents in the groundwater basin are beneficial and/or cost-effective and if additional measures are needed.

5.2 Monitoring Locations

Per the Recycled Water Policy, the preferred approach to selecting groundwater monitoring locations is to target existing wells, as feasible and appropriate, as was done in developing the SNMP monitoring program. The groundwater wells included in the SNMP monitoring program are water supply wells that were selected based on their proximity to the projects listed in Section 3. Per the Lahontan Regional Board's preference, well selection was limited to those available on the State Board's Groundwater Ambient Monitoring and Assessment (GAMA) database, which is based on subsets of other well databases and does not encompass all the State regulated wells. Most of the Antelope Valley Basin wells with data available in GAMA are located in the Lancaster sub-basin. The remaining Antelope Valley sub-basins are largely undeveloped and several do not have any well monitoring data available in GAMA. Since monitoring results for these wells can be found in GAMA, it is likely that future monitoring results will also be available in the GAMA database. Additional discussion on the GAMA database can be found in Section 3.

If needed, additional groundwater monitoring results that are not available from the GAMA program may be examined. Also, the United States Geological Survey (USGS) database may be accessed to compile additional groundwater data and information for the monitoring report. If new projects are added to the SNMP list of projects having the potential to significantly contribute to salt and/or nutrient impacts to the Antelope Valley Groundwater Basin, the agency responsible for the project shall designate a groundwater well (existing or new), as appropriate, for inclusion in the SNMP monitoring program. Other water sources, such as imported and recycled waters, are typically monitored at the applicable treatment plant.

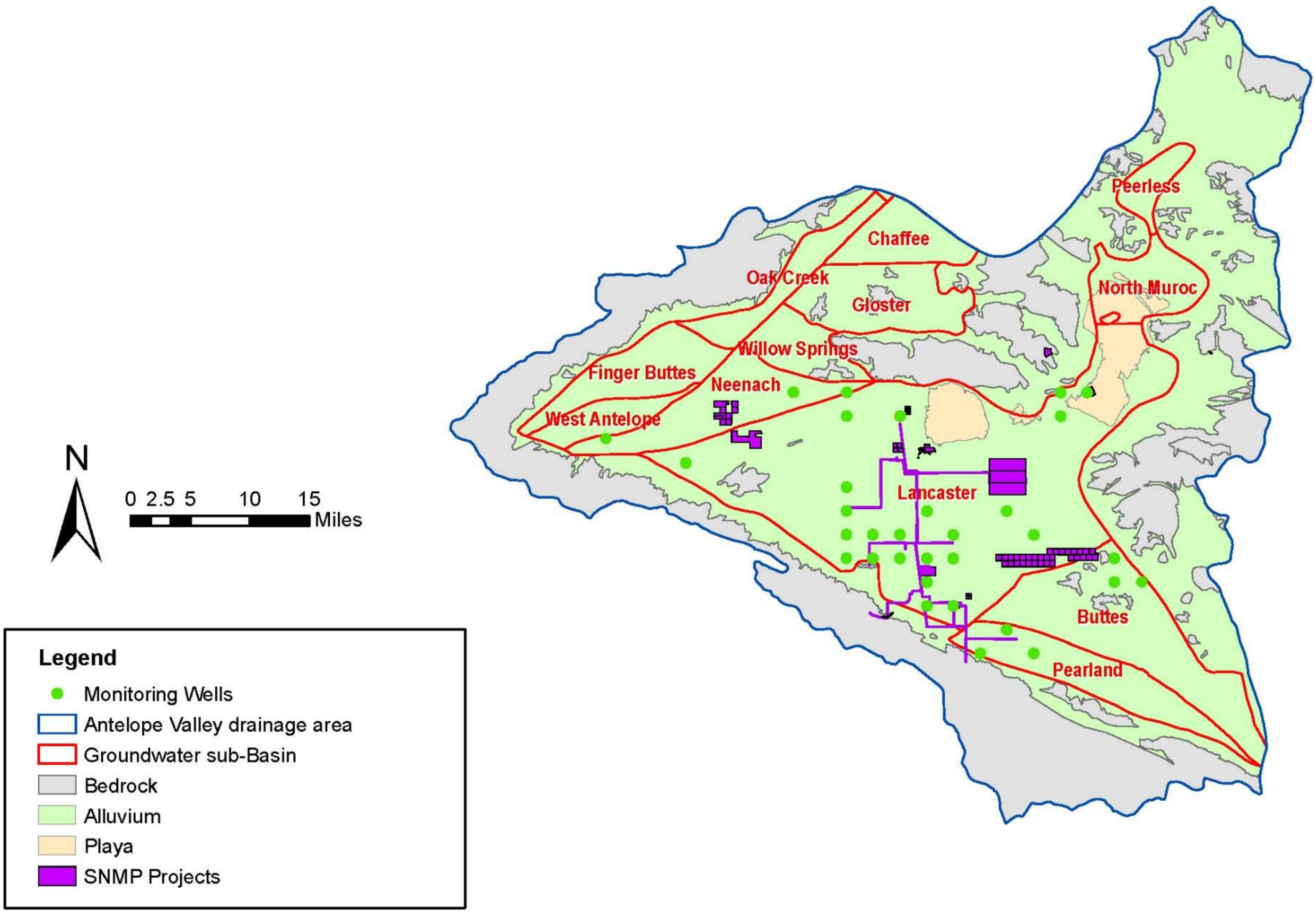
The SNMP groundwater wells to be included in the SNMP monitoring plan are listed in Table 5-1 and the locations are depicted in Figure 5-1. The Lancaster sub-basin is suitably represented with 23 monitoring locations. Buttes, Pearland, and Neenach sub-basins have three locations each. A minimum of three wells per sub-basin is preferred to be considered statistical valid for monitoring. Of the 32 potential wells, 23 are owned and operated by established water utilities or US Air Force. The remaining wells belong to mutual water companies, industrial companies and some smaller entities (hospital, elementary school, casino). Two wells used by Rosamond CSD and Land Project Mutual Water Company were discussed at a stakeholder meeting and found to be abandoned/inactive and no longer in use. These wells are not included in the SNMP monitoring plan.

Table 5-1 includes well identification numbers and location information. The depth of each well, the screen interval(s), and land surface elevation are not available from the GAMA database. However, future reporting efforts may include tracking this information.

Table 5-1: Groundwater Wells Included in the SNMP Monitoring Plan

State Well ID	GAMA Well ID	Sub-Basin	Latitude Coordinates	Longitude Coordinates
1910005-008	W0601910005	Buttes	34.627	-117.839
1910027-002	W0601910027	Buttes	34.656	-117.839
1910005-003	W0601910005	Buttes	34.627	-117.799
1503360-001	W0601503360	Lancaster	34.83	-118.156
1510018-009	W0601510018	Lancaster	34.83	-118.235
1510701-008	W0601510701	Lancaster	34.859	-117.918
1510701-011	W0601510701	Lancaster	34.83	-117.918
1510701-013	W0601510701	Lancaster	34.859	-117.879
1900751-001	W0601900751	Lancaster	34.714	-117.998
1900929-001	W0601900929	Lancaster	34.714	-118.235
1910067-211	W0601910067	Lancaster	34.772	-118.473
1910070-011	W0601910070	Lancaster	34.714	-118.116
1910070-026	W0601910070	Lancaster	34.656	-118.156
1910070-034	W0601910070	Lancaster	34.685	-118.156
1910070-036	W0601910070	Lancaster	34.685	-117.958
1910070-049	W0601910070	Lancaster	34.743	-118.235
1910070-070	W0601910070	Lancaster	34.685	-118.077
1910070-091	W0601910070	Lancaster	34.656	-118.116
1910097-004	W0601910097	Lancaster	34.656	-118.077
1910102-009	W0601910102	Lancaster	34.598	-118.077
1910102-015	W0601910102	Lancaster	34.598	-118.116
1910103-001	W0601910103	Lancaster	34.656	-118.235
1910103-007	W0601910103	Lancaster	34.685	-118.235
1910130-006	W0601910130	Lancaster	34.656	-118.196
1910130-009	W0601910130	Lancaster	34.685	-118.196
1910137-007	W0601910137	Lancaster	34.627	-118.116
1500421-001	W0601500421	Neenach	34.859	-118.314
1502569-001	W0601502569	Neenach	34.859	-118.235
1909006-001	W0601909006	Neenach	34.801	-118.592
1910102-021	W0601910102	Pearland	34.54	-118.037
1910102-027	W0601910102	Pearland	34.569	-117.998
1910203-005	W0601910203	Pearland	34.54	-117.958

Figure 5-1: Locations of the Groundwater Wells Included in the SNMP Monitoring Plan



5.3 Monitoring Frequency

Supply (e.g., raw imported and treated potable) and recycled waters are monitored annually. In general, public supply wells are monitored every year per California Department of Public Health (CDPH) requirements, but the monitoring frequency may vary depending on the specific constituent and the concentration of the constituent in the water extracted from the groundwater well (e.g., additional monitoring may be necessary if results indicated than an MCL is exceeded). The appropriate agency or well owner is responsible for monitoring water quality. For example, AVEK monitors raw imported water and the Sanitation Districts monitor the recycled water that they produce.

5.4 Constituents to be Monitored

As appropriate and necessary, the program will include monitoring of: total dissolved solids (TDS), nitrate, chloride, arsenic, total chromium, fluoride, and boron. Constituents of emerging concern (CECs; e.g., endocrine disrupters, personal care products or pharmaceuticals) and other constituents may be added to the monitoring program in consideration of actions taken by the State Board. In January 2013, the State Board adopted an amendment to the Recycled Water Policy and presented recommendations for monitoring CECs in recycled water. The Recycled water policy does not designate CEC monitoring requirements for recycled water used for landscape irrigation due to the low risk for ingestion of the water. However, the CEC monitoring requirements prescribed in the Recycled Water Policy pertain to the production and use of recycled water for groundwater recharge by surface and subsurface application methods. Only one of the listed projects in Section 3, the Littlerock Creek Groundwater Recharge and Recovery Project, proposes to use recycled water for groundwater recharge. Prior to the implementation of this project, or any other proposed groundwater recharge project using recycled water, the appropriate agency (or agencies) will monitor the water for CECs as prescribed in the Recycled Water Policy, as applicable, unless an alternative monitoring plan is approved by the Regional Board. The Recycled Water Policy does not prescribe CEC monitoring requirements for other uses of recycled water, but may in the future, at which time stakeholders may revisit and revise the SNMP monitoring plan as applicable and appropriate.

5.5 Data Evaluation and Reporting

Public supply wells are monitored and reported to the CDPH. The State's GAMA Program compiles a portion of these monitoring results (depending on the GAMA data needs) into a publicly-accessible internet database, GeoTracker GAMA[1]. GeoTracker GAMA integrates data from the State and Regional Boards, CDPH, Department of Pesticide Regulation, Department of Water Resources, USGS, and Lawrence Livermore National Laboratory.

The Antelope Valley SNMP Monitoring Report (Report) prepared for submittal to the Lahontan Regional Water Board may include, but is not limited to, the following:

1. The relevant monitoring data, as described above, including TDS, nitrate, chloride, arsenic, total chromium, fluoride, and boron.

[1] Accessible at http://www.waterboards.ca.gov/gama/geotracker_gama.shtml.

2. Determination of current ambient conditions. As stated in the definition in Section 1, the "current ambient condition" is the average concentration of a particular constituent measured in the water collected at the monitoring locations for the most recent 5-year period.
3. Comparisons of current ambient conditions to baseline conditions and to the values determined in the SNMP antidegradation analysis. Comparisons may include statistical and other analyses to test for significant differences, trends, and graphical representations (e.g., time versus concentration plots).
4. Comparisons of current water quality to applicable SNMP water quality management goals.
5. An update of the model and relevant calculations. This step may involve averaging the groundwater data from the basin to detect trends in constituent concentrations over time, which can be compared with model predictions to calibrate and improve the model.
6. An update of relevant projects and implementation information, such as discussed in Section 3.
7. Other relevant updates, such as land uses and cleanup site information from the State Board's GeoTracker database.
8. Discussion on adequacy of the SNMP monitoring plan (e.g., whether to incorporate additional wells into the SNMP monitoring program).
9. Discussion on adequacy of SNMP components (e.g., implementation strategies) based on analysis results and discussion of the SNMP monitoring program.

One goal of the SNMP monitoring and reporting is to evaluate whether basin water quality has changed over time and if it is consistent with the model predictions. This evaluation will help to assess whether the SNMP constituents are effectively managed to meet the SNMP water quality management goals or if changes to the SNMP are necessary to meet goals. The current intent is to submit the Report to the Lahontan Regional Board every three years.

The AVIRWMP group may take on the reporting responsibilities. It has also been discussed at an AV SNMP stakeholder meeting that reporting responsibilities could potentially be a duty of the eventual Antelope Valley Groundwater Watermaster.

THIS PAGE LEFT INTENTIONALLY BLANK

Section 6: Implementation Measures

6.1 Managing Salt and Nutrient Loadings on a Sustainable Basis

The baseline water quality analyses for the Antelope Valley Groundwater Basin indicates that overall groundwater quality with respect to the SNMP constituents of concern is below the SNMP water quality management goals. These goals are consistent with the Regional Board's Basin Plan to protect the beneficial uses of the water. The analysis of future water quality (through 2035) indicates slowly increasing trends and that, with implementation of the projects identified to have a potential effect on the salt and nutrient load to the groundwater basin, the overall basin groundwater salt and nutrient quality will remain below the SNMP water quality management goals. Under conservative assumptions, future water use is projected to increase arsenic concentrations in the groundwater above existing background levels in the 25-year planning period. However, the basin average will remain within an acceptable range over the long term to protect present and anticipated beneficial uses and any increases will be most likely due to naturally occurring causes. Therefore, no new implementation measures as part of the SNMP process are recommended at this time. Nevertheless, existing measures or practices are already in place to manage water quality, and frequent monitoring should also be implemented to assess trends in water quality.

In the case of some Antelope Valley sub-basins, average baseline water quality may already exceed the SNMP water quality management goals. However, none of the projects identified are located within those sub-basins or considered to have an impact on them since the projects are located downstream.

6.2 Existing Implementation Measures

As mentioned, the projected future groundwater quality concentrations are not expected to exceed the SNMP water quality management goals and implementation of the identified projects will not unreasonably affect the basin's designated beneficial uses. Therefore, no new implementation measures are recommended to manage salts and nutrients within the basin. Several programs are already underway in the basin, which help manage groundwater supplies and quality. These programs fall under five categories, as follows:

- Municipal Wastewater Management
- Recycled Water Irrigation
- Groundwater Management
- Onsite Wastewater Treatment System Management
- Agricultural

Implementation measures that are underway in the basin within these broad categories are described below.

6.2.1 Municipal Wastewater Management

Most of the municipal wastewater treatment agencies in the Antelope Valley have implemented source control programs including industrial waste management measures (i.e., pre-treatment program, educational outreach, coordination with customers) to control salinity and nutrients in influent waters, which ultimately improves the quality of recycled water.

The Palmdale and Lancaster Wastewater Reclamation Plants (WRPs) owned and operated by the Los Angeles County Sanitation Districts have undergone upgrades from secondary to tertiary treatment that include nitrification-denitrification treatment processes. This has led to a reduction in nitrate and overall nitrogen content in the recycled water produced at these plants. With the new tertiary treatment, the plants' effluents have also experienced reductions in TDS. The Rosamond Community Services District (RCSD) Wastewater Treatment Plant has undergone upgrades to treat a portion of its flow to tertiary standards, but has not yet expanded its recycled water use program.

6.2.2 Recycled Water Irrigation

The implementation of recycled water is regulated by the Title 22 California Code of Regulations (Title 22). Numerous BMPs and operating procedures must be followed when using recycled water for irrigation to ensure safety. The following BMPs, amongst others, are implemented in recycled water operations, per permitting by the Regional Board:

- Water quality monitoring at the treatment plant to ensure regulatory compliance with Title 22 and meet monitoring requirements as part of the Recycled Water Policy.
- Irrigation at agronomic rates – irrigation water is applied at a rate that does not exceed the demand of the plants, with respect to water and nutrients (typically monitored as nitrogen), and does not exceed the field capacity of the soil.
- Site Supervisor – a site supervisor who is responsible for the recycled water system and for providing surveillance to ensure compliance at all times with regulations and Permit requirements is designated for each site. The Site Supervisor is trained to understand recycled water, and supervision duties. In addition to monitoring the recycled water system, the Site Supervisor must also conduct an annual self-inspection of the system.
- Minimize runoff of recycled water from irrigation – Irrigation is not allowed to occur at any time when unauthorized runoff may occur, such as during times of rainfall or very low evapotranspiration, and any excessive overspray must be controlled.

6.2.3 Groundwater Management

Measures and practices to protect the basin include the following:

- The Antelope Valley Integrated Regional Water Management Plan (IWRMP) development process provided a mechanism for: 1) coordinating, refining and integrating existing planning efforts within a comprehensive, regional context; 2) identifying specific regional and watershed-based priorities for implementation projects; and 3) providing funding support for the plans, programs, projects and priorities of existing agencies and stakeholders. The process also includes public outreach and groundwater management strategies and objectives for the Region (including this SNMP), as well as a list of implemented and proposed projects to meet the management objectives.
- Basin-wide groundwater level monitoring.
- Groundwater quality monitoring, such as the State's GAMA program and other local efforts. Also includes groundwater quality analyses, such SNMP efforts to track water quality and improve the SNMP prediction model
- Groundwater banking and recharge studies and pilot-projects.
- Stormwater has low to no concentrations of salt and nutrients. Proposed projects for the region incorporates stormwater management and groundwater recharge.
- Arsenic treatment study and projects.
- Water recycling projects to offset groundwater pumping.
- Groundwater cleanup site programs.

- A water purveyor's Urban Water Management Plan (UWMP) provides a summary of an agency's water supplies, demands, and plans to ensure future reliability, such as potential water transfers and exchanges, desalination, and recycled water opportunities.
- The Antelope Valley Groundwater Basin is currently undergoing a groundwater rights adjudication process.

6.2.4 Onsite Wastewater Treatment System Management

A large percentage of the groundwater basin is overlain by rural areas that manage waste through individual onsite wastewater treatment system (OWTS), also known as septic systems. Individual property owners are responsible for managing their own system and employ a variety of BMPs such as monitoring and frequent pumping to manage the operation of the system. In 2012, the State Water Resources Control Board adopted the Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems. The intent of the Policy is "to allow the continued use of OWTS, while protecting water quality and public health". BMPs required in the Policy include site evaluations, setbacks, and percolation tests for new systems.

6.2.5 Agriculture

Agricultural areas include various ongoing BMPs that may include:

- Drip irrigation – water application is minimized by focusing the amount and area applied.
- Soil and plant testing – it is common practice for agricultural site managers to conduct annual soil testing to understand soil characteristics for crop production efficiencies and refine crop nutrient needs. Soil testing includes review of TDS and nitrate and other salts.
- Focused application of fertilizer and soil amendments

6.3 Additional Implementation Measures

As mentioned earlier, the projected future groundwater quality concentrations are not expected to exceed the SNMP water quality management goals and implementation of the identified projects will not unreasonably affect the basin's designated beneficial uses. It is the intention of the SNMP monitoring plan to obtain water quality results that will be used to compare future groundwater quality to applicable SNMP water quality management goals and determine whether additional measures are necessary to manage constituent load to the basin. After confirmation of results indicating that either the current average water quality of the basin exceeds the available baseline assimilative capacity use by 50% or that significant increases in the groundwater quality are projected within the next 10 years that would affect the designated beneficial uses, the implementation measures identified in the following sub-sections will be evaluated and the most appropriate measures will be recommended for implementation.

Implementation measures to reduce salt and/or nutrient concentrations in groundwater that may be considered include, but are not limited to, the following:

- Reducing the amount of salts/nutrients imported into the basin by implementing imported water treatment processes that remove salts and/or nutrients (e.g. reverse osmosis).
- Reducing the amount of salts added to groundwater via source water - wastewater treatments, modified processes such as increased retention time, or blending prior to use for irrigation or basin recharge.
- Reducing the amount of salts and nutrients added to water via anthropogenic sources – BMPs, public outreach, and land management guidelines.
- Natural treatment such as a wetland system.
- Ultrafiltration treatment (i.e., reverse osmosis) of source or recycled water. This treatment

is typically very costly and results in a waste stream that must be managed, which can itself be challenging and costly. Options for briny waste include: transporting and exporting salts to a landfill or other site, disposing of salts via brine lines (not cost effective or practical), or deep well injection.

- An ordinance or ban on water softeners that uses salts may result in reduced chloride and slightly reduced TDS concentrations in the wastewater and ultimately reduced concentrations in the recycled water produced.
- Evaluating industry (e.g. commercial, industrial, agricultural, etc.) processes.
- Replacing chlorination disinfection processes with ultraviolet light (UV) disinfection to reduce chloride concentrations.
- Developing BMPs such as limiting excess fertilizing (set realistic goals for maximum crop yield) and eliminating over-irrigation to curtail the leaching transport process.
- Developing nutrient management programs and crop-specific nutrient application rates to improve crop fertilizer efficiency (decrease the total residual mass of nitrogen in the soil by using nitrification inhibitors or delayed release forms of nitrogen).
- Encouraging Low Impact Development (LID), to increase stormwater recharge and limit salt and nutrient loading to runoff.

Section 7: References

- Antelope Valley-East Kern Water Agency. June 2011. 2010 Urban Water Management Plan.
- Antelope Valley Regional Water Management Group. 2007. Kennedy Jenks. Antelope Valley Integrated Regional Water Management Plan (IRWMP).
- Antelope Valley Regional Water Management Group. 2013 Update. RMC Water and Environment. Antelope Valley IRWMP.
- Antelope Valley Technical Committee. June 2008. Problem Statement Report Antelope Valley Area of Adjudication.
- Beeby, R., Durbin, T., Leever, W., Leffler, P., Scalmanini, J. C., & Wildermuth M. 2010. Antelope Valley Groundwater Adjudication Case Summary Expert Report for Phase 3 – Basin Yield and Overdraft.
- California Code of Regulations. Title 22.
- California Department of Water Resources (DWR). October 1980. Planned Utilization of Water Resources in Antelope Valley.
- California DWR. February 2004. California's Groundwater, Bulletin 118, Update 2003.
- Food and Agriculture Organization of the United Nations. Ayers, R. S. and D. W. Westcot. 1985. Irrigation and Drainage Paper 29 Rev. 1.
- Los Angeles County Sanitation District (LACSD). May 2004. Lancaster Water Reclamation Plant 2020 Facilities Plan.
- LACSD. 2013. Lancaster Water Reclamation Plant Annual Monitoring Report.
- LACSD. 2013. Palmdale Water Reclamation Plant Annual Monitoring Report.
- Los Angeles Waterworks District No. 40 (LACWD) and Quartz Hill Water District. June 2011. 2010 Integrated Regional Urban Water Management Plan for the Antelope Valley.
- LACWD. August 2006. Final Facilities Planning Report, Antelope Valley Recycled Water Project.
- LACWD. November 2008. North Los Angeles/Kern County Regional Recycled Water Project Final Program Environmental Impact Report SCH No. 2007101125.
- Metcalf and Eddy. Wastewater Engineering: Treatment and Reuse.
- Palmdale Water District. June 2011. Urban Water Management Plan.
- Palmdale, City of. April 2011. Proposition 1E Stormwater Flood Management Grant Proposals.
- Regional Water Quality Control Board, Lahontan Region. 1995. Water Quality Control Plan for the Lahontan Region.
- Rosamond Community Services District. June 2011. Urban Water Management Plan 2010.
- Semitropic-Rosamond Water Bank Authority- Antelope Valley Water Bank. January 2011. Marc Rosman, P.E. and Lorena Ospina. Managed Aquifer Recharge Symposium
- State Water Resources Control Board (SWRCB). October 1968. Resolution No. 68-16: Statement of Policy With Respect to Maintaining High Quality of Waters in California.
- SWRCB. November 2006. Board Meeting- Division of Financial Assistance.
- SWRCB. February 2009. Resolution 2009-0011: Adoption of a Policy for Water Quality Control for Recycled Water (Recycled Water Policy).
- SWRCB. April 2011. A Compilation of Water Quality Goals, 16th Edition.
- SWRCB. January 2013. Resolution 2013-0003: Adoption of an Amendment to the Policy for Water Quality Control for Recycled Water Concerning Monitoring Requirements for Constituents of Emerging Concern. Recycled Water Policy, as modified by State Board Resolution 2013-0003 (January 22, 2013).
- SWRCB. February 2013. Recommendation Addressing Nitrate in Groundwater. http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/docs/nitrate_rpt.pdf

- SWRCB. Draft Salt/Nutrient Management Plans –Suggested Elements.
- SWRCB. Geotracker Groundwater Ambient Monitoring and Assessment (GAMA). http://geotracker.waterboards.ca.gov/
- SWRCB. Water Quality Goals Searchable Database. http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/ .
- United States Bureau of Reclamation (USBR). September 2009. Total Dissolved Solids Fact Sheet. http://www.usbr.gov/pmts/water/publications/reportpdfs/Primer%20Files/08%20-%20TDS.pdf
- United States Department of Agriculture (USDA). September 1995. Fate and Transport of Nutrients: Nitrogen. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/crops/?cid=nrcs143_014202
- United States Department of the Interior. 1978. Calibration of a Mathematical Model of the Antelope Valley Groundwater Basin, California.
- United States Environmental Protection Agency (USEPA). November 1991. USEPA Region 3 Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments. By Roy L. Smith, Ph.D. Technical Guidance Manual.
- USEPA. January 2008. Health Effects Support Document for Boron. USEPA Document Number EPA-822 R-08-002
- USEPA. March 2012. Arsenic in Drinking Water.
- USEPA. April 2012. Chromium in Drinking Water.
- USEPA. May 2012. Basic Information about Fluoride in Drinking Water.
- United States Geological Survey (USGS). 1987. Geohydrology of the Antelope Valley Area, California and Design for a Ground-Water-Quality Monitoring Network. By Lowell F.W. Duell Jr.
- USGS. 1998. Water-level changes (1975-1998) in the Antelope Valley Ground-Water basin, California. By Carl S. Carlson and Steven P. Phillips. USGS Open-File Report: 98-561
- USGS. 2000. Aquifer-System Compaction: Analyses and Simulations- the Holly Site, Edwards Air Force Base, Antelope Valley, California, By Michelle Sneed and Devin L. Galloway. Water-Resources Investigations Report 00-4015.
- USGS. 2003. Simulation of Groundwater Flow and Land Subsidence.
- USGS. National Water Information System (NWIS). http://waterdata.usgs.gov/nwis/
- University of California, Berkley. 1955. Ground Water in California: The Experience of Antelope Valley. By J. Herbert Snyder.
- University of California, Davis. Nitrate Transport in Thick, Unsaturated, Alluvial Sediments. http://ucanr.org/sites/groundwater/Research/gw_205/

Appendix A

October 3, 2011

SCOPE OF WORK
Salt/Nutrient Management Plan for the Antelope Valley

PURPOSE

To develop a regional Salt/Nutrient Management Plan (SMP) for the Antelope Valley (AV) to manage salts and nutrients (and possibly other constituents of concern) from all sources within the basin to maintain water quality objectives and support beneficial uses. The intention is to involve all surface water and groundwater users and wastewater dischargers in the Antelope Valley basin to participate in efforts to protect these waters from accumulating concentrations of salt and nutrients that would degrade the quality of water supplies in the Antelope Valley to the extent that it may limit their use.

BACKGROUND

On February 3, 2009, the State Water Resources Control Board (State Board) adopted a Recycled Water Policy (Policy) that addresses the concern for protecting the quality of California's groundwater basins. In response to this Policy, Los Angeles County Waterworks Districts and Sanitation Districts of Los Angeles County have, with support of the Lahontan Regional Water Quality Control Board (Lahontan Water Board) staff, initiated efforts to organize a group to develop a regional SMP for the Antelope Valley.

Activities, such as irrigation using imported water, groundwater or recycled water can potentially add salts, typically measured as total dissolved solids (TDS), and nutrients to groundwater basins. Other sources of salts/nutrients can include natural soil conditions, atmospheric deposition, discharges of waste, soil amendments and water supply augmentation using surface water or recycled water.

The SMP shall be completed and proposed to the Lahontan Water Board by May 14, 2014; an extension of up to two years may be allowed if the Lahontan Water Board finds that the stakeholders are making substantial progress toward completion of the plan. In no case shall the period for the completion of the plan exceed seven years.

GOALS

One goal is to address salt/nutrient loading in the Antelope Valley basin region through the development of a management plan by the collaborative stakeholder process rather than the regional regulating agency imposing requirements on individual water projects. The process shall involve participation by Lahontan Water Board staff and be in compliance with California Environmental Quality Act (CEQA) regulations. The involvement of local agencies in a SMP may lead to more cost-effective means of protecting and enhancing groundwater quality, quantity, and availability.

Another goal is to assess impacts resulting from all activities with potential long-term basin-wide effects on groundwater quality, such as surface water, groundwater, imported water, and recycled water irrigation projects and groundwater recharge projects, as well as other salt/nutrient contributing activities through regional groundwater monitoring.

The design and implementation of a regional groundwater monitoring program must involve all stakeholders, including, but not limited to, water importers, purveyors, stormwater management agencies, wastewater agencies, Lahontan Water Board, and other significant salinity/nutrient contributors, in addition to the recycled water stakeholders.

The completion of the SMP may lead to the potential for enhanced partnering opportunities and potential project funding between water and wastewater agencies, or other stakeholders, for developing and protecting water supplies.

PLAN REQUIREMENTS

<u>Data Collection and Assessment</u>

1. Stakeholder Participation
   a. Outreach to the Lahontan Water Board staff and the stakeholders.
   b. Convene stakeholder meetings.
   c. Receive and review stakeholder input.

2. Determine SMP Area Boundaries
   a. The AV Integrated Regional Water Management (IRWM) Plan efforts cover the Antelope Valley groundwater basin. SMP stakeholders have determined that, while the scope of the AV SMP will include the groundwater sub-basins within the AV IRWM geographic boundaries, the Lancaster, Buttes, Neenach, and Pearland sub-basins, for which data has been provided to the AV SMP effort and relevant projects overlay, will be specifically addressed in detail. Additional sub-basins may be further addressed in the AV SMP depending on the willingness of users, purveyors, wastewater agencies, regulators, significant salt/nutrient contributors, and other stakeholders to participate and provide data. Surface water resources are defined using a watershed approach and are categorized based on a hierarchy of hydrologic systems including basins, units, areas, and subareas, which may or may not coincide with groundwater basin nomenclature defined by the CA Department of Water Resources (DWR). The surface waters within the Antelope Valley IRWM geographic boundary fall within the Antelope Hydrologic Unit of the South Lahontan Hydrologic Basin. There are a total of eight hydrologic areas within the Antelope Hydrologic Unit. For clarity and consistency, surface water hydrologic areas and hydrologic subareas will be identified and correlated, to the extent practical, with the groundwater basins as identified by DWR nomenclature within SMP area.
   b. Within the determined scope, identify land uses, surface water resources, groundwater basins and sub-basins, well locations, and hydrogeologic conditions including confined and unconfined aquifer systems, and current water quality.

3. Understand Current and Future Basin Uses
    a. Collect data from counties and participating cities regarding past/historic, current and potential future land uses contributing, or that could contribute, to potential salt/nutrient impacts.
    b. Identify existing surface/groundwater data collection efforts throughout the region.
    c. Create a map(s) with land uses and sites related to salts and nutrients, such as: irrigation (agricultural, commercial, residential); wastewater treatment and disposal (including septic and water softening systems); water recycling; groundwater augmentation and recharge, water treatment, applicable alternative energy; imported water; land application of solids; animal wastes (dairy, confined animal, and ranching) and other potential sources of salinity/nutrient contributions to the groundwater supply.

4. Create Groundwater Quality Database for Sub-basin
    a. Determine groundwater characteristics, recharge areas, and background water quality.
    b. Compile data and determine existing water quality, defined as the average concentration of salts/nutrients and other constituents of concern measured at each well.

5. Data Analysis
    a. Conduct a regional analysis of available groundwater quality databases to determine whether sufficient data and ongoing monitoring are available for the sub-basin.
    b. Collect data regarding other factors (such as atmospheric deposition, mixing of imported water with native basin water, natural sources) contributing, or that could contribute, to potential salt/nutrient impacts.
    c. If necessary, chose an appropriate model for data analysis and run the model. Provide rationale for selection of the specific model, if used. Calibrate the model used to analyze the data (including de-bugging of the chosen model) and verify the input data. Compare various model runs to observed values for each basin, as applicable.

<u>Characterization of Basin</u>

6. Salt and Nutrient Characterization
    a. Identify the current and projected sources and loadings of salts/nutrients. Include water balance/budget (volumetric analysis) and consider atmospheric nitrogen as a source.
    b. Determine the basin's assimilative capacity of salts/nutrients. Identify and include rationale for the assimilative capacity determination (e.g., selection of maximum TDS limit, etc.). Assimilative capacity will not be necessarily assumed based on Maximum Contaminant Levels, but rather based on a reasonably achievable objective derived from site-specific characteristics and source water quality.
    c. Determine the fate and transport of salt/nutrients.

d. Include other constituents of concern as necessary and appropriate (include naturally occurring constituents such as fluoride, boron, arsenic, chromium as well as constituents from anthropogenic sources, such as those concerned with cleanup sites).
e. Identify potential salt sinks.
f. Develop future planning scenarios for future users/uses that would include expected requests for projected recycled water production, reuse, discharges to Antelope Valley basins, and expected quality for each wastewater treatment facility (existing and projected). Planning scenarios could include appropriate planning spans, including, for example, a 5-year plan, 10-year plan, 25-year plan and a 50-year projected plan, or some combination as determined by the stakeholders.
g. Prepare a draft report to the stakeholders to present the data collected during basin characterization and the results for assimilative capacity (by sub-basin). Include rationale for selection of sub-basins (e.g., current uses, at risk basins, water quality, hydrogeology).
h. Consider the effects of importation of water and transferring recycled water sources between sub-basins. For example, consider the effects of source water derived from the Lancaster sub-basin that is recycled and subsequently transferred to the Buttes sub-basin (Buttes Hydrologic Area) for reuse as irrigation.

<u>Monitoring</u>

7. Develop a Monitoring Plan
    a. Define the scale of the monitoring plan component, dependent on site-specific conditions.
    b. Monitor for salts, nutrients, and other constituents of concern that potentially could adversely affect the water quality of the basin.
    c. Determine appropriate monitoring by targeting basin water quality at existing water supply and monitoring wells and areas proximate to large water recycling projects, and groundwater recharge projects.
    d. The monitoring plan should be designed to evaluate and track the long-term impacts to groundwater quality resulting from past, current, future, and transitioning land uses.
    e. Identify stakeholders responsible for conducting, compiling, and reporting the monitoring data.

8. Monitoring Implementation and Data Management
    a. Monitor each location at a determined frequency to assess impacts and take into account changes in all significant sources.
    b. Establish criteria for concentrations above ambient conditions based on statistical evaluation of data to trigger additional investigations.
    c. Conduct monitoring of constituents of concern (CECs), as recommended by the “blue-ribbon” Advisory Panel and approved by the State Board. CEC monitoring will be conducted in a manner consistent with the Policy.

d. Data submitted to the State Board for GAMA (Groundwater Ambient Monitoring & Assessment Program) shall follow the guidelines for "electronic submittal of information" outlined on the website: http://www.waterboards.ca.gov/ust/electronic_submittal/index.shtml
e. Report data to the Lahontan Water Board staff every 3 years.

<u>Implementation Measures</u>

9. Manage Salt/Nutrient Loadings on a Sustainable Basis
    a. Identify potential methods and best management practices to reduce and/or maintain salt and nutrient loadings—such as disposal and/or reducing methods.
    b. Recommend most appropriate methods and best management practices for reducing and/or maintaining salt and nutrient loadings.
    c. Include cost estimates for implementation and other economic information as required by state water law.
    d. Identify goals and objectives for water recycling and stormwater use/recharge and recommend management measures and ways to make the best use of these water resources.

<u>Antidegradation Analysis</u>

10. Demonstrate that the projects included in the SMP will satisfy the requirements of the State Antidegradation Policy (Resolution No. 68-16).

<u>Preparation of the SMP, Adoption by the members of the Antelope Valley Regional Water Management Group and Submittal to Lahontan Regional Water Board</u>

11. Draft the Salt and Nutrient Management Plan. At a minimum, plan will include the required elements as described in the State Board's Recycled Water Policy and as detailed in this Scope of Work.

12. Obtain approval/adoption/acceptance of the SMP by the members of the Antelope Valley Regional Water Management Group.

13. California Environmental Quality Analysis (CEQA)
    a. Draft appropriate CEQA documents related to the SMP.
    b. Adopt or file CEQA document.

14. Adoption of SMP by Lahontan Regional Board
    a. Collaborate as necessary with the Lahontan Regional Water Board staff to prepare the SMP for adoption into the Lahontan Region's Basin Plan (could include public hearing process, additional CEQA, presentation of SMP to the Lahontan Regional Water Board).
    b. Submit final SMP along with final CEQA document(s) to the Lahontan Regional Water Board for adoption.

Proposed Schedule

Task	Description	Estimated Completion Date
1a	Outreach to RWQCB and Stakeholders	July 2009
1b	Convene Initial S/N Management Plan Meeting	August 2009
2	Determine SMP Area Boundaries	January 2010
3	Current and Future Basin Uses	January 2011
4	Create Groundwater Quality Database	July 2010
5	Data Analysis	December 2011
6	Characterization of Basin	January 2012
7	Develop Monitoring Plan	March 2012
8	Monitoring Implementation	Every three years
9	Identify Implementation Measures	July 2012
10	Antidegradation Analysis	July 2012
11	Draft S/N Management Plan	January 2013
12	Adoption of SMP by members of AV RWM Group	May 2013
13	Completion of CEQA Documents	August 2013
14	Submit Final SMP to RWQCB	October 2013

THIS PAGE LEFT INTENTIONALLY BLANK

Appendix B

California Regional Water Quality Control Board
Lahontan Region

Matthew Rodriquez
Secretary for Environmental Protection

2501 Lake Tahoe Boulevard, South Lake Tahoe, California 96150
(530) 542-5400 • Fax (530) 544-2271
www.waterboards.ca.gov/lahontan

Edmund G. Brown Jr.
Governor

April 18, 2012

Antelope Valley Integrated Regional Water Management (IRWM) Stakeholder Group
Antelope Valley State Water Contractors Association
Palmdale Water District
2029 East Ave. Q
Palmdale, CA 93550

Attention: Matt Knudson

ACCEPTANCE OF SCOPE OF WORK FOR SALT AND NUTRIENT MANAGEMENT PLAN FOR ANTELOPE VALLEY IRWM REGION

Please send my thanks to Ms. Jessica Bunker and Ms. Erika de Hollan of the Antelope Valley IRWM Region Stakeholder Group for their effective presentation to the Lahontan Water Board on the Scope of Work (SOW) for the Antelope Valley IRWM proposed Salt and Nutrient Management Plan (SMP). As you know, a key element of the State Water Board's Recycled Water Policy (Resolution No. 2009-0011) is the development of a SMP for every groundwater basin in California by 2014.

Ms. Bunker and Ms. De Hollan explained to the Water Board the process that the Antelope Valley IRWM Stakeholder Group will use to develop its SMP, and that the development of the SMP will be controlled and funded by local stakeholders with participation from Water Board staff. As shown in the enclosed summary (October 12, 2011 Minutes from Regular Meeting of the Lahontan Water Board), the Water Board members were pleased with the initiative and collaboration demonstrated by the Antelope Valley IRWM Stakeholder Group in starting to develop its SMP. The Water Board did not express any concerns with the SOW or the process being used by the Antelope Valley IRWM Stakeholder Group.

Water Board staff appreciate the efforts of the Antelope Valley IRWM Stakeholder Group in its development of the SMP and look forward to continued participation in the process. Please contact me at (530) 542-5408 or Jan Zimmerman at (760) 241-7376 if you have questions or need more information.

Cindy Wise

Cindy Wise
Staff Environmental Scientist

Enclosure (1)

CC: Waterworks and Sanitation Districts

Jessica Bunker
P.O. Box 1460
Alhambra, CA 91802-1460

Erika de Hollan
1955 Workman Mill Road
Whittier, CA 90601

California Regional Water Quality Control Board
Lahontan Region

2501 Lake Tahoe Boulevard, South Lake Tahoe, California 96150
Phone: (530) 542-5400 • Fax: (530) 544-2271
Internet: http://www.waterboards.ca.gov/lahontan

Matthew Rodriquez
Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

MINUTES
October 12, 2011

Regular Meeting

Mojave Desert Air Quality Management District
14306 Park Avenue
Victorville, CA 92392

Chairman Clarke called the meeting to order at 1:00 p.m. on October 12, 2011.

Board Members Present
Jack Clarke, Apple Valley
Mike Dispenza, Palmdale
Keith Dyas, Rosamond
Amy Horne, Ph.D., Truckee
Peter C. Pumphrey, Bishop
Don Jardine, Markleeville
Eric Sandel, Truckee

Board Member Absent
None

Legal Counsel

Kimberly Niemeyer, Office of Chief Counsel, State Water Resources Control Board
Laura Drabandt, Office of Chief Counsel, State Water Resources Control Board

Staff Present

Harold Singer, Executive Officer
Lauri Kemper, Assistant Executive Officer
Scott Ferguson, Senior WRCE
Patrice Copeland, Senior Eng. Geologist
Keith Elliott, Senior WRCE
Cindy Wise, Staff Environmental Scientist
Cindi Mitton, Senior WRCE
Jan Zimmerman, Engineering Geologist
John Morales, Water Resources Control Eng
Mike Coony, Water Resources Control Eng
Eric Taxer, Water Resources Control Eng
Rebecca Phillips, Office Technician
Vanessa Ramirez, Student Assistant
Christopher White, Student Assistant

Addressing the Board

Dr. James Hart, Adelanto City Manager; Betsy Elzufon, Larry Walker and Assoc.; John Fogerty, Executive Office, San Bernardino Sheriff's Department; Mark Hagan, USAF; Raymond Tremblay, LA Co. Sanitation District; Stafford Lehr, CA Dept. of Fish and Game; Jessica Bunker, LA Co. Water Works District No. 40; Erika de Hollan, LA Co. Sanitation Districts

INTRODUCTIONS

Chairman Clarke introduced the Board members. Mr. Singer introduced the Water Board staff and Kimberly Niemeyer legal counsel.

1. **PUBLIC FORUM** – Item moved to Page 6, following No. 9 continuation of Executive Officer's Report

2. **MINUTES**

Minutes of the Regular Meeting of September 14 – 15, 2011 in Kings Beach (Amber Wike)

- **Motion**: Moved by Mike Dispenza seconded by Dr. Horne and **unanimously carried** to adopt the September 14 – 15, 2011 minutes as written.

3. **ADOPTION OF UNCONTESTED CALENDAR**

Note: Items denoted by (*) appears next to items adopted by the Board on the uncontested calendar.

RESCISSION OF WASTE DISCHARGE REQUIREMENTS

*4. Rescission of Waste Discharge Requirements for Desert Terrace Apartments, San Bernardino County

- **Motion**: Moved by Dr. Horne, seconded by Peter Pumphrey and **unanimously carried** to adopt the Rescission Order as proposed.

STATUS REPORTS

5. Adelanto Public Utility Authority Cease and Desist Order Status Report, San Bernardino County

   Mr. Singer made introductory comments on this item. He informed the Board that this is just an information item and workshop. Mr. Singer also informed the Board that the City and Water Board prosecution team submitted additional information which was added in their packets.

   Dr. James Hart, Adelanto City Manager, gave a general update on this item. He informed the Board that Larry Walker and Associates have been retained to help with reporting on the Water Board Orders. The three year extension has been finalized with VVWRA for diversion. Testing on Ponds 3, 4, 5 and 9 have been completed. Pond 5 construction is complete and is receiving discharge. Also Pond 9 construction is complete. Pond 4 will be completed by October 15.

   Betsy Elzufon, with Larry Walker and Associates made a presentation to the Water Board to assist with answering comments from Water Board staff regarding the report that was submitted last week. The Water Board and Mr. Singer asked questions after Ms. Elzufon's presentation.

   Eric Taxer, commented on the presentation made by Dr. Hart and said that the City of Adelanto has worked very hard to address the Regional Board's concerns. He also stated that there are still a few outstanding issues that have not been complied with which were provided to the Board in a table. Chairman Clarke and Dr. Horne had questions for Mr. Taxer.

   Laura Drabandt, State Water Board, Staff Counsel, reported to the Water Board on the enforcement options. Due to the separation of functions, she informed the Board that she could not be more specific. She also informed the Board that the City of Adelanto is not yet in compliance.

   Chairman Clarke had concerns with the amount of beds at the prisons in the presentation. He said the numbers were not adding up. Mr. Singer suggested that the City and Prosecution team should review the information and provide more clarity to the Board at a future meeting.

6. County Sanitation District No. 14 of Los Angeles County, Lancaster Water Reclamation Plant, Los Angeles County Cease and Desist Order Status Report

   Mike Coony, Water Resources Control Engineer with the Victorville office gave the staff presentation. Mr. Coony answered questions from the Board.

RENEWAL OF NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

7. California Department of Fish and Game; Fish Springs Fish Hatchery, Inyo County
   Note: This item has been postponed to a future Board Meeting.

   Mr. Singer informed the Water Board that this item has been removed from the agenda.

8. California Department of Fish and Game; Mojave River Fish Hatchery, San Bernardino County

   Keith Elliott, Senior Engineer gave the staff presentation. Dr. Horne suggested additional changes regarding the rain event in the Order.

   Board discussion

   Dr. Horne commented on the professionalism that the Fish and Game is showing and thanked them. Mr. Elliott answered questions from the Water Board.

   • **Motion**: Moved by Eric Sandel, seconded by Keith Dyas and **unanimously carried** to adopt the Order with the late revisions and correction, and additional changes as proposed.

OTHER BUSINESS

9. **Executive Officer's Report**

   Mr. Singer discussed items from the April 1, 2011 - June 31, 2011 Executive Officer's Report and answered questions from the Board.

   Mr. Singer informed the Board that the Hinkley residents have requested that the Board have a Public Forum regarding PG&E. Mr. Singer suggested they do this at 7:00 p.m. this evening. He will discuss the PG&E Executive Officer's Report before the Public Forum. A Cleanup and Abatement Order (CAO) was issued on October 11, 2011 and Mr. Singer will give the Board a briefing on the CAO which was placed in the Board's folders. Ms. Kemper will give the Board a briefing on the status of other Water Board activities associated with PG&E's groundwater cleanup.

   Mr. Singer went over the Draft Board Meeting schedule for 2012.

   Note: Executive Officer's Report to be continued at 7:00 p.m.

10. **Reports by Water Board Chair and Board Members**

Dr. Horne commented on the Water Quality Coordinating Committee meeting that she attended. At the meeting, they discussed having the Water Boards working together as one Board. She also informed the Board about an art exhibit that she attended in Reno regarding altered landscapes that are in the Lahontan and Colorado Region. Dr. Horne handed out the brochure from this exhibit.

Mr. Pumphrey commented on the Water Quality Coordinating Committee meeting that he attended. He was very impressed by the talents and skills of the agency and made him more aware of the work and efforts of the Water Board staff.

Chairman Clarke gave a report regarding the Chair's conference call. He informed the Board that the discussion of the Water Board working together as one Board has been brought up before several times during the Chair's conference calls.

11. **CLOSED SESSION***

The Board met in closed session from 4:30 p.m. to 4:41 p.m. to consider Item k. Discussion of Personnel Matters. Authority: Government Code section 11126. The Board reconvened in open session at 4:45 p.m.

The Board recessed for dinner at 4:45 p.m.

Regular Meeting continued
7:00 p.m., October 12, 2011

Chairman Clarke called the meeting to order at 7:00 p.m.

Board Members Present
Jack Clarke, Apple Valley
Mike Dispenza, Palmdale
Keith Dyas, Rosamond
Amy Horne, Ph.D., Truckee
Don Jardine, Markleeville
Peter C. Pumphrey, Bishop
Eric Sandel, Truckee

Board Member Absent
None

INTRODUCTIONS

Chairman Clarke introduced the Board members.
Mr. Singer introduced the Water Board staff.

9. Executive Officer's Report (continued)

Mr. Singer discussed the CAO that was issued yesterday, October 11, 2011 to PG&E on replacement of water. The Water Board delegated Mr. Singer to issue the CAO. Mr. Singer gave a summary of the CAO and asked if the Board had questions.

Ms. Kemper discussed the 2008 CAO that required PG&E to develop a comprehensive strategy to clean up the ground water in the Hinkley Valley which included the submittal of a feasibility study to the Board last September.

Ms. Kemper informed the Board and Public that staff will have a public meeting later this year at the Hinkley School. They will be discussing the responses from the Peer Review on the background study, the status of the EIR, and current status of the plume investigation and the ground water cleanup.

1. **PUBLIC FORUM** *(continued)*

Carmela Spasojevich, Hinkley resident, expressed her relief that a CAO has been issued to PG&E, and also expressed her dismay at the length of time that PG&E is being given to comply with this CAO.
Robert Conaway, Helphinkley.org, voiced concern that Hinkley / Barstow area need representation on the Water Board.
James Dodd, PG&E Advisory Board Committee: He commends the Water Board for getting something done but not moving fast enough. He believes PG&E needs to help the people who want to move out of the area.
Karen Dodd, Hinkley resident: Where is the legal Administrative Civil Liability for PG&E?
Elaine Kearney, Hinkley resident: Built their retirement home in Hinkley and was not aware of the water problems. She is concerned that her property and home is poisoned and worthless.
Daron Banks, Hinkley resident: Private wells need to be added to the total and complete plume map. Suggest Water Board staff test their water not PG&E personnel.
Patti Dickman, Hinkley resident: Thanks the Water Board for issuing the CAO to PG&E, but disappointed in staff for the length of time that it took and the 10 months that the CAO gives PG&E to comply.
Jackie Conaway, Hinkley resident: Ms. Conaway thanks Mr. Singer for all he has done. Ms. Conaway asked if the Water Board knows the source of the Culligan Water being provided to the residences by PG&E and if it has been tested?

Dr. Horne thanked all the residents from Hinkley for coming to the Water Board meeting and making their presentations.

PLANS AND POLICIES

12. **Discussion of Proposed Scope of Work and Development of a Salt and Nutrient Management Plan (SMP) for the Antelope Valley, Antelope Valley Regional Water Management Group, Los Angeles and Kern Counties**

Jan Zimmerman, from the Victorville office and Cindy Wise from the South Lake Tahoe office each made a presentation to the Board. Also Jessica Bunker and Erika de Hollan, representing the Antelope Valley Group, described the efforts of the Antelope Valley Group.

Ms. Zimmerman, Ms. Wise, Ms. De Hollan and Ms. Bunker answered questions from the Board.

Mr. Sandel commented on the great insight that the presenters gave the Board. The presentation was very organized and well thought through.

Mr. Dispenza congratulated the Antelope Valley Group and is very proud of them.

Mr. Pumphrey is very impressed by the collaborated effort and it is great how they have involved all the stakeholders. The Group should really be commended.

Dr. Horne commented on how excited she is about this project.

Chairman Clarke agrees with all the Board Member's comments. Projects which are the result of collaboration of multiple agencies are great and can work.

Board members did not express any concerns with the workplan or the process being followed by the Antelope Valley Group.

ADJOURNMENT

With no further business to come before the Board, the meeting adjourned at 9:22 p.m. on October 12, 2011.

Prepared by: Rebecca Phillips
Rebecca Phillips, Office Technician

Adopted: **December 6, 2011**

Rp/h/BOInfo/Minutes/Final _MINUTES_OCT12-2011rp

THIS PAGE LEFT INTENTIONALLY BLANK

Appendix C

Antelope Valley Land Use Designations

Data Sources

City of Lancaster
Files from City of Lancaster Planning Department staff, January 2010.

Land Use Codes:
http://www.cityoflancasterca.org/Modules/ShowDocument.aspx?documentid=9333
http://www.cityoflancasterca.org/Modules/ShowDocument.aspx?documentid=9323
GENERAL PLAN 2030 web page: http://www.cityoflancasterca.org/index.aspx?page=427

City of Palmdale
Files from City of Palmdale Traffic Division/GIS Section staff, May 2010.

Land Use Codes: http://www.cityofpalmdale.org/departments/planning/general_plan/03-LandUse.pdf

Los Angeles County
Files from Los Angeles County Waterworks staff, April 2012.

Land Use Codes: 2012 Draft General Plan 2035
http://planning.lacounty.gov/assets/upl/project/gp_2035_Appendices_C_2012.pdf
http://planning.lacounty.gov/assets/upl/project/gp_2035_Part2_Chapter3_2012.pdf

Kern County
General Plan Map (updated 1-13-2012): http://www.co.kern.ca.us/gis/Files/GeneralPlan.zip
General Plan document: http://pcd.kerndsa.com/planning/planning-documents/general-plans

Floor Area Ratio (FAR) is the ratio of the total covered area on all floors of all buildings to the area of the project site. As a formula, FAR = (total covered area on all floors of all buildings)/ (area of the project site).

du/ac = dwelling unit(s) per acre

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Population Density (Persons/Acre)	Purpose
CM	Major Commercial	Residential or Mixed Use: 30-150 du/net ac Maximum FAR 3.0		Large and intense commercial uses, such as regional and destination shopping malls and centers, tourist and recreation related commercial services, hotels, and amusement activities; multifamily residences; and residential and commercial mixed uses.
CR	Rural Commercial	Maximum FAR 0.5		Limited commercial uses that are compatible with rural, agricultural, and low-intensity visitor-serving recreational activities, including: retail, personal, and professional services; restaurants; general stores; and professional offices.
CR-MU	Rural Commercial / Mixed Use	0-5 du/net ac Maximum FAR 0.5	13	Limited commercial uses that are compatible with rural, agricultural, and low-intensity visitor-serving recreational activities, including: retail; personal, and professional services; restaurants; general stores; and professional offices; and residential and commercial mixed uses.
H2	Large Lot Residential	0–2 du/net ac	6	Low-density, single family residences
H5	Suburban Residential	0–5 du/net ac	15	Low-density, single family residences
H9	Suburban High Density Residential	0–9 du/net ac	26	Single family residences.
H18	Medium Density Residential	0–18 du/net ac	52	Transitional single family and small-scale multifamily residences, including duplexes, triplexes, fourplexes, rowhouses, small lot subdivisions, and townhomes
H30	Urban Residential	0–30 du/net ac	61	Medium-scale, multifamily residences, and single family residences.
IH	Heavy Industrial	Maximum FAR 1.0		Heavy industrial uses, including heavy manufacturing, refineries, and other labor and capital intensive industrial activities.
IL	Light Industrial	Maximum FAR 1.0		Light industrial uses, such as industrial park activities, warehouses, distribution, assembly, disassembly, fabricating, finishing, manufacturing, packaging, and repairing or processing of materials, printing, commercial laundry, photographic film processing, vehicle repair garages, building maintenance shops, metal work, millwork, and cabinetry work.
ML	Military Land			Military installations and land controlled by U.S. Department of Defense.
OS-BLM	Bureau of Land Management			Areas managed by the Federal Bureau of Land Management.

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Population Density (Persons/Acre)	Purpose
OS-C	Conservation			For the preservation of open space areas and scenic resource preservation in perpetuity. Applies only to land that is legally dedicated for open space and conservation efforts.
OS-NF	National Forest			Areas within the national forest and managed by the National Forest Service.
OS-PR	Parks and Recreation			Open space recreational uses, such as regional and local parks, trails, athletic fields, community gardens, and golf courses.
OS-W	Water			Bodies of water, such as lakes, reservoirs, natural waterways, and man-made infrastructure, such as drainage channels, floodways, and spillways. Includes active trail networks within or along drainage channels.
P	Public and Semi-Public	Maximum FAR 3.0		Public and semi-public facilities and community-serving uses, including: public buildings and campuses, schools, hospitals, cemeteries, government buildings, and fairgrounds. Airports and other major transportation facilities. Major facilities, including landfills, solid and liquid waste disposal sites, multiple use stormwater treatment facilities, and major utilities.
RL1	Rural Land 1	Maximum 1 du/1 gross ac Maximum FAR 0.5	4	Single family residences; equestrian and limited animal uses; and limited agricultural and related activities.
RL2	Rural Land 2	Maximum 1 du/2 gross ac Maximum FAR 0.5	2	Single family residences; equestrian and limited animal uses; and limited agricultural and related activities.
RL5	Rural Land 5	Maximum 1 du/5 gross ac Maximum FAR 0.5	1	Single family residences; equestrian and limited animal uses; and limited agricultural and related activities.
RL10	Rural Land 10	Maximum 1 du/10 gross ac Maximum FAR 0.5	0.4	Single family residences; equestrian and animal uses; and agricultural and related activities.
RL20	Rural Land 20	Maximum 1 du/20 gross ac Maximum FAR 0.5	0.2	Single family residences; equestrian and animal uses; and agricultural and related activities.
RL40	Rural Land 40	Maximum 1 du/40 gross ac Maximum FAR 0.5	0.1	Single family residences; equestrian and animal uses; and agricultural and related activities.
TC	Transportation Corridor			

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Purpose
Aqueduct	California Aqueduct		Open space
AR	Airport and Related Uses		Intended for public and private airfields and support facilities, aerospace-related industries, transportation-related industries, and commercial facilities necessary to support military and commercial air traffic. Primarily applies to U.S. Air Force Plant 42 and the Palmdale Regional Airport site. While industrial development related to the aerospace industry has occurred at Air Force Plant 42, the airport property is largely vacant, supporting minor agricultural uses and sewage treatment facilities.
BP	Business Park		Intended for a variety of office, research and development, light assembly and fabrication, and supportive commercial uses within an environment characterized by master-planned complexes maintaining a high quality of design and construction. Development in this designation is expected to provide enhanced landscaping and outdoor amenities to create a campus setting. Operations and storage activities are to be confined to enclosed buildings.
CC	Community Commercial	Maximum FAR of 1.0.	Intended for retail and service uses, such as restaurants, apparel stores, hardware stores, grocery markets, banks, offices, and similar uses.
CM	Commercial Manufacturing		Intended for mixed use development of lighter industrial uses and the more intensive service, retail and wholesale commercial uses. Uses include research and development, distribution, manufacturing and wholesale or retail sale of industrial supplies, transportation equipment, building equipment and materials, and similar uses. Supportive commercial uses such as restaurants or convenience markets, which serve consumers within the industrial/commercial area, may be allowed. However, this designation is not intended for general commercial uses, either of a retail or service nature, which will attract non-industrial users. Areas shall have or plan to have adequate sewer, water, transportation, drainage, utilities and public services available. The designation may be used as a transitional use between more intensive industrial uses and less intensive commercial uses.
DC	Downtown Commercial		Intended for the City's traditional retail/service core area, located in proximity to Palmdale Boulevard. Representative uses are designed to produce high levels of social or commercial activity in the downtown area and include entertainment uses, institutional uses, pedestrian oriented retail and service uses, and support community commercial uses.
ER	Equestrian Residential	maximum gross density of 0.40 du/ac (1 unit per 2½ acres)	Intended for single family residential uses where equestrian and related animal keeping activities are permitted. Areas are rural in nature with parcel sizes of 2½ acres or larger. Full urban services such as community water and sewer may not be available to these areas. Estimated population: 800 persons/mi^2.
IND	Industrial		Includes a variety of industrial uses, including the manufacturing and assembly of products and goods, warehousing, and distribution. May include some limited commercial uses which are incidental to and supportive of the primary industrial uses. Areas shall have or plan to have adequate sewer, water, transportation, drainage, utilities and public services.
LDR	Low Density	maximum gross	This designation is appropriate to hillside areas and as a transition between rural and suburban areas. It is

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Purpose
	Residential	density of 1 du/ac	generally expected that urban services such as community sewer and water will be provided to new development proposed within this designation. Minimum lot sizes will generally be one acre or larger, although clustering may be permitted to encourage preservation of natural resources and steep slopes. Estimated population: 1,600 persons/mi^2.
MFR	Multifamily Residential	10.1-16 du/ac	Housing types may include a variety of attached and detached dwelling unit types. Estimated population: 26,000 persons/mi^2.
MR	Medium Residential	maximum gross densities of 6.1 to 10 du/ac	Housing types may include single family detached, single family attached, townhouses, condominiums, duplexes, triplexes, apartments, or manufactured housing developments. Minimum lot size is 7,000 ft^2 for single family residential uses. Equestrian and large animal uses are not intended within these areas. Estimated population: 16,200 persons/mi^2.
MRE	Mineral Resource Extraction		Intended for extraction and processing of mineral resources, including sand, gravel and decomposed granite. Activities include mining, crushing and sales of mineral products; asphalt and concrete batching.
NC	Neighborhood Commercial	Maximum FAR is 0.50	Intended for convenience type retail and service activities designed to serve the daily and short-term needs of the immediate neighborhood.
OC	Office Commercial	Maximum FAR is 1.0	Intended for a variety of professional office uses, including medical, personal, business, legal, insurance, real estate, financial, and other similar uses. May include limited retail, service, child care and eating establishments to support the primary office users within this designation. May include vocational, technical and trade schools, private or public college or universities, and supportive commercial uses. This designation is appropriate between more intensive commercial uses and residential designations, or within commercial areas serving the administrative and professional service needs of businesses and the general public.
OS	Open Space		Intended to identify and reserve land for both natural and active open space uses, including City parks. The designation identifies existing and acquired but not yet built park sites within the community, as well as lands dedicated for open space purposes. This designation is appropriate to protect sites with physical limitations such as flood plains, very steep terrain (slopes steeper than 50 percent), or significant natural resources. Typical uses include recreational uses, horticulture, agriculture, animal grazing or similar uses.
PF	Public Facility	Maximum FAR is 1.0.	Intended for various types of public facilities, including but not limited to schools, parks, libraries, hospitals, public safety and governmental facilities, sewer and water treatment plants, and landfills. Within the PF designation, uses are specifically identified by use type: PF-B Public Facility-Basin PF-C Public Facility-Cemetery PF-Landfill Public Facility-Landfill PF-P&R Public Facility-Park and Ride PF-S Public Facility-School PF-TP Public Facility-Treatment Plant PF-W Public Facility-Water Treatment

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Purpose
RC	Regional Commercial	Maximum FAR is 1.0.	Intended for retail and service uses attracting consumers from a regional market area. Goods and services provided are typically long-term in nature, rather than convenience goods. Uses include department stores, regional shopping malls, automobile dealerships, hotel/motels, and large retail outlets. Supportive commercial uses serving a community commercial function, such as financial institutions, retail and food services, may also be included, provided that such uses are not primarily oriented to the convenience market.
SD	Special Development		Intended for areas which, due to lack of infrastructure and public services, topography, environmental sensitivity, and development constraints, require comprehensive planning beyond that normally associated with the General Plan. This planning could be accomplished through the Specific Plan process. Development is primarily intended to be residential in nature, with a gross density of 0-2 dwelling units per acre. However, supportive commercial uses are anticipated within this designation. Higher residential density and the location and intensity of supportive commercial uses may be established based upon environmental, topographic, and infrastructural capacity of the land.
SFR-1	Single Family Residential 1	0-2 du/ac	Intended for single family residential uses with net lot sizes generally one half acre or larger, creating a semi-rural environment with horse/animal keeping possible. Full urban services are expected in these areas, although larger lot subdivisions may be developed. Estimated population of 3,600 persons/mi^2.
SFR-2	Single Family Residential 2	0-3 du/ac	Intended for single family residential uses with net lot sizes generally 10,000 ft^2 or larger, although clustering may be permitted to preserve steeper terrain or significant physical features. Full urban services will be required in new development areas. Estimated population of 5,600 persons/mi^2.
SFR-3	Single Family Residential 3	3.1-6 du/ac	Intended for single family residential uses with subdivisions containing a 7,000 ft^2 minimum lot size. Estimated population of 9,700 persons/mi^2.

City of Palmdale Specific Plans

General Plan Land Use
Antelope Valley Auto Center Specific Plan (SP-16)
Antelope Valley Business Park Specific Plan
City Ranch Specific Plan (SP-2)
Foothill Ranch Specific Plan (SP-17)
Hillside Residential Specific Plan (SP-7)
Joshua Hills Specific Plan (SP-4)
Lockheed Specific Plan (SP-11)

General Plan Land Use
Palmdale Trade and Commerce Specific Plan (SP-13)
Palmdale Transit Village Specific Plan (SP-??)
Quarry and Reclamation Specific Plan (SP-14)
Quarry and Reclamation Specific Plan
Rancho Vista Specific Plan (SP-5)
Ritter Ranch Specific Plan (SP-3)

City of Lancaster Land Uses

Code	General Plan Land Use	Permitted Density	Description	SNMP Designation
NU	Non-urban Residential	0.4 - 2.0 dwellings per acre (DU/AC)	Density ranges from one dwelling unit per 2.5 acres to two dwelling units per acre.	
UR	Urban Residential	2.1 - 6.5 DU/AC		
MR1	Multiple Family Residential – Medium Density	6.6 - 15.0 DU/AC		
MR2	Multiple Family Residential – High Density	15.1 - 30.0 DU/AC		
C	Commercial	Floor area ratios (FARs) ranging from 0.5 to 1.0.	Includes a broad spectrum of uses, including regional, community, neighborhood, and highway-oriented uses.	
OP	Office/Professional	Maximum FAR of 0.75.	Includes office and professional uses and supporting commercial uses.	
LI	Light Industry	Maximum FAR of 0.5.	Clean, non-polluting industrial and office uses with support commercial.	
HI	Heavy Industry	Maximum FAR of 0.5.	Includes a range of industrial uses in a less restrictive setting.	
H	Public and Quasi- Public Facilities – Health Care		Includes public and private hospitals, health care facilities, and related independent or assisted-living residential facilities.	
P	Public	Maximum FAR of 1.0.	Uses and lands in public ownership, including governmental administration and service facilities. Includes public schools and educational institutions.	
O	Open Space		Includes publicly owned parks and recreation facilities. Existing parks are specifically delineated; future parks may be represented symbolically. Includes cemeteries, funeral homes, mausoleums, crematoriums, and columbariums.	
SP	Specific Plan		Specific Plans and planned developments.	
MU	Mixed Use	Average density: 21 dwelling units/acre Average FAR: 1.0 Unit density and floor area rations may vary depending on the purpose and design.	This category combines retail, service and office uses with higher density residential uses in the same building or on the same site with residential potentially located above commercial activities. Development typically functions as the center of activity for the surrounding area and emphasizes integrated design with strong pedestrian/transit connections. Areas considered for mixed-use development will typically require development under the guidance of a specific plan.	

Kern County Land Uses

General Plan Land Use	Description
State and Federal Land	Applied to all property under the ownership and control of the various State and federal agencies operating in Kern County (military, U.S. Forest Service, Bureau of Land Management, Department of Energy, etc.).
Incorporated Cities	Cities responsible for the preparation and maintenance of their own General Plans.
Solid Waste Disposal Facility	Public, semi-public, or private municipal solid waste facilities, organic waste disposal facilities, and segregated waste stream disposal facilities.
Accepted County Plan Areas	A designation of areas for which specific land use plans have already been prepared and approved.
Interim Rural Community Plan	Settlements in the County that have individual character which, in past plans, have been broadly merged with the surrounding countryside. These settlements are recognized as unique communities; each with its own character, special advantages, and problems which should more appropriately be addressed at a specific plan level of detail.
Specific Plan Required	Areas wherein large-scale projects have been previously proposed by the project landowner(s). The project proponent bears the burden of demonstrating the suitability of the property for the conceptual uses and densities. The Maximum Allowed Land Use Density tables (Appendix C) showing acreages and densities are conceptual and shall be used as guidelines should a specific plan be developed. Actual land uses and densities shall be based on consistency with the General Plan goals, policies and environmental review and may require reduction or elimination.
Maximum 4 Units/Net Acre	This category is designed to accommodate urban single-family development on lots with a minimum average size of 1/4 net acre (10,890 Sq. Ft. Site Area/Unit).
Maximum 1 Unit/Net Acre	Single-family designation with rural service needs in the valley and desert regions, while in the mountain region, residential uses of this density will require urban service provision (43,560 Sq. Ft. Site Area/Unit).
Minimum 2.5 Gross Acres/Unit	Single family designation with rural service needs in the valley and desert regions, while in the mountain region residential uses of this density will require urban service provision.
Minimum 5 Gross Acres/Unit	Designated in the outlying, less densely settled areas, often characterized with physical constraints and not requiring connections to public water and sewer infrastructure.
Minimum 20 Gross Acres/Unit	Designated in the outlying, less densely settled areas, often characterized by physical constraints and not requiring connections to public water and sewer infrastructure.
Highway Commercial	Uses which provide services, amenities, and accommodations at key locations along major roadways to visitors and through traffic. Uses include, but are not limited to: Hotels, motels, restaurants, garages, service stations, recreational vehicle parks, fast-food restaurants, truck stops, and truck washes.
Light Industrial	Unobtrusive industrial activities that can be located in close proximity to residential and commercial uses with a minimum of environmental conflicts. Industries are characterized as labor-intensive and nonpolluting and do not produce fumes, odors, noise, or vibrations detrimental to nearby properties. Uses may include: wholesale businesses, storage buildings and yards, warehouses, manufacturing, and assembling.
Service Industrial	Commercial or industrial activities which involve outdoor storage or use of heavy equipment. Such uses produce significant air or noise pollution and are visually obtrusive. Uses include, but are not limited to: Automobile and truck parking, storage and repair shops, freighting or trucking yards, bottling plants, breweries, welding shops, cleaning plants, and other manufacturing and processing activities.

Kern County Land Uses

General Plan Land Use	Description
Heavy Industrial	Large-scale industrial activities that are incompatible with other land uses because of potential severe environmental impacts and/or high employee densities. Uses include, but are not limited to: Manufacturing, assembling and processing activities, transportation facilities, material and equipment storage, sawmills, foundries, refineries, and petroleum product storage.
Intensive Agriculture (Min. 20-Acre Parcel Size)	Areas devoted to the production of irrigated crops or having a potential for such use. Other agricultural uses, while not directly dependent on irrigation for production, may also be included. Uses may include: Irrigated cropland; orchards; vineyards; horse ranches; raising of nursery stock ornamental flowers and Christmas trees; fish farms' bee keeping' ranch and farm facilities and related uses; one single-family dwelling unit; cattle feed yards; dairies; dry land farming; livestock grazing; water storage; groundwater recharge acres; mineral; aggregate; and petroleum exploration and extraction; hunting clubs; wildlife preserves; farm labor housing; public utility uses; and land within development areas subject to significant physical constraints.
Resource Reserve (Min. 20- Or 80- Acre Parcel Size)	Areas of mixed natural resource characteristics, such as rangeland, woodland, and wildlife habitat which occur within an established County water district. Uses may include: Livestock grazing; dry land farming; ranching facilities; wildlife and botanical preserves; and timber harvesting; one single-family dwelling unit; irrigated croplands; water storage or groundwater recharge areas; mineral; aggregate; and petroleum exploration and extraction; recreational activities, such as gun clubs and guest ranches; and land within development areas subject to significant physical constraints.
Extensive Agriculture (Min. 20- Or 80-Acre Parcel Size)	Agricultural uses involving large amounts of land with relatively low value-per-acre yields, such as livestock grazing, dry land farming, and woodlands. Uses may include: Livestock grazing; dry land farming; ranching facilities; wildlife and botanical preserves; and timber harvesting; one single-family dwelling unit; irrigated croplands; water storage or groundwater recharge areas; mineral; aggregate; and petroleum exploration and extraction; and recreational activities, such as gun clubs and guest ranches; and land within development areas subject to significant physical constraints.
Mineral And Petroleum (Min. 5-Acre Parcel Size)	Areas which contain producing or potentially productive petroleum fields, natural gas, and geothermal resources, and mineral deposits of regional and Statewide significance. Uses are limited to activities directly associated with the resource extraction. Uses may include: Mineral and petroleum exploration and extraction, including aggregate extraction; extensive and intensive agriculture; mineral and petroleum processing (excluding petroleum refining); natural gas and geothermal resources; pipelines; power transmission facilities; communication facilities; equipment storage yards; and borrow pits.
Resource Management (Min. 20- Or 80-Acre Parcel Size)	Primarily open space lands containing important resource values, such as wildlife habitat, scenic values, or watershed recharge areas. Other lands may include undeveloped, non-urban areas that do not warrant additional planning within the foreseeable future because of current population (or anticipated increase), marginal physical development, or no subdivision activity. Uses may include: Recreational activities; livestock grazing; dry land farming; ranching facilities; wildlife and botanical preserves; and timber harvesting; one single-family dwelling unit; irrigated croplands; water storage or groundwater recharge areas; mineral; aggregate; petroleum exploration and extraction; open space and recreational uses; one single-family dwelling; land within development areas subject to significant physical constraints; State and federal lands which have been converted to private ownership.

Appendix D

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T10000002727	Air Force Plant 42 - Air Force Plant #42, Palmdale - Site 2 T2-1, T2-2, & T2-3 Bldg 214	Military Cleanup Site	Open - Inactive	Palmdale	93550	34.6427	-118.0906	
DOD100004000	Air Force Plant 42 - AOC 2 - Former Firing Range at Bldg 728	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Palmdale	93550-2196	34.6214	-118.0969	
T10000002610	Air Force Plant 42 - RCRA Facility Assessment at SWMU 95	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Palmdale	93550-2196	34.6388	-118.0994	
T0603700347	Air Force Plant 42 - SITE 1 UST T1-1 & T1-2 (BLDG 147)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6355	-118.0984	Aviation
T0603700374	Air Force Plant 42 - SITE 1 UST T1-10 BLDG 127	Military UST Site	Completed - Case Closed	Palmdale	93550	34.638	-118.097	Aviation
T10000002785	Air Force Plant 42 - Site 1 UST T1-11	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6379	-118.0966	Aviation
T10000002741	Air Force Plant 42 - Site 1 UST T1-13	Military UST Site	Completed - Case Closed	Palmdale	93550	33.8809	-118.3787	Aviation, Gasoline, Heating Oil / Fuel Oil
T10000002739	Air Force Plant 42 - Site 1 UST T1-3	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6354	-118.0994	Gasoline
T0603700369	Air Force Plant 42 - SITE 1 UST T1-4 BLDG 145	Military UST Site	Completed - Case Closed	Palmdale	93550	34.636	-118.0991	Gasoline
T0603700370	Air Force Plant 42 - SITE 1 UST T1-5 BLDG 145	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6362	-118.0995	Heating Oil / Fuel Oil
T0603700371	Air Force Plant 42 - SITE 1 UST T1-6 BLDG 198	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6378	-118.0994	Aviation
T10000002740	Air Force Plant 42 - Site 1 UST T1-7	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6411	-118.0975	
T0603700373	Air Force Plant 42 - SITE 1 UST T1-8 BLDG 143	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6379	-118.0953	Heating Oil / Fuel Oil
T10000002732	Air Force Plant 42 - Site 1 UST T1-9 & T1-12, Bldg 145	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6369	-118.0983	
T0603700232	Air Force Plant 42 - SITE 2	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6371	-118.0892	
T10000002774	Air Force Plant 42 - Site 2 Clarifier C2-12	Military Cleanup Site	Completed - Case Closed	Palmdale	93550	34.6374	-118.0884	
T10000002728	Air Force Plant 42 - Site 2 T2-1, T2-2, & T2-3 (Bldg 214)	Military Cleanup Site	Completed - Case Closed	Palmdale	93550	34.6367	-118.0854	Benzene, Toluene, Trichloroethylene (TCE), Xylene, Gasoline
T10000002745	Air Force Plant 42 - Site 2 UST T2-11	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6375	-118.09	Gasoline, Other Petroleum
T0603700350	Air Force Plant 42 - SITE 2 UST T2-4 & T2-5 (BLDG 210)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6382	-118.0892	Diesel
T0603700226	Air Force Plant 42 - SITE 2 UST T2-6 (BLDG 210)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6376	-118.0905	Gasoline
T0603700372	Air Force Plant 42 - SITE 2 UST T2-7, T2-8, T2-9, T2-10 (Bldg 210)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6381	-118.0886	Diesel
DOD100000500	Air Force Plant 42 - Site 27, Waste Piles	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Palmdale	93550-2196	34.6284	-118.0968	Lead, Zinc, Polynuclear aromatic hydrocarbons (PAHs)

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100000900	Air Force Plant 42 - Site 28, Dust Control Area	Military Cleanup Site	Open - Site Assessment	Palmdale	93550-2196	34.6391	-118.0871	Polychlorinated biphenyls (PCBs), Polynuclear aromatic hydrocarbons (PAHs)
T10000002776	Air Force Plant 42 - Site 3 Clarifier C3-16	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6389	-118.08	
T10000002752	Air Force Plant 42 - Site 3 Clarifier C3-19 & C3-20 and Sump S3-21 & S3-22	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6401	-118.0823	
T10000002754	Air Force Plant 42 - Site 3 Clarifier C3-28	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6383	-118.0802	Other Petroleum
T10000002734	Air Force Plant 42 - Site 3 T3-2 & T3-3	Military UST Site	Open - Eligible for Closure	Palmdale	93550	34.6374	-118.082	
T10000002736	Air Force Plant 42 - Site 3 T3-4, T3-5, T3-6, T3-7, T3-8, T3-14, T3-15, & S3-27	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6384	-118.0809	
T10000002775	Air Force Plant 42 - Site 3 UST T3-1	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6416	-118.0826	
T10000002746	Air Force Plant 42 - Site 3 UST T3-17	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6368	-118.0815	Aviation
T10000002747	Air Force Plant 42 - Site 3 UST T3-18 & T3-24	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6425	-118.0771	
T10000002749	Air Force Plant 42 - Site 3 UST T3-26	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6424	-118.0769	Diesel, Gasoline, Heating Oil / Fuel Oil
T10000002737	Air Force Plant 42 - Site 3 UST T3-9, T3-10, T3-11, T3-12, and T3-13	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6383	-118.0775	Heating Oil / Fuel Oil
T0603700399	Air Force Plant 42 - SITE 4 NORTHROP GRUMMAN	Military UST Site	Completed - Case Closed	Palmdale	93350	34.6408	-118.0666	Gasoline
T0603799267	Air Force Plant 42 - Site 4 Surface Release UST T4-201 (Bldg 460)	Military UST Site	Completed - Case Closed	Palmdale	93350	34.6406	-118.0665	Gasoline
T0603700237	Air Force Plant 42 - Site 4 UST T4-601 & T4-603 (Bldg 431) Pipeline Release	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6395	-118.0684	Aviation
T0603700275	Air Force Plant 42 - SITE 5 FUEL FARM, UST T5-12, T5-13, T5-14, T5-15, and T5-16	Military UST Site	Open - Eligible for Closure	Palmdale	93550	34.6129	-118.1069	Aviation
T10000002738	Air Force Plant 42 - Site 5 T5-21, T5-22, & T5-23	Military UST Site	Open - Eligible for Closure	Palmdale	93550	34.6216	-118.0766	
T0603700398	Air Force Plant 42 - SITE 5 UST T5-1 & T5-2	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6099	-118.0896	Gasoline
T10000002766	Air Force Plant 42 - Site 5 UST T5-17	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6218	-118.0756	Other Petroleum
T10000002905	Air Force Plant 42 - Site 5 UST T5-20	Military UST Site	Open - Site Assessment	Palmdale	92395	34.6201	-118.0782	
T10000002907	Air Force Plant 42 - Site 5 UST T5-24 (Bldg 531)	Military UST Site	Open - Site Assessment	Palmdale	93551	34.6201	-118.0812	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T10000002756	Air Force Plant 42 - Site 5 UST T5-3 & T5-5	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6292	-118.0815	Diesel, Gasoline, Other Petroleum
T10000002757	Air Force Plant 42 - Site 5 UST T5-4	Military UST Site	Completed - Case Closed	Palmdale	93550	34.628	-118.0826	Aviation, Diesel, Gasoline, Other Petroleum
T10000002759	Air Force Plant 42 - Site 5 UST T5-6, T5-7, T5-8, T5-9, T5-10, T5-11, T5-18, T5-19	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6278	-118.0814	Other Petroleum
T0603700227	Air Force Plant 42 - SITE 7 BLDG 727	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6181	-118.0988	Stoddard solvent / Mineral Spriits / Distillates
T0603700346	Air Force Plant 42 - SITE 7 TANK 7-1 BLDG 752	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6239	-118.0924	Aviation
T0603700365	Air Force Plant 42 - SITE 7 TANK 7-2 BLDG 757	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6211	-118.0914	Aviation
T0603700345	Air Force Plant 42 - SITE 7 TANK 7-3 BLDG 740	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6199	-118.0958	Diesel
T0603700366	Air Force Plant 42 - SITE 7 TANK 7-4 BLDG 730	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6187	-118.0958	Aviation
T0603700367	Air Force Plant 42 - SITE 7 TANK 7-5/C7-10/C7-14 BLDG 722	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6191	-118.0968	Diesel
T10000002909	Air Force Plant 42 - Site 7 UST 7-12 (Bldg 723)	Military UST Site	Completed - Case Closed	Palmdale	93551	34.6197	-118.0962	Toluene, Xylene, Copper, Lead, Other Metal
T10000002910	Air Force Plant 42 - Site 7 UST 7-13 (Bldg 779)	Military UST Site	Open - Site Assessment	Palmdale	93551	34.6204	-118.0962	
T10000002908	Air Force Plant 42 - Site 7 UST T7-11 (Bldg 723)	Military UST Site	Completed - Case Closed	Palmdale	93551	34.6196	-118.0963	
T10000002769	Air Force Plant 42 - Site 7 UST T7-15	Military UST Site	Completed - Case Closed	Palmdale	93550	34.618	-118.0987	Diesel, Other Petroleum
T10000002770	Air Force Plant 42 - Site 7 UST T7-16	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6165	-118.0991	
T0603700228	Air Force Plant 42 - SITE 7, BLDG 722, UST T7-6, T7-7, T7-8	Military UST Site	Completed - Case Closed	Palmdale	93550	34.619	-118.0973	Diesel
T10000002771	Air Force Plant 42 - Site 8 UST T8-1 & T8-3	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6219	-118.1092	Diesel, Gasoline
T10000002911	Air Force Plant 42 - Site 8 UST T8-2 (Bldg 870)	Military UST Site	Completed - Case Closed	Palmdale	93551	34.6225	-118.1111	
DOD100002000	Air Force Plant 42 - SS007 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6378	-118.0863	
DOD100003800	Air Force Plant 42 - SS008 - Fuel Transfer Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6212	-118.1142	
DOD100000800	Air Force Plant 42 - SS012 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6367	-118.0952	
DOD100001000	Air Force Plant 42 - SS014 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6364	-118.0896	
DOD100001900	Air Force Plant 42 - SS015 - Triethyl Borane (TEB) Disposal Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6364	-118.0882	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100001200	Air Force Plant 42 - SS019 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6424	-118.0837	
DOD100000100	Air Force Plant 42 - SS020 - Noise Level Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6364	-118.0854	
DOD100003200	Air Force Plant 42 - SS022 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6145	-118.0891	
DOD100003700	Air Force Plant 42 - ST004 - Vehicle Washrack and Leaking UST	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6207	-118.0814	
DOD100003600	Air Force Plant 42 - ST026 - Battery Shop UST	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6202	-118.0812	
DOD100074300	Edwards Air Force Base - 1 - AOC 344	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100074400	Edwards Air Force Base - 1 - AOC 365	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.908	-117.9115	
DOD100074500	Edwards Air Force Base - 1 - AOC 367	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9191	-117.9023	
DOD100074600	Edwards Air Force Base - 1 - AOC 377	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9062	-117.9117	
DOD100075900	Edwards Air Force Base - 1 - AOC 397	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9226	-117.8859	
DOD100076000	Edwards Air Force Base - 1 - Site 10	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9316	-117.8869	
DOD100076100	Edwards Air Force Base - 1 - Site 11	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.927	-117.8821	
DOD100076200	Edwards Air Force Base - 1 - Site 16	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9365	-117.8888	
DOD100077500	Edwards Air Force Base - 1 - Site 17	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9208	-117.8879	
DOD100077600	Edwards Air Force Base - 1 - Site 18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9415	-117.8899	
DOD100077700	Edwards Air Force Base - 1 - Site 19	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9324	-117.8789	
DOD100077800	Edwards Air Force Base - 1 - Site 20	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.942	-117.8903	
DOD100090400	Edwards Air Force Base - 1 - Site 21	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9313	-117.891	
DOD100090500	Edwards Air Force Base - 1 - Site 23	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9374	-117.893	
DOD100090600	Edwards Air Force Base - 1 - Site 24	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9386	-117.8933	
DOD100090700	Edwards Air Force Base - 1 - Site 33	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9169	-117.8963	
DOD100082300	Edwards Air Force Base - 1 - Site 342	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9079	-117.9122	
DOD100082400	Edwards Air Force Base - 1 - Site 343	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9151	-117.8991	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100082500	Edwards Air Force Base - 1 - Site 345	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9242	-117.8967	
DOD100082600	Edwards Air Force Base - 1 - Site 346	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9237	-117.8981	
DOD100087100	Edwards Air Force Base - 1 - Site 366	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9166	-117.905	Soil
DOD100087200	Edwards Air Force Base - 1 - Site 41	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9141	-117.8982	
DOD100087300	Edwards Air Force Base - 1 - Site 42	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9074	-117.9129	
DOD100087400	Edwards Air Force Base - 1 - Site 43	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9138	-117.9005	
DOD100079100	Edwards Air Force Base - 1 - Site 44	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9158	-117.8996	
DOD100079200	Edwards Air Force Base - 1 - Site 45	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9172	-117.8969	
DOD100079300	Edwards Air Force Base - 1 - Site 46	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.919	-117.8953	
DOD100079400	Edwards Air Force Base - 1 - Site 47	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9189	-117.8914	
DOD100083900	Edwards Air Force Base - 1 - Site 48	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9235	-117.8859	
DOD100084000	Edwards Air Force Base - 1 - Site 49	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9218	-117.8847	
DOD100084100	Edwards Air Force Base - 1 - Site 50	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9245	-117.8873	
DOD100084200	Edwards Air Force Base - 1 - Site 51	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9243	-117.8823	
DOD100088800	Edwards Air Force Base - 1 - Site 52	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9227	-117.8823	
DOD100088900	Edwards Air Force Base - 1 - Site 53	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9272	-117.8883	
DOD100089000	Edwards Air Force Base - 1 - Site 54	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9308	-117.8872	
DOD100089100	Edwards Air Force Base - 1 - Site 55	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9285	-117.8824	
DOD100080700	Edwards Air Force Base - 1 - Site 56	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9396	-117.8918	
DOD100080800	Edwards Air Force Base - 1 - Site 57	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9391	-117.8849	
DOD100080900	Edwards Air Force Base - 1 - Site 58	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9418	-117.885	
DOD100081000	Edwards Air Force Base - 1 - Site 59	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.924	-117.8954	
DOD100085500	Edwards Air Force Base - 1 - Site 60	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9266	-117.8918	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100085600	Edwards Air Force Base - 1 - Site 62	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9459	-117.8877	
DOD100085700	Edwards Air Force Base - 1 - Site 64	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9248	-117.8782	
DOD100085800	Edwards Air Force Base - 1 - Site 65	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9339	-117.8902	
DOD100118400	Edwards Air Force Base - 1 - Site 66	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9369	-117.8851	
DOD100118500	Edwards Air Force Base - 1 - Site 67	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9202	-117.8938	
DOD100118600	Edwards Air Force Base - 1 - Site 68	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9277	-117.8895	
DOD100118700	Edwards Air Force Base - 1 - Site 8	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9293	-117.8765	
DOD100120000	Edwards Air Force Base - 10 - 1C	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9963	-117.8272	
DOD100120100	Edwards Air Force Base - 10 - 1D	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9958	-117.8277	
DOD100120200	Edwards Air Force Base - 10 - AOC 254	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9836	-117.8722	
DOD100120300	Edwards Air Force Base - 10 - AOC 418	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9789	-117.8701	
DOD100121600	Edwards Air Force Base - 10 - AOC 462	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9954	-117.8432	
DOD100121700	Edwards Air Force Base - 10 - AOC 463	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.998	-117.8473	
DOD100121800	Edwards Air Force Base - 10 - AOC 464	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9959	-117.8626	
DOD100121900	Edwards Air Force Base - 10 - AOC 465	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9952	-117.8495	
DOD100098000	Edwards Air Force Base - 10 - AOC 466	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.996	-117.8547	
DOD100098100	Edwards Air Force Base - 10 - AOC 467	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9801	-117.8117	
DOD100098200	Edwards Air Force Base - 10 - AOC 468	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9909	-117.8111	
DOD100098300	Edwards Air Force Base - 10 - Site 1A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.999	-117.844	
DOD100099600	Edwards Air Force Base - 10 - Site 1B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9959	-117.8267	
DOD100099700	Edwards Air Force Base - 10 - Site 1E	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9983	-117.8431	
DOD100099800	Edwards Air Force Base - 10 - Site 234	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9677	-117.8802	
DOD100099900	Edwards Air Force Base - 10 - Site 273	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9789	-117.8711	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100101200	Edwards Air Force Base - 10 - Site 274	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9964	-117.8356	
DOD100101300	Edwards Air Force Base - 10 - Site 275	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9925	-117.8279	
DOD100101400	Edwards Air Force Base - 10 - Site 276	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9765	-117.8906	
DOD100101500	Edwards Air Force Base - 10 - Site 277	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9979	-117.8446	
DOD100102800	Edwards Air Force Base - 10 - Site 278	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9988	-117.8532	
DOD100102900	Edwards Air Force Base - 10 - Site 279	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9978	-117.8819	
DOD100145300	Edwards Air Force Base - 15	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100145400	Edwards Air Force Base - 167	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100103000	Edwards Air Force Base - 2 - AOC 218	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.893	-117.8994	
DOD100103100	Edwards Air Force Base - 2 - AOC 219	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9116	-117.8683	
DOD100104400	Edwards Air Force Base - 2 - AOC 220	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8776	-117.8817	
DOD100104500	Edwards Air Force Base - 2 - AOC 222	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8777	-117.8737	
DOD100104600	Edwards Air Force Base - 2 - AOC 290	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.812	-117.9168	
DOD100104700	Edwards Air Force Base - 2 - AOC 291	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8188	-117.8757	
DOD100106000	Edwards Air Force Base - 2 - AOC 364	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8847	-117.8847	
DOD100106100	Edwards Air Force Base - 2 - AOC 408	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8167	-117.8924	
DOD100106200	Edwards Air Force Base - 2 - AOC 417	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8164	-117.8913	
DOD100106300	Edwards Air Force Base - 2 - AOC 458	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8737	-117.8744	
DOD100107600	Edwards Air Force Base - 2 - AOC 459	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9188	-117.8655	
DOD100107700	Edwards Air Force Base - 2 - AOC 460	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8979	-117.8791	
DOD100107800	Edwards Air Force Base - 2 - S223	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100107900	Edwards Air Force Base - 2 - Site 100	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8974	-117.8624	
DOD100109200	Edwards Air Force Base - 2 - Site 101	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8964	-117.8617	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100109300	Edwards Air Force Base - 2 - Site 102	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8876	-117.8667	
DOD100109400	Edwards Air Force Base - 2 - Site 103	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8861	-117.866	
DOD100109500	Edwards Air Force Base - 2 - Site 104	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8773	-117.8988	
DOD100110800	Edwards Air Force Base - 2 - Site 105	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8733	-117.913	
DOD100110900	Edwards Air Force Base - 2 - Site 106	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8719	-117.9125	
DOD100111000	Edwards Air Force Base - 2 - Site 107	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8768	-117.8971	
DOD100111100	Edwards Air Force Base - 2 - Site 108	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8766	-117.9118	
DOD100112400	Edwards Air Force Base - 2 - Site 109	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8735	-117.9153	
DOD100112500	Edwards Air Force Base - 2 - Site 110	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8598	-117.8681	
DOD100112600	Edwards Air Force Base - 2 - Site 111	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8697	-117.8825	
DOD100112700	Edwards Air Force Base - 2 - Site 112	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8607	-117.8848	
DOD100114000	Edwards Air Force Base - 2 - Site 14 South Base Fire Fighting Training Facility	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8943	-117.8654	
DOD100114100	Edwards Air Force Base - 2 - Site 15A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8986	-117.8783	
DOD100114200	Edwards Air Force Base - 2 - Site 15B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8984	-117.8771	
DOD100114300	Edwards Air Force Base - 2 - Site 22	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9003	-117.8693	
DOD100115600	Edwards Air Force Base - 2 - Site 221	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8852	-117.8746	
DOD100115700	Edwards Air Force Base - 2 - Site 223	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.913	-117.8647	
DOD100115800	Edwards Air Force Base - 2 - Site 29 South Base Abandoned Sanitary Landfill	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8695	-117.881	
DOD100115900	Edwards Air Force Base - 2 - Site 341	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8728	-117.9109	
DOD100117200	Edwards Air Force Base - 2 - Site 5 Former South Base Waste POL Storage Area	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9003	-117.8814	
DOD100117300	Edwards Air Force Base - 2 - Site 69	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.908	-117.8863	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100117400	Edwards Air Force Base - 2 - Site 70	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9094	-117.8835	
DOD100117500	Edwards Air Force Base - 2 - Site 71	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9048	-117.8803	
DOD100118800	Edwards Air Force Base - 2 - Site 72	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9085	-117.8798	
DOD100118900	Edwards Air Force Base - 2 - Site 73	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9077	-117.8777	
DOD100119000	Edwards Air Force Base - 2 - Site 74	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9049	-117.8762	
DOD100119100	Edwards Air Force Base - 2 - Site 75	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9008	-117.8924	
DOD100120400	Edwards Air Force Base - 2 - Site 76 Old South Base Assorted Facilities	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9041	-117.8683	
DOD100120500	Edwards Air Force Base - 2 - Site 77	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9097	-117.8733	
DOD100120600	Edwards Air Force Base - 2 - Site 78	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9073	-117.8685	
DOD100120700	Edwards Air Force Base - 2 - Site 79	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9068	-117.8634	
DOD100122000	Edwards Air Force Base - 2 - Site 80	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9108	-117.8583	
DOD100122100	Edwards Air Force Base - 2 - Site 81	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9044	-117.859	
DOD100122200	Edwards Air Force Base - 2 - Site 82	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9055	-117.8622	
DOD100122300	Edwards Air Force Base - 2 - Site 83	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.902	-117.8634	
DOD100098400	Edwards Air Force Base - 2 - Site 84A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9014	-117.8613	
DOD100098500	Edwards Air Force Base - 2 - Site 84B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9018	-117.8593	
DOD100098600	Edwards Air Force Base - 2 - Site 85	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8984	-117.8727	
DOD100098700	Edwards Air Force Base - 2 - Site 86 Building 300 Engine Test Cell	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9038	-117.8615	
DOD100100000	Edwards Air Force Base - 2 - Site 87	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9024	-117.8592	
DOD100100100	Edwards Air Force Base - 2 - Site 88	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9075	-117.8728	
DOD100100200	Edwards Air Force Base - 2 - Site 89	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9071	-117.8736	
DOD100100300	Edwards Air Force Base - 2 - Site 90	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9078	-117.8706	
DOD100101600	Edwards Air Force Base - 2 - Site 91	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9049	-117.866	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100101700	Edwards Air Force Base - 2 - Site 92	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.909	-117.8691	
DOD100101800	Edwards Air Force Base - 2 - Site 93	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9086	-117.8623	
DOD100101900	Edwards Air Force Base - 2 - Site 94	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9016	-117.8694	
DOD100103200	Edwards Air Force Base - 2 - Site 95	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8862	-117.8889	
DOD100103300	Edwards Air Force Base - 2 - Site 96	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8894	-117.8909	
DOD100103400	Edwards Air Force Base - 2 - Site 97	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8884	-117.8851	
DOD100103500	Edwards Air Force Base - 2 - Site 98	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8797	
DOD100104800	Edwards Air Force Base - 2 - Site 99	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8895	-117.8844	
DOD100104900	Edwards Air Force Base - 3 - Site 409	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100105000	Edwards Air Force Base - 3 - Site 410	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100105100	Edwards Air Force Base - 3 - Site 411	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100106400	Edwards Air Force Base - 3 - Site 412	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100106500	Edwards Air Force Base - 3 - Site 413	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100106600	Edwards Air Force Base - 3 - Site 414	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100106700	Edwards Air Force Base - 3 - Site 415	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100108000	Edwards Air Force Base - 3 - Site 416	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
T10000001992	Edwards Air Force Base - 4 - Site 120 AFRL Sewage Treatment Plant	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	923524-113	34.9071	-117.7003	
DOD100105500	Edwards Air Force Base - 4 - Site 133 AFRL Civil Engineering Yard Groundwater Plume	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9276	-117.6872	
DOD100118300	Edwards Air Force Base - 4 - Site 37 Building 8595 PCE Plume	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9298	-117.6985	
DOD100108100	Edwards Air Force Base - 4A - AOC 119	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9093	-117.6976	
DOD100108200	Edwards Air Force Base - 4A - AOC 121	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9086	-117.6996	
DOD100108300	Edwards Air Force Base - 4A - AOC 134	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9275	-117.6862	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100109600	Edwards Air Force Base - 4A - AOC 135	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9284	-117.6872	
DOD100109700	Edwards Air Force Base - 4A - AOC 136	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.928	-117.6871	
DOD100109800	Edwards Air Force Base - 4A - AOC 138	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.934	-117.6954	
DOD100109900	Edwards Air Force Base - 4A - AOC 139	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9318	-117.7025	
DOD100111200	Edwards Air Force Base - 4A - AOC 140	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.937	-117.6935	
DOD100111300	Edwards Air Force Base - 4A - AOC 144	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9373	-117.676	
DOD100111400	Edwards Air Force Base - 4A - AOC 147	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9374	-117.6923	
DOD100111500	Edwards Air Force Base - 4A - AOC 148	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9294	-117.6872	
DOD100112800	Edwards Air Force Base - 4A - AOC 149	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9323	-117.6875	
DOD100112900	Edwards Air Force Base - 4A - AOC 151	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9319	-117.6844	
DOD100113000	Edwards Air Force Base - 4A - AOC 152	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9301	-117.6843	
DOD100113100	Edwards Air Force Base - 4A - AOC 154	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9277	-117.6839	
DOD100114400	Edwards Air Force Base - 4A - AOC 155	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9339	-117.7009	
DOD100114500	Edwards Air Force Base - 4A - AOC 156	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9367	-117.7007	
DOD100114600	Edwards Air Force Base - 4A - AOC 157	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9352	-117.701	
DOD100114700	Edwards Air Force Base - 4A - AOC 158A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9347	-117.7026	
DOD100116000	Edwards Air Force Base - 4A - AOC 158B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9341	-117.7019	
DOD100116100	Edwards Air Force Base - 4A - AOC 159	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9325	-117.7032	
DOD100116200	Edwards Air Force Base - 4A - AOC 161	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9366	-117.7052	
DOD100116300	Edwards Air Force Base - 4A - AOC 163	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9363	-117.7045	
DOD100117600	Edwards Air Force Base - 4A - AOC 164	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9485	-117.6834	
DOD100117700	Edwards Air Force Base - 4A - AOC 165	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9479	-117.6797	
DOD100117900	Edwards Air Force Base - 4A - AOC 168	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9398	-117.6952	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100119200	Edwards Air Force Base - 4A - AOC 169	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9441	-117.6863	
DOD100119500	Edwards Air Force Base - 4A - AOC 173	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9303	-117.7005	
DOD100120800	Edwards Air Force Base - 4A - AOC 175	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9301	-117.7009	
DOD100120900	Edwards Air Force Base - 4A - AOC 184	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9277	-117.6938	
DOD100121000	Edwards Air Force Base - 4A - AOC 314	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100121100	Edwards Air Force Base - 4A - AOC 315	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100098800	Edwards Air Force Base - 4A - AOC 316	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100098900	Edwards Air Force Base - 4A - AOC 317	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.943	-117.6886	
DOD100099000	Edwards Air Force Base - 4A - AOC 319	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100099100	Edwards Air Force Base - 4A - AOC 320	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100100400	Edwards Air Force Base - 4A - AOC 326	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9372	-117.6729	
DOD100100500	Edwards Air Force Base - 4A - AOC 327	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9366	-117.669	
DOD100100600	Edwards Air Force Base - 4A - AOC 335	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9356	-117.6891	
DOD100100700	Edwards Air Force Base - 4A - AOC 336	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.939	-117.6976	
DOD100102000	Edwards Air Force Base - 4A - AOC 372	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.929	-117.6845	
DOD100102100	Edwards Air Force Base - 4A - AOC 373	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9305	-117.6843	
DOD100102200	Edwards Air Force Base - 4A - AOC 374	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9352	-117.6866	
DOD100102300	Edwards Air Force Base - 4A - AOC 404	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9344	-117.6967	
DOD100103600	Edwards Air Force Base - 4A - AOC 405	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9297	-117.6858	
DOD100103700	Edwards Air Force Base - 4A - AOC 406	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9313	-117.6997	
DOD100103800	Edwards Air Force Base - 4A - AOC 407	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9382	-117.6965	
DOD100103900	Edwards Air Force Base - 4A - AOC160	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9375	-117.7052	
DOD100105200	Edwards Air Force Base - 4A - AOC174	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9311	-117.6994	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100105300	Edwards Air Force Base - 4A - Site 12	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9483	-117.6813	
DOD100106800	Edwards Air Force Base - 4A - Site 137	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9305	-117.6856	
DOD100106900	Edwards Air Force Base - 4A - Site 143A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9351	-117.6994	
DOD100107000	Edwards Air Force Base - 4A - Site 143B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9344	-117.6998	
DOD100107100	Edwards Air Force Base - 4A - Site 145	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9301	-117.6909	
DOD100108400	Edwards Air Force Base - 4A - Site 146	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9281	-117.6873	
DOD100110200	Edwards Air Force Base - 4A - Site 162	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9374	-117.7046	
DOD100111600	Edwards Air Force Base - 4A - Site 177	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9379	-117.6748	
DOD100111700	Edwards Air Force Base - 4A - Site 185	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9327	-117.6879	
DOD100111800	Edwards Air Force Base - 4A - Site 186	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9287	-117.6876	
DOD100113300	Edwards Air Force Base - 4A - Site 313	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100113400	Edwards Air Force Base - 4A - Site 318	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9415	-117.6845	
DOD100113500	Edwards Air Force Base - 4A - Site 32	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9377	-117.6853	
DOD100114800	Edwards Air Force Base - 4A - Site 333A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8849	-117.6354	
DOD100114900	Edwards Air Force Base - 4A - Site 333B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8857	-117.6325	
DOD100115000	Edwards Air Force Base - 4A - Site 35	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100115100	Edwards Air Force Base - 4A - Site 354	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9284	-117.6958	
DOD100116400	Edwards Air Force Base - 4A - Site 355	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9345	-117.6956	
DOD100116500	Edwards Air Force Base - 4A - Site 356	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9285	-117.6868	
DOD100116600	Edwards Air Force Base - 4A - Site 357	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9302	-117.6858	
DOD100116700	Edwards Air Force Base - 4A - Site 358	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9297	-117.6876	
DOD100118000	Edwards Air Force Base - 4A - Site 359	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9313	-117.7078	
DOD100118100	Edwards Air Force Base - 4A - Site 36	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9331	-117.7032	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100118200	Edwards Air Force Base - 4A - Site 361	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9396	-117.6955	
DOD100119700	Edwards Air Force Base - 4A - Site 40	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9283	-117.7059	
DOD100119800	Edwards Air Force Base - 4A - Site 461	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9432	-117.6894	
DOD100119900	Edwards Air Force Base - 4A - Site A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100121200	Edwards Air Force Base - 4B - AOC 167	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8898	-117.633	
DOD100145500	Edwards Air Force Base - 5	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100097700	Edwards Air Force Base - 5 - AOC 187	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9934	-117.8739	
DOD100097800	Edwards Air Force Base - 5 - AOC 188	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9934	-117.8726	
DOD100097900	Edwards Air Force Base - 5 - AOC 189	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9932	-117.8728	
DOD100099200	Edwards Air Force Base - 5 - AOC 190	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9933	-117.8736	
DOD100099300	Edwards Air Force Base - 5 - AOC 191	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9945	-117.8733	
DOD100099400	Edwards Air Force Base - 5 - AOC 192	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.994	-117.873	
DOD100099500	Edwards Air Force Base - 5 - AOC 193	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9941	-117.8722	
DOD100100800	Edwards Air Force Base - 5 - AOC 194	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9945	-117.8722	
DOD100100900	Edwards Air Force Base - 5 - AOC 195	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9931	-117.8758	
DOD100101000	Edwards Air Force Base - 5 - AOC 196	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9936	-117.8782	
DOD100101100	Edwards Air Force Base - 5 - AOC 197	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9936	-117.8764	
DOD100102400	Edwards Air Force Base - 5 - AOC 198	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9941	-117.878	
DOD100102500	Edwards Air Force Base - 5 - AOC 199	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9947	-117.8767	
DOD100102600	Edwards Air Force Base - 5 - AOC 200	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9976	-117.8764	
DOD100102700	Edwards Air Force Base - 5 - AOC 201	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9937	-117.8776	
DOD100115200	Edwards Air Force Base - 5 - AOC 202	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9947	-117.8762	
DOD100115300	Edwards Air Force Base - 5 - AOC 203	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9997	-117.877	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100115400	Edwards Air Force Base - 5 - AOC 204	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	35.0008	-117.868	
DOD100115500	Edwards Air Force Base - 5 - AOC 228	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9837	-117.8624	
DOD100107200	Edwards Air Force Base - 5 - AOC 230	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9847	-117.8647	
DOD100107300	Edwards Air Force Base - 5 - AOC 232	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9812	-117.8674	
DOD100107400	Edwards Air Force Base - 5 - AOC 237	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9856	-117.8628	
DOD100107500	Edwards Air Force Base - 5 - AOC 243	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9884	-117.8578	
DOD100112000	Edwards Air Force Base - 5 - AOC 244	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.989	-117.8588	
DOD100112100	Edwards Air Force Base - 5 - AOC 245	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9857	-117.8652	
DOD100112200	Edwards Air Force Base - 5 - AOC 246	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9838	-117.8661	
DOD100112300	Edwards Air Force Base - 5 - AOC 247	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9838	-117.8641	
DOD100116800	Edwards Air Force Base - 5 - AOC 248	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9861	-117.8624	
DOD100116900	Edwards Air Force Base - 5 - AOC 249	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9855	-117.8648	
DOD100117000	Edwards Air Force Base - 5 - AOC 251	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.8642	
DOD100117100	Edwards Air Force Base - 5 - AOC 251	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.8644	
DOD100104000	Edwards Air Force Base - 5 - AOC 252	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.865	
DOD100104100	Edwards Air Force Base - 5 - AOC 253	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.8637	
DOD100104200	Edwards Air Force Base - 5 - AOC 255	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9846	-117.865	
DOD100104300	Edwards Air Force Base - 5 - AOC 256	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9862	-117.8602	
DOD100108800	Edwards Air Force Base - 5 - AOC 281	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9922	-117.873	
DOD100108900	Edwards Air Force Base - 5 - AOC 283	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9934	-117.8743	
DOD100109000	Edwards Air Force Base - 5 - AOC 284	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8766	
DOD100109100	Edwards Air Force Base - 5 - AOC 286	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8759	
DOD100113600	Edwards Air Force Base - 5 - AOC 287	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.994	-117.8628	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100113700	Edwards Air Force Base - 5 - AOC 288	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9952	-117.8715	
DOD100113800	Edwards Air Force Base - 5 - AOC 289	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9908	-117.8792	
DOD100113900	Edwards Air Force Base - 5 - AOC 350	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9911	-117.8776	
DOD100105600	Edwards Air Force Base - 5 - AOC 369	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8731	
DOD100105700	Edwards Air Force Base - 5 - AOC 370	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9872	-117.8592	
DOD100105800	Edwards Air Force Base - 5 - AOC 401	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8656	
DOD100105900	Edwards Air Force Base - 5 - AOC 402	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9866	-117.8598	
DOD100110400	Edwards Air Force Base - 5 - AOC 403	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9852	-117.8643	
DOD100110500	Edwards Air Force Base - 5 - AOC 420	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.994	-117.8742	
DOD100110600	Edwards Air Force Base - 5 - AOC 421	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9957	-117.8733	
DOD100110700	Edwards Air Force Base - 5 - AOC 423	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9971	-117.8767	
DOD100142400	Edwards Air Force Base - 5 - AOC 424	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9969	-117.8735	
DOD100142500	Edwards Air Force Base - 5 - Site 229	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9843	-117.8635	
DOD100142600	Edwards Air Force Base - 5 - Site 231	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9843	-117.8655	
DOD100142700	Edwards Air Force Base - 5 - Site 233	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9823	-117.8679	
DOD100144000	Edwards Air Force Base - 5 - Site 235	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9852	-117.8635	
DOD100144100	Edwards Air Force Base - 5 - Site 236	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9845	-117.864	
DOD100144200	Edwards Air Force Base - 5 - Site 238	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9854	-117.8632	
DOD100144300	Edwards Air Force Base - 5 - Site 239	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9857	-117.8638	
DOD100145600	Edwards Air Force Base - 5 - Site 240	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9877	-117.8596	
DOD100145700	Edwards Air Force Base - 5 - Site 241	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9889	-117.8606	
DOD100145800	Edwards Air Force Base - 5 - Site 242	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9888	-117.8605	
DOD100145900	Edwards Air Force Base - 5 - Site 282	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9945	-117.8724	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100147200	Edwards Air Force Base - 5 - Site 285	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9967	-117.8766	
DOD100147300	Edwards Air Force Base - 5 - Site 348	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9928	-117.8738	
DOD100147400	Edwards Air Force Base - 5 - Site 349	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.994	-117.8736	
DOD100147500	Edwards Air Force Base - 5 - Site 422	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9911	-117.8782	
DOD100123600	Edwards Air Force Base - 6 - AOC 205	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123700	Edwards Air Force Base - 6 - AOC 206	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123900	Edwards Air Force Base - 6 - AOC 208	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125200	Edwards Air Force Base - 6 - AOC 209 N14	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9625	-117.8853	
DOD100125300	Edwards Air Force Base - 6 - AOC 210	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125400	Edwards Air Force Base - 6 - AOC 211	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125500	Edwards Air Force Base - 6 - AOC 212	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126900	Edwards Air Force Base - 6 - AOC 214	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127000	Edwards Air Force Base - 6 - AOC 215	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127100	Edwards Air Force Base - 6 - AOC 216	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128400	Edwards Air Force Base - 6 - AOC 217	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128500	Edwards Air Force Base - 6 - AOC 307	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130000	Edwards Air Force Base - 6 - AOC 310	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130100	Edwards Air Force Base - 6 - AOC 311	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128600	Edwards Air Force Base - 6 - Site 205 N1	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9528	-117.8832	
DOD100130200	Edwards Air Force Base - 6 - Site 206 N2	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.95	-117.8861	
DOD100123800	Edwards Air Force Base - 6 - Site 207 N3	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9493	-117.8892	
DOD100128700	Edwards Air Force Base - 6 - Site 208 N4	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9477	-117.885	
DOD100126800	Edwards Air Force Base - 6 - Site 211 N7	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9468	-117.8878	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100130300	Edwards Air Force Base - 6 - Site 351	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146800	Edwards Air Force Base - 7	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100131600	Edwards Air Force Base - 7 - AOC 260	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9112	-117.9497	
DOD100131700	Edwards Air Force Base - 7 - AOC 261	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9444	-117.9439	
DOD100131800	Edwards Air Force Base - 7 - AOC 268	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9215	-117.7727	
DOD100131900	Edwards Air Force Base - 7 - AOC 368	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9698	-117.9307	
DOD100133200	Edwards Air Force Base - 7 - AOC 371	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9901	-117.7005	
DOD100133300	Edwards Air Force Base - 7 - AOC 378	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133400	Edwards Air Force Base - 7 - AOC 379	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133500	Edwards Air Force Base - 7 - AOC 380	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134800	Edwards Air Force Base - 7 - AOC 381	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134900	Edwards Air Force Base - 7 - AOC 382	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135000	Edwards Air Force Base - 7 - AOC 383	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8319	-117.7681	
DOD100135100	Edwards Air Force Base - 7 - AOC 384	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.7932	-117.7128	
DOD100136400	Edwards Air Force Base - 7 - AOC 385	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8073	-117.7487	
DOD100136500	Edwards Air Force Base - 7 - AOC 386	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8229	-117.7587	
DOD100136600	Edwards Air Force Base - 7 - AOC 387	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100136700	Edwards Air Force Base - 7 - AOC 388	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138000	Edwards Air Force Base - 7 - AOC 389	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138100	Edwards Air Force Base - 7 - AOC 390	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138200	Edwards Air Force Base - 7 - AOC 391	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138300	Edwards Air Force Base - 7 - AOC 392	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139600	Edwards Air Force Base - 7 - AOC 393	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100139700	Edwards Air Force Base - 7 - AOC 394	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139800	Edwards Air Force Base - 7 - AOC 395	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139900	Edwards Air Force Base - 7 - AOC 398	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9429	-117.9449	
DOD100141200	Edwards Air Force Base - 7 - AOC 399	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9287	-117.9437	
DOD100141300	Edwards Air Force Base - 7 - AOC 400	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9287	-117.9408	
DOD100141400	Edwards Air Force Base - 7 - AOC 450	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9369	-117.9444	
DOD100141500	Edwards Air Force Base - 7 - AOC 451	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100142800	Edwards Air Force Base - 7 - AOC 452	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100142900	Edwards Air Force Base - 7 - AOC 453	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100143000	Edwards Air Force Base - 7 - AOC 454	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100143100	Edwards Air Force Base - 7 - AOC 455	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100144400	Edwards Air Force Base - 7 - AOC 456	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100144500	Edwards Air Force Base - 7 - AOC 469	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9653	-117.5668	
DOD100144600	Edwards Air Force Base - 7 - AOC 470	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9903	-117.9182	
DOD100144700	Edwards Air Force Base - 7 - AOC CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146000	Edwards Air Force Base - 7 - AOC CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146100	Edwards Air Force Base - 7 - Site 258	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9242	-117.9435	
DOD100146200	Edwards Air Force Base - 7 - Site 259	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9235	-117.9381	
DOD100146300	Edwards Air Force Base - 7 - Site 262	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9265	-117.7555	
DOD100147600	Edwards Air Force Base - 7 - Site 263	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9278	-117.7558	
DOD100147700	Edwards Air Force Base - 7 - Site 264	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9689	-117.755	
DOD100147800	Edwards Air Force Base - 7 - Site 265	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9862	-117.7096	
DOD100147900	Edwards Air Force Base - 7 - Site 266	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8928	-117.6855	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100122400	Edwards Air Force Base - 7 - Site 267	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9227	-117.765	
DOD100122500	Edwards Air Force Base - 7 - Site 269	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9423	-117.7834	
DOD100122600	Edwards Air Force Base - 7 - Site 270	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8216	-117.8006	
DOD100122700	Edwards Air Force Base - 7 - Site 271	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9002	-117.7066	
DOD100143200	Edwards Air Force Base - 7 - Site 272	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9548	-117.7801	
DOD100143300	Edwards Air Force Base - 7 - Site 28	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9148	-117.9658	
DOD100143400	Edwards Air Force Base - 7 - Site 280	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8714	-118.1399	
DOD100143500	Edwards Air Force Base - 7 - Site 292	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8626	-117.9247	
DOD100144800	Edwards Air Force Base - 7 - Site 293A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8337	-117.9237	
DOD100144900	Edwards Air Force Base - 7 - Site 293B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8284	-117.9262	
DOD100145000	Edwards Air Force Base - 7 - Site 294	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8453	-117.9105	
DOD100145100	Edwards Air Force Base - 7 - Site 295	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.7932	-118.1175	
DOD100146400	Edwards Air Force Base - 7 - Site 296	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8828	-117.9473	
DOD100146600	Edwards Air Force Base - 7 - Site 302	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9435	-117.9308	
DOD100146700	Edwards Air Force Base - 7 - Site 339	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.7842	-118.1169	
DOD100122800	Edwards Air Force Base - 7 - Site 34	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8225	-118.1408	
DOD100122900	Edwards Air Force Base - 7 - Site 340	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.7961	-118.0351	
DOD100123000	Edwards Air Force Base - 7 - Site 353	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9127	-117.95	
DOD100123100	Edwards Air Force Base - 7 - Site 4	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9532	-117.9583	
DOD100124000	Edwards Air Force Base - 7 - Site 419	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9253	-117.9164	
T10000001939	Edwards Air Force Base - 7 - Site 426	Military Cleanup Site	Completed - Case Closed	EDWARDS AFB	93524-1130	34.9228	-117.9008	Other Groundwater (uses other than drinking water), Soil
T10000001942	Edwards Air Force Base - 7 - Site 442 - Area 1	Military Cleanup Site	Open - Remediation	EDWARDS AFB	93524-1130	34.8918	-117.7438	Soil, Under Investigation
T10000001943	Edwards Air Force Base - 7 - Site 442 - Area 2	Military Cleanup Site	Open - Remediation	EDWARDS AFB	93524-1130	34.8935	-117.7489	Soil, Under Investigation

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T10000001944	Edwards Air Force Base - 7 - Site 442 - Area 3	Military Cleanup Site	Open - Remediation	EDWARDS AFB	93524-1130	34.8435	-117.5987	Soil, Under Investigation
DOD100132300	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125900	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127400	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125700	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124100	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133600	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132100	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130400	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128900	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129100	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128800	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125800	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132200	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124300	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125600	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132000	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130700	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127500	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130600	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127200	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127300	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129000	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100130500	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124200	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133700	Edwards Air Force Base - 7 - Site CWM-A-AREA 1	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100133800	Edwards Air Force Base - 7 - Site CWM-B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133900	Edwards Air Force Base - 7 - Site CWM-B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135200	Edwards Air Force Base - 7 - Site CWM-B-AREA 2	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135300	Edwards Air Force Base - 7 - Site CWM-C-AREA 3	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100135400	Edwards Air Force Base - 7 - Site CWM-D-AREA 4	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135500	Edwards Air Force Base - 8 - AOC 303	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9413	-117.9033	
DOD100136800	Edwards Air Force Base - 8 - AOC 304	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9463	-117.8919	
DOD100136900	Edwards Air Force Base - 8 - AOC 306	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9456	-117.9133	
DOD100137000	Edwards Air Force Base - 8 - Site 2	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9342	-117.9106	
DOD100137100	Edwards Air Force Base - 8 - Site 224	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9305	-117.8995	
DOD100138400	Edwards Air Force Base - 8 - Site 225	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9286	-117.8989	
DOD100138500	Edwards Air Force Base - 8 - Site 226	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9304	-117.8962	
DOD100138600	Edwards Air Force Base - 8 - Site 227	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9275	-117.8939	
DOD100138700	Edwards Air Force Base - 8 - Site 25	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Edwards AFB	93524-1130	34.9588	-117.9053	
DOD100140000	Edwards Air Force Base - 8 - Site 257	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9636	-117.9145	
DOD100140200	Edwards Air Force Base - 8 - Site 298	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.927	-117.8997	
DOD100140300	Edwards Air Force Base - 8 - Site 299	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9267	-117.9058	
DOD100141600	Edwards Air Force Base - 8 - Site 300 A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9361	-117.8993	
DOD100141700	Edwards Air Force Base - 8 - Site 300 B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9351	-117.8994	
DOD100141800	Edwards Air Force Base - 8 - Site 301	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9325	-117.9002	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100141900	Edwards Air Force Base - 8 - Site 31	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.942	-117.9122	
DOD100124400	Edwards Air Force Base - 8 - Site 347	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9326	-117.8993	
DOD100124500	Edwards Air Force Base - 8 - Site 352	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9399	-117.8972	
DOD100124600	Edwards Air Force Base - 8 - Site 61	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9421	-117.8965	
DOD100126000	Edwards Air Force Base - 8 - Site 9	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9446	-117.9038	
DOD100126100	Edwards Air Force Base - 9 - AOC 114	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9526	-117.646	
DOD100126200	Edwards Air Force Base - 9 - AOC 117	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9315	-117.6382	
DOD100127600	Edwards Air Force Base - 9 - AOC 122	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9102	-117.6569	
DOD100127700	Edwards Air Force Base - 9 - AOC 123	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9085	-117.6553	
DOD100127800	Edwards Air Force Base - 9 - AOC 124	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.893	-117.6486	
DOD100127900	Edwards Air Force Base - 9 - AOC 126	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8895	-117.6505	
DOD100130900	Edwards Air Force Base - 9 - AOC 142	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9475	-117.6646	
DOD100131000	Edwards Air Force Base - 9 - AOC 176	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9018	-117.6648	
DOD100131100	Edwards Air Force Base - 9 - AOC 179	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9326	-117.6512	
DOD100132600	Edwards Air Force Base - 9 - AOC 183	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9472	-117.6661	
DOD100132700	Edwards Air Force Base - 9 - AOC 322	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8995	-117.6608	
DOD100134000	Edwards Air Force Base - 9 - AOC 323	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8996	-117.6605	
DOD100134100	Edwards Air Force Base - 9 - AOC 324	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9088	-117.6549	
DOD100134200	Edwards Air Force Base - 9 - AOC 328A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9414	-117.6586	
DOD100134300	Edwards Air Force Base - 9 - AOC 328B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9339	-117.6508	
DOD100135600	Edwards Air Force Base - 9 - AOC 330	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9285	-117.6431	
DOD100135700	Edwards Air Force Base - 9 - AOC 331	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9248	-117.6454	
DOD100137200	Edwards Air Force Base - 9 - AOC 337	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9526	-117.6445	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100137300	Edwards Air Force Base - 9 - AOC 375	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9395	-117.6623	
DOD100137500	Edwards Air Force Base - 9 - Site 115	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9544	-117.6471	
DOD100138800	Edwards Air Force Base - 9 - Site 116	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9339	-117.6432	
DOD100138900	Edwards Air Force Base - 9 - Site 125	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8932	-117.6478	
DOD100139100	Edwards Air Force Base - 9 - Site 178A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9336	-117.6528	
DOD100140400	Edwards Air Force Base - 9 - Site 178B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9401	-117.6449	
DOD100140700	Edwards Air Force Base - 9 - Site 305	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9543	-117.6459	
DOD100142000	Edwards Air Force Base - 9 - Site 321	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9006	-117.6619	
T10000001993	Edwards Air Force Base - 9 - Site 321 Liquid Propellant Storage Complex Catch Tanks	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9008	-117.6622	Aquifer used for drinking water supply, Soil
DOD100142100	Edwards Air Force Base - 9 - Site 325	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9478	-117.6651	
DOD100142200	Edwards Air Force Base - 9 - Site 338	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9524	-117.643	
DOD100142300	Edwards Air Force Base - 9 - Site 360	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9037	-117.666	
DOD100143600	Edwards Air Force Base - 9 - Site 362	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9554	-117.6449	
DOD100143700	Edwards Air Force Base - 9 - Site 376	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9544	-117.6462	
DOD100143800	Edwards Air Force Base - 9 - Site 38	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8994	-117.6606	
DOD100143900	Edwards Air Force Base - 9 - Site 39	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.956	-117.6442	
DOD100146900	Edwards Air Force Base - B8595	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
T0602985237	Edwards Air Force Base - Edwards Air Force Base	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146500	Edwards Air Force Base - Operable Unit 7 - Site 3	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9443	-117.9453	Other Groundwater (uses other than drinking water), Soil Vapor
DOD100105400	Edwards Air Force Base - OU 4 - Site 13 AFRL Closed Landfill	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9225	-117.6853	
DOD100113200	Edwards Air Force Base - OU 4 - Site 312 Test Area 1-14 Polychlorinated Biphenyl (PCB) Sill Area	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9348	-117.6996	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100119300	Edwards Air Force Base - OU 4&9 - AOC 170 Building 8595 Indoor Vapor Degreaser Pit and Indoor Sump	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.931	-117.7	
DOD100119400	Edwards Air Force Base - OU 4&9 - AOC 171 Building 8595 Indoor Vapor Degreaser Pit and Indoor Sump	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9299	-117.6993	
T10000001961	Edwards Air Force Base - OU 4&9 - Site 115 Test Area 1-100 Missile Silos 1 and 2	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9529	-117.6463	
DOD100108500	Edwards Air Force Base - OU 4&9 - Site 150A Building 8451 Former Waste Evaporation Ponds	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9324	-117.6872	
DOD100108600	Edwards Air Force Base - OU 4&9 - Site 150B Building 8451 Former Waste Evaporation Ponds	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9311	-117.6869	
DOD100108700	Edwards Air Force Base - OU 4&9 - Site 153A Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9314	-117.6858	
DOD100110000	Edwards Air Force Base - OU 4&9 - Site 153B Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9298	-117.6867	
DOD100110100	Edwards Air Force Base - OU 4&9 - Site 153C Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.93	-117.6855	
DOD100117800	Edwards Air Force Base - OU 4&9 - Site 166 Building 8240 Former Waste Discharge Area and Removed Waste Oil UST	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9276	-117.6935	
T10000001958	Edwards Air Force Base - OU 4&9 - Site 167 Test Area 1-46 Beryllium Firing Range	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.8867	-117.6367	
DOD100110300	Edwards Air Force Base - OU 4&9 - Site 172 Building 8595 Outdoor Sump	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9306	-117.7003	
DOD100111900	Edwards Air Force Base - OU 4&9 - Site 26 Former Fire Training Area	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9291	-117.6829	
T10000001960	Edwards Air Force Base - OU 4&9 - Site 318 Test Area 1-120 Catch Basin and Evaporation Pond	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9408	-117.6846	
DOD100121300	Edwards Air Force Base - OU 4&9 - Site 329A Test Area 1-46 Former Wash Rack and Oxidation Pond	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8828	-117.6388	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100121400	Edwards Air Force Base - OU 4&9 - Site 329B Test Area 1-46 Former Wash Rack and Oxidation Pond	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8829	-117.6372	
DOD100121500	Edwards Air Force Base - OU 4&9 - Site 329C Test Area 1-46 Former Wash Rack and Oxidation Pond	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8833	-117.6378	
DOD100119600	Edwards Air Force Base - OU 4&9 - Site 396 Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9284	-117.6837	
DOD100097600	Edwards Air Force Base - OU 4&9 - Site 7 Test Area 1-46 Beryllium-Contaminated Earth Piles	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8883	-117.6387	
T10000001957	Edwards Air Force Base - OU 4&9 Site 36 Test Area 1-21 Former Wastewater Evaporation Tank	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9323	-117.7027	
DOD100147000	Edwards Air Force Base - PRL1	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100147100	Edwards Air Force Base - PRL10	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123200	Edwards Air Force Base - PRL11	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123300	Edwards Air Force Base - PRL12	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123400	Edwards Air Force Base - PRL13	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123500	Edwards Air Force Base - PRL14	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100124800	Edwards Air Force Base - PRL15	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124900	Edwards Air Force Base - PRL16	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125000	Edwards Air Force Base - PRL17	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125100	Edwards Air Force Base - PRL18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126400	Edwards Air Force Base - PRL19	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126500	Edwards Air Force Base - PRL20	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126600	Edwards Air Force Base - PRL21	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126700	Edwards Air Force Base - PRL22	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128000	Edwards Air Force Base - PRL23	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100128100	Edwards Air Force Base - PRL24	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128200	Edwards Air Force Base - PRL25	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128300	Edwards Air Force Base - PRL26	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100140800	Edwards Air Force Base - PRL27	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100140900	Edwards Air Force Base - PRL28	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100141000	Edwards Air Force Base - PRL29	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100141100	Edwards Air Force Base - PRL30	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132800	Edwards Air Force Base - PRL31	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132900	Edwards Air Force Base - PRL32	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133000	Edwards Air Force Base - PRL4	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133100	Edwards Air Force Base - PRL5	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137600	Edwards Air Force Base - PRL6	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137700	Edwards Air Force Base - PRL7	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137800	Edwards Air Force Base - PRL8	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137900	Edwards Air Force Base - PRL9	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129600	Edwards Air Force Base - S133	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129700	Edwards Air Force Base - S172	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129800	Edwards Air Force Base - S426	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129900	Edwards Air Force Base - SIT14	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100134400	Edwards Air Force Base - SIT16	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134500	Edwards Air Force Base - SIT18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100134600	Edwards Air Force Base - SIT29	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134700	Edwards Air Force Base - SIT45	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100139200	Edwards Air Force Base - SRAM	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139300	Edwards Air Force Base - STE18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139400	Edwards Air Force Base - STE25	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100140100	Edwards Air Force Base - 8 - Site 297	Military UST Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9201	-117.9173	
DOD100124700	Edwards Air Force Base - 8 - Site 63	Military UST Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9429	-117.9069	Soil
T0602900810	Edwards Air Force Base - BLDG 0723	Military UST Site	Completed - Case Closed	EDWARDS AFB	93524	34.9208	-117.9031	Soil
T0602900967	Edwards Air Force Base - BLDG 0736	Military UST Site	Completed - Case Closed	EDWARDS AFB	93524	34.9208	-117.9031	Soil
T0602900859	Edwards Air Force Base - BLDG 112	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900857	Edwards Air Force Base - BLDG 148	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900911	Edwards Air Force Base - BLDG 1616/18	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Under Investigation
T0602900890	Edwards Air Force Base - BLDG 173	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900994	Edwards Air Force Base - BLDG 1735 HUSH HOUSE	Military UST Site	Completed - Case Closed	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900960	Edwards Air Force Base - BLDG 1824	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900870	Edwards Air Force Base - BLDG 1824	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900977	Edwards Air Force Base - BLDG 1873	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Aquifer used for drinking water supply
T0602900973	Edwards Air Force Base - BLDG 2110 GASOLINE & DIESEL	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900892	Edwards Air Force Base - BLDG 2580	Military UST Site	Completed - Case Closed	EDWARDS AFB	93523	34.905	-117.8836	Under Investigation
T0602900894	Edwards Air Force Base - BLDG 3800	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900887	Edwards Air Force Base - BLDG 3807	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Aquifer used for drinking water supply
T0602900904	Edwards Air Force Base - BLDG 4402	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Under Investigation
T0602900808	Edwards Air Force Base - BLDG 8409	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900921	Edwards Air Force Base - BLDG 940	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602999269	Edwards Air Force Base - HYDRANT FUEL DISTR BLDG 1724	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.905	-117.8836	Soil

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T0602900819	Edwards Air Force Base - NASA/ADFRF GAS STATION	Military UST Site	Open - Remediation	EDWARDS AFB	93523	34.9204	-117.9156	Aquifer used for drinking water supply
T0602900896	Edwards Air Force Base - PRATT & WHITNEY BLDG 1899	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Aquifer used for drinking water supply
T0602900880	Edwards Air Force Base - PRATT & WHITNEY BUILDING	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Under Investigation
T0602900813	Edwards Air Force Base - SITE 17 BLDG 1404	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Aquifer used for drinking water supply
T0602900991	Edwards Air Force Base - Site 51 BLDG 1724 HYDRANT 1	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9243	-117.8823	Other Groundwater (uses other than drinking water)
L10007240290	AIR FORCE PLANT 42 FFTF	Land Disposal Site	Open	PALMDALE	93550	34.6228	-118.102	
L10009605384	ANTELOPE VALLEY RECYCLING # 1	Land Disposal Site	Open	PALMDALE	93550	34.5697	-118.1497	
L10004594296	ANTELOPE VALLEY RECYCLING #2	Land Disposal Site	Open	PALMDALE	93550	34.5699	-118.1498	
L10009721950	BIO-GRO SYSTEMS-LANCASTER	Land Disposal Site	Completed - Case Closed	LANCASTER	93534	34.8155	-118.3879	
L10004638786	BORON CLASS III LANDFILL	Land Disposal Site	Open	BORON	93516	34.9905	-117.6483	
L10001386878	BORON MINE FACILITY	Land Disposal Site	Open	BORON	93516-2000	35.0397	-117.7024	
L10005924923	DEBORD SEPTAGE PONDS	Land Disposal Site	Completed - Case Closed	BORON	93516	35.019	-117.6074	
L10003261293	DRUM STORAGE AREA (Lebec Cement Plant)	Cleanup Program Site	Completed - Case Closed	LEBEC	93243	34.8233	-118.7491	
L10003257539	EDWARDS AIR FORCE BASE- 4 - SITE 13 - RESEARCH LAB CLASS III LF	Land Disposal Site	Completed - Case Closed	EDWARDS AFB	93523	34.923	-117.6844	
L10005585471	GANGUE/OVERBURDEN/REF WASTE	Land Disposal Site	Open	BORON	93516-2000	35.0448	-117.698	
L10009466231	LANCASTER LF & GW TRTMT DSCHRG	Land Disposal Site	Open	LANCASTER	91325	34.7443	-118.1176	
L10006923234	LEBEC CEMENT PLANT	Land Disposal Site	Open - Closed/with Monitoring	LEBEC	93243	34.8196	-118.7589	
L10003043139	MAIN BASE CLASS III LANDFILL	Land Disposal Site	Open	EDWARDS AFB	93523	34.9541	-117.9571	
SL206063824	MAINTENANCE SHOP (LEBEC CEMENT PLANT)	Cleanup Program Site	Open - Remediation	LEBEC	93243	34.8213	-118.7495	
L10002272084	MIDDLE BUTTES PROJECT	Land Disposal Site	Open	MOJAVE	93501	34.9615	-118.2897	
T10000003229	Mission Linen Supply	Cleanup Program Site	Open - Site Assessment	Lancaster	93535	34.6994	-118.1348	Tetrachloroethylene (PCE), Trichloroethylene (TCE)
L10001220608	MOJAVE PLANT NO 55	Land Disposal Site	Open - Inactive	MOJAVE	93501	35.0041	-118.1568	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
L10009509578	MOJAVE PLANT-CALIF PORTLAND	Land Disposal Site	Open	MOJAVE	93501	35.0393	-118.3016	
SL206083826	OLD INDUSTRIAL LANDFILL (LEBEC CEMENT PLANT)	Cleanup Program Site	Open - Remediation	LEBEC	93243	34.8233	-118.7491	Other Chlorinated Hydrocarbons, Tetrachloroethylene (PCE), Trichloroethylene (TCE)
T10000004967	Palmdale Water Reclamation Plant	Cleanup Program Site	Open - Assessment & Interim Remedial Action	Palmdale	93550	34.5957	-118.0748	Nitrate
L10002603256	PHILLIPS LAB INDUSTRIAL PONDS	Land Disposal Site	Open	EDWARDS AFB	93524-6225	34.886	-117.6374	
SL0603710027	QUALITY CLEANERS	Cleanup Program Site	Completed - Case Closed	PALMDALE	93550	34.5584	-118.0837	* Chlorinated Solvents - PCE, * Chlorinated Solvents - TCE, * Volatile Organic Compounds (VOC)
L10003439498	SHUMAKE PROJECT	Land Disposal Site	Open	MOJAVE	93501	34.9509	-118.2907	
T10000002837	Sierra Suntower LLC Sierra Suntower Generating Station	Land Disposal Site	Open - Inactive	Lancaster	93534	34.733	-118.1357	Nitrate, Other inorganic / salt, Arsenic, Chromium, Other Metal
SL206123828	SILVER HANGER DRY CLEANERS	Cleanup Program Site	Completed - Case Closed	Palmdale		34.6886	-118.1597	
L10001287451	SMITH & THOMPSON WTF	Land Disposal Site	Open	LANCASTER		34.6894	-118.1314	
L10001283834	SOLEDAD MOUNTAIN PROJECT	Land Disposal Site	Open	MOJAVE	93502-0820	34.9931	-118.1937	
L10005171449	STANDARD HILL PROJECT	Land Disposal Site	Completed - Case Closed	MOJAVE	93502	35.0121	-118.1691	
SL206073825	US BORAX & CHEMICAL PONDS A THROUGH E	Cleanup Program Site	Open - Remediation	BORON	93516	35.0447	-117.7176	

THIS PAGE LEFT INTENTIONALLY BLANK

Appendix E

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: ____

Project Sponsor: ____

Project Contact Person: ______________________________________

Project Contact Phone: _______________________________________

Project Contact Email: _______________________________________

Project Location (include name of sub-basin): ____________________

____

Project Description: ____

____

____

____

____

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Amargosa Creek Recharge Project

Project Sponsor: City of Palmdale

Project Contact Person: Gordon Phair

Project Contact Phone: (661) 267-5310

Project Contact Email: gphair@cityofpalmdale.org

Project Location (include name of sub-basin): 20 acres along Amargosa Creek near Elizabeth Lake Road and 25th St W. Located outside, but upstream of the Lancaster sub-basin.

Project Description: Recharge component that is a part of a larger project, "Upper Amargosa Creek Flood Control, Recharge and Habitat Restoration Project." The project includes eight basins to recharge groundwater using raw State Water Project water and stormwater runoff from the Amargosa Creek Watershed. Recharge volumes dependent on available supply and annual precipitation. Anticipated averages provided below.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater	-	400	400	400	400	400
Imported Water, raw	-	24,300	24,300	24,300	24,300	24,300
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2015

Project Status (check status):

____ Concept

_X_ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Antelope Valley Water Bank

Project Sponsor: Antelope Valley Water Storage

Project Contact Person: Mark Beuhler

Project Contact Phone: (323) 860-4829

Project Contact Email: MBeuhler@avwaterbank.com

Project Location (include name of sub-basin): Property is located west of Rosamond (Neenach sub-basin)

Project Description: The project is owned by the Valley Mutual Water Company, which operates the bank within the structure of the Semitropic-Rosamond Water Bank Authority. At full build-out, the water banking project will provide up to 500,000 acre-feet of storage and the ability to recharge and recover up to 100,000 AFY of water for later use when needed. The project recharges water from the State Water Project into storage using recharge basins and will use new and existing wells to recover water for delivery and regional conveyances. The project is being constructed in phases and currently has 320 acres of operational percolation pond capacity.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw	1,300	22,000	22,000	22,000	22,000	22,000
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2010

Project Status (check status):

____ Concept

____ Planning

____ Design

_X_ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Eastside Banking and Blending Project

Project Sponsor: Antelope Valley East Kern Water Agency (AVEK)

Project Contact Person: Dwayne Chisam

Project Contact Phone: (661) 943-3201

Project Contact Email: dchisam@avek.org

Project Location (include name of sub-basin): Lancaster sub-basin

Project Description: Operational water recharge and recovery site providing a supplemental potable source of water for the AVEK Eastside Water Treatment Plant. The project will involve State Water Project water spread over local recharge basins, storing water for future recovery during dry or drought years. This alternative potable water supply will be used for periodic substitution or supplementation to the Eastside plant.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw	-	5,000	10,000	10,000	10,000	10,000
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2015

Project Status (check status):

____ Concept

____ Planning

____ Design

_X__ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Air Force Research Laboratory Treatment Plant

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base

Project Description: Secondary wastewater treatment plant. All the effluent is discharged to the onsite evaporation ponds.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	46	46	46	46	46	46
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year:____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Main Base Wastewater Treatment Plant

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base

Project Description: The plant discharges treated domestic wastewater. The facility can collect, treat and dispose of a design 24-hour daily average flow of 2.5 million gallons per day (mgd) and a design peak daily flow of 4.0 mgd from the EAFB areas. The facility is designed to produce tertiary treated effluent and has the capacity to hold up to 3,000 gallons per day of seepage.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	511	511	511	511	511	511
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Evaporation Ponds

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base (Lancaster sub-basin)

Project Description: The evaporation ponds receive effluent from the EAFB Air Force Research Laboratory Treatment Plant and EAFB Main Base Wastewater Treatment Plant.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	174	174	174	174	174	174
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Golf Course Irrigation

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base. Located above becrock.

Project Description: The golf course is the largest user of recycled water at the EAFB. It receives tertiary effluent from the EAFB Main Base Wastewater Treatment Plant as irrigation water during warmer months of the year. The golf course is located over bedrock and will have limited influence groundwater quality. The inclusion of the site is conservative.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	383	383	383	383	383	383
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Lancaster Water Reclamation Plant Upgrade and Expansion

Project Sponsor: Los Angeles County Sanitation District No. 14

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Lancaster (Lancaster sub-basin)

Project Description: The upgrade and expansion project was completed in 2012. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	17,000	18,500	20,000	21,500	23,000
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Lancaster Water Reclamation Plant Eastern Agricultural Site

Project Sponsor: Los Angeles County Sanitation District No. 14

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Lancaster (Lancaster sub-basin)

Project Description: Existing agricultural site using recycled water produced by the Lancaster Water Reclamation Plant. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation from the root zone to the groundwater table of the applied recycled water.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	1,000	10,500	11,500	11,200	11,700	10,900
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Lancaster Water Reclamation Plant environmental maintenance reuse

Project Sponsor: Los Angeles County Sanitation District No. 14

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): Lancaster sub-basin

Project Description: Disinfected tertiary recycled water produced by the Lancaster WRP is used for environmental maintenance at Apollo Community Regional Park (Apollo Park) and Piute Ponds. Since 1972, Apollo Park has been using recycled water to fill a series of lakes that are used for recreational fishing and boating. Piute Ponds are located on Edwards Air Force Base Property and uses recycled water to maintain marsh-type habitat. Flows below do not include water from Apollo Park lakes that is used for landscape irrigation within the park.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	(plant upgrades were completed in 2012)	5,700	5,700	5,700	5,700	5,700
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Last revised: 09/17/2013

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Multi-use/Wildlife Habitat Restoration Project

Project Sponsor: Wagas Land Company, LLC.

Project Contact Person: Ed Renwick

Project Contact Phone: (213) 628-7131

Project Contact Email: erenwick@hanmor.com

Project Location (include name of sub-basin): Northern LA County bounded by Avenue A, 35th St W, Avenue A-8 and the Interstate 14 Freeway (Lancaster sub-basin).

Project Description: AV Duck Hunting Club in both Kern/LA County, started in 1925. The AV region is a flyaway zone for many migratory birds flying south and the Wagas Land Company has been preserving habitat. The Club is proposing to replace their potable water use with recycled water. The Club would allow Waterworks to use a portion of the property for banking.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	-	2000	2000	2000	2000
Groundwater	1000	1000	-	-	-	-
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2016

Project Status (check status):

_X_ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: North Los Angeles/Kern County Regional Recycled Water Project

Project Sponsor: LA County Waterworks District No. 40, City of Lancaster, City of Palmdale

Project Contact Person: ____________________

Project Contact Phone: ____________________

Project Contact Email: ____________________

Project Location (include name of sub-basin): Lancaster and Pearland Sub-basins

____

Project Description: The recycled water project is the backbone for a regional recycled water distribution system in the Antelope Valley. The proposed system is sized to distribute recycled water throughout the service area and also deliver recycled water for recharge areas. Construction is phased over time and portions are already complete. The first phase (1A) was implemented in 2009. The flow projection below is based on project components being complete and excludes flows to the Palmdale Hybrid Power Plant (3,100 AFY) and groundwater recharge.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	3	700	1,800	3,600	4,700	7,100
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2009

Project Status (check status):

____ Concept

____ Planning

_X_ Design

_X_ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Hybrid Power Plant Project

Project Sponsor: City of Palmdale

Project Contact Person: Gordon Phair

Project Contact Phone: (661) 267-5310

Project Contact Email: gphair@cityofpalmdale.org

Project Location (include name of sub-basin): City of Palmdale, Lancaster Sub-basin

Project Description: Construction of 570 Mega-Watt electricity generating facility. The power plant will be a hybrid design, utilizing natural gas combined cycle technology and solar thermal technology. The plant is projected to use approximately 3,400 AFY of recycled water and will employ "zero liquid discharge" design.

Water Volume Projections (fill in applicable rows)

	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Recycled Water (acre-feet/year)	-	-	3,400	3,400	3,400	3,400
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2016

Project Status (check status):

____ Concept

____ Planning

____ Design

_X__ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Recycled Water Authority Recycled Water Project

Project Sponsor: Palmdale Recycled Water Authority

Project Contact Person: ____

Project Contact Phone: ____

Project Contact Email: ____

Project Location (include name of sub-basin): Lancaster, Buttes, and Pearland Sub-basins

Project Description: The recycled water project is the recycled water distribution system for the Palmdale Recycled Water Authority (PRWA). Construction is phased over time and the first portion to serve McAdam Park was completed and implemented in 2012.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	0	80	1000	1000	2300	3500
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2012

Project Status (check status):

____ Concept

____ Planning

X Design

X Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Water Reclamation Plant Upgrade and Expansion

Project Sponsor: Los Angeles County Sanitation District No. 20

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Palmdale (Lancaster sub-basin)

Project Description: The upgrade and expansion project was completed in 2011. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	11,000	12,000	12,000	13,000	13,000
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Water Reclamation Plant Agricultural Site

Project Sponsor: Los Angeles County Sanitation District No. 20

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Palmdale (Lancaster sub-basin)

Project Description: Existing agricultural site using recycled water produced by the Palmdale Water Reclamation Plant. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation of the applied recycled water from the root zone to the groundwater table. Additional land acquired for future agricultural operations with infrastructure in place, but not currently used.

Water Volume Projections (fill in applicable rows)

	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Recycled Water (acre-feet/year)	7,600	10,200	6,400	7,400	4,100	800
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Rosamond Community Services District Wastewater Treatment Plant

Project Sponsor: Rosamond Community Services District (RCSD)

Project Contact Person: Mike Gilardone

Project Contact Phone: (661) 816-5184

Project Contact Email: mgilardone@rosamondcsd.com

Project Location (include name of sub-basin): Rosamond (Lancaster sub-basin)

Project Description: The plant, owned and operated by RCSD, produces both secondary and tertiary treated recycled water. The capacity of the secondary treatment is 1.3 mgd, while the tertiary capacity is 0.5 mgd. The design to upgrade the tertiary treatment capacity to 1.0 mgd is complete. However, the construction is on hold indefinitely due to lack of funding.

Water Volume Projections (fill in applicable rows)

	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Recycled Water (acre-feet/year)	560	560	560	560	560	560
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: RCSD Wastewater Treatment Plant Evaporation Ponds

Project Sponsor: Rosamond Community Services District (RCSD)

Project Contact Person: Mike Gilardone

Project Contact Phone: (661) 816-5184

Project Contact Email: mgilardone@rosamondcsd.com

Project Location (include name of sub-basin): Rosamond (Lancaster sub-basin)

Project Description: The evaporation ponds receives effluent from the RSCD Wastewater Treatment Plant.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	560	560	560	560	560	560
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Water Supply Stabilization Project (WSSP-2)

Project Sponsor: Antelope Valley East Kern Water Agency (AVEK)

Project Contact Person: Dwayne Chisam

Project Contact Phone: (661) 943-3201

Project Contact Email: dchisam@avek.org

Project Location (include name of sub-basin): Lancaster sub-basin

Project Description: Imported water stabilization program that utilizes SWP water delivered to the Antelope Valley Region's west side for groundwater recharge during wet years for supplemental supply required during summer peaking demand and anticipated dry years. This project includes facilities necessary for the delivery of untreated water for direct recharge (percolation basins) and includes wells and pipeline for raw water and treated water conveyance.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water	10,000	25,000	25,000	25,000	25,000	25,000

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

THIS PAGE LEFT INTENTIONALLY BLANK

Appendix F

SALT AND NUTRIENT MANAGEMENT PLAN (SNMP)

FOR THE ANTELOPE VALLEY

Draft, June 2013

R. Large Comments

21 Aug 13

Before providing specific comments, I would like to complement the preparation team on the huge amount of specific and relevant information provided by this document. Since my comments tend to address multiple document sentences, I think it will be more efficient for me to use the paragraph/page approach rather than the track change approach.

As I have indicated in our discussions, I am very much in favor of the SNMP being an integral part of the overall AV Integrated Regional Water Management Plan (IRWMP). As such, redundant information that has been developed in the two plans as they were separately drafted needs to be removed. I am referring to information such as the basin and climate descriptions, historical and projected water flows, and project descriptions. I know this is challenging, and that there are times when the SNMP is being presented as a stand-alone document, but the reduction in errors as basic IRWMP-specific information is updated, a potentially sizeable reduction in duplicated efforts, and especially a concern for the ultimate user/reader of the integrated document, make it very worthwhile. My recommendation is care in creating modules (linkable by references), and establishing an active coordination effort between the two teams. My remaining comments pertain to the SNMP document, as drafted.

Pg. 1, Section 1.1: Since the Stakeholders are defined in some detail in Section 1.3 (Pg. 2), the sentence in the second paragraph beginning "Stakeholders include ..." should read, "Stakeholder participation is described in Section 1.3".

Pg. 3, Section 1.3 (cont.): "Lakes Town Council", vice "Lake Town Council" [the Lakes Town council represents the communities of Lake Hughes and Elizabeth Lake].

Pg. 3, Section 1.5: To say that the SNMP stakeholder group "established" the definitions implies that we sat down any made up our own definitions. Don't we really mean to say that we accepted and are using common definitions (as used in this technical field) for the following terms? There is still room in the list to note where we had to uniquely define a term (e.g., possibly the Future Planning Period, which would be an opportunity to note that it was selected to be concurrent with the overall IRWMP planning period—hopefully, that's true.)

Pg. 6, Section 2: This is a section that needs to be common and consistent between the IRWMP and SNMP drafts. I have a problem with both the Sub-Basin Boundary Map (SNMP Pg.8) and the IRWMP Groundwater Basin Subunit map (IRWMP Draft of July '07, Pg. 2-19) [Note: inconsistent terminology]: The sub-basin containing Edwards AFB Main Base and the sub-basin that includes Boron (a significant portion of the whole basin, in terms of surface area) are not named or described. While I recognize that this is probably consistent with the USGS 1987 definitions, it makes the map essentially incomplete. In Section 2.4 (Pg. 21) we discuss regulatory groundwater cleanup sites, several of which are in these unnamed sub-basins. It is inconsistent to have a concern about a listed site (i.e., that it might be polluting groundwater), yet not have a sub-basin name/description of the area presumably being polluted.

Pg. 11, Section 2.1: "Peerless" vice "Pearless"—it's confusing enough to have both "Peerless" and "Pearland" in the same map.

Pg. 14, Section 2.1.2: The Water Supply description, which needs to be a common element of the IRWMP and the SNMP, is incomplete in that it leaves out the interests of individual/small pumpers and landowners who would likely become small pumpers (in order to develop their land) in the future in areas where it is uneconomical to extend water lines from the M&I purveyors.

Pg. 21, Section 2.3: The first sentence in the last paragraph appears to have a typo: should be "objectives" vice "objects".

Pg. 24, Section 3.1.5: In the reference to the chromium-6 study by EPA, the statement implies that the study was not complete as of this report. Is it true that, after five years, there is still no assessment, or is this a case of not checking with EPA for an update?

Pg. 25, Section 3.1.7: The second paragraph, discounting the impact of boron, seems out of place here, since it is addressed on Pg. 27. If the EPA reference is needed, it should be added to the discussion on page 27.

Pg. 26, Section 3.2.1: The second paragraph appears to again erroneously refer to "Pearless".

Pp. 29, 30, 31, 32, 33, 34, and 35: The legends and map symbols for the constituent levels are almost unreadable, particularly with the changing background from map to map. I am not sure what the answer to this dilemma is, but one possibility would be to use slightly larger and distinctly different symbols: e.g.: "o, *, $, +".

Pg. 36, Section 3.2.2.: Several of the North Muroc constituents are so out of line with the other basins, that it seems appropriate to have some discussion in this section regarding them.

Pp. 50-52, Section 3.5.1: There appear to be a number of inconsistencies between the descriptions on these pages, the presumed corresponding numbers on the map (Figure 3-17), and the map legend on page 55. For example, the EAFB Main Base WTP is discussed as item 7, but item 7 in the legend is the e-Solar tower, which appears to be correctly shown in Lancaster on the map. The EAFB/AFRL WTP is discussed and listed in the legend as item 4, but there does not appear to be an item 4 on the map, but that could be the duplicate point labeled "5" in the eastern (unlabeled) sub-basin. The Lancaster WRP Eastern Agricultural site is discussed as item 10, but the legend and map appear to show this as item 9. Item 15, discussed as the Palmdale WRP Ag site, appears in the legend and on the map as Piute Ponds. Similar problems exist with items 17, 18, 19 and 20.

Pg. 52-53, Section 3.5.2: I am uncomfortable reviewing this item and the associated table on page 56, because it introduces yet other plan(s)—the LACWD Integrated Regional Urban Water Management Plan for the AV and the PWD Urban Water Management Plan—which I have not seen and which could have assumptions inconsistent with the IRWMP. Water volume projections are an intense item of debate and it would be far better, in my opinion, if the IRWMP addressed this issue directly and the SNMP referenced the IRWMP discussion as its primary source.

Pg. 58, Section 4.3: I found this one of the most difficult sections to review in the plan. For example, in the first paragraph, it seems like the antidegradation policy should have a time component to it, not just a single figure for assimilative capacity. [By the way, in the last sentence of the first paragraph, it appears that it should be "utilize" vice "utilizes"].

Pg. 59, Section 4.4: The discussion of Fluoride is confusing. How did we get from negative assimilative capacity for the Lancaster sub-basin to plus 20%? It appears that what is being done is using a multiple project argument to allow averaging over multiple sub-basins. But the figure and chart on page 65 seems to indicate that imported water for agriculture is being phased out, and there is no flow connection on the diagram from recycled water projects to agriculture. As long as some of the agriculture water was from imported water, you could make the argument that some dilution of fluoride was occurring because the imported water had less fluoride concentration than the baseline water, but Table 4-5 shows a phasing out of the use of imported water for agriculture. In the absence of other water sources, agricultural water would be pumped from the aquifer, further degraded with chemicals, and a portion would go back into the water table. How is this not an antidegradation concern? What is the rationale for phasing out imported water for agriculture?—I didn't see the discussion.

Pg. 64, Section 4.6: This discussion closely relates to my previous comment. From other sources, I have seen figures of as much as 15 years for water to move from the surface to the water table. I have not seen the studies of how rapidly water moves horizontally or vertically in the aquifer, but how is it considered a "worst case" analysis to assume that salt and nutrient concentrations are "instantly" diluted with the total volume of the aquifer (i.e., 55 million AF). If, in fact, there is slow diffusion, then it would appear that concentrations of undesirable constituents in the upper layers of soil could be significantly more than projected by overall averaging. I think we also need to try to put at least some bounds on the other contributing sources (e.g., fertilizer, manure, etc.) to see if setting them aside impacts our conclusions.

Pg. 59 and 60, Section 4.5.1: Is the term "Fate" being used in a technical sense? If so, it would be helpful if it were defined. Is it the intent for this draft to define the trigger for TDS (last sentence on page 60)—if so, I don't recall the group having done this.

Pg. 63, Figure 4-1: It appears that the label definitions for the sub-basin boundaries and the study area got swapped.

This concludes my comments.

California Water Boards

Edmund G. Brown Jr., Governor

Matthew Rodriquez, Secretary for Environmental Protection

Lahontan Regional Water Quality Control Board

September 6, 2013

File: Antelope Valley Basin Planning

Timothy Chen
Los Angeles County Department of Public Works
Waterworks Division
1000 South Fremont Avenue
Building A9-E, 4th Floor
Alhambra, CA 91803
Email: tchen@dpw.lacounty.gov

COMMENTS ON THE DRAFT SALT AND NUTRIENT MANAGEMENT PLAN FOR THE ANTELOPE VALLEY (JUNE 2013), ANTELOPE VALLEY INTEGRATED REGIONAL WATER MANAGEMENT GROUP, LOS ANGELES AND KERN COUNTIES

The California Regional Water Quality Control Board, Lahontan Region (Water Board) staff received a copy of the above-referenced draft Salt and Nutrient Management Plan (SNMP) on July 17, 2013. The draft SNMP was prepared primarily by staff from the Los Angeles County Waterworks Districts and the Sanitation Districts of Los Angeles County with cooperation from the stakeholders of the Antelope Valley Integrated Regional Water Management (IRWM) Group (collectively referred to herein as "the Group"). This draft SNMP was prepared in accordance with the State Water Resources Control Board Resolution Number 2009-0011 (Recycled Water Policy), as amended.

Water Board staff has reviewed the draft SNMP in light of the Scope of Work approved by the Water Board in October 2011, the requirements of the Recycled Water Policy, and with the requirements of the *Water Quality Control Plan for the Lahontan Region* (Basin Plan). We commend the Group in taking the initiative to develop a collaborative plan that evaluates reuses of multiple local water sources and the potential long term effects on water quality. The draft SNMP compliments the IRWM plan and, in conjunction, will benefit and support sustainability of the Antelope Valley. We have determined that the draft SNMP will need to be revised, per our comments below. Listed first are comments on specific components of the plan, followed by comments on plan content.

BACKGROUND WATER QUALITY DATA

A wealth of water quality data has been compiled from the United States Geological Survey (USGS) and the State Water Resources Control Board's Groundwater Ambient Monitoring Assessment Program (GAMA) data sources. For purposes of the SNMP, the Group selected the GAMA dataset for use as the background water quality dataset;

yet, the rationale for selecting only data from GAMA is unclear. For breadth, we recommend combining the USGS and GAMA water quality data into one comprehensive dataset to establish baseline water quality. Care should be taken to avoid duplicating water quality data during the integration.

The USGS data is a subset of GAMA, therefore GAMA should be more inclusive. However, there appears to be data in the USGS dataset (Table 3-1) that is not included in the GAMA dataset (Table 3-2). For example, Table 3-1 lists water quality data for wells located in the Gloster sub-basin, yet in Table 3-2 there is no water quality data available for the Gloster sub-basin from GAMA sources. Such discrepancies may arise from inaccurate or partial well location information as reported by the respective agencies, errors occurring during data downloads, or data entry errors. We recommend the differences between the USGS data and GAMA data be reconciled, to the extent possible, before these two datasets are combined.

For clarity, we request the draft SNMP include a discussion of the existing/background water quality as represented by the combined/comprehensive USGS/GAMA dataset described above. The detailed technical analyses and assumptions that went into developing this background dataset could then be presented in a technical memorandum and appended to the SNMP. The memorandum should include the following: separate discussions for each of the USGS and GAMA data sources; the criteria for selecting viable data from each source (i.e. assumptions, outliers, screened interval, etc.) and the number of wells selected from each data source; the process for siting or mapping well locations; the discrepancies between data obtained from the two sources; the process for combining the two data sets into one comprehensive background water quality dataset; a discussion of the background water quality as represented by the combined USGS/GAMA dataset; and a discussion regarding data gaps.

WATER QUALITY OBJECTIVES

Water quality data illustrate that background water quality in the Antelope Basin varies across the basin, with some sub-basins having higher quality groundwater than others. Water Board staff have determined that one set of water quality objectives (WQOs) applied unilaterally across the entire Antelope Basin (see Table 4-1) is not applicable in this case; rather, the SNMP must establish WQOs for each constituent on a **sub-basin level**. Proper identification of applicable WQOs is critical to calculating assimilative capacity, modeling loading over time, evaluating implementation strategies to manage salts and nutrients, and developing a monitoring program to evaluate the effectiveness of the SNMP. The discussion below provides examples for how the Water Board establishes WQOs.

The general methodology used in establishing WQOs involves, first, designating beneficial water uses, and second, selecting and quantifying the water quality parameters (thresholds) necessary to protect the most vulnerable (sensitive) beneficial uses. Our Basin Plan designates beneficial uses of groundwater in the Antelope Basin as municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), and freshwater replenishment (FRSH). The Basin Plan does not identify specific numeric WQOs for groundwater in the Antelope Basin. However the following narrative WQOs are applicable to all groundwaters in the region, including the Antelope Basin: waters shall not contain concentrations of chemical constituents that adversely affect the water for beneficial uses; waters designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) based upon drinking water standards; waters designated as AGR shall not contain concentrations of chemical constituents in amounts that adversely affect the water for agricultural uses; and waters shall not contain taste or odor producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. Narrative WQOs do not have specific numeric thresholds; therefore, other sources must be referred to in order to determine appropriate thresholds to meet these objectives. Note that WQOs must be protective of the most vulnerable (sensitive) beneficial uses, which may or may not be numeric thresholds established for drinking water standards, as other protected beneficial uses, such as AGR, may be more sensitive.

A Compilation of Water Quality Goals is an online searchable database of water quality-based numeric thresholds for drinking water standards, public health goals, and agricultural water quality goals/thresholds, among others. The database is a compilation from various sources and is maintained by staff of the State Water Resources Control Board, Office of Information Management and Analysis. The database can be accessed online at http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/. We recommend using this database to aid in identifying the appropriate numeric thresholds for WQOs.

Variability in background water quality indicates that WQOs must be identified for each constituent on a sub-basin level. For example, total dissolved solids (TDS) is a constituent that primarily affects taste and odor and has a three part drinking water standard with a recommended SMCL of 500 milligrams per liter (mg/L), an upper limit of 1,000 mg/L, and a short-term level of 1,500 mg/L. Baseline concentrations of TDS in the Lancaster and Pearland sub-basins is 323 mg/L and 264 mg/L, respectively (see Table 3-2). These baseline concentrations are well below the upper level of 1,000 mg/L as well as the SMCL of 500 mg/L. Baseline TDS concentration in the Neenach sub-basin is 501 mg/L, which exceeds the SMCL of 500 mg/L, but is less than 1,000 mg/L. In this example, it would be appropriate to apply a TDS WQO of 500 mg/L for the Lancaster and Pearland sub-basins. The next higher standard of 1,000 mg/L may be an appropriate TDS WQO for the Neenach sub-basin. This rationale must be applied and justified when identifying WQOs for each constituent.

WQOs must also be protective of the most vulnerable (sensitive) beneficial uses, which may or may not be numeric thresholds established for drinking water standards. Depending on the chemical constituent, AGR beneficial uses may dictate lower WQOs than might otherwise be necessary to protect MUN beneficial uses. For example, chloride has a SMCL of 250 mg/L for drinking water, but has an agricultural water quality threshold of 106 mg/L. Chloride concentrations above 106 mg/L impair the waters AGR beneficial uses. In this example, a WQO for chloride set at 106 mg/L would be the most restrictive and protective of both AGR and MUN beneficial uses.

Now consider baseline chloride concentrations for the Antelope Basin. The data in Table 3-2 show that background water quality for chloride is well below the SMCL of 250 mg/L and below the agricultural threshold of 106 mg/L in all sub-basins (where data is available), with the exception of the North Muroc sub-basin that has a baseline chloride concentration of 155 mg/L. Using the more restrictive agricultural threshold as a numerical objective to protect AGR beneficial uses, the WQO for chloride is 106 mg/L in all sub-basins. Background chloride concentrations in the North Muroc sub-basin presently exceed the 106 mg/L WQO. The SNMP should include a discussion for those sub-basins where background water quality exceeds WQOs.

We recommend amending Table 4-1 to include the numeric thresholds that were used to select the WQO for each constituent within individual sub-basins. The selected WQO must be protective of the most sensitive beneficial uses, which may or may not be numeric thresholds established for drinking water standards.

ASSIMILATIVE CAPACITY

Establishing WQOs is pivotal to calculating assimilative capacity. Because baseline water quality data varies between the sub-basins of the Antelope Basin, the SNMP should identify WQOs for each constituent on a sub-basin level. Consequently, assimilative capacity will also vary depending on the constituent and sub-basin location. Therefore, we recommend that baseline assimilative capacity be calculated for each constituent in each sub-basin where background water quality is available. A discussion should be included in the SNMP for those sub-basins where there is little to no assimilative capacity. Incorporating baseline assimilative capacities for all sub-basins, rather than limiting the focus to only those sub-basins where projects are currently being implemented, would further support the intent of the SNMP, which is to serve as a tool for planning and siting future projects that have the potential to contribute to salt and nutrient loading within the basin.

SOURCE IDENTIFICATION AND LOADING

Source identification and estimating their mass loading of salts and nutrients to the groundwater is fundamental to assessing changes in water quality over time. In addition to the current and future projects identified, various other salt and nutrient contributing sources should be considered in the salt balance calculations. In particular, salt and nutrient loading from agricultural sources (fertilizer, soil amendments, and applied water), residential inputs (septic systems, fertilizer, soil amendments, and applied water), and animal waste (manure land application) should be evaluated and included in Table 4-3. General loading factors and assumptions based on land use categories are available in the literature. The Group is encouraged to review other SNMPs prepared to date where some of this information is summarized and references are cited. All assumptions and references used in the loading and salt/nutrient balance calculations must be identified in the plan, and data gaps should be identified and discussed.

GROUNDWATER MODELING

The simple mixing model should be supplemented with more refined models over time, as there will not be uniform mixing throughout the entire basin as a result of loading. We anticipate that impacts will initially be localized and of much higher magnitude than estimated by the mixing model. Areas of highest concern, particularly the urbanized areas of Palmdale and Lancaster, and in sub-basins where assimilative capacity is threatened, should be targeted for more discrete groundwater modeling in the future.

MONITORING AND REPORTING PROGRAM

We envision that progress toward salt and nutrient management will be assessed through regular evaluation and responses to three pivotal questions over the 25-year planning period: (1) Is water quality changing over time as models predicted? (2) Are salts and nutrients effectively being managed to maintain WQOs for beneficial uses? (3) Can technology and new information improve implementation strategies to reduce salt and nutrient loading? Over the implementation period, these questions will be answered through groundwater monitoring, data evaluation, and adaptive management, and will help the Group define the salt/nutrient management benefit derived from their investment of time and resources.

A groundwater monitoring program is vital to tracking changes in water quality over time, evaluate assimilative capacity, and assess effectiveness of implementation strategies. The Recycled Water Policy states that the monitoring network should "focus on basin water quality near water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects. Also, monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with the adjacent surface waters." The preferred approach is to "collect samples from existing wells if feasible as long as the existing wells are located appropriately to determine water quality throughout the most critical areas of the basin."

The monitoring network is the backbone of any monitoring program and requires a sufficient number of strategically located monitoring wells. The proposed SNMP monitoring well locations are shown on Figure 3-16. Please provide a discussion of well selection criteria, and for each well selected, please provide the following: state well number; other well identification numbers; location information (latitude/longitude and corresponding groundwater sub-basin); depth of well; screened interval(s); land surface elevation; frequency of sampling; and sampling program (i.e. USGS, GAMA, California Department of Public Health, etc.). A minimum of three monitoring wells per sub-basin is necessary to be considered statistically valid.

The proposed well locations appear to be located near current and future recycled water projects; however, we recognize that there are other critical areas within the basin with little to no monitoring coverage. We recommend incorporating additional wells in the following locations: the Neenach sub-basin near the Antelope Valley Water Bank Project; the Lancaster and Buttes sub-basins near the Palmdale Water Reclamation Plant Agricultural Site; north of the Lancaster sub-basin near the Edwards Air Force Base Golf Course Landscape Irrigation Project; and near the Amargosa Creek Recharge Project. Several of these projects have active groundwater water monitoring programs, and existing monitoring wells associated with these projects could be incorporated into the SNMP monitoring program.

In order to be a useful tool, the monitoring program must include data analysis and adaptive management components. Increasing and/or decreasing concentration trends need to be tracked and in some cases statistical analyses may need to be performed to evaluate the significance of the changes in water quality. Time versus concentration plots is one way to graphically display data. Adaptive management would provide the process and framework for updating the SNMP to reflect changes over time in land use, project status, source water quality, and groundwater quality, to add or modify implementation strategies, to incorporate new wells as the monitoring program evolves, and to provide a feedback system to the Group. Specific triggers that would lead to further analyses need to be clearly identified.

PLAN APPROVAL PROCESS

We do not envision that the SNMP, in its entirety, will be incorporated in the Basin Plan. Rather, elements of the SNMP, such as revised WQOs and implementation strategies and BMPs, may be incorporated. The final SNMP will be presented to the Water Board at a public hearing for their review and acceptance. We anticipate that at that hearing, further direction will be provided to the Group on how the SNMP or its components will be incorporated into the Basin Plan.

Water Board staff considers submittal of a complete draft SNMP by May 2014 as meeting the deadline requirements outlined in the Recycled Water Policy.

ADDITIONAL COMMENTS

Our comments on plan content are provided below.

1. The draft SNMP contains a wealth of information that is necessary to understanding the existing quality of the groundwater within the Antelope Valley. However, the presentation of the information is fragmented and hard to follow. We recommend that the Group consider adding an Executive Summary and structuring the document in a format where each section builds up the previous one.

2. The stakeholder roles and responsibilities for preparing and implementing the SNMP must be clearly defined, as required by the Recycled Water Policy.

3. Please include water recycling and stormwater recharge/use goals and objectives in the SNMP, as required by the Recycled Water Policy.

4. We suggest adding definitions for "pollution" and "degradation." Pollution, as defined in the California Water Code, section 13050(l), means beneficial uses of water are unreasonably affected. Degradation means natural water quality is adversely altered, but still satisfies water quality objectives to support beneficial uses.

5. Section 2.1.1 states that the SNMP analyses will focus on the Neenach, Lancaster, Buttes, and Pearland sub-basins. However, the Buttes sub-basin is not included in any of the analyses in subsequent sections of the plan.

6. Section 2.4 is a discussion regarding the groundwater cleanup sites included in GeoTracker, and Appendix D is a list of those sites provided by GeoTracker. Please note that Department of Defense sites, such as Air Force Plant 42 and Edwards Air Force Base, have ongoing groundwater cleanup actions, but are absent from the list and discussion.

7. Figures 3-8 through 3-15 are of a noticeable lesser quality than Figures 3-1 through 3-7. The mean concentration of constituent, as represented by Figures 3-8 through 3-15, is a more easily discernible presentation of the data. We request that the quality of Figures 3-8 through 3-15 equal or exceed the quality of Figures 3-1 to 3-7.

8. The water quality data presented distinct differences laterally between sub-basins, but there was little to no discussion regarding vertical partitioning of water quality. Is there sufficient information to discern vertical changes in water quality within some or all of the sub-basins? We request this discussion be included in the SNMP.

9. Not all areas of the Antelope Basin have been subdivided into sub-basins. For example, the western fringe of the basin is not included as a sub-basin, and the area in and around Edwards Air Force Base is also not included as a sub-basin. For those areas where a sub-basin has not been identified, how does the Group intend to assess background water quality? There are several recycled water projects currently implemented in these areas. How will the Group address salt and nutrient management in these areas? These issues need to be addressed in the SNMP.

10. Figure 3-16 and Figure 3-17 show current/future projects in the basin. There are several discrepancies between these figures: different scales; different number of projects shown/listed; and different project number schemes. We recommend using Figure 3-17 as a base for current and future projects. All symbols used on the map must be listed in the legend.

11. TDS, chloride, and nitrate are the chosen indicator parameters for salts and nutrients in the draft SNMP. A discussion as to why these constituents have the potential to degrade water quality and how they were selected as indicator parameters should

be included in the SNMP. The different contributing salt and nutrient sources, both anthropogenic and naturally occurring, should be identified for each.

12. Figure 4-1 is a groundwater contour map of the Antelope Valley based on static water levels in 1996. Groundwater levels have likely changed significantly from 1996 to the present. We recommend that the groundwater contour map be based on more recent water level data.

13. In Section 4.3, there are several references to the "policy." For clarity, we recommend that references to the "Antidegradation Policy" and the "Recycled Water Policy" be referenced as such, with no additional abbreviation.

14. Percolation, in addition to evaporation, is expected from some wastewater ponds in the Antelope Valley (Figure 4-2). We suggest modifying salt balance calculations to include the estimated mass loading from wastewater pond percolation and mass removal of from evaporation.

15. In addition to the "normal year" salt and nutrient mass balance calculations, we recommend that additional calculations be performed for worst-case scenario (no import water) and best-case scenario (full allocation of import water); the results of which should be factored into estimating future groundwater quality.

16. Figures 4-3 through 4-5 illustrate estimated increases in TDS, chloride, and nitrate based on source loading through the planning period. This evaluation seems too simplistic to be a meaningful analysis. From where is the 80% baseline assimilative capacity derived? Our understanding is that the Recycled Water Policy specifies that single recycled water projects should use less than 10% of the available assimilative capacity and, cumulatively, multiple projects are to use less than 20% of available assimilative capacity.

17. The draft SNMP should identify existing measures or practices that are already in place to manage groundwater quality in the basin. For example agricultural BMPs, strategies to manage the quality of municipal wastewater influent, local programs and policies that encourage low impact development, and stormwater recharge, etc., should be identified as appropriate, through the SNMP.

18. Please identify and discuss the triggers that will be used to determine when implementation strategies and BMPs are necessary and how their use will improve/protect water quality.

Thank you for the opportunity to comment. Please share our comments with the rest of the Group. If you have any questions regarding this letter, please contact me at (760) 241-7376 (jzimmerman@waterboards.ca.gov) or Patrice Copeland at (760) 241-7404 (pcopeland@waterboards.ca.gov).

Jan M. Zimmerman, PG
Engineering Geologist

cc: Aracely Jaramillo, County of Los Angeles Dept. of Public Works, Waterworks Districts (via email, ajaramillo@dpw.lacounty.gov)

jz/U:\PATRICE'S UNIT\Jan\SNMP_WM\Comments_Draft AVSNMP(06-13).docx

Page Intentionally Left Blank

Appendix H: Climate Change Vulnerability Question Worksheet

Page Intentionally Left Blank

Vulnerability	Y/N	Justification	Vulnerability Issue	Comments
Water Demand				
Are there major industries that require cooling/process water in your planning region?	Y	Thermal solar power generation, EAFB (not significant), Palmdale Power, landfills, recycling plants	Industrial demand would increase	• Renewables
Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?	Y	Major crops: Ornamental trees, turf, alfalfa, nuts, carrots	Crop demand would increase	• Maintain some crops
Do groundwater supplies in your region lack resiliency after drought events?	Y	Groundwater levels are a long-standing issue	Lack of groundwater storage to buffer drought	• Issue is already a major concern. I see the issue increasing exponentially. • Overpumping issues/concerns • Need increased storage to meet needs • Groundwater recharge is slow and AV basin already overdrawn so capacity is reduced
Are water use curtailment measures effective in your region?	N	Not yet saturated	Limited ability to conserve further	
Does water use vary by more than 50% seasonally in parts of your region?	Y	Higher demand in summer: Agriculture, indoor/outdoor varies	Limited ability to meet summer demand	• SWP uncertainty • Aggravates overall issue
Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	Y	Aquatic plants, freshwater shrimp,	Habitat demand would be impacted	
Water Supply				
Does a portion of the water supply in your region come from snowmelt?	Y	Local surface supply comes from snowmelt.	Decrease in local surface supply	• Our supply is already limited. Seeing that supply decrease some more is a concern. • Decrease in natural water supplies from snowpack and diverted water will increase dependency and expense of imported water • Impact to species/habitats by capture of runoff
Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	Y	Large portion of supply comes from imported (SWP)	Decrease in imported supply	• Vulnerability in storage/more rain, then snow - timing • SWP vulnerability • Dependency of Antelope Valley on imported water
Would your region have difficulty in storing carryover supply surpluses from year to year?	Y	Potential for groundwater recharge, have not yet met potential for GW recharge	Decrease in seasonal reliability	*No comments*
Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	N		Decrease in groundwater supply	
Has your region faced a drought in the past during which it failed to meet local water demands?	Y	Demand management plans have been effective in the past	Sensitivity due to higher drought potential	• See this as fundamental issue • More frequent and prolonged droughts • With the increased potential for drought, the competition for water would be a concern
Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	Y	Tamarisk, Cottonwoods	Invasives can reduce supply available	

Vulnerability	Y/N	Justification	Vulnerability Issue	Comments
Water Quality				
Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?	Y	Fire in the San Gabriel mountains could cause sedimentation in the Little Rock reservoir.	Increased erosion and sedimentation	• Resulting from fires and flash floods • Limited water quantity makes quality even more important
Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?	N	Little Rock reservoir and Lake Palmdale do not have eutrophication issues.	Poor water quality in surface waters	
Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?	N	Contaminant levels are low in areas with transport potential to drinking water bodies.	Increased constituent concentrations	
Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	N	Reservoirs are primarily for drinking water.	Decrease in recreational opportunity	
Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	N	Bulk of water either imported or groundwater	Increase in treatment needs and costs	
Sea Level Rise				
Has coastal erosion already been observed in your region?	N		Decrease in land	
Are there coastal structures, such as levees or breakwaters, in your region?	N		Damage to coastal infrastruture/receration/tourism	
Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?	N			
Is there land subsidence in the coastal areas of your region?	N			
Are there climate-sensitive low-lying coastal habitats in your region?	N		Damage to ecosystem/habitat	
Are there areas in your region that currently flood during extreme high tides or storm surges?	N			
Do tidal gauges along the coastal parts of your region show an increase over the past several decades?	N			

Vulnerability	Y/N	Justification	Vulnerability Issue	Comments
Flooding				
Does critical infrastructure in your region lie within the 200-year floodplain?	Y	Water reclamation plants are in the 100-yr to 500-yr floodplain	Increases in inland flooding	
Does aging critical flood protection infrastructure exist in your region?	Y	Aging local flood protection infrastructure exists in region		
Have flood control facilities (such as impoundment structures) been insufficient in the past?	Y	Areas exist that flood regularly		
Are wildfires a concern in parts of your region?	Y	Flash flooding has been an issue in the past	Increases in flash flooding	• Increase in extreme weather events though decrease in frequency • Historical occurrences • Development in flood plain • Need to avoid development in flash flooding channels/areas to increase availability of flows to habitat and EAFB landing fields • Great potential for damage
Does part of your region lie within the Sacramento-San Joaquin Drainage District?	N			
Ecosystem and Habitat				
Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	Y	Erosion and sedimentation in Little and Big Rock Wash, (watershed by Three Points)	Increased impacts to water dependent species	• Stressors to water dependent habitat • Potential conflicts among users of water supply
Does your region include aquatic habitats which rely on seasonal freshwater flow patterns?	Y	Local Piute ponds, ephemeral streambeds - all subwatersheds in desert are critical		
Do climate-sensitive fauna or flora populations live in your region?	Y	Evapotranspiration may affect habitat		
Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?	N	Region does not have coastal storms	Decrease in habitat protection against coastal storms	
Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	Y	Desert tortoise, burrowing owl, mojave ground squirrel	Decrease in available necessary habitat	• There are already several factors in play. With anticipated climate change issues, the issue will almost be exacerbated. • Many climate-sensitive and endangered species with limited opportunity for migration
Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	Y	Duck hunting in Piute ponds, bird watching, canoeing		
Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?	Y	Limited planning in ecological areas - Big Rock & Little Rock Washes, Broad Cyn Wash, Elizabeth Lake - "choke points"		
Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?	Y	The "Southwest Deserts", which include the Mojave Desert, is one of the "Top 10 Habitats"		
Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?	Y	Freshwater shrimp and mariposa lily require a certain quantity of flow	Decrease in environmental flows	*No comments*
Hydropower				
Is hydropower a source of electricity in your region?	N			

Vulnerability	Y/N	Justification	Vulnerability Issue	Comments
Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?	N		Decrease in hydropower potential	

Appendix I: List of Adjudication Documents

Page Intentionally Left Blank

Adjudication Documents

Leighton, D.A. and Phillips, S.P. 2003. Simulation of Ground-Water Flow and Land Subsidence in the Antelope Valley Ground-Water Basin, California. Prepared by the U.S. Geological Survey in cooperation with the Antelope Valley Water Group. Water-Resources Investigations Report 03-4016.

Rozman, M. et al. 2011. Semitropic-Rosamond Water Bank Authority – Antelope Valley Waterbank. Abstract and PowerPoint Presentation for the Managed Aquifer Recharge Symposium. January 25-26.

Superior Court of California. 2006. Revised Order After Hearing on Jurisdictional Boundaries. Antelope Valley Groundwater Cases (JCCP4408). Los Angeles County Superior Court Case No. BC 325 201.

Superior Court of California. 2008. Order After Phase Two Trial of Hydrologic Nature of Antelope Valley. Antelope Valley Groundwater Cases (JCCP4408). Los Angeles County Superior Court Case No. Case No. 1-05-CV 049053.

Superior Court of California. 2010. Ex Parte Application of "Moving Principals" for Continuance of Trial; Declaration of Douglas J. Evertz in Support of Application. Case No. BC 364553.

Superior Court of California. 2010. Willis Class Stipulation of Settlement. Case No. BC 364553.

Superior Court of California. 2011. Statement of Decision Phase Three Trial. Case No. BC 325201.

Superior Court of California. 2011. Declaration of Steven Bachman, Ph.D., In Response to the Declaration of Joseph Scalmanini Re: Rebuttal Testimony. Phase 3 Trial. Case No.: 1-05-CV-049053. Los Angeles County Superior Court Case No. BC 325 201.

Superior Court of California. 2012. Notice of Lodgment in Support of Notice of Motion and Motion for Reconsideration of the Court's November 16, 2011 Order RE Election for Periodic Payments of the Amended Final Judgment Approving Willis Class Action Settlement; Memorandum of Points and Authorities. Case No.: BC 364553.

Superior Court of California. 2013. Antelope Valley-East Kern Water Agency's Statement RE Phase V Trial Proposal. Phase 3 Trial. Case No.: 1-05-CV-049053. Los Angeles County Superior Court Case No. BC 325 201.

United States Geological Survey (USGS). 1967. Water Resources of the Antelope Valley-East Kern Water Agency Area, California. (67-21).

Page Intentionally Left Blank

Appendix J: Project Submittal Form

Page Intentionally Left Blank

Antelope Valley Integrated Regional Water Management Plan
Call for Projects
Project Identification Form

Note: Please refer to the *Department of Water Resources, Integrated Regional Water Management, Proposition 84 and 1E Guidelines, November 2012* for additional information about the items requested below (http://www.water.ca.gov/irwm/grants/docs/Guidelines/GL_2012_FINAL.pdf).

General Information

Project Name:

Project Sponsor:

Has Project Sponsor Adopted or will adopt the AV IRWMP?

If joint Project, Other Partners:

Project Contact Person:

Phone: FAX: Email:

Project Description

Project Description (1-2 Sentences):

Project Integration (Describe how the project does or could integrate with other projects in the Region by describing synergies or linkages between projects that result in added value or require coordinated implementation or operation):

Project Source (Cite plan(s) that describe or develop the Project (e.g., Watershed Master Plan, Recycled Water Master Plan, etc.)):

Project Location

Description of Project Location:

Latitude/Longitude - info available at: http://geocoder.us Lat: Long:

Project Benefits (please provide a brief description and quantified benefits, if available)

Water Supply: New Supply Created = _______ AFY or Check One: ☐ 1-100 AF ☐ 100-1,000 AF ☐ 1,000+ AF

Water Quality improved: Area Drained and/or: Volume Treated:

Public Access, Open Space, Habitat, Recreation (acres created/restored):

Does the Project Offset Water Supply from the Sacramento-San Joaquin Delta:

Does the Project provide flood management/protection?

Does the Project reduce energy consumption?

Does the Project reduce greenhouse gas (GHG) emissions?

Other (Describe "x" Amount of Benefit):

A. Indicate how the Project contributes to the IRWM Plan objectives

Select the IRWM Plan objectives the project will help to achieve in the table below.

Objectives	Select
Water Supply	
Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035	
Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries	
Stabilize groundwater levels	
Water Quality	
Provide drinking water that meets regulatory requirements and customer expectations	
Protect and maintain aquifers	
Protect and maintain natural streams and recharge areas	
Maximize beneficial use of recycled water	

Flood Management	
Reduce negative impacts of stormwater, urban runoff, and nuisance water	
Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses	
Environmental Resources Management	
Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region	
Land Use Planning/Management	
Maintain agricultural land use within the Antelope Valley Region	
Meet growing demand for recreational space	
Improve integrated land use planning to support water management	
Climate Change	
Mitigate against climate change	

B. How the Project is related to Resource Management Strategies (as defined by the California Water Plan Update 2009)

Select the Resource Management Strategies the Project will employ to help meet the IRWM Plan objectives.

Resource Management Strategies	Select
Reduce Water Demand	
Agricultural water use efficiency	
Urban water use efficiency	
Improve Operational Efficiency and Transfers	
Conveyance-delta	
Conveyance-regional/local	
System reoperation	
Water transfers	
Increase Water Supply	
Conjunctive management & groundwater	
Desalination	
Precipitation enhancement	
Recycled municipal water	
Surface storage – CALFED	
Surface storage – regional/local	
Improve Water Quality	
Drinking water treatment and distribution	
Groundwater and aquifer remediation	
Matching water quality to use	
Pollution prevention	
Salt and salinity management	
Urban runoff management	
Practice Resources Stewardship	
Agricultural lands stewardship	
Economic incentives (Loans, grants, and water pricing)	
Ecosystem restoration	
Forest management	
Land use planning and management	
Recharge areas protection	
Water-dependent recreation	
Watershed management	
Improve Flood Management	
Flood risk management	
Other	
Crop idling for water transfers	
Dewvaporation or atmospheric pressure desalination	

Resource Management Strategies	Select
Fog collection	
Irrigated land retirement	
Rainfed agriculture	
Waterbag transport/storage technology	

C. Technical Feasibility of the Project

Provide a list of studies/reports/documents that have been prepared for the Project:

Explain why there is sufficient technical documentation to support each of the benefits claimed above:

Describe the level of information known about the geologic conditions, hydrology, ecology or other aspects of the system where the project is located:

Explain data gaps that require additional studies to be developed for the project:

D. Specific Benefits to Critical DAC Water Issues

Describe how the Project addresses water supply and water quality needs of Disadvantaged Communities (DACs)[1]:

E. Specific Benefits to Critical Water Issues for Native American Tribal Communities

Describe how the Project addresses water supply and water quality needs of Native American tribal communities:

F. Environmental Justice Considerations[2]

Explain any environmental justice issues related to implementation of the Project:

G. Project Costs and Financing

Estimated capital costs: $______________ or check rough estimate: ☐ <$100K ☐ $100K -$1M ☐ $1M -$10M ☐ >$10M

Estimated Project annual operations and maintenance costs: $_________________

Estimated year of construction and year of Project startup:

Provide a copy of (or link to) the cost estimate, if available:

Explain funding sources/financing for the Project (e.g., State funding, regional assessments, CIP, etc.):

H. Economic Feasibility

Has a cost-effectiveness or benefit-cost analysis been performed for the Project?

Provide a copy of (or link to) the economic analysis, if available:

I. Project Status (i.e., readiness to proceed)

Project Status (Check one): ☐ Conceptual ☐ Design ☐ Ready for Construction ☐ CEQA Compliance

J. Strategic Considerations for IRWM Plan Implementation

Can the Project be integrated with other regional projects?

K. Contribution of the Project in Adapting to the effects of Climate Change

Explain how the Project addresses climate change:

Has any kind of climate change analysis been completed? If so, please provide a copy of (or link to) the analysis:

L. Contribution of the Project in Reducing GHG Emissions as Compared to Project Alternatives

Explain how the Project will aid the IRWM region in reducing GHG emissions:

---

[1] Disadvantaged Communities are defined as communities with an annual mean household income that is less than 80 percent of the Statewide annual median household income.

[2] Environmental justice seeks to redress inequitable distribution of environmental burdens (i.e., pollution, industrial facilities) and access to environmental good (i.e., clean water and air, parks, recreation, etc.).

Page Intentionally Left Blank

Appendix K: Project List

Page Intentionally Left Blank

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	Antelope Valley Conservancy	**Project Name: Antelope-Fremont Watershed Assessment Plan** Sponsor: Antelope Valley Conservancy Contact: Wendy Reed Phone: (661) 943-9000 Email: avconservancy@yahoo.com	Antelope-Fremont Valleys Watershed and upper Santa Clara River Watershed.	**Study/Report**	Y	Y	Y	This completed project created a GIS tool for Antelope Valley Conservancy's assessment and planning for the preservation and restoration of sensitive natural systems of the Antelope-Fremont Valleys Watershed and upper Santa Clara River Watershed.	3 - 2,000 acres open space/habitat/conservation lands. This has proven unrealistic to fulfill because lead agencies are not fulfilling (a) their mitigation responsibilities (Sanitation District of LA County	3	ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region.	1
I	Antelope Valley Water Storage	**Project Name: Antelope Valley Water Bank** Sponsor: Antelope Valley Water Storage Contact: Mark Beuhler, General Manager, Antelope Valley Water Bank Phone: 323-860-4829 Email: MBeuhler@avwaterbank.com Partners: Rosamond CSD, Valley Mutual Water Co., Semitropic Water Storage District		**Implementation**	Y	Y	Y	The Antelope Valley Water Bank will provide 500,000 AFY of storage in the Neenach Subbasin of the Antelope Valley Basin and the ability to recharge and recover 100,000 AFY. This storage could be used to regulate supplies on a seasonal and year-to-year basis by storing water when it is plentiful for later use when needed. The project is strategically located near imported water supply wheeling infrastructure (1 mile from AVEK West Feeder and 8 miles from East Branch of the SWP California Aqueduct) providing a geographically logical means to store and regulate supplies. Phase 2 planned for new two-way pipeline to east branch wells and booster station; recharge 350 cfs, recovery 250 cfs.	3 - Recharge and recover 100,000 AFY 3 - About 1,700 acres of open space 3 - Water Quality from soil aquifer storage 2 - Future offset of water supply from Sacramento-San Joaquin Delta 1 - Reduce energy of transporting delta water	12	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. A plan to meet supply needs of AV during a disruption of SWP deliveries. WQ: Provide drinking water that meets regulatory requirements and customer expectations. WQ: Protect and maintain aquifers LU: Maintain agricultural land use within the AV Region LU: Improve integrated land use planning to support water management CC: Mitigate against climate change	7

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Ecosystem Restoration Forest Management Watershed Management	3	3	10	Y	n/a	n/a	Yes	Complete	n/a	n/a			Yes		
Conveyance - Regional/local Conjunctive Management & Groundwater Drinking Water Treatment and Distribution Land Use Planning and Management	4	3	26	Y			Yes	Complete			Project could be integrated with other water banks such as Amargosa, Littlerock and WSSP-2.		Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	AVEK	**Project Name: Water Supply Stabilization Project – Westside Project (WSSP-2)** Sponsor: AVEK Contact: Dwayne Chisam Phone: 661-943-3201 Email: dchisam@avek.org		Implementation	Y	Y	Y	The project is an imported water stabilization program that utilizes SWP water delivered to the Antelope Valley Region's Westside for groundwater recharge and supplemental supply required for the Antelope Valley Region during summer peaking demand and anticipated dry years. This project includes additional facilities necessary for the delivery of untreated water for direct recharge (percolation basins) or indirect (in-lieu) recharge and for wells and pipeline for treated water conveyance.	3 - Supply 5,000 AFY to 10,000 AFY 3 - 15 acres open space 2 - 20 acres flood management. 2 - Future offset of water supply from Sacramento-San Joaquin Delta 1 - Reduce energy of transporting delta water	11	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. A plan to meet supply needs of AV during a disruption of SWP deliveries. WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations. WQ: Protect and maintain aquifers FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. LU: Maintain agricultural land use within the AV Region LU: Improve integrated land use planning to support water management CC: Mitigate against climate change	9
I	LACDPW	**Project Name: Solar Power System at K-8 Division** Sponsor: LACWD 40 Contact: Iwen Tseng Phone: (626) 300-4688 Email: itseng@dpw.lacounty.gov	Avenue K-8 and Division Street in Lancaster	Implementation	Y	Y	Y	The system is a 350-kilowatt, ground mounted single-axis tracker solar photovoltaic system, expected to produce 760,000 kilowatt-hours per year. The panels will power the three groundwater wells and four booster pumps on that site. The solar photovoltaic panels will be installed at a 2.5 acre Waterworks facility at Avenue K-8 and Division Street in Lancaster	1 - Reduce long-term energy costs at the site and reduce green house gas emissions.	1	CC: Mitigate against climate change.	1
I	LACDPW	**Project Name: Quartz Hill Storm Drain** Sponsor: LADPW Contact: Russ Bryden Phone: (626) 458-4334 Email: rbryden@dpw.lacounty.gov	50th Street, from Avenue M-8 to Avenue K-8	Implementation	Y	Y	Y	As such, the project proposes construction of a storm drain, including several lateral connections and catch basins, to provide stormwater collection and conveyance. The project would connect to existing and new drainage facilities, with the improvements located mainly along 50th Street, from Avenue M-8 to Avenue K-8.	1 - Flood protection of 95 acres of County street right-of-way, and 1,108 acres of private property.	1	FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water.	1
I	LACSD	**Project Name: Lancaster WRP Effluent Management Sites** Sponsor: LACSD Contact: Phone: Email:		Implementation	Y	Y	Y	This project includes the following series of activities at proposed new effluent management sites: land acquisition, purchase and installation of irrigation equipment, development of an area wide farm management plan, site development, completion of associated studies and permits, soil sampling, and well investigation of proposed effluent management sites.	3 - Reduces further elevation of nitrate levels at management sites	3	WQ: Protect and maintain aquifers WQ: Maximize beneficial use of recycled water	2

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Drinking Water Treatment and Distribution Land Use Planning and Management	3	3	26	Y			Yes	Complete					Yes		
System Reoperation	1	0	3	Y	$2 Million		Yes	Complete							
Flood Risk Management	1	0	3	Y	$9,670,000		Yes	Complete							
Surface Storage - Regional/Local Matching Water Quality to Use	2	3	10	Y			Yes	Complete					Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	LACSD	**Project Name: Palmdale WRP Effluent Management Sites** Sponsor: LACSD Contact: Phone: Email:		Implementation	Y	Y	Y	This project includes the following series of activities at proposed new effluent management sites: land acquisition, purchase and installation of irrigation equipment, development of an area wide farm management plan, site development, completion of associated studies and permits, groundwater monitoring, and well abandonment.	3 - Reduces further elevation of nitrate levels at management sites	3	WQ: Protect and maintain aquifers WQ: Maximize beneficial use of recycled water	2
I	LACSD	**Project Name: Lancaster WRP Stage V** Sponsor: LACSD Contact: Phone: Email:		Implementation	Y	Y	Y	The project involves construction and design of a new pump station, storage reservoirs, and other ancillary facilities needed to increase effluent storage capacity to 21 mgd. The project also includes land acquisition needed for site development.	3 - Providing approx. 14.1mgd of nitrified, tertiary recycled water 3 - Water Quality benefits	6	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WQ: Protect and maintain aquifers WQ: Maximize beneficial use of recycled water	4
I	LACSD	**Project Name: Palmdale WRP Stage V** Sponsor: LACSD Contact: Phone: Email:		Implementation	Y	Y	Y	This phase of the upgrade project includes the following series of activities: construction of an effluent pump station, force main, agricultural recycled water pump station, and an agricultural recycled water storage tank and reservoir; development of the new reservoir site and installation of monitoring wells; and design and construction of secondary/tertiary treatment facilities.	3 - Providing approx. 9.04 mgd of nitrified, tertiary recycled water 3 - Water Quality benefits	6	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WQ: Protect and maintain aquifers WQ: Maximize beneficial use of recycled water	4
I	LACWD 40	**Project Name: Aquifer Storage and Recovery Project: Injection Well Development** Sponsor: LACWD 40 Contact: Aracely Jaramillo Phone: (626) 300-3353 Email: ajaramillo@dpw.lacounty.gov		Implementation	Y	Y	N	The project involves the construction of ten new well sites in a groundwater depression area of the Antelope Valley Region to improve water supply reliability. The additional wells would be available for water injection during wet years and for water extraction during dry years.	3 - 12,000 AFY of supply	3	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Est. a contingency plan to meet water supply needs of the AV Region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations. WQ: Protect and maintain aquifers	5

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Surface Storage - Regional/Local Matching Water Quality to Use	2	3	10	Y			Yes	Complete					Yes		
Recycled Municipal Water Surface Storage - Regional/Local Groundwater and Aquifer Remediation Matching Water Quality to Use	4	3	17	Y			Yes	Complete					Yes		
Recycled Municipal Water Surface Storage - Regional/Local Groundwater and Aquifer Remediation Matching Water Quality to Use	4	3	17	Y			Yes	Complete					Yes		
Conjunctive Management & Groundwater Drinking Water Treatment and Distribution	2	3	13	Y			Yes	Complete					Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	LACWD 40	**Project Name: Aquifer Storage and Recovery Project: Additional Storage Capacity** Sponsor: LACWD 40 Contact: Aracely Jaramillo Phone: (626) 300-3353 Email: ajaramillo@dpw.lacounty.gov		**Implementation**	**Y**	**Y**	**N**	This project would increase the District's turnout capacity from AVEK through improvements made to existing infrastructure. Four older, smaller turnout pipelines would be replaced with larger ones to supply water to ASR wells.	3 - Water supply	3	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Est. a contingency plan to meet water supply needs of the AV Region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations.	4
I	LACWD 40	**Project Name: North Los Angeles/Kern County Regional Recycled Water Project - Phase 2** Sponsor: LACWD 40; City of Palmdale Contact: Carolina Hernandez Phone: (626) 300-3318 Email: chernandez@dpw.lacounty.gov		**Implementation**	**Y**	**Y**	**Y**	The Los Angeles/Kern County Regional Recycled Water Project outlines the foundation of a regional recycled water system in the Antelope Valley Region. The proposed system would distribute recycled water throughout the service area and provide a backbone system that could accommodate minimum and maximum demands and allow significant deliveries of recycled water to recharge areas. The recommended plans placement of the system components is based on an analysis of the service area demands, topography, and desired operating pressures. Specifically, the proposed system components of the recommended plan consist of: recycled water supply, a main pump station, booster pump stations, storage reservoirs, and distribution system. The construction of the recycled water supply system would be phased overtime and it is anticipated that all phases of construction would be completed by 2011. Recycled water users would include municipal medians, agriculture, commercial, golf courses, school yards, and parks as allowed by California Department of Health Services, Division 4, Title 22 (Title 22).	3 - Water supply conveyed 3 - Offset Delta Water 3 - Reduce energy consumption/GHG	9	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Establish a contingency plan to meet water supply needs of the AV region during a plausible distruption of SWP deliveries WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	5
I	LACWD 40	**Project Name: Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation** Sponsor: LACWD 40 Contact: Aracely Jaramillo Phone: (626) 300-3353 Email: ajaramillo@dpw.lacounty.gov		**Implementation**	**Y**	**Y**	**N**	This project proposed arsenic mitigation of five groundwater wells using a proven and cost-effective non-treatment alternative to expensive treatment methods. Water Well Nos. 4-43, 4-54, 4-55, 4-58, and 4-59 were modified. Work included replacement of pumps and motors; grout sealing to the lower aquifer layers within the wells; development of foreshortened well columns, aquifer pump testing, water quality sampling; and other incidental and appurtenant work.	3 - Prevents loss of groundwater pumping and existing supply 3 - Ensures water quality that meets MCL requirements.	6	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Provide drinking water that meets regulatory requirements and customer expectations. WQ: Protect and maintain aquifers CC: Mitigate against climate change	4

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Drinking Water Treatment and Distribution	2	3	12	Y			Yes	Complete					Yes		
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use	3	3	20	Y			Yes	Complete					Yes		
Drinking Water Treatment and Distribution Pollution Prevention	2	0	12	Y	$642,082		Yes	Complete							

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	LACWD 40	**Project Name: North Los Angeles/Kern County Regional Recycled Water Project - Division Street Corridor** Sponsor: LACWD 40 Contact: Jamshed Yazdani Phone: (661) 945-6880 Email: jyazdani@cityoflancaster.org		**Implementation**	**Y**	**Y**	**Y**	The Los Angeles/Kern County Regional Recycled Water Project outlines the foundation of a regional recycled water system in the Antelope Valley Region. The proposed system would distribute recycled water throughout the service area and provide a backbone system that could accommodate minimum and maximum demands and allow significant deliveries of recycled water to recharge areas. The recommended plans placement of the system components is based on an analysis of the service area demands, topography, and desired operating pressures. Specifically, the proposed system components of the recommended plan consist of: recycled water supply, a main pump station, booster pump stations, storage reservoirs, and distribution system. The construction of the recycled water supply system would be phased overtime and it is anticipated that all phases of construction would be completed by 2011. Recycled water users would include municipal medians, agriculture, commercial, golf courses, school yards, and parks as allowed by California Department of Health Services, Division 4, Title 22 (Title 22).	3 - Water supply conveyed 3 - Offset Delta Water 3 - Reduce energy consumption/GHG	9	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	5
I	LACWD 40	**Project Name: North Los Angeles/Kern County Regional Recycled Water Project - Phase 1b** Sponsor: LACWD 40; City of Lancaster Contact: Jamshed Yazdani Phone: (661) 945-6880 Email: jyazdani@cityoflancaster.org		**Implementation**	**Y**	**Y**	**Y**	The Los Angeles/Kern County Regional Recycled Water Project outlines the foundation of a regional recycled water system in the Antelope Valley Region. The proposed system would distribute recycled water throughout the service area and provide a backbone system that could accommodate minimum and maximum demands and allow significant deliveries of recycled water to recharge areas. The recommended plans placement of the system components is based on an analysis of the service area demands, topography, and desired operating pressures. Specifically, the proposed system components of the recommended plan consist of: recycled water supply, a main pump station, booster pump stations, storage reservoirs, and distribution system. The construction of the recycled water supply system would be phased overtime and it is anticipated that all phases of construction would be completed by 2011. Recycled water users would include municipal medians, agriculture, commercial, golf courses, school yards, and parks as allowed by California Department of Health Services, Division 4, Title 22 (Title 22).	3 - Water supply conveyed 3 - Offset Delta Water 3 - Reduce energy consumption/GHG	9	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Establish a contingency plan to meet water supply needs of the AV region during a plausible distruption of SWP deliveries WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	5

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use	3	3	20	Y			Yes	Complete					Yes		
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use	3	3	20	Y			Yes	Complete					Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	Antelope Valley Resource Conservation District	**Project Name: Antelope Valley Regional Conservation Project** Sponsor: Antelope Valley Resource Conservation District Contact: Debra Gillis, AVRCD Phone: (661) 945-2604 Email: debragillis@sbcglobal.net	10143 West Avenue I. Lancaster, Ca. 93536 Lat: 34,703853° ,N34° 42’ 13.9” 34° 42..2312’ Long: 118.309141° W118° 18’ 32.9” -118° 18..55485’	Implementation	Y	Y	Y	The AV Regional Conservation Project will provide education, conservation programs and rebates, and resource protection throughout the Antelope Valley. It will provide conservation resources to all water districts small and large, within the Antelope Valley, by providing resources for rebates on SFR, MFR, and CII customers to reduce water use. The project will provide workshops on water conservation, sustainable landscaping, efficient irrigation, flood control, soil preparation, wildlife habitation and other related topics to provide resource protection and water conservation. The project will provide conservation outreach to Antelope Valley residences and students to reduce water supply demand. The project will provide a conservation garden for Antelope Valley allowing the public and agencies to learn about sustainable plantings, and efficient irrigation to reduce demand. The AVRCD is proposing to use 2.0 acres of the 5.00 acres that the District has allocated to start the conservation garden facility that will benefit the surrounding communities at large. The goals and objectives of the water conservation garden are: 1) Reduce residential and large landscape water use to outreach customers by 20%, 2) Provide educational programs on landscape design and maintenance to reduce water use to the general public 3) Provide school educational programs on landscaping for future water saving 4) Provide beneficial uses to the Bay-Delta by providing water quality and water use reduction through conservation over a 15 year period. 5) Reduce fugitive dust in the Antelope Valley 6) Provide water conservation rebate incentives	3 - Water demand reduction through rebate programs 3 - 2.0 acres of recreational/open space creation 2 - water conservation, dust control, and flood management (through education) 1 - Use of solar to offset energy use 1 - GHG reduction through planting trees	10	WS: Provide a reliable water supply to meet the AV Region's expected demand between now and 2035; and adapt to climate change ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. LU: Meet growing demand for recreational space LU: Improve integrated land use planning to support water management CC: Mitigate against climate change.	5

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Agricultural Water Use Efficiency Urban Water Use Efficiency Pollution Prevention Economic Incentives Ecosystem Restoration Watershed Management	6	3	24		985,776.00	20K-30K	Yes	2014-2016	State funding, local sponsors, Southern CA Edison and AVRCD	Demand Management Measures (DMM's) and the Best Management Practices (BMPs) are listed in the California Water Code and the California Urban Water Conservation Council's (CUWCC') BMP's. The project area is described in the AV IRWMP- SECTION 2-10 Conservation Garden design plans providedand cost benefit anaylsis	Yes, the conservation project will become "The Regional Conservation Plan for the Antelope Valley."	The conservation project will provide conservation planning for future water demand, but no climate change analysis has been completed.	YES Will benefit whole AV Region	None	

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	AVEK	**Project Name: Eastside Banking & Blending Project** Sponsor: AVEK Contact: Dwayne Chisam Phone: 661-943-3201 Email: dchisam@avek.org	**Lat: 34°31'42.25"N** **Long: 117°56'25.45"W** Two potential construction staging areas are located west of 116th Street East within the Eastside WTP property. Construction of the proposed project is anticipated to begin in December 2012 and would take approximately 21 months to complete.	**Implementation**	**Y**	**Y**	**Y**	The Eastside Water Banking and Blending Project is an operational water recharge and recovery project providing a supplemental potable source of water for AVEK's existing Eastside Water Treatment Plant. The Project, located in the eastern portion of the Antelope Valley, would involve the spreading of State Water Project water coming from the California Aqueduct being delivered in to local recharge basins, storing water for future recovery. This alternative potable water supply will be used for periodic substitution or supplementation to the Agency's treatment plant. Up to 3 miles of recharge pipeline, three recharge basins, four recovery wells connected to 1.5 miles of treated water recovery pipeline will be constructed on the project site. All pipelines will be installed underground between AVEK's Eastside plant and the recharge basins and recovery wells. This project is currently being designed with specific benefits to AVEK's customers being addressed with each element of the project. Benefits include the banking of surface water for future recovery and use during dry or drought years. This will also reduce the need to purchase special "Dry Year Water" at a higher cost. This project will also increase water quality with the control of Trihalomethane (THM), a disinfection by-product (DBP), as part of the Agency's compliance with new Stage 2 DBP Rules for treated water. The project will provide high-quality recovered groundwater for blending with treated surface water.	3 - Supply - more than 1,000 AFY 3 - Water Quality - lower THM formation 2 - Future offset of water supply expected 1 - Reduce energy/GHG from reduction in delta water use	9	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. A plan to meet supply needs of AV during a disruption of SWP deliveries. WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations. WQ: Protect and maintain aquifers LU: Improve integrated land use planning to support water management CC: Mitigate against climate change	7

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Drinking Water Treatment and Distribution Land Use Planning and Management	3	3	22		$8,990,000	$115,400	Yes	2014	Undetermined but comination of CIP and State funding	WSSP-2 in western region Studies include the evaluation of alternative methods for the reduction of disinfection by-products (DBPs), the review of historical SWP water quality as to the formation of THM's within the project, the development of a groundwater model studying recharge potential, water levels, and quality. In addition, sufficient documentation has been prepared in regarding the feasibility of banking water in the eastside portion of the Valley including studies provided by U.S. Geological Studies and Stetson Engineers (Study of Potential Groundwater Recharge Sites in the Antelope Valley, 2002).			Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	AVEK	**Project Name: Water Supply Stabilization Project (WSSP) – Westside Expansion** **Sponsor: AVEK** **Contact: Dwayne Chisam** **Phone: 661-943-3201** **Email: dchisam@avek.org**	http://geocoder.us	**Implementation**	**Y**	**Y**	**Y**	The Water Supply Stabilization Program (WSSP) – Westside Expansion would add additional water banking capacity for the Antelope Valley by increasing the delivery of AVEK's State Water Project (SWP) water into the region's western area for groundwater recharge and supplemental supply required during summer peaking demand and anticipated dry years. The project would include sufficient land and facilities necessary for up to an additional 500,000 Acre-Feet of water storage used in order to firm up AVEK's annual Table A imported supplies from the State. The project can be integrated with other regional water supply projects for increased reliability.	3 - Water Supply - ~6,000 AFY 2 - Water Quality - Soil aquifer treatment. Avoided expansion of Rosamond Treatment Plant 2 - Future offset of water supply from Sacramento-San Joaquin Delta 1 - Reduce energy of transporting delta water	8	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. A plan to meet supply needs of AV during a disruption of SWP deliveries. WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations WQ: Protect and maintain aquifers LU: Maintain agricultural land use within the AV Region LU: Improve integrated land use planning to support water management CC: Mitigate against climate change	8

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Water Transfers Conjunctive Management & Groundwater Drinking Water Treatment and Distribution Land Use Planning and Management	4	3	23		>$10M	To Be Determined	Yes	2016	State Funding, CIP Funds	The expansion of water banking within the Antelope Valley (e.g. the Water Supply Stabilization Program (WSSP)) are identified in AVEK's current Capacity Charge Evaluation report and are currently in the CIP for the Agency. Additional technical studies or reports will be developed as required. AVEK currently operates the Water Supply Stabilization Program – Westside Project (WSSP-2) in the western region of the Antelope Valley. At the present time, sufficient documentation prepared in regard to the feasibility of the WSSP-2 Water Banking Project has been provided by U.S. Geological Studies and AECOM Engineering which provides a basis for the project. The proposed Western Expansion project would extend the development of the WSSP to include additional facilities.	The project can be integrated with other regional projects	None	As a regional project, the WSSP – Western Expansion will benefit the economic development of the whole of the Antelope Valley including the Disadvantage Communities as indicated in the Antelope Valley IRWM Plan.	None	No

Status I = Implementation C = Conceptual	Sponsor	General Information	Project Location (1) Description of location (2) Lat & Long	Scoring Criteria Implementation/Conceptual Study/Report	General Info Y or N	Description Y or N	Location Y or N	Project Description	Project Benefits Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	IRWMP Objectives Objectives 1 point each	Objs Score
I	AVEK	**Project Name: South Antelope Valley Intertie Project** Sponsor: AVEK Contact: Dwayne Chisam Phone: 661-943-3201 Email: dchisam@avek.org Potential regional partners include Los Angeles County Waterworks Districts, Palmdale Water District, and Littlerock Creek Irrigation District.	Quartz Hill / Lancaster / Palmdale area between South feeder and East feeder Lat: 34°38'45.66"N Long: 118° 0'18.74"W	Implementation	Y	Y	Y	The Southern Antelope Valley Intertie Project will connect the two existing treated water pipelines, AVEK's South Feeder with their East Feeder to allow for the balancing of imported water supplies in the southern portion of the Antelope Valley. In addition, this intertie pipeline project could provide the transmission of recovered water from proposed Eastside Banking Project. At the present time there is an imbalance in the supply of groundwater being extracted relative to that amount being recharged in the populated areas of the cities of Palmdale and Lancaster. To correct this imbalance, some groundwater pumping can be moved further west where groundwater levels are more favorable and the impact of extractions less harmful. The Southern Antelope Valley Intertie Project would provide the mechanism to transport that water from those preferred areas to the areas of greatest need. The project is further enhanced by its ability to provide the recovery of water previously stored in the Valley's eastside recharge projects. The region's overall treated water distribution system will benefit from greater reliability, giving two points of supply: AVEK's Quartz Hill Water Treatment Plant and Eastside Water Treatment Plant. The Southern Antelope Valley Intertie Project is currently part of the AVEK Capital Improvement Plan (CIP), a planning document that list the Agency's significant capital improvements for construction and determines specific customer benefit with each improvement. The project can be integrated with other regional water supplier's projects for increased reliability. To help with further project collaboration, this intertie would provide the mechanism to transport recovered water from the Valley's banking sites such as AVEK's Water Supply Stabilization Project No. 2 (WSSP-2) and other eastside recharge sites.	2 - Water Quality improved: Better distribution for lower THM formation. 3 - Water Supply	5	WS: Provide a reliable water supply to meet the AV Region's expected demand between now and 2035; and adapt to climate change WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations WQ: Protect and maintain aquifers LU: Improve integrated land use planning to support water management	6
I	AVEK	**Project Name: AVEK Strategic Plan** Sponsor: AVEK Contact: Dwayne Chisam Phone: 661-943-3201 Email: dchisam@avek.org	info available at http://geocoder.us western side of AV	Study/Report	Y	Y	Y	The project contains a number of components, including supply. The plan identifies the Water Resources necessary to meet the long-term needs of the greater Antelope Valley Region. The Plan will specify the potential sources of water, their quantities, and the required scheduling in order to facilitate an orderly pace to local development; as is also consistent with current land use planning. The Plan will integrate with other regional planning documents by helping to guide future development in identifying the most beneficial projects and incorporating them into a long-term water resource plan for the greater Antelope Valley. Each of these projects will be of greater value as they are linked to the Plan's strategy for greater water supply and reliability. Various regional plans developed from local agencies along with expert reports generated from the current Antelope Valley Groundwater Adjudication process help to support the need for the Antelope Valley Water Resource Strategic Plan.	3 - Identify Water Supply 3 - Plan for offsetting Delta water supply	6	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. a plan to meet supply needs of AV during a disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Maximize beneficial use of recycled water LU: Improve integrated land use planning to support water management CC: Mitigate against climate change	6

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conveyance - Regional/local System Reoperation Water Transfers Drinking water treatment and distribution	7	3	21		$17.25 M	Nominal	Yes	2016	Project financing is still undetermined at this time, combination of CIP funds and State funding	The historical imbalance of the region's groundwater extraction relative to recharge has been documented in expert reports provided as part of the phase III trial of the Antelope Valley Groundwater Cases for basin adjudication. Information on the Project site geology, soils, and hydrogeology have been provided through AVEK studies of their existing water pipeline alignments, the 2002 Study of Potential Recharge sites completed by Stetson Engineers, and previous studies performed in the area by U.S. Geological Studies. Further information is provided with the expert reports mentioned above. Specific design criteria (e.g. pipeline sizing) would need to be studied and established based on the local water supply demand, hydrology, and geography.	Project could be integrated with other supply projects.	Project would not address climate change	The Project can benefit local Disadvantaged Communities including Lake Los Angeles and Edgemont Acres.	None	None.
Urban Water Use Efficiency Agricultural Lands Stewardship Watershed Management Recycled Municipal Water Conjunctive Management & Groundwater Surface Storage - Local/Regional Land Use Planning & Management	7	3	22		$100K-$1M	None			IRWMP State Funding, Regional Support	Benefits demonstrated in various technical documents including export reports provided as part of the phase III trial of the Antelope Valley groundwater adjudication. Support for geology, soils, and hydrogeology provided by various participating agencies' expert reports including the 2002 Study of Potential Recharge sites completed by Stetson Engineers, past studies performed in the area by U.S. Geological Studies, and through expert reports as mentioned above.	YES	Not at this time	Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	Boron CSD	**Project Name: BCSD Arsenic Management Feasibility Study and Well Design** Sponsor: Boron CSD Contact: Natalie Dadey Phone: (760) 762-6127 Email:		**Study/Report**	Y	Y	Y	The Boron Community Services District (BCSD) Arsenic Management Feasibility Study and Well Design Project consists of developing a hydrology study, preliminary engineering report, pilot well, and production well design to provide a recommended project to BCSD for arsenic management in their groundwater supply. The hydrogeology study will be completed to determine the best site, depth, and testing programs for a pilot test well. The pilot test well will be constructed to determine a recommended depth, screen interval, zone isolation and construction method for a new production well, assumed to be part of the eventual recommended construction project. Arsenic removal treatment may also be identified as part of the Construction Project.	3 - Water Quality o Ensure Compliance with arsenic MCL for BCSD customers o Reduction in arsenic concentrations in local groundwater supply 3 - Water Supply - Local o Improve Reliability - Replacement of aging wells with new wells o Improve Reliability - Development of new local groundwater supplies o Increase in availability of AVEK supplies for other uses 3 - Water Supply - Regional o Regional Reliability - Offset of imported water demands from the State Water Project (SWP) o Reduced Delta demands to help address CALFED Bay-Delta Program objectives o Reduction in total dissolved solids (TDS) imported from outside the Region o Energy Conservation o Avoided greenhouse gas (GHG) emissions	9	WS: Provide a reliable water supply to meet the AV Region's expected demand between now and 2035; and adapt to climate change WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WQ: Provide drinking water that meets regulatory requirements and customer expectations WQ: Protect and maintain aquifers CC: Mitigate against climate change	5
I	City of Lancaster	**Project Name: Lancaster National Soccer Center Recycled Water Conversion** Sponsor: City of Lancaster Contact: Carlyle S. Workman Phone: 661-723-6079 Email: cworkman@cityoflancaster.com	City of Lancaster Recycled Water Facilities and Operations Master Plan, RMC January 2006. Lat: 34.664242 degrees Long: -118.077196 degrees	**Implementation**	Y	Y	Y	Project consists of constructing a recycled water main from the existing regional backbone in Division Street to Lancaster National Soccer Center located on the northwest and northeast corners of Avenue L and 30th Street East and convert the irrigation system to use recycled water. This main extension could also make recycled water available to the Skytower Park and Eastside High School. Providing recycled water to the National Soccer Center and reducing the groundwater pumped by 500 Acre-feet per year has been identified in the on-going Groundwater Adjudication settlement proposal.	3 - Water Supply: 100-1,000 AF 3 - Offsets Delta water supply 3 - Reduces energy consumption	9	WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035 WS: Stabilize groundwater levels WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	5
I	City of Lancaster	**Project Name: Pierre Bain Park Recycled Water Conversion** Sponsor: City of Lancaster Contact: Carlyle S. Workman Phone: 661-723-6079 Email: cworkman@cityoflancaster.com	Pierre Bain Park is located on approximately 15 acres on the southwest corner of Avenue I and 5th Street East. Lat: 34.70392 degrees Long: -118.121817 degrees	**Implementation**	Y	Y	Y	Construction of a recycled water main from the existing regional backbone in Division Street to Pierre Bain Park located at the southwest corner of Avenue I and 5th Street East and convert the irrigation system to use recycled water. This main extension will also make recycled Water available to the County Medical Center currently under construction on the northeast corner of Avenue I and 3rd Street East.	3 - Water Supply: Offset 75 acre-feet of irrigation per year 3 - Offsets Delta water supply 3 - Reduces energy consumption	9	WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035 WS: Stabilize groundwater levels WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	5

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Drinking Water Treatment and Distribution Groundwater and Aquifer Remediation Salt and Salinity Management	3	3	20		$427,000	None	Yes	n/a	Prop 84, Round 2	Boron CSD Scope of Work and Associated Budget, Attachment 1, Project No. 1510002-001 Prop 1E application Project will assess the technical feasibility of the project.	Integration with other arsenic remediation projects such as the "RCSD Consolidation Project".	Project would offset imported water.	Boron is a DAC.	None	Unknown
Conveyance-Regional/local Recycled Municipal Water Matching Water Quality to Use	3	3	20		$15,000,000	$20,000/year		2018	State Grant Funding and Loan Program – Water Recycling Funding Program (WRFP), Planning Grants, Etc.	Recycled Water Facilities and Operations Master Plan prepared by RMC in January 2006.	Integration with other recycled water projects possible.	Project will diversify water supplies and help to adapt to climate change.	Since this project would offset approximately 500 Acre-feet of groundwater a year and would benefit the entire Antelope Valley ground water basin as a whole, it would benefit the DACs within the Valley positively in regards to water supply.		
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use	3	3	20		$770,000	$10,000/year		2017	State Grant Funding and Loan Program – Water Recycling Funding Program (WRFP), Planning Grants, Etc.	Recycled Water Facilities and Operations Master Plan prepared by RMC in January 2006.	Integration with other recycled water projects possible.	Project will diversify water supplies and help to adapt to climate change.	Since this project would offset approximately 75 Acre-feet of potable a year and would benefit the entire Antelope Valley ground water basin as a whole, it would benefit the DACs within the Valley positively in regards to water supply.		

Status I = Implementation C = Conceptual	Sponsor	General Information	Project Location (1) Description of location (2) Lat & Long	Scoring Criteria Implementation/Conceptual Study/Report	General Info Y or N	Description Y or N	Location Y or N	Project Description	Project Benefits Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	IRWMP Objectives Objectives 1 point each	Objs Score
I	City of Lancaster	**Project Name: Whit Carter Park Recycled Water Conversion** Sponsor: City of Lancaster Contact: Carlyle S. Workman Phone: 661-723-6079 Email: cworkman@cityoflancaster.com	Whit Carter Park is located on approximately 20 acres on the west side of Sierra Highway (45635) between Avenue H-6 and Avenue H-8. Lat: 34.712442 degrees Long: -118.139487 degrees	Implementation	Y	Y	Y	Construction of a recycled water main from the existing regional backbone in Division Street to Whit Carter Park located west of Sierra Highway at approximately Avenue H-7 and conversion of the irrigation system to recycled water. This main extension will also make recycled water available to the industrial park between Division Street and Sierra Highway, south of Avenue H.	3 - Will offset approximately 50 AF of irrigation per year 3 - Offsets Delta water supply 3 - Reduces energy consumption	9	WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035 WS: Stabilize groundwater levels WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	5
I	City of Lancaster	**Project Name: Antelope Valley Recycled Water Master Plan** Sponsor: City of Lancaster Contact: Carlyle S. Workman Phone: 661-723-6079 Email: cworkman@cityoflancaster.com	Antelope Valley	Study/Report	Y	Y	Y	Palmdale, Lancaster, and Los Angeles County Waterworks all have studies regarding recycled water. This project would undertake the effort to prepare a regional master plan to consolidate the existing master plans/studies. The North Valley Regional Recycled Water System is intended to connect the Lancaster and Palmdale Wastewater Reclamation Plants with backbone recycled water line. A regional master plan incorporating the laterals, tanks, pumps, etc. necessary to construct an integrated delivery system for the Antelope Valley would ensure compatibility and efficiency throughout the system	3 - Water Supply: Offset up to 17,000 AFY of potable water use 3 - Offsets Delta water supply 3 - Reduces energy consumption	9	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC WS: Stabilize groundwater levels WS: Maximize beneficial use of recycled water CC: Mitigate against climate change	4
I	City of Lancaster	**Project Name: Division Street and Avenue H-8 Recycled Water Tank** Sponsor: City of Lancaster Contact: Carlyle S. Workman Phone: 661-723-6079 Email: cworkman@cityoflancaster.com	The proposed tank site is behind the existing pump station at 45540 Division Street. Lat: 34.710587 degrees Long: -118.130965 degrees	Implementation/Conceptual	Y	Y	Y	Construction a 1 million gallon recycled water tank at the City's existing pump station at 45540 Division Street, just south of Avenue H-8. In order to provide a stable supply of recycled water in the North Valley Regional Recycled Water System, tanks and pumps will need to be installed throughout the system. This tank would take the place of Los Angeles County Waterworks District No. 40's existing tank, on loan to the City. Making recycled water available to more users will free up potable water and improve the groundwater situation within the Antelope Valley.	3 - Water Supply: 1,000+ AF 3 - Offsets Delta water supply 3 - Reduces energy consumption	9	WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035 WS: Stabilize groundwater levels WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WQ: Maximize beneficial use of recycled water CC: Mitigate against climate change	5

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use	3	3	20		$815,417	$10,000/year		2016	State Grant Funding and Loan Program – Water Recycling Funding Program (WRFP), Planning Grants, Etc.	City of Lancaster Recycled Water Facilities and Operations Master Plan, RMC January 2006.	Integration with other recycled water projects possible.	Project will diversify water supplies and help to adapt to climate change.	Since this project would offset approximately 50 Acre-feet of potable a year and would benefit the entire Antelope Valley ground water basin as a whole, it would benefit the DACs within the Valley positively in regards to water supply.		
Conveyance - Regional/local Conjunctive Management & Groundwater Recycled Municipal Water Matching Water Quality to Use Economic incentives	5	3	21		$100K -$1M	$0		2014, 2015	State Grant Funding and Loan Program – Water Recycling Funding Program (WRFP), Planning Grants, Etc.	City of Lancaster Recycled Water Facilities and Operations Master Plan, RMC January 2006; Final Facilities Planning Report, Antelope Valley Recycled Water Project, Kennedy/Jenks 2005; Antelope Valley Recycled Water Product, Phase 2 Design Concept Report, LACWW District No. 40, January 2009	This project can be integrated with other regional projects.	Project will diversify water supplies and help to adapt to climate change.	Since this Master Plan would benefit the entire Antelope Valley ground water basin as a whole, it would benefit the DACs within the Valley positively in regards to water supply.		
Conveyance-regional/local Recycled municipal water Matching Water Quality to Use	3	3	20		$1M -$10M	$25,000/year		2015, 2016	State Grant funding, Federal Funding, CIP.	Recycled Water Facilities and Operations Master Plan prepared by RMC in January 2006.	The North Valley Regional Recycled Water System, when completed, will link the Lancaster Water Reclamation Plant and the Palmdale Water Reclamation Plant and provide recycled water distribution to both cities and Los Angeles County unincorporated areas. There are several projects in the current IRWMP that comprise portions of the regional system that will integrate with this project.	Project will diversify water supplies and help to adapt to climate change.	Since the increased use of recycled water can offset potable water use, the groundwater table can be stabilized throughout the Antelope Valley. This will affect the DACs water situation beneficially.		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	City of Palmdale	**Project Name: Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org Partners: AVEK, PWD, LACWW	Site is approx. 600-acre city-owned property that is bounded by Sierra Highway to the west, East Ave M (Columbia Way) to the north, and U.S. Air Force Plant 42 on the south and east	**Implementation**	**Y**	**Y**	**Y**	Proposed project improvements include: expanding the size and capacity of the spreading ground of the natural recharge area; developing and preserving an ephemeral stream habitat; and channelization of Amargosa Creek (soft bottom) and providing a grade separation of 20th street west over Amargosa Creek.	3 - capture approx. 400 AFY stormwater and recharge with SWP water (14,600-53,600 AFY) 1 - Water Quality Improved, reduced Arsenic 3 - 15 acres open space/habitat 3 - Offset water supply from the Delta (during dry years) 3 - 20 acres flood protection	13	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. a plan to meet supply needs of AV during a disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations WQ: Protect and maintain aquifers WQ: Protect and maintain natural streams and recharge areas FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. LU: Meet growing demand for recreational space CC: Mitigate against climate change	11
I	City of Palmdale	**Project Name: Palmdale Power Plant Project** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		**Implementation**	**Y**	**Y**	**Y**	Construction of a 570 Mega-Watt (MW) electricity generating facility. The Palmdale Power Project will be a hybrid design, utilizing natural gas combined cycle technology and solar thermal technology. The Palmdale Power Project would be a customer and end user of 3,400 AFY of reclaimed water.	3 - Identified user of approximately 3,400 AFY of recycled water.	3	WQ: Maximize beneficial use of recycled water LU: Improve integrated land use planning to support water management CC: Mitigate against climate change.	3

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Groundwater and Aquifer Remediation Pollution Prevention Flood Risk Management Ecosystem Restoration Recharge Areas Protection Water-dependent Recreation Watershed Management	8	3	35							Grant application			Yes		
Recycled Municipal Water Matching Water Quality to Use Land Use Planning and Management	3	3	12										Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	Palmdale Recycled Water Authority	**Project Name: Palmdale Recycled Water Authority – Phase 2 Distribution System** Sponsor: Palmdale Recycled Water Authority (JPA between the City of Palmdale and Palmdale Water District) Contact: Gordon Phair and Matt Knudson Phone: (661) 267-5310 and (661) 456-1018 Email: gphair@cityofpalmdale.org and mknudson@palmdalewater.org	The installation of a recycled water line from the intersection of Avenue R and 30th Street East, south to Avenue R-8, east to 65th Street East. Distribution laterals will be installed to feed Domenic Massari, Yellen, and Palmdale Oasis Parks. Laterals will also be installed to feed Palmdale and Knight High Schools.	Implementation	Y	Y	Y	The installation of a recycled water line from the intersection of Avenue R and 30th Street East, south to Avenue R-8, east to 65th Street East. Distribution laterals will be installed to feed Domenic Massari, Yellen, and Palmdale Oasis Parks. Laterals will also be installed to feed Palmdale and Knight High Schools. The installation of a recycled water line from the existing LACSD effluent recycled water line for in-lieu agricultural water exchange will also be part of this project. This project will be extended in the future to supply recycled water to proposed recharge facilities in Littlerock Wash. This project is part of the Recycled Water Master Facilities Plan being prepared by the Palmdale Recycled Water Authority.	3 - New Water supply (1,000+ AF). 3 - Offset Delta Water 3 - Reduce Energy Consumption	9	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change.	6
I	Palmdale Water District	**Project Name: Littlerock Creek Groundwater Recharge and Recovery Project** Sponsor: Palmdale Water District Contact: Matt Knudson Phone: (661) 456-1018 Email: mknudson@palmdalewater.org Partners: AVEK, City of Palmdale, LCID	Latitude: 34.5675 Longitude: -117.9839	Implementation	Y	Y	Y	This project involves groundwater recharge using recycled water from the Palmdale WRP. This project is anticipated to be similar to the Lancaster groundwater recharge project described below and have similar blending and extraction numbers (e.g., a blend of 10,000 AFY of recycled water and 40,000 AFY of SWP water). In order to have 40,000 AFY of SWP water to blend, this project would most likely end up being an AVSWCA project (or at least a joint venture type project with AVEK and/or LCID).	3 - 43,090 AFY supply 1 - Improve Water Quality (soil aquifer treatment) 3 - Offset Delta Water 1 - Flood Management 3 - Reduce energy consumption	11	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Est. a contingency plan to meet water supply needs of the AV Region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations WQ: Protect and maintain aquifers	9

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conveyance - Regional/local Conjunctive Management & Groundwater Recycled Municipal Water Matching water quality to use	4	3	22		$10 Million					Palmdale Water District Recycled Water Facilities Plan (2010)		No Climate Change Analysis	Yes		None.
Conjunctive Management & Groundwater Recycled Municipal Water Matching Water Quality to Use Pollution Prevention Flood Risk Management	5	3	28		$1,897,969		Yes	2013, 2015	Prop 1e, PWD funds	Palmdale Water District Strategic Water Resources Plan, 2010 Technical studies examining water supply for recharge, alternatives, environmental issues and constraints, groundwater modeling, and project feasibility is anticipated for 2015.	This project can be integrated with other groundwater recharge projects, as well as other recycled water projects.	This project would help the region to adapt to changes in supply availability through the storage of imported and recycled water.	The project would provide supplies regionally, including to DACs.	None	

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
I	Palmdale Water District	**Project Name: Littlerock Dam Sediment Removal** Sponsor: Palmdale Water District Contact: Matt Knudson Phone: (661) 456-1018 Email: mknudson@palmdalewater.org Partners: USFS	Littlerock Dam Latitude: 34.4814 Longitude: -118.0236	**Implementation**	**Y**	**Y**	**Y**	This project will remove up to 900,000 cubic yards of sediment that has been accumulated from runoff into Littlerock Reservoir, and up to 40,000 cubic yards on an annual basis after the initial sediment is removed. The project may include a grade control structure that will protect the identified habitat of the arroyo toad.	3 - 560 AFY supply 1 - Improve Water Quality 3 - Offset water supply from the Delta 3 - Provide flood management/protection 2 - Preserve habitat (for the endangered Arroyo Toad) 3 - Reduce energy consumption/GHGs	15	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. A plan to meet supply needs of AV during a disruption of SWP deliveries. WQ: Provide drinking water that meets regulatory requirements and customer expectations. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. CC: Mitigate against climate change	6
I	Rosamond CSD	**Project Name: RCSD Arsenic Consolidation Project** Sponsor: RCSD Contact: Phone: Email: Partners: 10 mutuals		**Implementation**	**Y**	**Y**	**Y**	Project will extend waterline from Lands of Promise N. to Willaim Fisher and connect all 10 small water companies to the RCSD system. The water delivered to the WFM customers would be below the arsenic MCL level of 10 ppb. Land of Promise storage system would provide water volume and pressures to William Fisher that would be adequate to provide fire flows and meet RCSD, Kern County, and CDPH standards.	2 - Water Quality Improvement 3 - Improve reliability of drinking water system 3 - reduce energy consumption by improving system efficiency	8	WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035; and adapt to climate change WS: Stabilize groundwater levels WQ: Provide drinking water that meets regulatory requirements and customer expectations. CC: Mitigate against climate change.	4
C	Antelope Valley Duck Hunting	**Project Name: Multi-use/Wildlife Habitat Restoration Project** Sponsor: Antelope Valley Duck Hunting Club (Co-sponsor: Waterworks), Wagas Land Company Contact: Ed Renwick; Aracely Jaramillo Phone: (626) 300-3353 Email: AJaramillo@dpw.lacounty.gov		**Conceptual**	**Y**	**Y**	**N**	Duck Hunting Club in both Kern and LA County, started in 1925. The AV Region is a flyway zone for many migratory birds flying south and the Wagas Land Co. has been preserving habitat. It has been coordinating with District 40 and would like replace their potable water use with recycled water. The Club would allow District 40 to use a portion of the property for spreading, creating a potential banking opportunity for the region. The project would continue to preserve open space/habitat and would "free up" potable water for other uses. The habitat area's highest water need is during the winter time (approx. 80%). Permeability tests need to be performed to verify percolation.	Offset potable water use with recycled water Potential to bank water Continue to preserve open space and habitat		WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035; and adapt to climate change. WQ: Maximize beneficial use of recycled water ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region. LU: Meet growing demand for recreational space CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Surface Storage - Regional/local Flood Risk Management Ecosystem Restoration Pollution Prevention	4	3	28		$11,963,233	$810,000/year	Yes	2012, 2020	PWD funds	Palmdale Water District Strategic Water Resources Plan, 2010 Littlerock Reservoir Hydrologic and Sediemtn Transport Analysis Technical Report, June 2005 Technical justification for the project was established in the Prop 1E grant application submitted in January 2013.	This project can be integrated with downstream groundwater recharge projects.	This project would help the region to adapt to changes in flow in Littlerock Creek, and allow for additional seasonal storage.	The project would provide supplies regionally, including to DACs.	None	
Conveyance - Regional/local System Reoperation Drinking Water Treatment and Distribution Matching Water Quality to Use Conjunctive Management & Groundwater	5	3	20				Yes			RCSD Regional CDPH Arsenic Compliance Project Preliminary Engineering Report (PER 3A and 3B)			Yes		
Urban Water Use Efficiency Conveyance - Regional/local Matching Water Quality to Use Ecosystem Restoration Land Use Planning and Management Water-dependent Recreation Watershed Management		0	0								Project could be integrated with other wetland habitat projects that attract migratory birds. Could also integrate with other recycled water projects in the Valley.	Project would offset imported water.			

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	Boron CSD	**Project Name: BCSD Arsenic Removal Treatment Plant (Construction)** Sponsor: Boron CSD Contact: Natalie Dadey Phone: (760) 762-6127 Email: boroncsd@yahoo.com	The Well No. 15 site is located five miles west of the town of Boron, off of Highway 58 to the North on Gephart Rd. to the west side of Gephart Rd. New plant will be constructed at this location or possibly at a new well site that will contain lower arsenic concentrations TBD based on future studies	**Conceptual**	**Y**	**Y**	**Y**	The goal of the project is to construct an arsenic removal treatment plant to treat the local groundwater supply to remove the arsenic contaminant; thereby achieving the state and federal compliance guidelines and enabling safe drinking water to be delivered to customers.	Offset Delta Water Supply Drinking water Quality improved		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Provide drinking water that meets regulatory requirements and customer expectations. CC: Mitigate against climate change	
C	City of Lancaster	**Project Name: Lancaster Cemetery Recycled Water Conversion** Sponsor: City of Lancaster Contact: Carlyle S. Workman Phone: 661-723-6079 Email: cworkman@cityoflancaster.com	Northeast corner of East Lancaster Blvd and Division St Lat. 34.696593 Long. -118.130795	**Conceptual**	**Y**	**Y**	**Y**	Install a purple pipe irrigation system throughout the cemetery and connect to the existing recycled water main in Division St	3 - Offset approx. 40 AFY of groundwater that is currently pumped 3 - Reduce energy consumption	6	WS: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035 WS: Stabilize groundwater levels WS: Maximize beneficial use of recycled water CC: Mitigate against climate change	4
C	City of Lancaster	**Project Name: Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H** Sponsor: City of Lancaster Contact: Carlyle Workman Phone: (661) 723-6079 Email: cworkman@cityoflancasterca.org		**Conceptual**	**Y**	**Y**	**Y**	This project involves the construction of a 12-inch lateral pipeline off the Regional Backbone at/ near Ave M conveying tertiary treated water to a point approximately one mile west and designed to deliver recycled water into the Amargosa Creek channel. Tertiary treated water would travel northerly within the Amargosa Creek roughly 4.7 miles, creating incidental recharge en route until collecting at Lake Lancaster (retention basin north of Ave H). Here, it would be available for irrigation and dust control at the Antelope Valley Fair Grounds and extended use to the west side of Lancaster and surrounding Antelope Valley Region.	100 to 1,000 AFY additional supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. a plan to meet supply needs of AV during a disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Maximize beneficial use of recycled water CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Drinking Water Treatment and Distribution		3	3										Yes		
Conveyance-regional/local Recycled municipal water Matching Water Quality to Use	3	3	16		$100,000	$1,500	No	2014, 2015	Funding would likely come from grants and/or City and County CIP funds	Water usage records for the Cemetery indicate the amount of groundwater use to be offset by recycled water			YES Since the GW levels of the valley would be stabilized and water supply improved		
Conveyance - Regional/local Conjunctive Management & Groundwater Recycled Municipal Water Matching Water Quality to Use		3	3				No	2 to 3					Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	City of Lancaster	**Project Name: Amargosa Creek Pathways Project** Sponsor: City of Lancaster Contact: Carlyle Workman Phone: (661) 723-6079 Email: cworkman@cityoflancasterca.org		**Conceptual**	Y	Y	Y	This project includes development of a top of bank trail or paseo along the eastern side of Lake Lancaster, and construction of a foot-bridge structure crossing the lake and connecting under Hwy 14 to link to the existing trailhead at the Antelope Valley Fairgrounds. The project integrates stormwater/flood control with natural riparian habitat enhancement and preservation, open/ recreational space and land use management. The goal is to construct a pathway in hamrony with established riparian habitat, within a flood management basin which captures stormwater and nuisance water runoff that, in turn, sustains riparian habitat. This project will additionally increase the amount of rotected natural habitat and provide improved flood control within the Amargosa Creek watershed.	Open space 1-100 AFY Water Supply (from percolating water)		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resoures and species in the Antelope Valley Region LU: Meet growing demand for recreational space LU: Improve integrated land use planning to support water mgmt.	
C	City of Lancaster	**Project Name: Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H** Sponsor: City of Lancaster Contact: Carlyle Workman Phone: (661) 723-6079		**Conceptual**	Y	Y	Y	This project establishes riparian habitat along the eastern edge of the Amargosa Creek in elongated segments and sections resulting in a "Riparian Curtain": extending from Ave J north to Ave H. This project requires site reconnaissance, coordination with California Department of Fish and Game (CDFG), various bio assessments and planting plans prior to implementation and creation. Restoration projects such as this are holistic and enhance the environment, providing physical buffers and off-sets to impacts on the overall ecosystem of ephemeral and riparian habitat associated with Amargosa Creek.	100 to 1,000 AF of open space created Water Supply (from percolating water) Provide buffers to protect water quality in stream		WQ: Protect and maintain natural streams and recharge areas FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. ENV: Preserve open space and natural habitats that protect and enhance water resoures and species in the Antelope Valley Region LU: Meet growing demand for recreational space CC: Mitigate against climate change	
C	City of Palmdale	**Project Name: 45th Street East Groundwater Recharge and Flood Control Basin** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		**Conceptual**	Y	Y	Y	The project includes the construction of a new basin, an approximately 2,083 AF drainage basin near 45th Street East and Avenue P-8, on property currently owned by the City of Los Angeles' Department of Airports.	Approximately 208 acres of new wildlife habitat would be created by this project. Water quality would also be expected to improve as a result of reduced contaminated stormwater runoff and capture of up to 2,083 AF. Water supply would be created through recharge Provide flood management/protection		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Establish a contingency plan to meet water supply needs of the Antelope Valley Regino during a plausible disruption of SWP deliveries. WS: Stabilize groundwater levels WQ: Protect natural streams and recharge areas from contamination FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water.	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Pollution Prevention Ecosystem Restoration Land Use Planning & Mgmt Flood Risk Management Watershed Management		0	0				Yes	3 to 5							
Pollution Prevention Ecosystem Restoration Urban Runoff Management Watershed Management		0	0				No	3 to 5							
Conjunctive Management & Groundwater Ecosystem Restoration Recharge Areas Protection Flood Risk Management		0	0												

Status I = Implementation C = Conceptual	Sponsor	General Information	Project Location (1) Description of location (2) Lat & Long	Scoring Criteria Implementation/Conceptual Study/Report	General Info Y or N	Description Y or N	Location Y or N	Project Description	Project Benefits Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	IRWMP Objectives Objectives 1 point each	Objs Score
C	City of Palmdale	**Project Name: Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		**Conceptual**	Y	Y	Y	The project entails the acquisition and construction of an approximately 1,612 AF detention basin located between Avenue P-12 and Avenue Q, from 20th Street East to 30th Street East.	Approximately 161 acres of new wildlife habitat would be created by this project. Water quality would also be expected to improve as a result of reduced contaminated stormwater runoff Capture of up to 1,612 AF. Flood management/protection		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Stabilize groundwater levels WS: Establish a contingency plan to meet water supply needs of the Antelope Valley Regino during a plausible disruption of SWP deliveries. WQ: Protect natural streams and recharge areas from contamination. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. CC: Mitigate against climate change	
C	City of Palmdale	**Project Name: Avenue R and Division Street Groundwater Recharge and Flood Control Basin** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		**Conceptual**	Y	Y	Y	The City proposes to construct a 950 acre-foot basin on 93 acres located at the northeast corner of Avenue R and Division St., including all necessary and associated grading, inlet/outlet structures, spillway, and storm drain piping as part of its stormwater collection and conveyance system.	Provide for wildlife habitat Provide conservation Provide stormwater capture. Provide flood management/protection		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Stabilize groundwater levels WS: Establish a contingency plan to meet water supply needs of the Antelope Valley Regino during a plausible disruption of SWP deliveries. WQ: Protect natural streams and recharge areas from contamination. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Ecosystem Restoration Recharge Areas Protection Flood Risk Management		0	0												
Conjunctive Management & Groundwater Ecosystem Restoration Recharge Areas Protection Flood Risk Management		0	0												

Status I = Implementation C = Conceptual	Sponsor	General Information	Project Location (1) Description of location (2) Lat & Long	Scoring Criteria Implementation/Conceptual Study/Report	General Info Y or N	Description Y or N	Location Y or N	Project Description	Project Benefits Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	IRWMP Objectives Objectives 1 point each	Objs Score
C	City of Palmdale	**Project Name: Barrel Springs Groundwater Recharge and Flood Control Basin** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		**Conceptual**	Y	Y	Y	Construction of an 878 AF detention basin in the Barrell Springs area upstream of Old Harold Road and 25th Street East, on a 40-acre, City-owned property.	Flood control for the City of Palmdale Provide approximately 40 acres of habitat Capture of stormwater for groundwater recharge Water quality would also be expected to improve as a result of reduced contaminated stormwater runoff		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Stabilize groundwater levels WS: Establish a contingency plan to meet water supply needs of the Antelope Valley Regino during a plausible disruption of SWP deliveries. WQ: Protect natural streams and recharge areas from contamination. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. CC: Mitigate against climate change	
C	City of Palmdale	**Project Name: Hunt Canyon Groundwater Recharge and Flood Control Basin** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		**Conceptual**	Y	Y	Y	The project entails construction of a new 3,000 AF detention/ recharge basin, located south of Pearblossom Highway at 57th Street East. The basin would be used to store aqueduct water to allow recharge into the aquifer, and would act as a detention basin during severe storms.	Approximately 300 acres of new wildlife habitat would be created by construction of this project. Water quality would be expected to improve as a result of reduced contaminated stormwater runoff Capture of up to 3,000 AF. Flood management/protection		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Stabilize groundwater levels WS: Establish a contingency plan to meet water supply needs of the Antelope Valley Regino during a plausible disruption of SWP deliveries. WQ: Protect natural streams and recharge areas from contamination. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV. CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Ecosystem Restoration Recharge Areas Protection Flood Risk Management		0	0												
Conjunctive Management & Groundwater Ecosystem Restoration Recharge Areas Protection Flood Risk Management			0												

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	City of Palmdale	**Project Name: 42nd Street East, Sewer Installation** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org		Conceptual	Y	Y	N	The City proposes to construct new sewer lines, and will require homes in the vicinity of 42nd Street East to connect to the system, thereby eliminating the use of septic tanks and the potential for groundwater pollution due to leaks and spills.	Groundwater quality would be improved and future contamination reduced through elimination of septic systems		WQ: Protect and maintain aquifers WQ: Protect natural streams and recharge areas from contamination.	
C	City of Palmdale	**Project Name: Lower Amargosa Creek Recharge Project** Sponsor: City of Palmdale Contact: Gordon Phair Phone: (661) 267-5310 Email: gphair@cityofpalmdale.org and		Conceptual	Y	Y	N	Development of in-stream recharge of water from the State Water Project blended with recycled water. Integration with the Upper Amargosa Creek Recharge Project, Amargosa Water Banking and Stormwater Retention Project, and the North Los Angeles/Kern County Regional Recycled Water Project.	New Water supply (1,000+ AF).	1	WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels WQ: Protect natural streams and recharge areas from contamination. WQ: Maximize beneficial use of recycled water. CC: Mitigate against climate change.	6
C	EAFB	**Project Name: Antelope Valley Watershed Surface Flow Study** Sponsor: EAFB Contact: Wanda Deal Phone: 661-810-9622 Email: wanda.deal@us.af.mil	Antelope Valley	Study/Report	Y	Y	Y	The project would characterize the Antelope Valley surface water flow from the San Gabriel and Tehachapi Mountains to Rosamond and Rogers Lake. It would aim to determine the amount of flow and tributaries, the health of the lakebeds, and how much water is required to either keep them healthy or make them healthy. The project would determine the impacts of implementing current and future proposed water diversion/removal projects and impacts of continued retention basin development. It would quantify potential effects of future flood management projects.	Determine necessary flow to maintain habitat Quantify impacts of future water projects and management		WQ: Protect and maintain natural streams and recharge areas FLD: Optimize balance between existing beneficial uses of stormwater and capturing stormwater for new uses ENV: Preserve open space and natural habitats that protect and enhance water resources and species in the AV Region LU: Improve integrated land use planning to support water management	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Pollution Prevention		0	0												
Conjunctive Management & Groundwater Recycled Municipal Water Ecosystem Restoration Matching water quality to use	4	0	11									No			No
Ecosystem Restoration Forest Management Land Use Planning and Management Recharge Area Protection Water-dependent Recreation Watershed Management Flood Risk Management		0	0							NSR Surface Flow Study, EAFB, 2011					

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	LACDPW	**Project Name: Big Rock Creek In-River Spreading Grounds** Sponsor: LACDPW Contact: Ken Zimmer Phone: (626) 458-6188 Email: kzimmer@dpw.lacounty.gov		**Conceptual**	**Y**	**Y**	**N**	Big Rock Creek drainage area is 23 square miles. The creek runs from the San Gabriel Mountains north into the Antelope Valley. The Los Angeles County Flood Control District proposes to develop a spreading ground facility near the San Gabriel Mountain foothills in order to increase groundwater recharge. The facility will include earthen levees in and adjacent to the creek to capture and recharge stormwater from the creek into the groundwater basin. The Antelope Valley Watershed Region's continued and projected population growth will lead to increased water demand. Future estimates of the region's water budget predict an increasing shortfall in water supply. Developing in-stream groundwater recharge facility will increase groundwater recharge by an estimated 5,500 acre-feet per wet-year. This proposed project will improve the health and long-term sustainability of the basin, increase local groundwater supplies, and	Increase groundwater recharge by an estimated 5,500 acre-feet per wet-year Water supply (New Supply Created): 1,000+ AFY Water Quality – Area drained: 23 Sq. Mi.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels FLD: Optimize balance between existing beneficial uses of stormwater and capturing stormwater for new uses	
C	LACDPW	**Project Name: Little Rock Creek In-River Spreading Grounds** Sponsor: LACDPW Contact: Ken Zimmer Phone: (626) 458-6188 Email: kzimmer@dpw.lacounty.gov		**Conceptual**	**Y**	**Y**	**N**	Little Rock Creek drainage area is 49 square miles. The creek runs from the San Gabriel Mountains north into the Antelope Valley. The Los Angeles County Flood Control District proposes to develop a spreading ground facility near the San Gabriel Mountain foothills in order to increase groundwater recharge. The facility will include earthen levees in and adjacent to the creek to capture and recharge stormwater from the creek into the groundwater basin. The Antelope Valley Watershed Region's continued and projected population growth will lead to increased water demand. Future estimates of the region's water budget predict an increasing shortfall in water supply. Developing in-stream groundwater recharge facility will increase groundwater recharge by an estimated 7,600 acre-feet per wet-year. This proposed project will improve the health and long-term sustainability of the basin, increase local groundwater supplies, and reduce the region's reliance on water imports.	Increase groundwater recharge by an estimated 7,600 acre-feet per wet-year Water supply (New Supply Created): 1,000+ AFY Water Quality – Area drained: 49 Sq. Mi.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WS: Stabilize groundwater levels FLD: Optimize balance between existing beneficial uses of stormwater and capturing stormwater for new uses CC: Mitigate against climate change.	
C	LACWD 40	**Project Name: Implement ET Controller Program** Sponsor: LACWD 40 Contact: Rea Joseph-Gonzalez Phone: 626-300-3338 Email:		**Conceptual**	**Y**	**Y**	**N**	Develop and implement an ET controller pilot program in the Antelope Valley Region that can be used as a model to a future mandatory program for new development. The pilot program will include the purchase and installation of (estimated) two weather stations in a selected residential development and replace (approximately) 300 manually adjusted irrigation controllers with weather-sensitive irrigation controllers for the District's qualified customers.	100 to 1,000 AFY conserved supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. CC: Mitigate against climate change	
C	LACWD 40	**Project Name: Ultra-Low Flush Toilet Change-out Program** Sponsor: LACWD 40 Contact: Rea Joseph-Gonzalez Phone: 626-300-3338 Email:		**Conceptual**	**Y**	**Y**	**N**	The ULFT Change Out Program would distribute ULFTs to customers through one-day Saturday toilet distributions. The one-day distributions provide single-family residents with up to two free ULFTs. This proposal provides one annual one-day distribution events over a three-year duration. Each one-day event will include up to 1,500 ULFTs for District No. 40 per year. This proposal is consistent with BMP No. 14, Residential ULFT Replacement Programs to replace existing highwater- using toilets with ultra-low flush (1.6 gallons or less) toilets for residential customers.	100 to 1,000 AFY conserved supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Flood Risk Management		0	0		$9,000,000							No			No
Conjunctive Management & Groundwater Flood Risk Management		0	0		$4,000,000							No			No
Urban Water Use Efficiency Urban Runoff Management Pollution Prevention		0	0												
Urban Water Use Efficiency		0	0												

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	LACWD 40	**Project Name: Waste Water Ordinance** Sponsor: LACWD 40 Contact: Rea Joseph-Gonzalez Phone: 626-300-3338 Email:		**Conceptual**	**Y**	**Y**	**N**	Develop a year-round conservation program as an enforceable ordinance to reduce the impacts of water demand during drought years. May include watering schedule ordinance, water waste ordinance, and landscape ordinance for new development.	Conserving supply, but more information required to quantify benefit.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. CC: Mitigate against climate change	
C	LACWD 40	**Project Name: Water Conservation School Education Program** Sponsor: LACWD 40 Contact: Rea Joseph-Gonzalez Phone: 626-300-3338 Email:		**Conceptual**	**Y**	**Y**	**N**	Develop and implement a school education program to promote water conservation awareness and encourage stewardship among school-age children (fourth grade). This program is consistent with BMP No. 8, School Education Program to promote water conservation and water conservation related benefits, including working with school districts and private schools with within the District's service area to provide instructional assistance, educational materials, and classroom presentations that identify urban, agricultural, and environmental issues and conditions in the local watershed.	Conserving supply, but more information required to quantify benefit.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. CC: Mitigate against climate change	
C	LACWD 40	**Project Name: Avenue K Transmission Main, Phases I-IV** Sponsor: LACWD 40 Contact: Sami Kabar Phone: (626) 300-3339 Email: skabar@dpw.lacounty.gov	Phase I: 10th St West to 5th St East Phase II: 5th St East to 20th St East Phase III: 20th St East to 30th St East Phase IV: 10th St West to 60th St West	**Conceptual**	**Y**	**Y**	**Y**	The project consists of four phases for a total of approximately 32,000 linear feet of 30-inch and 36-inch diameter steel transmission main. The proposed transmission main will have interconnections to the existing distribution system and will increase the capacity of the water system to meet the existing domestic and fire protection requirements.	Firms up existing supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC.	
C	LACWD 40	**Project Name: North Los Angeles/Kern County Regional Recycled Water Project - Phase 3** Sponsor: LACWD 40; City of Palmdale Contact: Carolina Hernandez Phone: (626) 300-3318 Email: chernandez@dpw.lacounty.gov		**Conceptual**	**Y**	**Y**	**Y**	The Los Angeles/Kern County Regional Recycled Water Project outlines the foundation of a regional recycled water system in the Antelope Valley Region. The proposed system would distribute recycled water throughout the service area and provide a backbone system that could accommodate minimum and maximum demands and allow significant deliveries of recycled water to recharge areas.	Water supply conveyed Offset Delta Water Reduce energy consumption/GHG		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Establish a contingency plan to meet water supply needs of the AV region during a plausible distruption of SWP deliveries WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Urban Water Use Efficiency		0	0												
Urban Water Use Efficiency		3	3										Yes		
Drinking water treatment and distribution Conveyance - Regional/local		0	0		Phase I: $3.66M Phase II: $3.65M										
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use		3	3										Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	LACWD 40	**Project Name: North Los Angeles/Kern County Regional Recycled Water Project - Phase 4** Sponsor: LACWD 40 Contact: Carolina Hernandez Phone: (626) 300-3318 Email: chernandez@dpw.lacounty.gov		**Conceptual**	**Y**	**Y**	**Y**	The Los Angeles/Kern County Regional Recycled Water Project outlines the foundation of a regional recycled water system in the Antelope Valley Region. The proposed system would distribute recycled water throughout the service area and provide a backbone system that could accommodate minimum and maximum demands and allow significant deliveries of recycled water to recharge areas.	Water supply conveyed Offset Delta Water Reduce energy consumption/GHG		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Exablish a contingency plan to meet water supply needs of the AV region during a plausible disruption of SWP deliveries WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	
C	LACWD 40	**Project Name: Avenue M and 62th Street West Tanks** Sponsor: LACWD 40 Contact: Julian Juarez Phone: 626-300-4693 Email:		**Conceptual**	**Y**	**y**	**Y**	This project would include the design and construction of four (4) 3 mgd water storage tanks.	Water supply, but more information required to quantify benefit.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC.	
C	Leona Valley Town Council	**Project Name: Precision Irrigation Control System** Sponsor: Leona Valley Town Council Contact: Peggy Fuller Phone: 661-270-0771 Email: pfuller@leonavalleytc.org		**Conceptual**	**Y**	**Y**	**N**	The project is a proposed irrigation control system using electronic sensor probes at root level. Sensors relay data to a computer which controls irrigation valves, delivering a precise amount of water and effectively eliminating over-irrigation.	More than 150 AFY of conserved supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use		3	3										Yes		
Drinking water treatment and distribution Conveyance - regional/local		0	0		$4 M										
Urban Water Use Efficiency Urban Runoff Management Pollution Prevention		0	0												

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	Leona Valley Town Council	**Project Name: Stormwater Harvesting** Sponsor: Leona Valley Town Council Contact: Peggy Fuller Phone: 661-270-0771 Email: pfuller@leonavalleytc.org		**Conceptual**	**Y**	**Y**	**N**	This project includes the construction of stormwater collection of conveyance facilities, water filtration devices, and cisterns and collection tanks. Through advanced filtration methods, this project can also be expanded to create potable water for residential uses.	Once fully implemented, it is estimated that water conservation of up to 25 AFY could be realized. Improve flood management Improve water quality by reducing contaminants going into creeks		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Protect and maintain natural streams and recharge areas FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. FLD: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses CC: Mitigate against climate change	
C	North Edwards WD	**Project Name: Arsenic Contamination Project** Sponsor: North Edwards WD Contact: Dollie Kostopoulos Phone: (760) 769-4520 Email: dlcsd@ccis.com		**Conceptual**	**Y**	**N**	**N**					
C	Palmdale Water District	**Project Name: ET Based Controller Program** Sponsor: Palmdale Water District Contact: Matt Knudson Phone: (661) 456-1018 Email: mknudson@palmdalewater.org		**Conceptual**	**Y**	**Y**	**N**	This project involves the installation of ET-based irrigation controllers for landscaped areas. This project can assist water purveyors in the Antelope Valley Region in meeting BMPs for water use efficiency and will reduce runoff from over watering of landscaped areas.	Approximately 240 AFY of supply conserved if used on 14 large landscape users in PWD's service area.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water. CC: Mitigate against climate change	
C	Palmdale Water District	**Project Name: New PWD Treatment Plant** Sponsor: PWD Sponsor: Palmdale Water District Contact: Matt Knudson Phone: (661) 456-1018 Email: mknudson@palmdalewater.org		**Conceptual**	**Y**	**Y**	**Y**	This project involves the construction of a new water treatment plant at 47th Street East and the California Aqueduct, for the treatment of SWP and Littlerock Reservoir water. The initial capacity of the plant will be 10 mgd.	The new plant would be capable of treating up to 10 mgd of imported water Littlerock water.		WQ: Provide drinking water that meets regulatory requirements and customer expectations.	
C	QHWD	**Project Name: QHWD Partial Well Abandonment** Sponsor: QHWD Contact: Chad Reed Phone: 661-943-3170 Email: creed@qhwd.org		**Conceptual**	**Y**	**Y**	**N**	This project will pull the pump from the well located on West Avenue L in Lancaster and "microgrout" the region of strata that contains higher levels of arsenic. Doing so will localize these regions of strata using a cost-effective, non-treatment method.	Prevents loss of groundwater pumping and existing supply and ensures water quality that meets		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Provide drinking water that meets regulatory requirements and customer expectations WQ: Protect and maintain aquifers CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Urban Water Use Efficiency Urban Runoff Mgmt Improve Flood Management Matching Water Quality to Use Pollution Prevention Watershed Management		0	0												
			0		$1,100,000										Yes
Urban Water Use Efficiency Urban Runoff Management Pollution Prevention		3	3										Yes		
Drinking Water Treatment and Distribution		3	3		25 million	$2,240,000/year	No	2020	PWD funds, SRF loans	Palmdale Water District Strategic Water Resources Plan, 2010 Palmdale Water District Strategic Water Resources Plan: Alternatives Analysis TM, 2010	This project can be integrated with other projects that acquire additional imported water.	None	The project would provide supplies regionally, including to DACs.	None	
Drinking water treatment and distribution Pollution Prevention		0	0												Yes

Status I = Implementation C = Conceptual	Sponsor	General Information	Project Location (1) Description of location (2) Lat & Long	Scoring Criteria Implementation/Conceptual Study/Report	General Info Y or N	Description Y or N	Location Y or N	Project Description	Project Benefits Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	IRWMP Objectives Objectives 1 point each	Objs Score
C	Road Maintenance Division (LACDPW)	**Project Name: Build a bridge at the existing dip crossing of Mt. Emma Road @ Littlerock Creek** Sponsor: Road Maintenance Division (LACDPW) Contact: Mark Caddick Phone: (661) 947-7173 Email: mcaddick@dpw.lacounty.gov	Mt. Emma Road @ Littlerock Creek	**Conceptual**				When it floods the Road Division has to close the gates, which creates a substantial detour for Mt. Emma traffic.	Flood Management		FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water.	
C	Road Maintenance Division (LACDPW)	**Project Name: Flooding issues Avenue P-8, between 160th and 170th Street East** Sponsor: Road Maintenance Division (LACDPW) Contact: Mark Caddick Phone: (661) 947-7173 Email: mcaddick@dpw.lacounty.gov	Avenue P-8, between 160th and 170th Street East	**Conceptual**				Road Maintenance Division is in the process of acquiring drainage easements to relieve flooding to multiple private properties.	Flood Management		FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water.	
C	Road Maintenance Division (LACDPW)	**Project Name: Flooding issues Avenue W, near 133rd Street East** Sponsor: Road Maintenance Division (LACDPW) Contact: Mark Caddick Phone: (661) 947-7173 Email: mcaddick@dpw.lacounty.gov	Avenue W, near 133rd Street East	**Conceptual**				There are several unmet drainage needs in Lake LA on private properties, specifically on Avenue W, near 133rd Street East.	Flood Management		FLD: Reduce negative impacts of stormwater, urban runoff, and nuisance water.	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Flood Risk Management			0												
Flood Risk Management			0												
Flood Risk Management			0												

Status I = Implementation C = Conceptual	Sponsor	General Information	Project Location (1) Description of location (2) Lat & Long	Scoring Criteria Implementation/Conceptual Study/Report	General Info Y or N	Description Y or N	Location Y or N	Project Description	Project Benefits Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	IRWMP Objectives Objectives 1 point each	Objs Score
C	Rosamond CSD	**Project Name: Purchasing Spreading Basin Land** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**N**	**Y**	**N**	Purchase water spreading basins land in West Kern County from Avenue A to Rosamond B.	Supply benefit, but more information required to quantify benefit.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WS: Estab. A plan to meet supply needs of AV during a disruption of SWP deliveries. WS: Stabilize groundwater levels	
C	Rosamond CSD	**Project Name: Gaskell Road Pipeline** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**N**	**Y**	**Y**	Construct and operate a 30-inch diameter potable water pipeline on Gaskell Road, in Southeast Kern County, from 60th Street West to 140th Street West, with pumps, valves, meters, telemetry and remote controls from a centralized SCADA control point in Rosamond Community Services District's Operational Center.	100 to 1,000 AF supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC.	
C	Rosamond CSD	**Project Name: KC & LAC Interconnection Pipeline** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**N**	**Y**	**N**	Place 36-inch piping between RCSD and Los Angeles County at Avenue A at 20th and 60th Streets West. Place piping north and south on 20th Street and 60th Street to existing recycled water pipelines.	Supply benefit, but more information required to quantify benefit.		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Maximize beneficial use of recycled water CC: Mitigate against climate change	
C	Rosamond CSD	**Project Name: Place Values and Turnouts on Reclaimed Water Pipeline** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**Y**	**Y**	**N**	Place various required turnouts, remove controlled valves, treatment stations, other control features to move water around.	100 to 1,000 AFY supply		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Maximize beneficial use of recycled water CC: Mitigate against climate change	
C	Rosamond CSD	**Project Name: RCSD Wastewater Pipeline** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**Y**	**Y**	**N**	This project would include placing a 36-inch wastewater pipeline from LACSD to RCSD's WWTP. The total distance would be approximately 15 miles.	Increases potential users of recycled water		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Maximize beneficial use of recycled water CC: Mitigate against climate change	
C	Rosamond CSD	**Project Name: Tropico Park Pipeline Project** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**N**	**Y**	**Y**	Place 16-inch recycled water pipeline from Gaskell Road north to Tropico regional Park area.	Potable water offset		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC. WQ: Maximize beneficial use of recycled water LU: Meet growing demand for recreational space CC: Mitigate against climate change	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater Recharge Areas Protection		0	0												
Conveyance - Regional/local		0	0												
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use		0	0												
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use		0	0												
Conveyance - Regional/local Recycled Municipal Water Matching Water Quality to Use		0	0												
Conveyance-Regional/local Recycled Municipal Water Matching Water Quality to Use		3	3										Yes		

Status	Sponsor	General Information	Project Location	Scoring Criteria	General Info	Description	Location	Project Description	Project Benefits		IRWMP Objectives	
I = Implementation C = Conceptual			(1) Description of location (2) Lat & Long	Implementation/Conceptual Study/Report	Y or N	Y or N	Y or N		Benefits (3=good justification; 2=fair justification; 1=poor justification)	Benefits score	Objectives 1 point each	Objs Score
C	Rosamond CSD	**Project Name: Deep Wells to Recapture Banked Water** Sponsor: RCSD Contact: Phone: Email:		**Conceptual**	**N**	**Y**	**N**	Drill and equip 6 deep wells between Avenue A and Rosamond Blvd. 70th to 140th Street West.	Supply benefit, but more information required to quantify benefit		WS: Provide reliable supply to meet AV's expected demand between now and 2035, and help to adapt to CC.	

Resource Management Strategies		DAC Benefits	Total Score	Complete?	Estimated Project Capital Costs	Estimated O&M Costs	Has a cost estimate been prepared?	Estimated years of construction & start-up	Potential funding / financing sources	Technical Feasibility	Additional Project Information				
Strategies (1 per Resource Management Strategy)	RMS Score	Score (0 = no; 3 = yes)		Y = Yes							Strategic Considerations	Climate Change Benefits	DAC Benefits	Tribal Benefits	EJ issues
Conjunctive Management & Groundwater			0		$16,302,100				CDPH Grant						

Appendix L: IRWM Grant Program Guidelines, Appendix H – Plan Review Process Cross-Reference Table

Page Intentionally Left Blank

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Governance			
The name of the RWMG responsible for implementation of the Plan.	Executive Summary	Section 1	1-2
A description of the IRWM governance structure	Section 8.2.2	Section 8.2	8-2 to 8-8
• Public outreach and involvement processes	Section 8.2	Section 1.2 Section 8.2.1	1-6 to 1-21 8-4 to 8-5
• Effective decision making	Section 8.2.2	Section 8.2.2	8-5
• Balanced access and opportunity for participation in the IRWM process	Section 8.2.2	Section 8.2.3	8-5
• Effective communication – both internal and external to the IRWM region	Sections 8.2.3 and 8.2.4 (these were recommendations)	Section 1.2.3 Section 8.2.4	1-15 8-7
• Long term implementation of the IRWM Plan	Section 8.2	Section 8.2.5	8-7
• Coordination with neighboring IRWM efforts and State and federal agencies	Section 8.2.4 (recommendations)	Section 8.2.6	8-7 to 8-8
• The collaborative process(es) used to establish plan objectives	Section 8.2.3	Sections 1.2, 1.3 Section 4.1	1-6 to 1-28 4-1 to 4-4
• How interim changes and formal changes to the IRWM Plan will be performed	Section 8.2.4	Section 1.3.2 Section 8.2.7	1-24 to 1-25 8-8
• Updating or amending the IRWM Plan	Section 8.2.4	Section 1.3.2 Section 8.2.7	1-24 to 1-25 8-8
• Publish NOI to prepare/update the plan; adopt the plan in a public meeting	N/A	Section 1.2.3 Section 1.3.2	1-15 1-25
Region Description			

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
If applicable, describe and explain how the plan will help reduce dependence on the Delta supply regionally	Section 6.1.1	Section 6.1 (all water supply measures help to reduce dependence)	6-2 to 6-13
Describe watersheds and water systems	Section 2	Sections 2.3 to 2.5 Section 3.4	See below
• Hydrology	Section 2.4.1	Sections 2.3 to 2.4 Figs. 2-5 to 2-12	2-4 to 2-19
• Groundwater	Section 2.4.2	Section 2.4.2 Figs. 2-11 to 2-13	2-21 to 2-26
• Vegetation	Section 3.4.1	Section 3.4	3-50 to 3-53
• Species	Section 3.4.2	Section 3.4	3-53 to 3-54
• Habitats of special concern	Section 3.4.1	Section 3.4	3-50 to 3-52
• Management issues (e.g. invasive species)	Section 3.4.2	Section 3.4	3-53 to 3-54
• Climate change	Section 3.1.9.6	Section 2.8 Section 3.6	2-41 to 2-43 3-58 to 3-60

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Describe internal boundaries *(includes the boundaries of municipalities, service areas of individual water, wastewater, flood control districts, and land use agencies. The description should also include those not involved in the Plan (i.e. groundwater basin boundaries, watershed boundaries, county, State, and international boundaries).*	Section 1.2 (water districts) Figure 2-1 (service districts) Figure 2-2 (cities, special districts) Figure 2-7 (watershed boundaries) Section 2.4.2, Figure 2-10 (groundwater) Section 2.5, Figure 2-11 (land use)	Section 2.2 Figure 2-3 Section 2.2 Figure 2-4 Secs. 2.2 and 2.7 Figure 2-4 Section 2.4 Figure 2-9 Section 2.4.2 Figs. 2-11 to 2-13 Section 2.5 Figure 2-14 Section 2.5.1 Figure 2-4 (Flood Control)	2-4 and 2-7 2-4 and 2-8 2-4 and 2-8 2-11 to 2-16 2-21 to 2-26 2-27 to 2-35 2-8 and 2-31
Description of <u>water supplies and demands</u> for a minimum 20-year planning horizon.	Section 3.1	Section 3.1	3-1 to 3-40
Describe water quality conditions	Section 3.2	Section 3.2	3-41 to 3-46

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Describe social and cultural makeup	Sections 1.2.4 (DAC identification), 2.6 and 2.7	Section 1.2.4 Figure 1-2 Secs. 2.8 to 2.10	1-16 to 1-21 2-32 to 2-40
Describe major water-related objectives and conflicts	Section 3.1.9, 3.2.5, 3.3.1, 3.4.2	Section 3.1.9 Section 3.2.5 Section 3.3.1 Section 3.4.1 Section 3.5.1	3-34 to 3-40 3-44 to 3-45 3-47 to 3-50 3-53 to 3-54 3-55 to 3-58
Explain how the IRWM regional boundary was determined and why the region is an appropriate area for IRWM planning.	Section 2.1	Section 1.1 Figure 1-1 Section 2.1 Figs. 2-1 and 2-2	1-3 to 1-5 2-1 to 2-4
Describe neighboring and/or overlapping IRWM efforts	Section 2.2	Section 2.2 Figs. 2-1 and 2-2 Section 8.2.6	2-2 to 2-4 8-7 to 8-8
Define maximum opportunities for integration of water management activities	Section 6	Section 5.8 Section 6 Section 8	5-17 to 5-26 6-1 to 6-26 8-1 to 8-35
Objectives			

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Determine the IRWM Plan objectives: Minimum requirements on p. 41 of Guidelines. All IRWM Plans shall address all of the following:	Section 4	Sections 4.1 to 4.7	
• Protection and improvement of water supply reliability, including identification of feasible agricultural and urban water use efficiency strategies		Table 4-1 Section 4.2	4-3 4-5 to 4-6
• Identification and consideration of the drinking water quality of communities within the area of the Plan.		Table 4-1 Section 4.3	4-3 to 4-4 4-7
• Protection and improvement of water quality within the area of the Plan consistent with relevant Basin Plan.		Table 4-1 Section 4.3	4-3 to 4-4 4-7 to 4-9
• Identification of any significant threats to groundwater resources from overdrafting.		Table 4-1 Section 4.3	4-3 4-6
• Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region.		Table 4-1 Section 4.5	4-4 4-10 to 4-12
• Protection of groundwater resources from contamination.		Table 4-1 Section 4.3 Section 1.2.4.1	4-4 4-8 1-17 to 1-18
• Identification and consideration of water-related needs of disadvantaged communities in the area within the boundaries of the Plan.		Section 2.14 Section 3.7 Appendix D (2.1.2 and 2.1.3 Final Draft TMs)	2-37 3-63

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Describe the collaborative process and tools used to establish objectives: • How the objectives were developed • What information was considered (i.e., water management or local land use plans, etc.) • What groups were involved in the process • How the final decision was made and accepted by the IRWM effort	Section 4.1	Section 4.1	4-1 to 4-3
Identify quantitative or qualitative metrics and measureable objectives: Objectives must be measurable – there must be some metric the IRWM region can use to determine if the objective is being met as the IRWM Plan is implemented. Neither quantitative nor qualitative metrics are considered inherently better.	Section 4.2	Section 4.1 Table 4-1 Sections 4.2 to 4.7	4-1 to 4-4 4-3 4-5 to 4-15
Explain how objectives are prioritized or reason why the objectives are not prioritized.	N/A	Section 4.1	4-2
Reference specific overall goals for the region: RWMGs may choose to use goals as an additional layer for organizing and prioritizing objectives, or they may choose to not use the term at all.	Section 4.1	Section 4.1	4-1 to 4-2
Resource Management Strategies			
Identify RMS incorporated in the IRWM Plan: Consider all RMS criteria (29) listed in Table 3 from the CWP Update 2009	Section 5	Section 5.1 Secs. 5.2 to 5.7 Section 5.8	5-1 to 5-6 5-7 to 5-17 5-17 to 5-26
Consider climate change effects on the IRWM region must be factored into RMS	Section 5	Section 5.7	5-16 to 5-17

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Address which RMS will be implemented in achieving IRWM Plan Objectives	Section 5	Secs. 5.2 to 5.7	5-7 to 5-17
Integration			
Contains structure and processes for developing and fostering integration: • Stakeholder/institutional • Resource • Project implementation	Section 6	Secs. 6.1 to 6.6 Section 8	6-1 to 6-26 8-1 to 8-35
Project Review Process			
Process for projects included in IRWM plan must address 3 components: • Procedures for submitting projects • Procedures for reviewing projects • Procedures for communicating lists of selected projects	Section 5.1.2 Section 7.3 Section 7.3	Section 7.1 Section 7.2 Section 7.3	7-1 to 7-6 7-6 to 7-8 7-9
Address how the project contributes to plan objectives	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address how project is related to Resource Management Strategies	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address the project technical feasibility	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Address specific benefits to DAC issues	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address Environmental Justice considerations	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address project cost and financing	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address economic feasibility through economic analysis	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address project status	Section 7.3	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Consider strategic implementation of plan and project merit	Section 7	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Consider effects of Climate Change in the region	Section 3.1.9.6	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Contribution of project in reducing GHGs compared to project alternatives	Section 3.1.9.6	Secs. 7.1 to 7.2 Table 7-1 Appendix J	7-1 to 7-8 7-8
Address if project proponents have or will adopt the IRWM plan	N/A	Section 7.1 (Implementation) Section 8.2.5	7-3 8-7

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Address how the projects will reduce dependence on Delta supply	N/A	Section 7.4	7-9 to 7-13
Impact and Benefit			
Discuss potential impacts and benefits of plan implementation within IRWM regions, between regions, with DAC/EJ concerns and Native American Tribal communities.	Section 7	Section 5.8 Tables 5-3 to 5-8	5-17 to 5-26
State when a more detailed project-specific impact and benefit analysis will occur (prior to any implementation activity)	N/A	Section 5.8	5-17
Review and update the impacts and benefits section of the plan as part of the normal plan management activities	Section 8.6	Section 5.8	5-17
Plan Performance and Monitoring			
Contain performance measures and monitoring methods to ensure that IRWM objectives are met.	Section 8.5	Section 8.6	8-20 to 8-35
Describe a method for evaluating and monitoring the RWMG's ability to meet the objectives and implement projects.	Section 8.5	Secs. 8.6 and 8.7	8-20 to 8-35
Data Management			
Describe data needs within region	Section 8.5.2	Section 8.4.2	8-14
Describe typical data collection technique	Section 8.4	Section 8.4.1 Section 8.4.3	8-13 to 8-14 8-14 to 8-15
Describe stakeholders contributions to data	Section 8.4	Section 8.4.1 Section 8.4.3 Section 8.5	8-13 to 8-14 8-14 to 8-15 8-16 to 8-19
Describe entity responsible for maintaining data	Section 8.4.1	Section 8.4.1 (AVSWCA)	8-13
Describe QA/QC measures for data	Section 8.4.1	Section 8.4.4	8-16

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Explain how data collected will be shared	Section 8.4.1	Section 8.4.1	8-13
Explain how the Data Management System supports the efforts to share collected data	Section 8.4	Section 8.4.1	8-13 to 8-14
Outline how data will be compatible with the state systems	Section 8.4.4	Section 8.4.4	8-15 to 8-16
Finance			
Include a plan for implementation and financing of identified projects and programs including the following:	Section 8.3.4 Table 8-5	Section 8.3	8-8 to 8-12
List known, as well as, possible funding sources, programs, and grant opportunities for the development and ongoing funding of the IRWM Plan.	Section 8.3.4 Table 8-4	Section 8.3.1	8-9 to 8-10
List the funding mechanisms, including water enterprise funds, rate structures, and private financing options, for projects that implement the IRWM Plan.	Secs. 8.3.3 & 8.3.4	Section 8.3.1	8-9 to 8-10
An explanation of the certainty and longevity of known or potential funding for the IRWM Plan and projects that implement the Plan.	Secs. 8.3.3 & 8.3.4	Section 8.3.2 Table 8-2	8-10
An explanation of how operation and maintenance (O&M) costs for projects that implement the IRWM Plan would be covered and the certainty of operation and maintenance funding.	N/A	Section 8.3 Table 8-2 Appendix K	8-9 to 8-12
Technical Analysis			
Document the data and technical analyses that were used in the development of the plan.	Section 8.5.1	Section 8.5 Table 8-3 Appendix K	8-16 to 8-19

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Relation to Local Water Planning			
Identify a list of local water plans used in the IRWM plan	Section 8.1.2 Section 8.1.3 Table 8-2	Section 8.1.1 Table 8-1	8-1 to 8-3
Discuss how the plan relates to these other planning documents and programs	Section 8.1.2 Section 8.1.3 Table 8-2	Section 8.1.1 Table 8-1	8-1 to 8-3
Describe the dynamics between the IRWM plan and other planning documents	Section 8.1.2 Section 8.1.3 Table 8-2	Section 8.1.1	8-1 to 8-2
Describe how the RWMG will coordinate its water mgmt planning activities	Section 8.2	Section 8.2	8-2 to 8-8
Relation to Local Land Use Planning			
Document current relationship between local land use planning, regional water issues, and water management objectives.	Section 1	Section 8.1.1 Table 8-1	8-1 to 8-3
Document future plans to further a collaborative, proactive relationship between land use planners and water managers.	Section 1	Section 8.1.1 Table 8-1	8-1 to 8-3
Stakeholder Involvement			
Contain a public process that provides outreach and an opportunity to participate in IRWM plan	Sections 1 and 8	Section 1.2 Section 8.2	1-6 to 1-21 8-2 to 8-8
Identify process to involve and facilitate stakeholders during development and implementation of plan regardless of ability to pay; include barriers to involvement	Section 1.2.3, 1.2.4	Section 1.2 Section 8.2	1-6 to 1-21 8-2 to 8-8
Discuss involvement of DACs and tribal communities	Section 1.2.4	Section 1.2 Section 8.2	1-6 to 1-21 8-2 to 8-8

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Describe decision making process and roles that stakeholders can occupy	Section 1.2	Section 1.2 Section 8.2	1-6 to 1-21 8-2 to 8-8
Discuss how stakeholders are necessary to address objectives and RMS	Section 1.2 Section 8	Section 1.2 Section 8.2	1-6 to 1-21 8-2 to 8-8
Discuss how a collaborative process will engage a balance in interest groups	Section 8	Section 1.2 Section 8.2	1-6 to 1-21 8-2 to 8-8
Coordination			
Identify the process to coordinate water management projects and activities of participating local agencies and stakeholders to avoid conflicts and take advantage of efficiencies	Section 1 Section 6	Section 1.2.2	1-12 to 1-15
Identify neighboring IRWM efforts and ways to cooperate	N/A	Section 2.2 Section 8.2.6	2-2 to 2-4 8-7 to 8-8
Identify areas where a State agency can assist in communication or cooperation	N/A	Section 1.2.2.4 Section 1.2.2.5 Section 8.2.6	1-13 1-13 to 1-14 8-7 to 8-8
Climate Change			
Evaluate vulnerabilities to climate change and potential adaptation responses based on vulnerabilities assessment in the DWR Climate Change Handbook for Regional Water Planning	N/A	Section 2.11 Section 3.6 Section 5.2	2-41 to 2-43 3-58 to 3-60 5-7 to 5-8
Provide a process that considers GHG emissions when choosing between project alternatives.	N/A	Section 7.1 Section 7.2 Table 7-1	7-4 to 7-5 7-6 to 7-8
Include a list of prioritized vulnerabilities based on the vulnerability assessment and the IRWM's decision making process.	N/A	Section 3.6.2 Table 3-19	3-59 to 3-60

IRWM Grant Program Guidelines, Appendix H - Plan Review Process Requirement:	Section in 2007 IRWMP	Section in 2013 IRWMP	Page Numbers in 2013 IRWMP
Contain a plan, program, or methodology for further data gathering and analysis of prioritized vulnerabilities.	N/A	Section 3.6.2 Section 8.6.1 Table 8-4 Section 8.7	3-61 to 3-62 8-24 8-32 8-35
Include climate change as part of the project review process	N/A	Section 7.1 Section 7.2 Table 7-1	7-4 to 7-5 7-6 to 7-8

Page Intentionally Left Blank