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

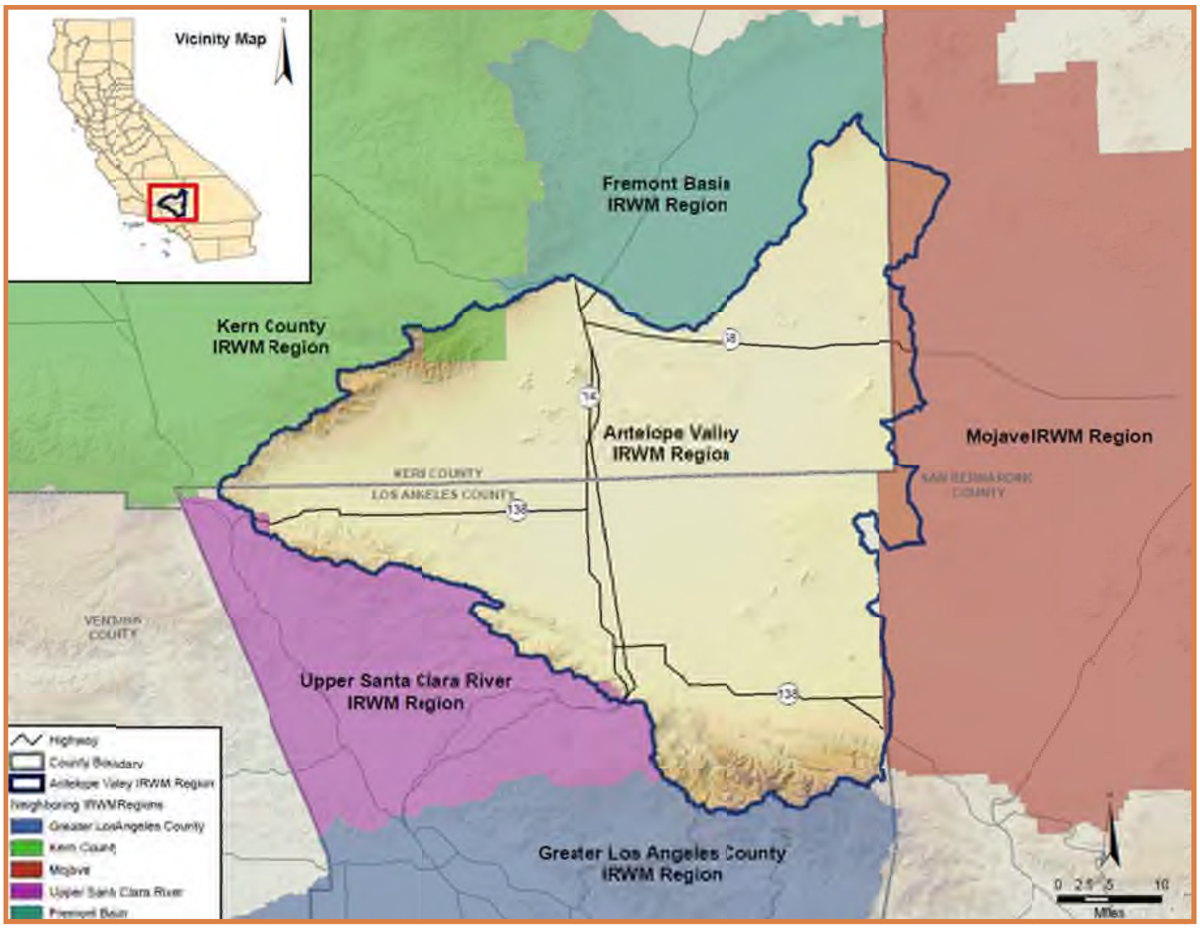

Figure 2-2: DWR IRWM Funding Areas

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(°F)[b]	58.5	62.1	67.4	74.0	81.9	90.2
Average Min Temperature (°F)[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(°F)[b]	97.6	96.9	91.4	80.2	67.3	58.7	77.2
Average Min Temperature (°F)[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.

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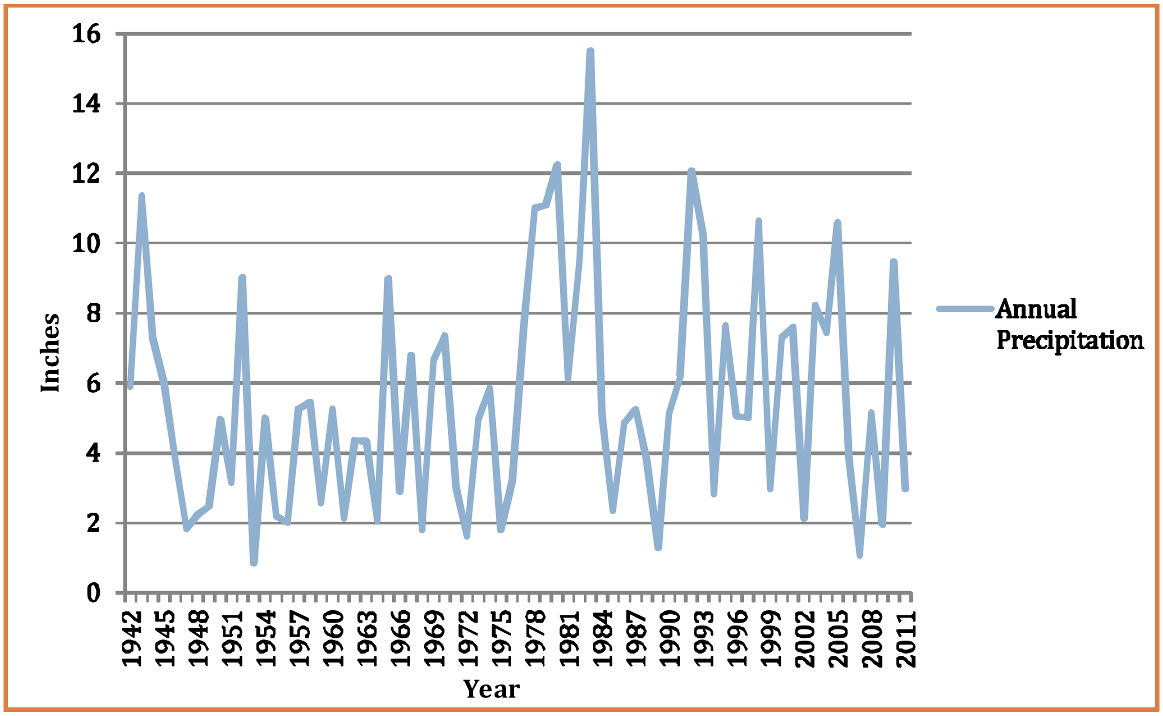
Figure 2-3: Antelope Valley Service Districts

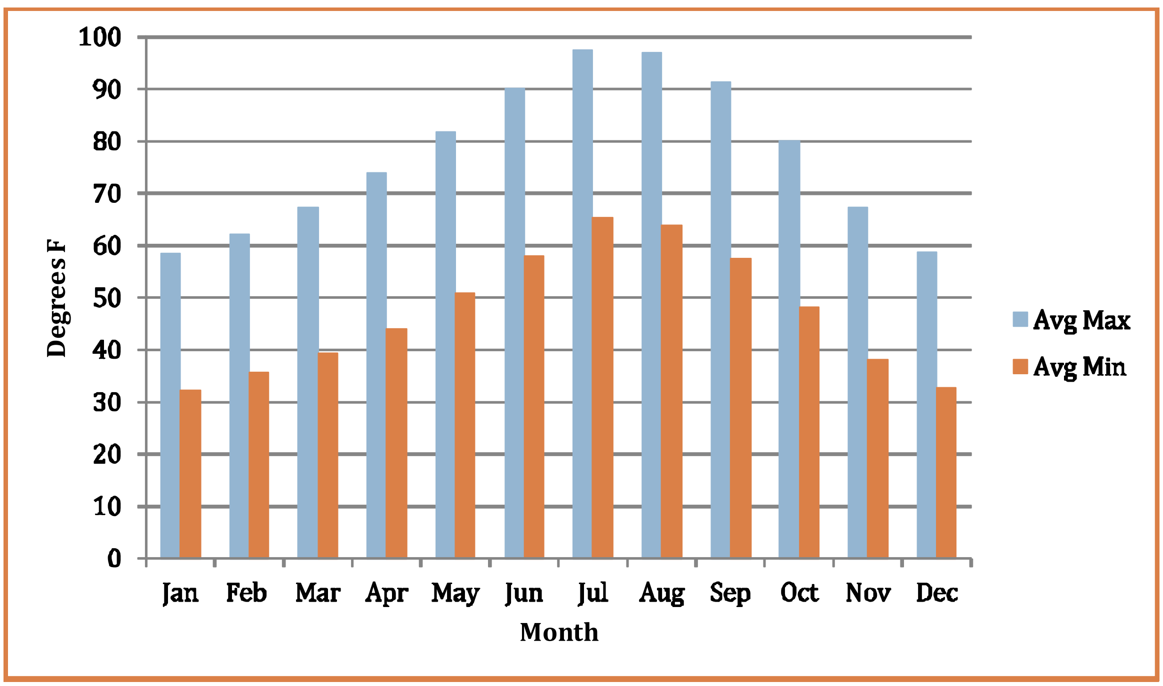
Figure 2-4: Antelope Valley City Boundaries and Special Districts

Figure 2-5: Annual Precipitation



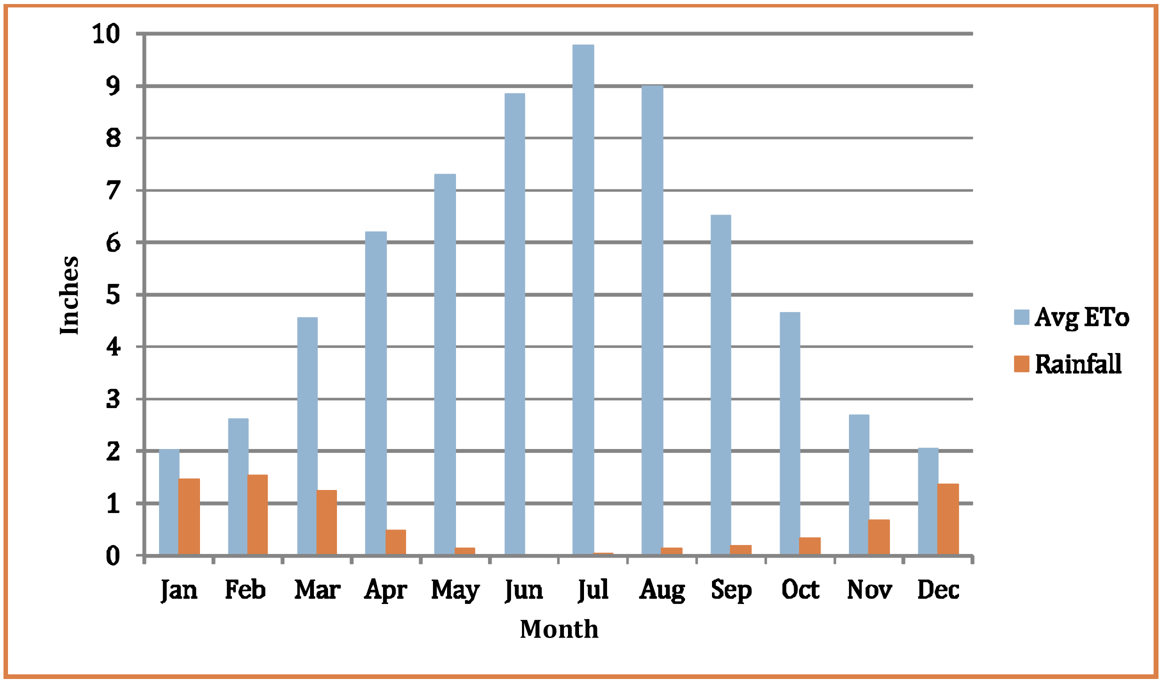
Source: 1942-2011 EAFB

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



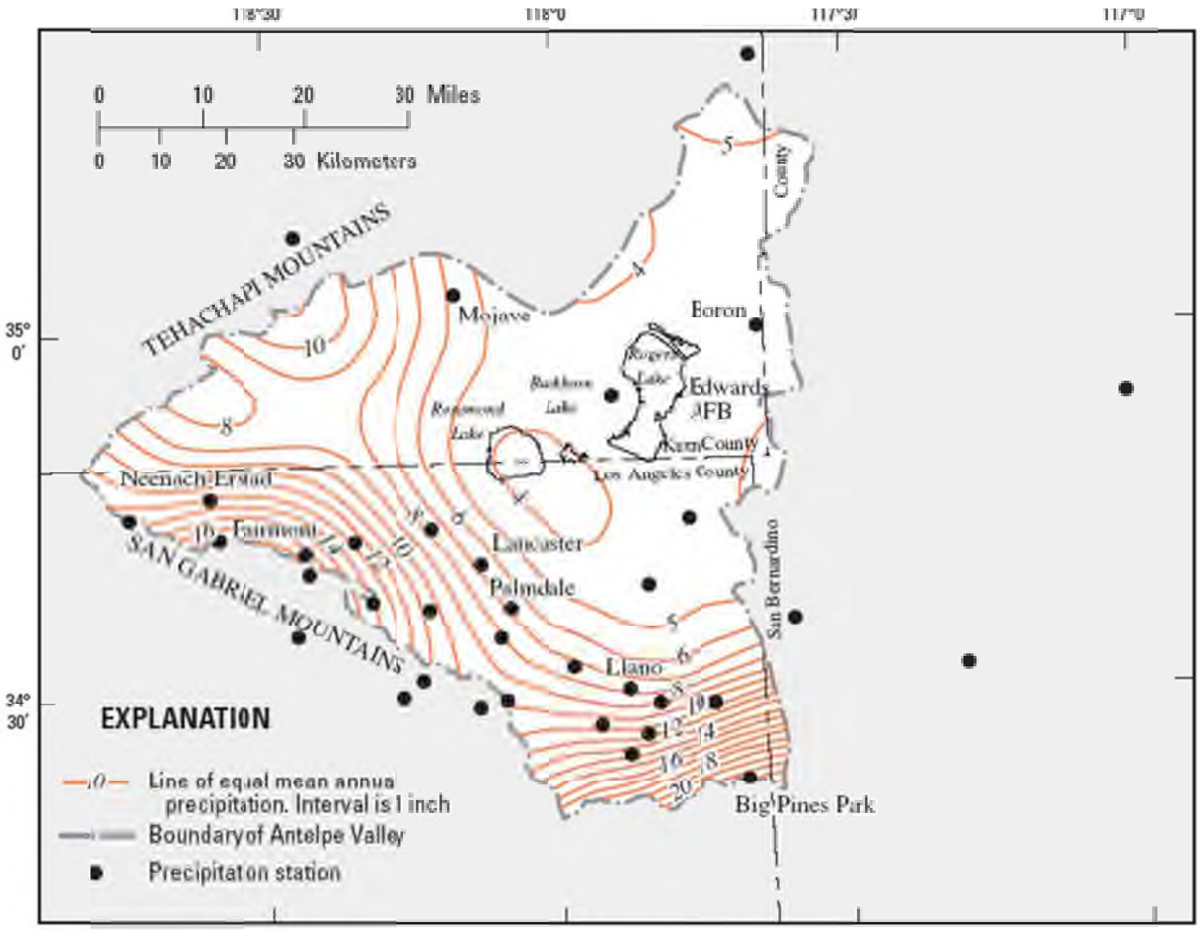
Source: Western Regional Climate Center, Palmdale Station (046624) for the Years 1903 to 2012.

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.

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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

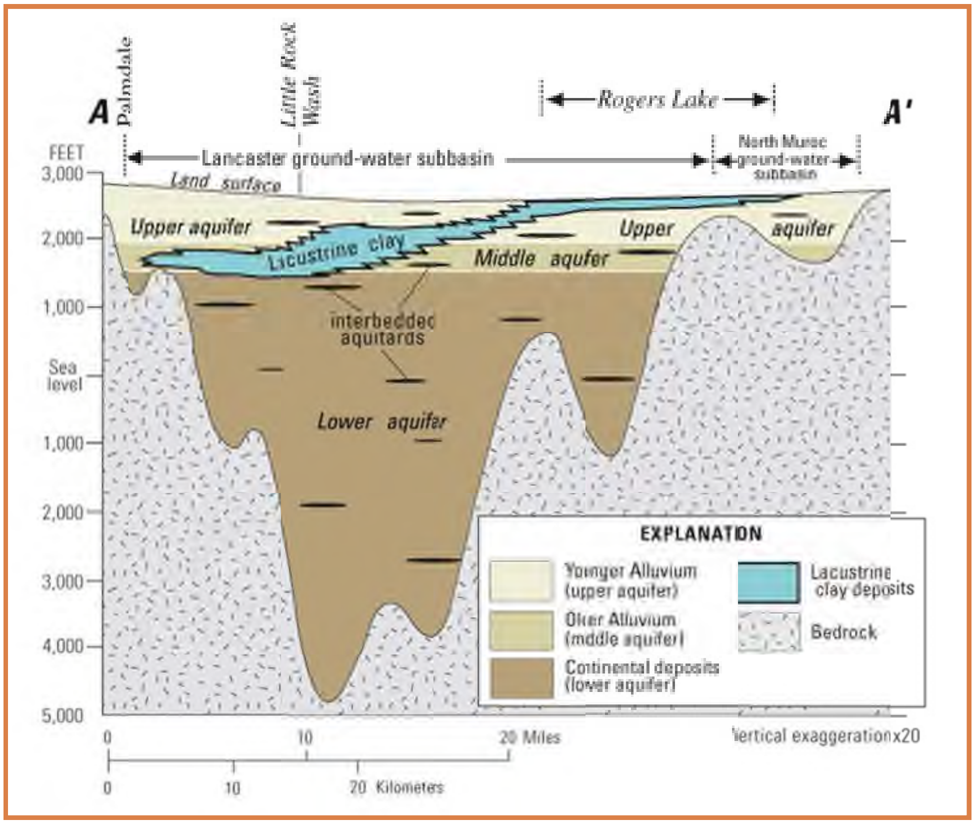
Surface water from the surrounding hills and from the Antelope Valley Region floor flows primarily toward the three dry lakes on EAFB. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley Region from the surrounding mountains, quickly percolates into the 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.

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Figure 2-12: Antelope Valley Soils Map

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