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Final Facilities Planning Report, Antelope Valley Recycled Water Project

8 August 2006

Prepared for

Los Angeles County Waterworks District No. 40
900 South Fremont Avenue
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K/J Project No. 0589030

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List of Abbreviations

AACE - American Association of Cost Engineers

AAD – Average Annual Demand

ADD – Average daily demand

Acre-feet – AF

AFY – AF per year

AMD – average monthly demand

APN – Assessors Parcel Number

ASR – Aquifer Storage and Recovery

AVEK – Antelope Valley-East Kern Water Agency

AVFPR – Antelope Valley Facilities Planning Report

AVTTP – Antelope Valley Tertiary Treatment Plant

BMP – Best management practices

BOD – Biochemical Oxygen Demand

CalTrans Right-of-Way – California Department of Transportation Right-of-Way

CAO – Cleanup And Abatement Order

CAS – conventional activated sludge

CDO – Cleanup and Desist Order

CEQA – California Environmental Quality Act

cfs – cubic feet per second

CIMIS – California Irrigation Management Information System

CIP – capital improvement program

CSDLAS – County Sanitation Districts of Los Angeles County

CUWCC – California Urban Water Conservation Council

DFG – California Department of Fish and Game

DHS – California Department of Health Services

District No. 14 – Los Angeles County Sanitation District No. 14

District No. 20 – Los Angeles County Sanitation District No. 20

DWR – State Department of Water Resources

EAFB – Edwards Air Force Base

EDU – Equivalent Dwelling Unit

ENR – Engineering News-Record

EPA – Environmental Protection Agency

GIS – Geographic Information System

GPM – Gallons per minute

GWMP – Groundwater Management Plan

HCF – Hundred Cubic Feet

HDPE – High Density Polyethylene

HGL – hydraulic grade line

HOA – Homeowners Association

IS/MND – Initial Study/Mitigated Negative Declaration

LACWW40 – Los Angeles County Waterworks District No. 40

LAWA – Los Angeles World Airports

LCID – Littlerock Creek Irrigation District

LLUP Map – Local Land Use Planning Map

LWRP – Lancaster Water Reclamation Plant

MG – Million gallons

mgd – Million gallons per day

mg/l – Milligrams per liter

MOU – Memorandum of Understanding

MPN – Maximum probable number

NPDES – National Pollutant Discharge Elimination Systems

O&M – Operational and Maintenance

PDD – Peak Day Demand

PHD – Peak Hour Demand

PID – Palmdale Irrigation District

PWD – Palmdale Water District

PWRP – Palmdale Water Reclamation Plant

ppm – Parts per million

Purple Book – Excerpts from The Heath and Safety Code, Water Code, and Titles 22 and 17 of the California Code of Regulations

QHWD – Quartz Hill Water District

RCSD – Rosamond Community Services District

RW – Recycled Water

RWQCB-LR – Regional Water Quality Control Board, Lahontan Region

RWWTP – Rosamond Wastewater Treatment Plant

RWQCB – Regional Water Quality Control Board

SCAG – Southern California Association of Governments

SWP – State Water Project

SWRCB – State Water Resources Control Board

SWTR – Surface Water Treatment Rule

TDS – Total Dissolved Solids

TSS – Total Suspended Solids

Units – hundred cubic feet (HCF)

USBR – U.S. Bureau of Reclamation

USGS – U.S. Geological Survey

UV – Ultraviolet

UWMP – Urban Water Management Plan

WDR – Waste Discharge Permit

WQO – Water Quality Objectives

WRF – Water Reclamation Facility

WSA – Water Supply Assessment

WTP – Water Treatment Plant

WWMP – Wastewater Master Plan

WWTP – Wastewater Treatment Plant

Section 1: Executive Summary

1.1 Overview

Los Angeles County Waterworks District No. 40 (LACWW40) prepared this Antelope Valley Facilities Planning Report (AVFPR) to apply for financial assistance from the State Water Resources Control Board (SWRCB) Proposition 50 Recycled Water Construction Grants program. This report is written in accordance with the SWRCB Recycled Water Funding Guidelines (Guidelines).

As described in the Guidelines, the AVFPR gives background information of the study area (Section 2), water supply (Section 3), and wastewater supply (Section 4); provides requirements for treatment (Section 5); provides a market assessment of potential recycled water users (Section 6); develops and evaluates alternatives for delivering recycled water (Section 7); recommends an alternative and gives reasoning for the preferred alternative (Section 8); and presents a construction financing plan and revenue program (Section 9).

1.2 Benefits of the Recycled Water Facilities Plan

If implemented, this project will generate many benefits, which include:

- Saving a significant amount of potable water currently provided either by local groundwater, local surface water or from imported State Water Project (SWP);
- Potential to provide water for recharging the Antelope Valley's groundwater basin;
- Saving money that is currently being spent for potable water;
- Providing a valuable alternative for effluent management; and
- Promoting the State's policies of beneficial reuse of recycled water to replace potable water where possible.

1.3 Facility Planning Considerations

Costs, convenience (location, ability to join the system), and technical elements (peak flows, pressure) were given consideration for the planning of facilities. By taking a range of different considerations into account, alternative systems with the ability to deliver the desired amount of recycled water were developed.

1.4 Recommended Project

The recommended project described in Table 1 was developed through hydraulic modeling analysis and is the most convenient and has the lowest cost. On a phase-by-phase basis, the table describes area served, estimated annual volume delivered, facilities for conveyance, treatment, and storage, and construction capital costs for the alternative. Capital costs include construction, construction management, and engineering. Operation and Maintenance (O&M) costs include labor, chemicals, energy and equipment replacement, if necessary. The phased facilities are shown on Figure 1 and Figure 2. Please note that only Phases 1A-4 is included in this Facilities Planning Report.

1.5 Estimated Cost per Acre-foot Recycled Water Delivered

The value of each phase of this proposed system is also represented in terms of the quantity of demand served. The capital and O&M costs applied over 20 years are used to generate a life-cycle cost for the project per year. This life-cycle cost is then divided by the total acre-feet of recycled water that is being delivered per phase to arrive at $/AFY. The $/AFY for each phase is shown below in Table 1.

1.6 Summaries of Existing Antelope Valley Reports Relevant to Recycled Water

In this section, brief discussions of existing Antelope Valley reports relevant to recycled water are presented. Detailed summaries are included in Appendix A.

Antelope Valley Water Resources Study, Kennedy/Jenks Consultants, November 1995

The primary objective of the Antelope Valley Water Group's water resource study was to develop consensus on a water resource management plan that addresses the need of the municipal and industrial purveyors to reliably provide the quantity and quality of water necessary to serve the growth projected by the planning agencies while concurrently addressing the need of agricultural users to have adequate supplies of reasonable cost irrigation water. Recycled water was one of several water supply alternatives discussed in this study.

Reclamation Concept and Feasibility Study (Draft Report), Metcalf & Eddy, July 1997

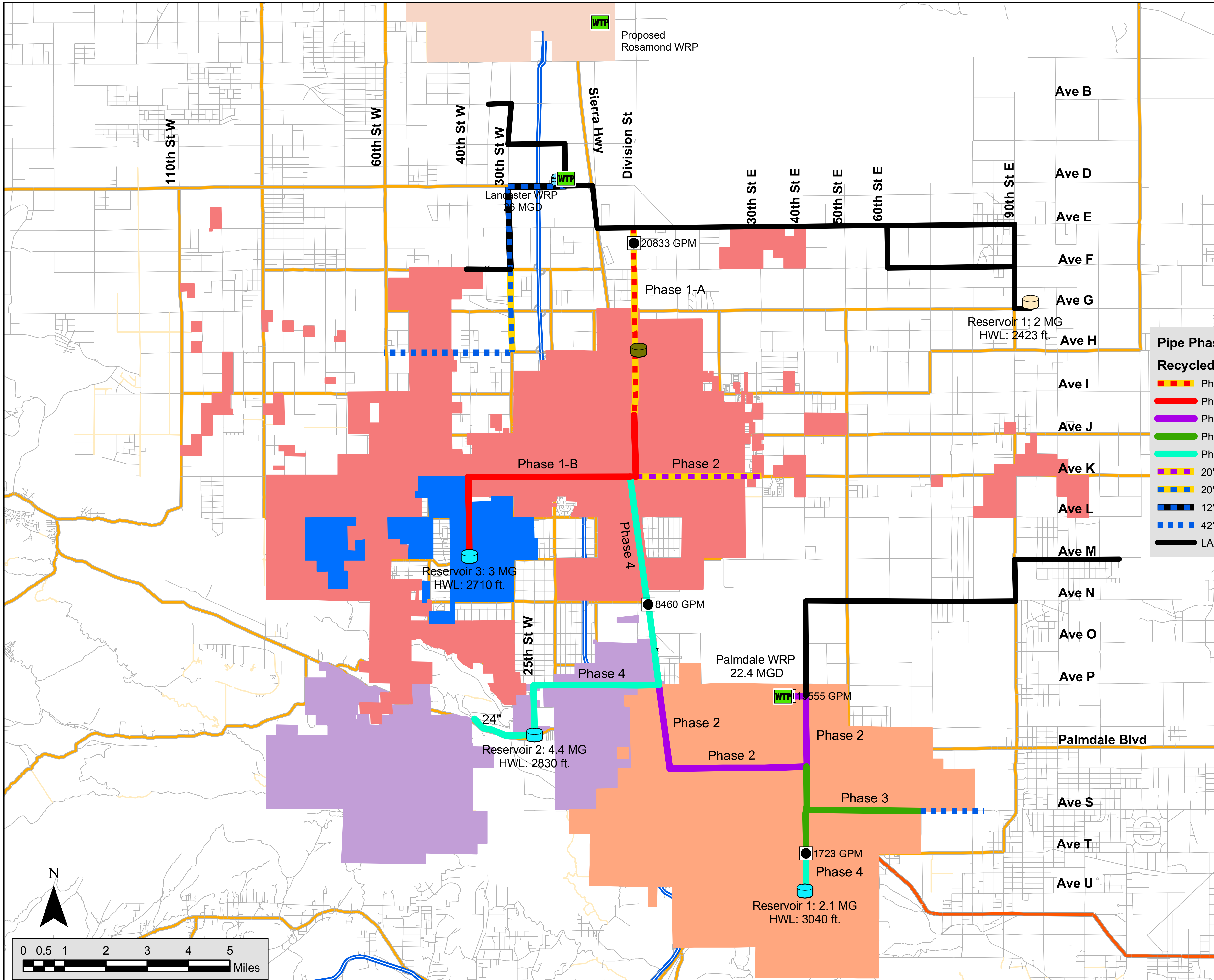
The purpose of this report was to develop a conceptual reclamation program and to evaluate the feasibility of its implementation. An analysis of recycled water use was included as part of a regional water supply study (*Antelope Valley Water Resource Study*, 1995) and this feasibility study was focused on a refinement of the previous analysis with an emphasis on providing recycled water to proposed projects being considered by the City of Palmdale, in addition to providing recycled water to existing parks, schools and golf courses.

Palmdale Water Reclamation Concept Study, Kennedy/Jenks Consultants, June 2000

The purpose of the Water Reclamation Concept Study was to evaluate three potential conceptual uses of recycled water produced by the Palmdale Water Reclamation Plant, owned and operated by County Sanitation Districts of Los Angeles County, District No. 20. The concepts considered included the following:

1. Discharge of effluent into existing sand and gravel pits located in the eastern portion of the City of Palmdale to create a recreational facility.

2. Recharge of local groundwater basins with highly treated effluent.



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Proposed Antelope Valley Recycled Water Facilities and Agency Boundaries

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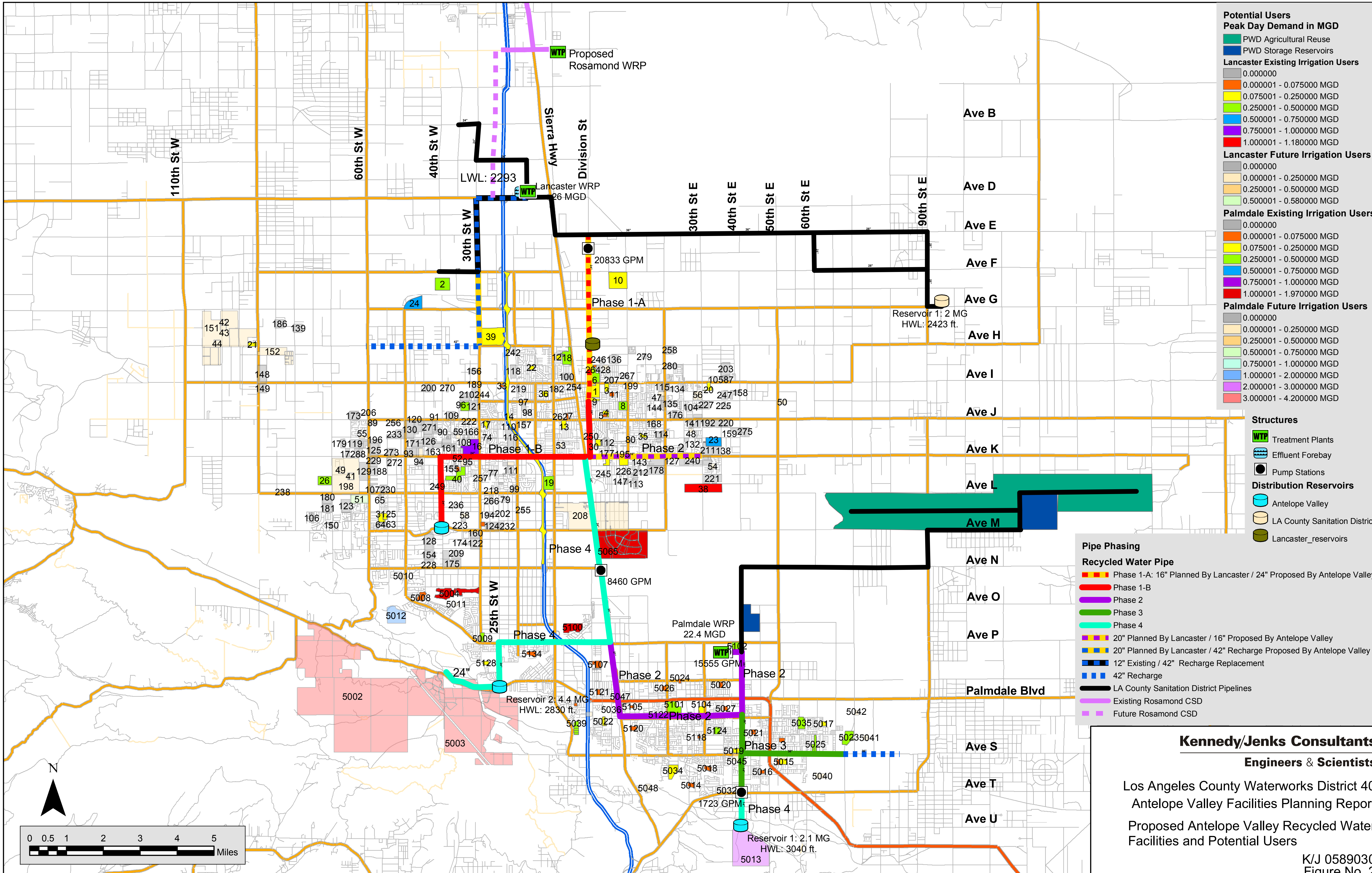
Figure No. 1



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Proposed Antelope Valley Recycled Water Facilities and Potential Users

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Figure No. 2

- Option 1 - Excludes total dissolved solids (TDS) reduction (includes TOC reduction with granular activated carbon)

- Option 2 – Includes TDS reduction with reverse osmosis

3. Discharge of highly treated effluent into Lake Palmdale, which serves as the forebay for the Palmdale Water District Water Treatment Plant.

Each of these alternatives was evaluated at the conceptual level in an effort to identify feasibility and preliminary costs.

The findings of the Study indicated that utilizing effluent for recreational purposes within gravel pits would not result in the utilization of a significant quantity of effluent. With this finding, such use was found not to be feasible unless combined with another alternative.

The introduction of highly treated effluent into Lake Palmdale was not considered feasible; as such discharge would not comply with the preliminary requirements established by the California Department of Health Services for a similar proposal developed by the City of San Diego.

The third alternative, discharge of highly treated effluent into local groundwater basins, was been found to be technically feasible and would have costs similar to alternative water supplies available within the Antelope Valley region.

Implementing a groundwater recharge program would require resolution of a number of key regulatory issues, the outcome of which could greatly impact the cost of the program.

Lancaster Water Reclamation Plant (LWRP) 2020 Facilities Plan, Environmental Science Associates, May 2004

The objectives of the LWRP 2020 Plan are as follows:

1. Provide wastewater treatment and effluent management capacity adequate to meet the needs of District No. 14 through the year 2020 in an environmentally sound and cost-effective manner;
2. Eliminate unauthorized effluent-induced overflows from Piute Ponds to Rosamond Dry Lake in the most expeditious manner possible and in consideration of the Regional Water Quality Control Board – Lahontan Region (RWQCB-LR), in order to avoid any threatened nuisance condition as determined by Edwards Air Force Base (EAFB);
3. Ensure recycled water of sufficient quality and quantity is available to satisfy emerging municipal reuse needs; and
4. Comply with the requirements to maintain Piute Ponds.

The LWRP 2020 Plan recommended project, *26* million gallons per day (mgd) Conventional Activated Sludge (CAS)/Tertiary Treatment, Agricultural Reuse, and Storage Reservoirs, addresses the objectives listed above.

Palmdale Water Reclamation Plant (PWRP) 2025 Facilities Plan and Environmental Impact Report, Environmental Science Associates, October 2005

The overall goal of the PWRP 2025 Plan is to identify a project that meets the wastewater treatment and effluent management needs of District No. 20 through year 2025 in a cost-effective and environmentally sound manner. To meet the above-listed needs, the objectives of the PWRP 2025 Plan are as follows:

- Provide wastewater treatment capacity adequate to meet the needs of District No. 20 through the year 2025;
- Provide effluent management capacity adequate to meet the needs of District No. 20 through the year 2025;
- Provide a long-term solution for meeting water quality requirements set forth by regulatory agencies; and
- Provide a wastewater treatment and effluent management program that accommodates emerging recycled water reuse opportunities.

The major components of the recommended project are wastewater treatment facilities, effluent management facilities, and municipal reuse. Some processes of the wastewater treatment and effluent management facilities will be constructed to upgrade the treatment and effluent management level currently provided at the PWRP. For other processes, facilities will be expanded from 15.0 mgd to 22.4 mgd. These changes will be performed in stages.

Table 1: Summary of Recommended Alternative

Phase	Area Served	Annual Volume RW Delivered (AFY & MG/yr)		Conveyance, Treatment, Storage Facilities	Capital Costs	Annual O&M Costs	Total Capital and O&M Cost Per Year[1]	Total Cost Per Year Per AF RW Delivered
Phase 1A	Backbone from LWRP	786	256	24,200 LF of 24-inch diameter pipeline (increased Lancaster pipeline sizing from 16-inch)	$4,027,000	N/A [2]	N/A	N/A
Phase 1B	Western Lancaster	2,161	704	39,000 LF of 24-inch diameter pipelines, 3.0 MG reservoir and 1 LWRP PS @ 20,833 gpm	$27,958,000	$485,600 [3]	$2,639,000	$895
Phase 2	Eastern Lancaster and first phase backbone from PWRP	2,076	676	56,000 LF of 16-inch to 36-inch diameter pipelines, 1 PWRP PS @ 15,555 gpm	$33,316,000	$853,500	$3,093,000	$1,490
Phase 3	Existing and Future Palmdale	1,295	422	26,000 LF of 14- inch to 36-inch diameter pipelines,	$17,168,000	$294,400	$1,448,400	$1,119
Phase 4	Existing and Future Palmdale and Connecting backbones of LWRP and PWRP	7,013	2,285	57,000 LF of 14-inch to 24-inch diameter pipeline, 1 booster PS @ 1,725 gpm, 1 booster PS @ 8,460 gpm, 1 storage tank @ 2.1 MG 1 storage tank @ 4.4 MG	$36,715,000	$1,819,600	$4,287,600	$611

[1] Capital costs annualized over 20 years at 2.7 % interest.
[2] First phase of City of Lancaster recycled water use program.
[3] Includes Phase 1A & 1B operating costs.

Section 2: Study Area Characteristics

2.1 Project Setting

The Antelope Valley encompasses approximately 2,400 square miles in northern Los Angeles County, southern Kern County and western San Bernardino County. The area 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 San Bernardino county line. There are three playa (dry) lakes located in the center of the valley on EAFB: Rosamond Dry Lake, Rogers Dry Lake and Buckhorn Dry Lake. Major communities within the valley include Boron, EAFB, Lancaster, Mojave, Palmdale and Rosamond. The vicinity map is provided on Figure 3.

2.1.1 Topography

The topography of the Antelope Valley includes a relatively flat valley with a few occasional buttes and/or rock outcroppings. The valley is surrounded by the San Gabriel Mountains to the southwest, the Tehachapi Mountains to the northwest, and various hills and buttes along the eastern boundary that generally follow the San Bernardino County line. Figure 4 displays the topographical features of the area.

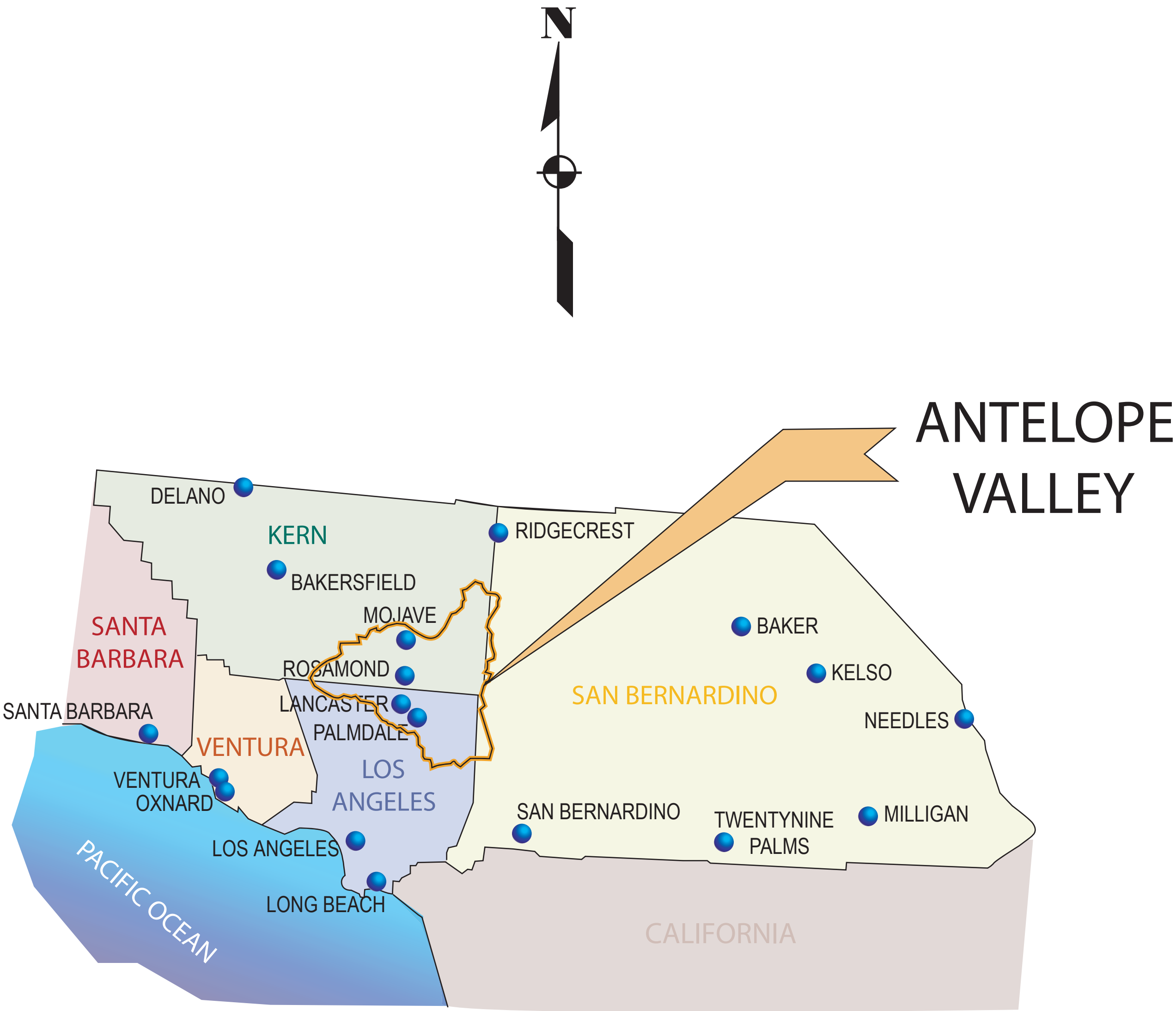
2.1.2 Existing Recycled Water Facilities

Lancaster Water Reclamation Plant (LWRP), Palmdale Water Reclamation Plant (PWRP) and Rosamond Wastewater Treatment Plant (RWWTP) are the three wastewater treatment plants in the Antelope Valley considered for this report. The LWRP is owned and operated by the Los Angeles County Sanitation District No. 14 (District No. 14). The PWRP is owned and operated by the Los Angeles County Sanitation District No. 20 (District No. 20). The RWWTP is owned and operated by the City of Rosamond.

Currently, these three plants primarily provide secondary treated effluent. The only existing recycled water facility that is treated to a tertiary level is a small percentage of the wastewater at the LWRP through additional onsite facilities (0.6 mgd capacity) known as the Antelope Valley Tertiary Treatment Plant (AVTTP). This recycled water is conveyed to Apollo Lakes Regional County Park. LWRP, PWRP and RWWTP will all provide tertiary treated effluent with future upgrades. Additional discussion regarding these facilities is found in Section 4.

2.1.3 Study Area Boundaries

The study area for the recycled water project includes the City of Palmdale, City of Lancaster, Los Angeles County Waterworks District No. 40 (LACWW40), Palmdale Water District (PWD), Rosamond Community Services District (RCSD), Quartz Hill Water District (QHWD) and Littlerock Creek Irrigation District (LCID). The study area boundaries are indicated on Figure 5.



Source: Antelope Valley Water Resource Study
(Kennedy/Jenks Consultants, 1995)

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Antelope Valley Vicinity Map

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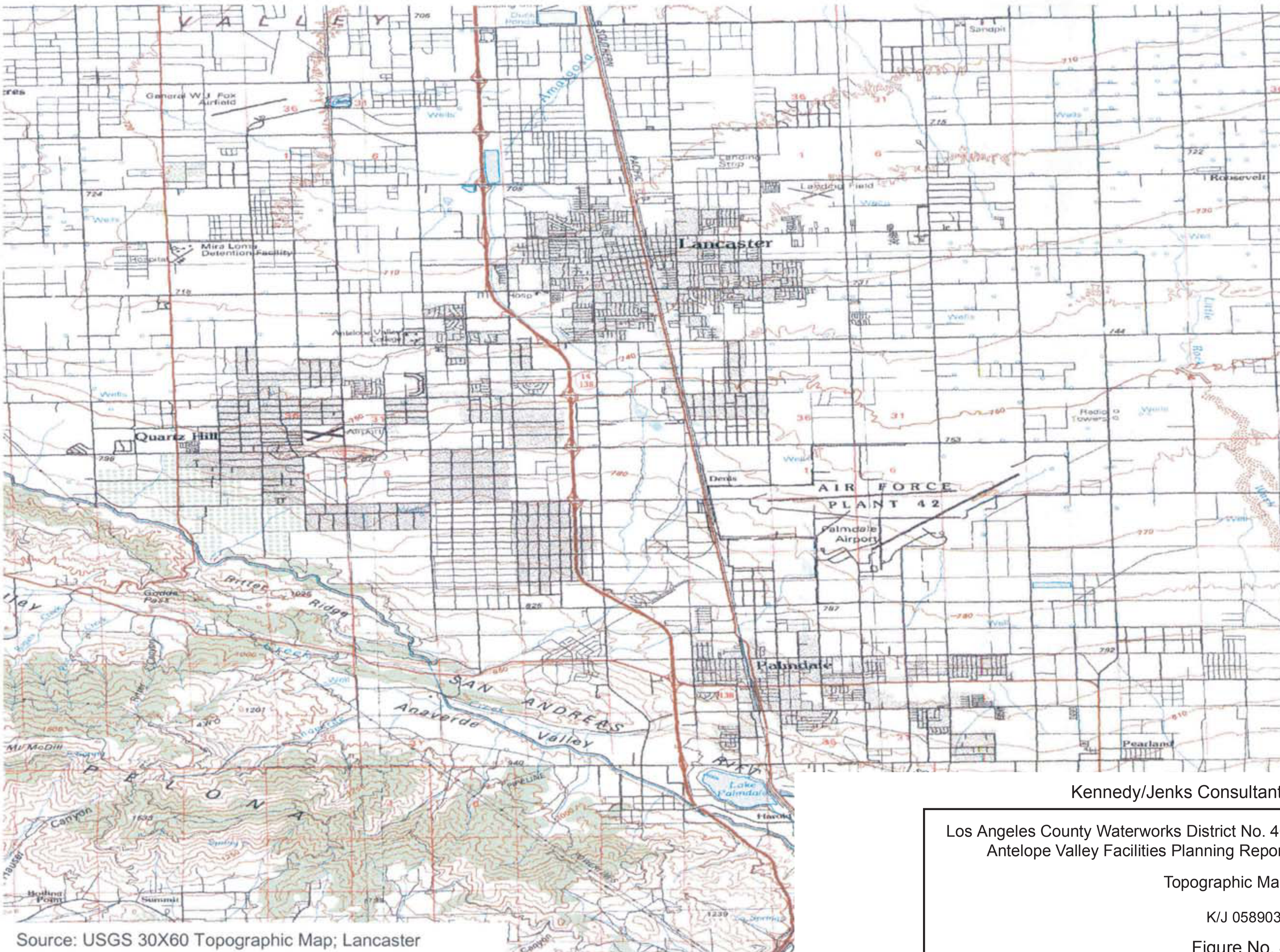
Figure No. 3



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Topographic Map

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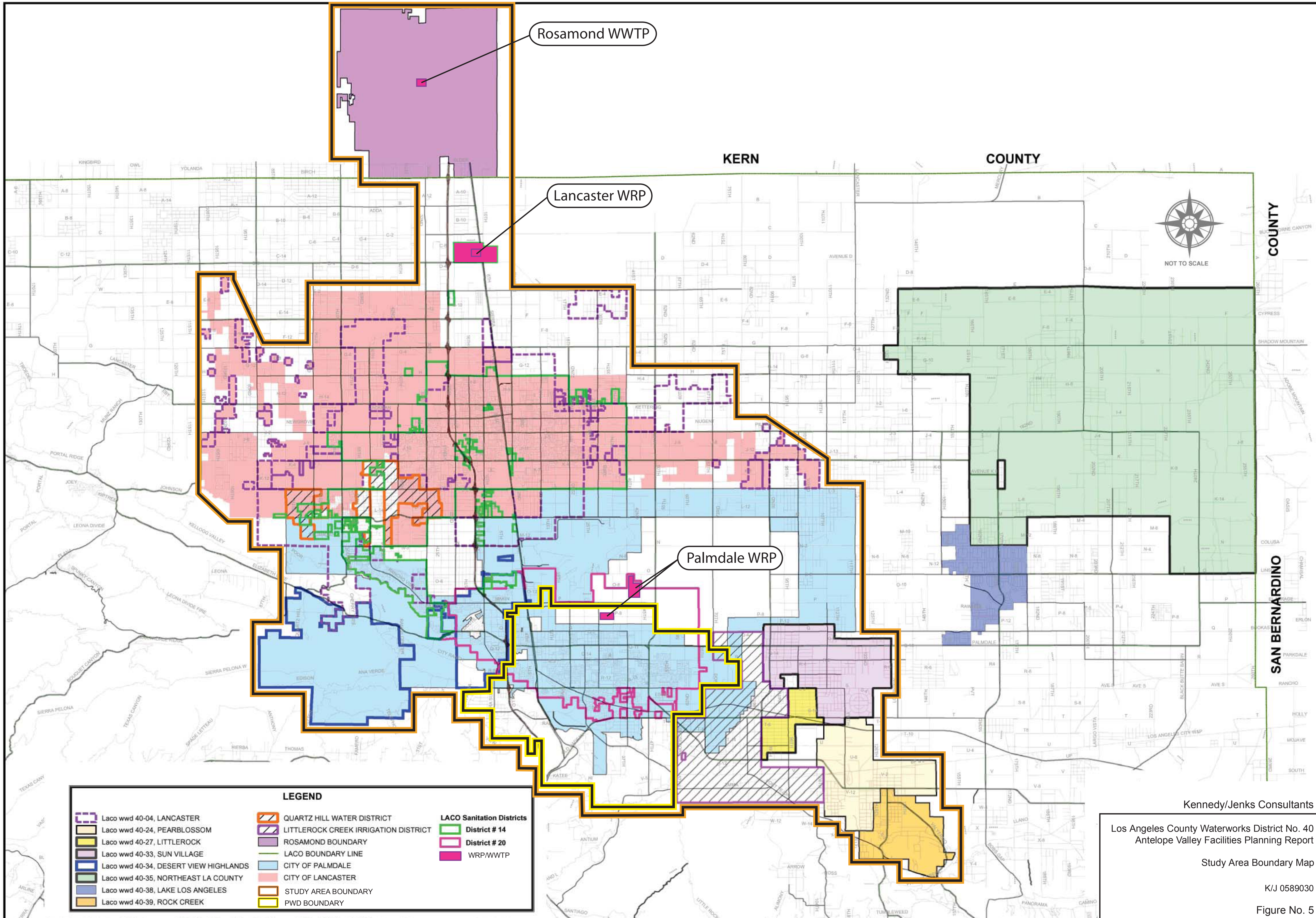
Figure No. 4



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Study Area Boundary Map

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Figure No. 5

2.2 Hydrologic Features

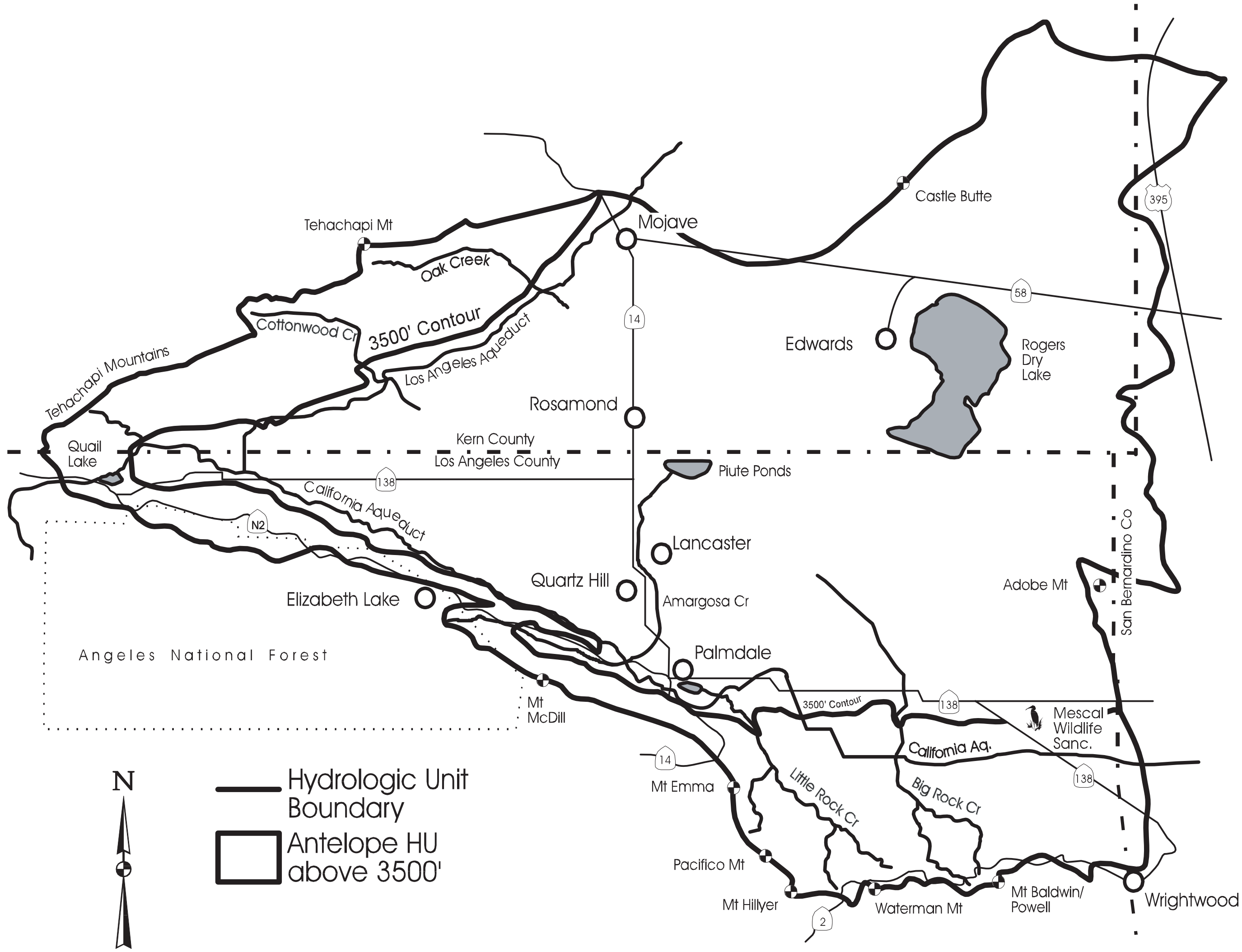
The Antelope Valley is a closed basin. Surface water from the surrounding hills and from the valley floor flow primarily toward three dry lakes on Edwards AFB: Rosamond Lake, Buckhorn Lake and Rogers Lake. Surface water flows are carried by ephemeral streams. The most hydrologically significant streams begin in the San Gabriel Mountains in the southwestern edge of the Valley and include, from east to west, Big Rock Creek, Little Rock Creek and Amargosa Creek. Amargosa Creek runs north/south and is between the Antelope Valley Freeway (14) and Sierra Highway. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley from the surrounding mountains and quickly percolates into the stream bed and recharges the groundwater basin. Surface water flows that reach the dry lakes are generally lost to evaporation. It appears that little percolation occurs in the Antelope Valley other than near the base of the surrounding mountains due to impermeable layers of clay overlying the groundwater basin. The U.S. Geological Survey (USGS) estimates that nearly 1.4 million acre-feet (AF) of surface water in the Antelope Valley is lost to evapotranspiration each year (USGS, 1987). The hydrologic features are shown on Figures 6 and 7.

Little Rock Creek is the only developed surface water supply in the Antelope Valley. The Little Rock Reservoir, jointly owned by PWD and LCID, collects runoff from the San Gabriel Mountains. The reservoir currently has a useable storage capacity of 3,500 AF of water (PWD Final Water System Master Plan Update {FWSMPU} 2001). Historically, water stored in the Little Rock Reservoir has been used directly for agricultural uses within LCID's service area and for municipal and industrial uses within PWD's service area following treatment at PWD's water purification plant.

2.3 Groundwater Basins

There are two primary aquifers: 1) the principal aquifer and 2) the deep aquifer. The principal aquifer is an unconfined aquifer. 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 Valley near the San Gabriel Mountains, while the deep aquifer is thickest in the vicinity of the dry lakes on Edwards Air Force Base. The Antelope Valley Groundwater Basin is divided into twelve subunits, as shown on Figure 7. The subunits are Finger Buttes, West Antelope, Neenach, Willow Springs, Chaffee, Oak Creek, Pearland, Buttes, Lancaster, North Muroc, and Peerless. The groundwater basin is principally recharged by deep percolation of precipitation and runoff from the surrounding mountains and hills.

According to the 1980 DWR report, there is an estimated 68 million AF of total storage capacity and 20 million AF of useable storage in the groundwater basin. According to the USGS, the Antelope Valley groundwater pumping has exceeded recharge every year since the early 1920s (LWRP 2020 Plan).



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Hydrologic Features

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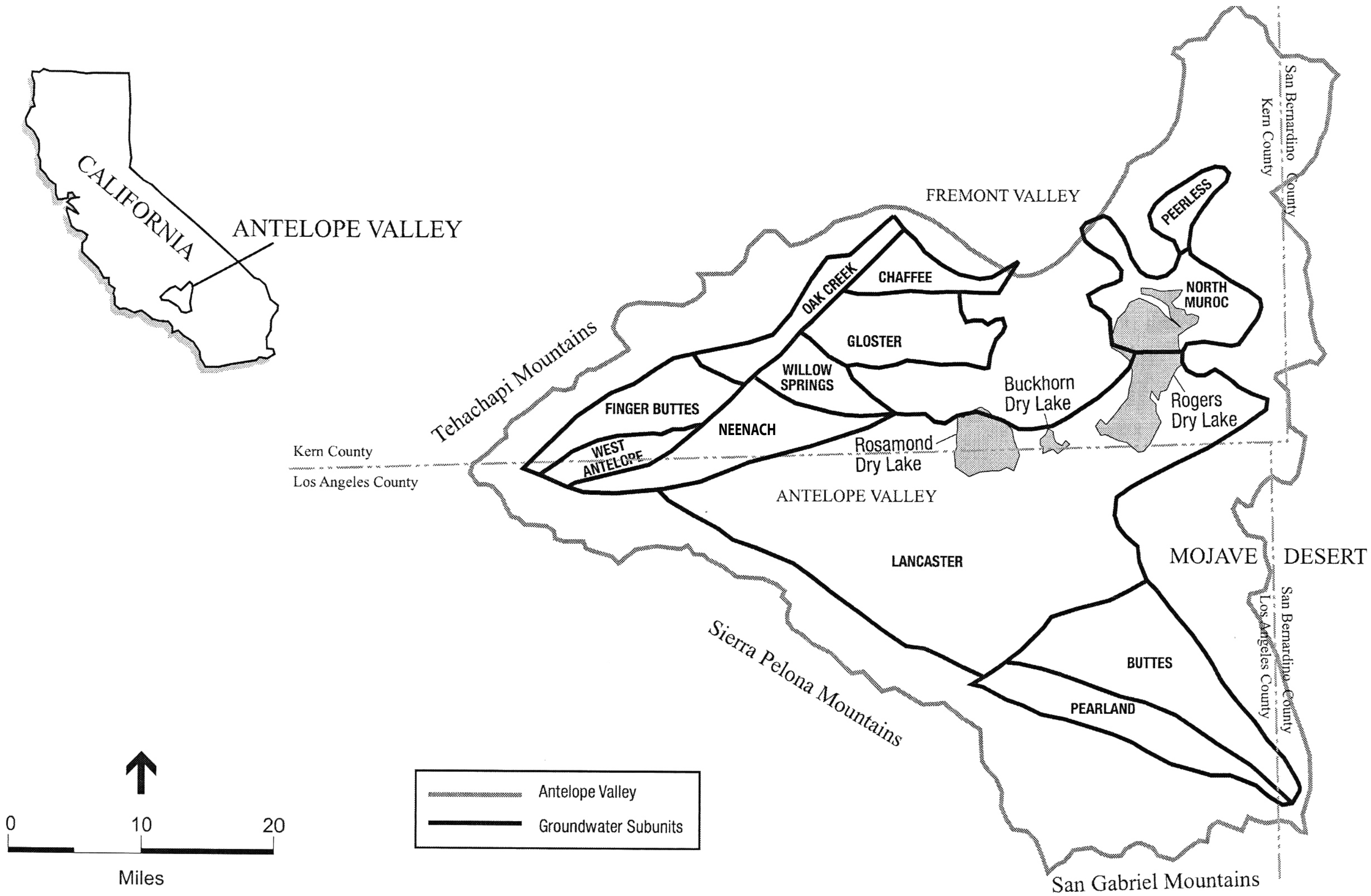
Figure No. 6

Source: Lahontan Regional Water Quality Control Board Basin Plan (1995), Figure 4.1-22.



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Antelope Valley Facilities Planning Report

Antelope Valley Groundwater Basin

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Figure No. 7

Source: Draft Palmdale Water Reclamation Plant 2025 Facilities Plan and Environmental Impact Report April 2005, Figure 14-3.

Natural recharge of the groundwater basin is due to infiltration of surface water in the alluvial fan areas at the southern, upstream reaches of Amargosa and Anaverde Creeks and Little Rock and Big Rock Washes at the base of the San Gabriel Mountains. The northern, downstream reaches of the above-mentioned creeks and washes tend to be impervious and any water reaching them evaporates (Final PWRP 2025 Plan and EIR).

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. (Final PWRP 2025 Plan and EIR)

A groundwater management plan currently does not exist for the basin as a whole, but one has been developed for the RCSD service area. Although the groundwater basin is not currently adjudicated, an adjudication process has begun and is in the early stages. Since the basin is not adjudicated and has not been deemed in overdraft by DWR, there are no existing restrictions on pumping. However, water rights will be assigned as part of the adjudication process.

2.4 Water Quality

2.4.1 Groundwater Water Quality

Groundwater quality is excellent within the principal aquifer but degrades toward the northern portion of the dry lakes 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 deep aquifer typically has a higher TDS level. Hardness ranges from 50 to 200 mg/L and high fluoride, boron, and nitrates are a problem in some areas of the basin. The groundwater in the basin is used for agricultural, municipal and industrial uses.

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

There has been a drinking water regulation for arsenic since 1975, which included an MCL of 0.05 mg/L (50 ppb). In 2001, US EPA revised the drinking water regulation for arsenic to include an MCL of 0.010 mg/L (10 ppb), effective nationwide (including California) 23 January 2006. The State of California is in the process of developing its own regulation for arsenic in drinking water, which could include a revised, lowered MCL. While by statute, the regulation should have been proposed by 30 June 2004, it is not expected out until the end of 2005. The compliance date for this revised state regulation is the same as the federal rule, 23 January 2006.

Arsenic has been observed in the groundwater for LACWW40, QHWD and RCSD. This is discussed further in Section 3.7.

2.4.2 Surface Water Quality

Littlerock Reservoir is the only developed surface water source in the Antelope Valley. This reservoir collects runoff from the San Gabriel Mountains. The storage capacity of the reservoir is 3,500 AF (PWD FWSMPU 2001). PWD and LCID jointly own Littlerock Reservoir. The reservoir discharges to Lake Palmdale and the water is ultimately treated by PWD's water treatment plant.

Section 3.3.2 discusses the surface water quality in more detail.

2.5 Land Use and Land Use Trends

Historically, land uses within the Antelope Valley have focused primarily on agriculture; however, the area is in transition as the predominant land use shifts from agricultural uses to residential and industrial uses. Agricultural land use has decreased from 73,000 acres in the early 1950s to 12,854 acres in 1993 (USGS 1994). DWR predicts that agricultural land use will continue to decrease to approximately 900 acres in 2020 (USGS 1994). It should be noted that DWR did not take into account approximately 5,500 acres for carrot production that was developed in the Antelope Valley between 1995 and 2000. In addition, the Los Angeles County Sanitation Districts' proposed farming operations in Lancaster and Palmdale are expected to utilize 4,650 and 5,140 acres, respectively, by the year 2020.

Historically, crops grown in the Antelope Valley have included alfalfa, wheat, barley and other livestock feed crops. In recent years, onions, turf and orchards have become more prominent. Broken down by the various types of crops, acreages in 1993 were 6,124 acres for alfalfa, 955 acres for pasture and turf, 835 acres for grain, 32 acres for field crops, 2,645 acres for truck crops and 2,263 acres for deciduous trees.

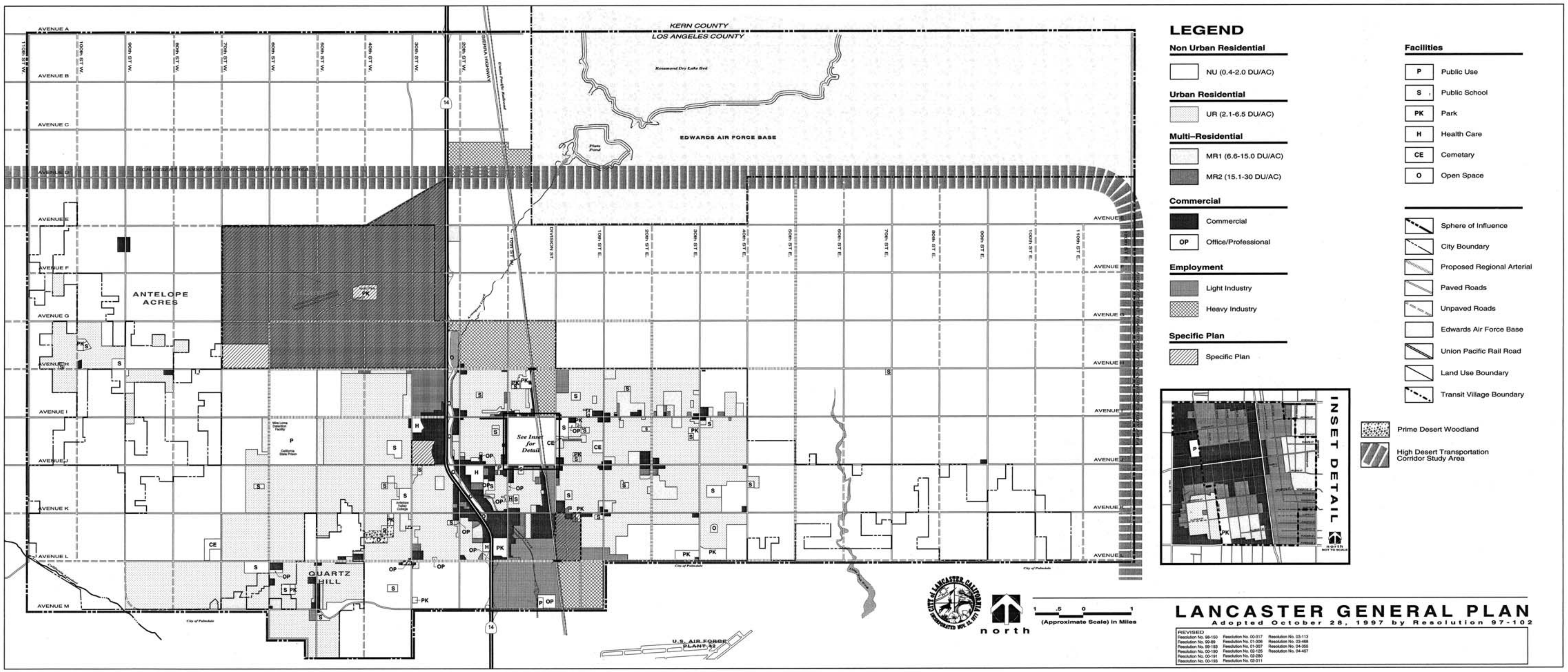
The increase in residential land use is evident from the population growth in the Antelope Valley, which is discussed in the next section. With significantly lower home prices than in Southern Los Angeles County, the Antelope Valley housing market has seen an increase as people chose to commute to the Los Angeles area.

Industrial land use in the Antelope Valley 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. Mining of borate in the northern areas and salt extract, rock, gravel and sand in the southern areas contribute to the Antelope Valley's industrial land uses.

Figures 8 and 9 show the land uses for the Lancaster and Palmdale areas, respectively.

2.6 Population Projections of Study Area

Population growth in the Antelope Valley proceeded at a slow pace until 1985 because agriculture was the primary focus. However, between 1985 and 1990, the growth rate



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Lancaster Land Use Map

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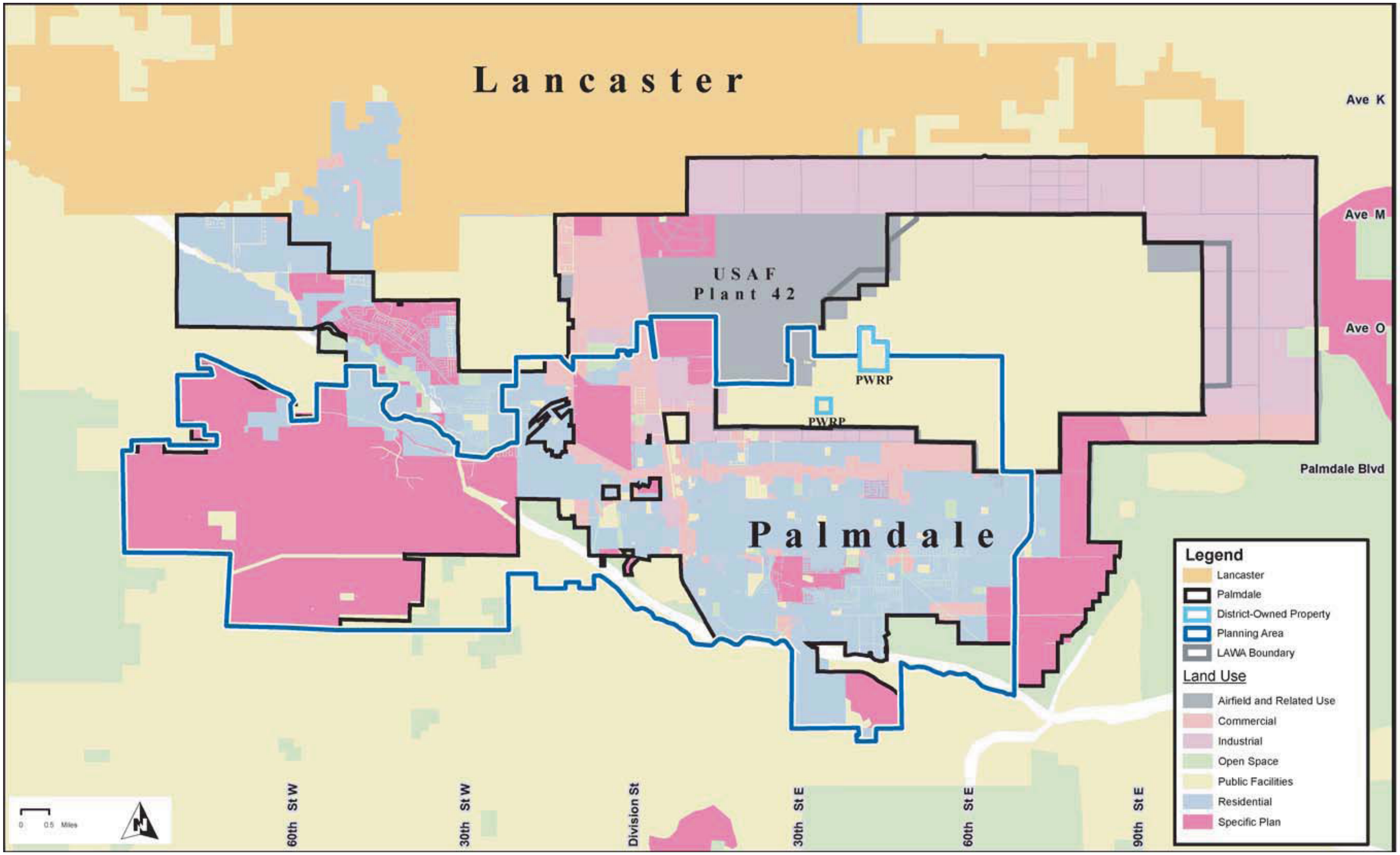
Figure No. 8



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Palmdale Area Land Use Map

K/J 0589030

Figure No. 9

Source: Draft Palmdale Water Reclamation Plant 2025 Facilities Plan and Environmental Impact Report, April 2005, Figure 2-9.

increased approximately 1,000 percent from the average growth rate between the years 1956 to 1985 as land uses shifted from agricultural to residential and industrial. Historical and projected population for the Antelope Valley is shown in Table 2. Southern California Association of Governments (SCAG) projections indicate that approximately 1,013,000 people will reside in the Antelope Valley by the year 2030. This represents an increase of approximately 187 percent from the 2000 population.

Table 2: Population Projections

	2004	2010	2015	2020	2025	2030
LACWW40[1]	144,357	176,666	204,206	231,746	259,286	286,826
RCSD[1]	15,510	24,901	36,944	54,812	81,322	120,656
QHWD[1]	15,500	17,980	20,857	24,194	28,065	32,555
PWD[2]	105,755[3]	130,570	146,019[4]	161,467	176,916[4]	192,364[4]
LCID[5]	2,900	2,900	2,900	2,900	2,900	2,900
Study Area	**284,022**	**353,017**	**410,926**	**475,119**	**548,489**	**635,301**

[1]Obtained from Draft 2005 Integrated Urban Water Management Plan for the Antelope Valley, Source: LACWW40 – SCAG Projections, Local Area Formation Commission (LAFCO) Projections, and Agency projections based upon additional 1800 connections per year at 3.06 persons per connection. Rosamond – Water Master Plan dated August 2004. QHWD – LAFCO Projections.

[2]Obtained from PWD 2001 FWSMPU, Table 2-3.

[3]2004 PWD population projections calculated using straight line projection between known 2000 population of 89,212 and 2010 population projection.

[4]2015, 2025 and 2030 PWD populations calculated using interpolation of 2010 and 2020 population projections.

[5]Obtained from discussions with LCID 2005.

2.7 Beneficial Uses of Receiving Waters

The Antelope Valley is located in Region 6 (Lahontan) of the nine Regional Water Quality Control Board regions.

The Water Quality Control Plan (Basin Plan) for the Lahontan Region identifies the beneficial uses of waters of the Antelope Valley. The Lahontan Basin Plan describes beneficial uses and water quality objectives for surface water and groundwater within the study area. Effluent limitations and discharge prohibitions are also included in the Lahontan Basin Plan. The most recent update of the entire Lahontan Basin Plan was adopted by the Regional Board on March 21, 1995. Amendments have been added since this date.

The beneficial uses for the Antelope Valley's surface waters are: municipal and domestic water supply, agricultural water supply, industrial service supply, groundwater recharge, freshwater replenishment, water contact recreation, non-contact water recreation, commercial and sportfishing, wildlife habitat, warm fresh water habitat, cold freshwater habitat, inland saline water, spawning, reproduction and development, water quality enhancement and flood peak attenuation/flood water storage.

Existing and potential beneficial uses applicable to groundwater in the region include municipal and domestic water supply, agricultural water supply, industrial service supply and fresh water replenishment.

Specific water quality objectives are described further in Section 5.3.

Section 3: Water Supply Characteristics and Facilities

3.1 Wholesale and Retail Entities

Antelope Valley-East Kern Water Agency (AVEK), PWD, LACWW40, RCSD, QHWD and LCID provide water to the Antelope Valley. Figure 5 in Section 2 shows the wholesale and retail entities.

3.1.1 Wholesale Entities

AVEK, PWD and LCID are the imported water wholesalers in the Antelope Valley. AVEK was established in 1956 to coordinate distribution of raw water provided by the California Department of Water Resources via the California Aqueduct. AVEK has a current annual contractual Table A amount for 141,400 AF of State Water Project (SWP) water that is for both municipal/industrial and agricultural uses. AVEK is also a retailer of untreated agricultural water.

PWD is a wholesaler and retailer of potable water. PWD's contractual Table A amount is 21,300 AFY from the California Aqueduct. The water is stored in Palmdale Lake until treatment and distribution. LCID's contractual Table A amount is 2,300 AFY of raw water from SWP (Antelope Valley Water Resources Study 1995).

3.1.2 Retail Entities

LACWW40, PWD, RCSD, QHWD and LCID are the water retailers in the Antelope Valley. LACWW40, RCSD and QHWD receive imported water from AVEK. As discussed above, PWD and LCID receive imported water directly from SWP.

3.2 Water Agencies of Antelope Valley

As discussed above, the water agencies of the Antelope Valley include AVEK, LACWW40, PWD, RCSD, QHWD and LCID.

3.2.1 AVEK

AVEK supplies SWP water to LACWW40, RCSD and QHWD. AVEK does not have production groundwater wells and does not provide recycled water. AVEK does provide a small amount of SWP to areas outside of the Antelope Valley.

3.2.2 LACWW40

LACWW40 is a retailer of potable water. LACWW40 receives water from AVEK and groundwater wells. LACWW40 was formed in accordance with Division 16 sections 55000-55991 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 and Sewer Maintenance Division of the County Department of Public Works providing administration, operation and maintenance of LACWW40's facilities. LACWW40 is comprised of eight regions serving customers in the communities of Lancaster and Palmdale (Regions 4 and 34), Pearblossom (Region 24), Littlerock (Region 27), Sun Village (Region 38), and Rock Creek (Region 39). Regions 4 and 34 are integrated and are operated as one system. Similarly, Regions 24, 27, and 33 are also integrated and operated as one system.

In general, LACWW40 serves all of the City of Lancaster and the western half of the City of Palmdale.

3.2.3 PWD

PWD is a wholesaler and retailer of potable water. PWD was established in 1973 as it evolved from the Palmdale Irrigation District (PID), which was formed in 1918. PWD has three sources for water: imported water from SWP, surface water (Littlerock Reservoir, which is jointly owned by LCID) and groundwater. Littlerock Reservoir has a storage capacity of 3,500 AF of water. Palmdale Lake stores the imported water and any Littlerock Reservoir discharges until treatment and distribution. Groundwater wells produce approximately 40% of PWD's water supply.

In general, PWD serves the eastern half of the City of Palmdale.

3.2.4 RCSD

RCSD is a retailer of imported water from AVEK and local groundwater. 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. It provides water, sewer, lighting service, and public park maintenance services to residential, commercial, industrial, and agricultural customers, and for environmental and fire protection uses. RCSD's service area boundary encompasses approximately 31 square miles of unincorporated residential, industrial, and undeveloped land. The majority of the land located within the RCSD's service area is undeveloped. The developed property focuses around central Rosamond, with the exception of the Tropico Hills.

3.2.5 QHWD

QHWD is a retailer of imported water from AVEK and local groundwater. QHWD is located in the southwest end of the Antelope Valley at the north end of Los Angeles County. It is 65 miles northwest of Los Angeles on the Antelope Valley State Route 14 and west of both Palmdale and Lancaster. QHWD occupies an area of about 4.5 square miles. Incorporation of QHWD occurred in 1955 and water service is provided to all residential, commercial, industrial, and agricultural customers, and for environmental and fire protection uses.

3.2.6 LCID

LCID receives raw water from SWP, surface water from Littlerock Creek Reservoir and pumps groundwater. LCID's SWP contractual Table A amount is 2,300 AF. The surface water is from surface runoff collected in Littlerock Creek Reservoir. Littlerock Creek 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 FWSMPU 2001). LCID has an agreement with PWD to treat LCID's SWP and Littlerock Creek water when it is needed for potable use. LCID has one groundwater well for agriculture, four groundwater wells producing potable water and five one-million gallon (MG) tanks to store potable water for residential use (Discussions with LCID 2005).

3.3 Sources of Water for Study Area

Available water resources in the Antelope Valley consist of local groundwater, surface water from Littlerock Creek reservoir, imported water from SWP, recycled water, and water conservation/demand reduction.

3.3.1 Groundwater

The Antelope Valley groundwater basin is a naturally stable, long-term, but finite, source of water (LWRP 2020 Plan). The groundwater basin under most of the Antelope Valley is the Lancaster subbasin. The Lancaster subunit is within the Lancaster subbasin and serves as the source of the majority of the groundwater pumped in the valley (PWRP 2025 Plan and EIR).

In addition to the Lancaster subunit, the Pearland and Buttes subunits and the San Andreas Rift Zone are available to PWD for groundwater pumping. Currently, PWD only pumps from Lancaster and Pearland subunits and the San Andreas Rift Zone.

The Lancaster subbasin was the source of groundwater for approximately 73,000 acres of farmland in the 1950s. A substantial amount of groundwater pumping was required to support this farming effort. State Water Resources Control Board (SWRCB) records report that water use peaked in 1956 at 270,000 AF. A 1955 electrical energy consumption study by J. H. Snyder indicated that groundwater use exceeded 400,000 AF per year (AFY) in the early 1950s. By 1972, with the completion of initial SWP facilities, imported water was delivered and groundwater pumping decreased to approximately 100, 000 AFY. Approximately 140,000 AFY of water was used in the Antelope Valley in 1998 (LWRP 2020 Plan). Groundwater pumping for LACWW40, PWD, RCSD, QHWD and LCID from 2000 – 2004 is provided in Table 3.

Table 3: Historic Pumping (AF)

	2000	2001	2002	2003	2004
LACWW40[1]	17,419	21,736	21,195	16,837[4]	21,357
RCSD[1]	1,464	2,169	2,364	1,773	1,760[4]
QHWD[1]	1,421	3,041	2,802	1,555	1,348
PWD[2]	9,765	11,302	8,298	10,608	11,046
LCID[3]	1,755	1,799	2,022	1,922	2,160
Study Area	**31,824**	**40,047**	**36,681**	**32,695**	**37,671**

[1]Obtained from Draft 2005 Integrated Urban Water Management Plan (IUWMP) for the Antelope Valley (AV).

[2]Obtained from discussions with PWD, 2005.

[3]Obtained from discussions with LCID, 2005.

[4] An exact breakdown of 2004 water use by source was not available at this time. Groundwater use was estimated as 60 percent of 2,933 AFY for 2004, since this is RCSD's target ratio. Exact numbers will be provided in Final 2005 IUWMP report for AV.

The capacity of the wells for each water agency is discussed in Section 3.4.1.

3.3.2 Surface Water

The surface water is from surface runoff collected in Littlerock Creek Reservoir. Littlerock Creek Reservoir, which is co-owned with PWD and LCID, 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.

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

3.3.3 Imported Water

LACWW40, RCSD and QHWD all receive imported water from SWP through AVEK. AVEK operates four water treatment plants to treat the raw SWP water. The main plant is the Quartz Hill Water Treatment Plant (WTP), which is capable of producing 65 mgd and serving 280,000 customers. Eastside WTP, Rosamond WTP and Acton WTP are designed to provide 10 mgd, 14 mgd and 4 mgd, respectively, and, jointly, can supply water to 121,000 consumers. (AVEK 2005)

PWD and LCID obtain their water directly from SWP. Table 4 provides a summary of the historic and current imported water volumes for the study area.

Table 4: Historic Imported Water Supply

	2000	2001	2002	2003	2004
LACWW40[1]	34,655	30,965	33,442	37,442	36,231
RCSD[1]	1,641	981	938	1,229	1,173[4]
QHWD[1]	3,353	1,830	2,630	3,706	4,099
PWD[2]	8,974	10,365	18,480	11,421	12,076
LCID[3]	0	0	0	0	0
Study Area	**48,623**	**44,141**	**55,490**	**53,798**	**53,579**

[1]Obtained from Draft 2005 Integrated Urban Water Management Plan for the Antelope Valley.

[2]Obtained from discussions with PWD, 2005.

[3]Obtained from discussions with LCID, 2005.

[4]Estimated as 40 percent of total 2,933 AFY for 2004.

3.3.4 Recycled Water

Currently, the only recycled water in the Study Area that is treated to a tertiary level is a small percentage of the wastewater at the LWRP through additional onsite facilities of the AVTTP. In the future, recycled water will be available from three primary sources: Lancaster, Palmdale, and Rosamond Water Reclamation Plants. Table 5 provides a summary of the availability of the recycled water to the Antelope Valley through 2030.

Table 5: Recycled Water Flow Projections 2005 - 2030

	2005	2010	2015	2020	2025	2030
Lancaster WRP [a] (mgd)	12[b]	14.8[c]	19[c,h]	23[c]	27.1[c,d]	31.2[c,d]
Palmdale WRP [e] (mgd)	10.9[f]	13.2[c]	16.4[c]	19.5[c]	22.4[c]	25.5[c,d]
Rosamond WWTP [g] (mgd)	0[i]	0.5[c]	1.0[c]	1.0[c]	1.0[c]	1.0[c]
Total Study Area (mgd)	**22.9**	**28.5**	**36.4**	**43.5**	**50.5**	**57.7**

[a] Obtained from the *Lancaster Water Reclamation Plant 2020 Facilities Plan*, prepared by the Sanitation Districts of Los Angeles County, May 2004, less the 3.03 mgd already committed.

[b] Total flow projection for 2005 is 15 mgd per Figure 7-3 in the *Lancaster Water Reclamation Plant 2020 Facilities Plan* (with 0.5 mgd (peak) treated to tertiary level per discussions with Sanitation Districts of Los Angeles County).

[c] All flow is tertiary treated.

[d] Flows are calculated using straight-line projections from the 2020 flows consistent with population increase estimates.

[e] Obtained from the *Final Palmdale Water Reclamation Plant 2025 Facilities Plan and Environmental Impact Report*, prepared by the Sanitation Districts of Los Angeles County, October 2005.

[f] All flow is secondary treated.

[g] Obtained from discussions with RCSD.

[h] Flow is calculated using straight-line projections between 2010 and 2020 flows consistent with population increase estimates.

[i] Existing WWTP (15-pond system that provides treatment, storage and disposal) is not designed to discharge any effluent for offsite reuse.

The previous table excludes quantities of recycled water accounted for in any existing contracts for recycled water that any of the WRPs or WWTP already have in place. These are discussed below:

3.3.4.1 Lancaster WRP Existing Contracts for Recycled Water

There are three existing commitments for recycled water form the LWRP as follows:

1. The LWRD 2020 Facilities Plan FEIR commits District No. 14 to maintain Piute Ponds (specifically at a rate sufficient to maintain a minimum of 400 wetted acres of habitat). District No. 14 staff calculates this to be an average of 2.62 mgd excluding any overflows.

2. Los Angeles County Parks and Recreation Department have an existing contract with the District No. 14 to deliver tertiary water to Apollo Park where it is used to for recreational uses. The park's usage averages approximately 0.15 mgd, and peaks to 0.5 mgd during summer months.

3. There is a Memorandum of Agreement (MOA) between District No. 14 and EAFB for discharge to a series of shallow impoundments south of Piute Ponds for recreational duck hunting. The effluent is discharged between November 1 and April 15 and averages approximately 0.26 mgd.

Items 1 through 3 above total 3.03 mgd of recycled water that is contracted out already to users for Lancaster WRP from 2005 - 2030.

3.3.4.2 Palmdale WRP Existing Contracts for Recycled Water:

There are 2 existing commitments for recycled water from the PWRP as follows:

1. District No. 20 entered into a 20-year lease agreement with the Los Angeles World Airports (LAWA) in 2002 for a 2,680 acre effluent management site on the WRP property. As part of the lease agreement, the LAWA has first right of refusal for any tertiary treated water that comes from the WRP.

2. There is one existing contract with Harrington Farms, a pistachio grower that expires in 2008, which is for secondary effluent. This contract expires before tertiary effluent is available in 2009. The contract with Harrington Farms for secondary effluent states that the farmer is NOT guaranteed the water if another user comes and wants to buy the tertiary water. Therefore, this contract is not included for future commitments of recycled water from PWRP.

3.3.5 Water Billing Rates

As LACWW40 is expected to be the major recycled water retailer in the Antelope Valley, the water billing rates for LACWW40 are the only rates discussed in this section. The water billing rates for LACWW40 are based on a tiered or block rate program to promote conservation among rate payers. The water usage tiers or blocks vary in summer and winter months. All water is billed in units of a hundred cubic feet (HCF), which is equal to 748 gallons.

1. "**Conservation" Tier:** The range of 5 - 20 HCF of water used in the summer (5 - 15 HCF in winter).

2. **"Normal" Tier:** The next 21 - 65 HCF of water used in the summer (16 - 30 HCF in winter).

3. **"Excessive" Tier:** The next 66+ HCF of water used in the summer (31+ HCF in winter).

Every property served by LAWWC40 is also charged a fixed meter charge. A summary of LACWW40's water billing rates is included in Tables 6 and 7.

Table 6: LACWW40 Summer Water Billing Rates

Rate Schedule/ Area	Monthly Service Charge (3/4-inch meter)	Water Usage Tier	Range (units) (HCF)	Quantity Charge (per unit)
0427 Lancaster	$13.65	Conservation	5 - 20	$0.69
		Normal	21 - 65	$0.81
		Excessive	> 65	$1.16
0428 Lancaster	$13.65	Conservation	5 - 20	$0.69
		Normal	21 - 65	$0.81
		Excessive	> 65	$1.16
0429 Lancaster	$13.65	Conservation	5 - 20	$0.69
		Normal	21 - 65	$0.81
		Excessive	> 65	$1.16
0430 Lancaster/Palmdale	$13.65	Conservation	5 - 20	$0.77
		Normal	21 - 65	$0.90
		Excessive	> 65	$1.29
0431 Lancaster/Palmdale	$13.65	Conservation	5 - 20	$0.77
		Normal	21 - 65	$0.90
		Excessive	> 65	$1.29
0433 Palmdale	$15.24	Conservation	5 - 20	$0.94
		Normal	21 - 65	$1.10
		Excessive	> 65	$1.58
0434 Lancaster	$15.24	Conservation	5 - 20	$0.94
		Normal	21 - 65	$1.10
		Excessive	> 65	$1.58
2405 Pearblossom	$14.80	Conservation	5 - 20	$0.76
		Normal	21 - 95	$0.88
		Excessive	> 95	$1.26
2705 Littlerock	$16.25	Conservation	5 - 20	$0.76
		Normal	21 - 95	$0.88
		Excessive	> 95	$1.26
3303 Sun Village	$16.25	Conservation	5 - 20	$0.76
		Normal	21 - 90	$0.88
		Excessive	> 90	$1.26
3405 Palmdale	$15.78	Conservation	5 - 20	$1.23
		Normal	21 - 65	$1.44
		Excessive	> 65	$2.06

Table 7: LACWW40 Winter Water Billing Rates

Rate Schedule/ Area	Monthly Service Charge (3/4-inch meter)	Water Usage Tier	Range (units) (HCF)	Quantity Charge (per unit)
0427 Lancaster	$13.65	Conservation	5 - 15	$0.69
		Normal	16 - 30	$0.81
		Excessive	> 30	$1.16
0428 Lancaster	$13.65	Conservation	5 - 15	$0.69
		Normal	16 - 30	$0.81
		Excessive	> 30	$1.16
0429 Lancaster	$13.65	Conservation	5 - 15	$0.69
		Normal	16 - 30	$0.81
		Excessive	> 30	$1.16
0430 Lancaster/Palmdale	$13.65	Conservation	5 - 15	$0.77
		Normal	16 - 30	$0.90
		Excessive	> 30	$1.29
0431 Lancaster/Palmdale	$13.65	Conservation	5 - 15	$0.77
		Normal	16 - 30	$0.90
		Excessive	> 30	$1.29
0433 Palmdale	$15.24	Conservation	5 - 15	$0.94
		Normal	16 - 30	$1.10
		Excessive	> 30	$1.58
0434 Lancaster	$15.24	Conservation	5 - 15	$0.94
		Normal	16 - 30	$1.10
		Excessive	> 30	$1.58
2405 Pearblossom	$14.80	Conservation	5 - 15	$0.76
		Normal	16 - 35	$0.88
		Excessive	> 35	$1.26
2705 Littlerock	$16.25	Conservation	5 - 15	$0.76
		Normal	16 - 35	$0.88
		Excessive	> 35	$1.26
3303 Sun Village	$16.25	Conservation	5 - 15	$0.76
		Normal	16 - 35	$0.88
		Excessive	> 35	$1.26
3405 Palmdale	$15.78	Conservation	5 - 15	$1.23
		Normal	16 - 30	$1.44
		Excessive	> 30	$2.06

3.4 Capacities of Present Facilities

3.4.1 Groundwater Wells

LACWW40 has 42 wells with a combined maximum pumping capacity of approximately 55.5 mgd. Groundwater is used to provide approximately 40% of LACWW40's water supply. (Draft 1999 LACWW40 MP)

PWD has 26 equipped groundwater wells and 4 additional drilled, unequipped wells throughout the Lancaster and Pearland groundwater subunits and the San Andreas Rift Zone. The total capacity for all PWD wells operating is 31,321 AFY, which includes the capacity for unequipped wells. As listed in Table 3 in Section 3.3.1, the total groundwater pumping in 2004 was 11,046 AFY. One of the San Andreas Rift Zone wells was taken out of production due to elevated nitrate concentrations. PWD received 42% of its water from groundwater sources in 1999 (PWD FWSMPU 2001)

RCSD pumps about 1,800 to 2,000 AFY from five wells. Typically, groundwater provides 60% of RCSD's water supply. (RCSD 2000 UWMP)

QHWD currently operates seven wells for a total maximum pumping capacity of 6,831 AFY. Two new wells with 500 gpm capacity each have been drilled and are expected to be on-line by the end of 2005 for a future maximum pumping capacity of 8,448 AFY. Until 2001, QHWD pumped approximately 1,450 AFY until 2001 when a shortage in SWP water required the District to increase pumping to 3,050 AFY. (QHWD 2002 UWMP)

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

3.4.2 Surface Water

Available surface water from Littlerock Creek and Santiago Creek is collected and stored in Littlerock Creek Reservoir. The storage capacity in Littlerock Creek Reservoir is 3,500 AF. The average annual yield from the reservoir is estimated to be approximately 7,000 AF, as 1949-1999 hydrology data shows annual diversions between 1,178 and 15,900 AFY (PWD 2001 FWSMPU).

3.4.3 Imported Water

AVEK has a contractual Table A amount of 141,400 AFY of SWP water. Currently, the four AVEK WTPs are capable of treating approximately 104,260 AFY of imported water. Quartz Hill WTP is rated for 65 mgd (72,870 AFY). The 1988 expansion of Eastside WTP provided 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).

SWP deliveries within the Valley ranged from 19% to 29% of the total contractual Table A amounts from 1976 to 1982, but dropped to 9% - 69% between 1983 and 1995 (LACWW40 Draft Water System Master Plan {WSMP} 1999). Typically, imported water is used to meet 60% of LACWW40's demand.

PWD is contracted to take 21,300 AF of SWP water per year from the California Aqueduct. PWD's water treatment plant capacity is 30 mgd (33,632 AFY), but it is limited to treating 28 mgd (31,390 AFY) in accordance with the California Department of Health Services (DHS) requirements to keep one filter offline as a reserve. (2001 PWD FWSMPU).

RCSD has a contract with AVEK for 4,000 AFY of imported water. AVEK serves RCSD from its Rosamond WTP. RCSD's imported water needs should be met with the current contractual Table A amount as the projected imported water use in 2025 is 2,250 AFY (RCSD 2000 UWMP).

QHWD submits its request for water to AVEK every October for the following year, but it is not certain whether QHWD will receive the requested amount. If additional water is available, QHWD can receive more than the original requested quantity. QHWD relied on imported water to meet the majority of its demand until 2001, when the availability of SWP water decreased and QHWD was forced to increase its well production to meet its demands. (QHWD 2002 UWMP)

LCID's SWP contractual Table A amount is 2,300 AFY, but LCID did not use any SWP water during the years of 2000 through 2004.

3.4.4 Storage Facilities

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

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

3.4.5 Limitations of Existing Facilities

The Antelope Valley 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 are pursuing different alternatives, such as recycled water and recharge, to decrease their reliance on imported water and groundwater sources.

SWP water reliability is a function of hydrologic conditions, state and federal water quality standards, protection of endangered species and water delivery requirements. Though contracts are signed, there is no guarantee how much imported water will be delivered each year.

Water agencies in the Antelope Valley cannot entirely rely on groundwater pumping either because excessive pumping for many years has over drafted the basin. According to the USGS, the Antelope Valley groundwater pumping has exceeded the recharge rate every year since the early 1920s (LWRP 2020 Plan). This approach to groundwater pumping will change in the future, as the adjudication process for establishing the groundwater rights in the Antelope Valley has begun.

AVEK's Quartz Hill WTP will require an expansion to approximately 97mgd to treat LACWW40's projected demands (LACWW40 Draft 1999 WSMP).

LACWW40'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. As evidenced by this report, LACWW40 is pursuing the use of recycled water as an alternative source of water for irrigation and recharge purposes. LACWW40 also has the Lancaster Aquifer Storage and Recovery Project underway in an effort to recharge treated SWP water for extraction at a later time. Section 3.8 discusses this project further. (LACWW40 Draft 1999 WSMP)

To meet future water needs, PWD will require new groundwater wells, storage reservoirs and water pipelines. PWD will also investigate enhancing yield from Littlerock Creek Reservoir. There may be a need to purchase additional SWP water in order to extend the yield of the Littlerock Creek reservoir. The use of recycled water from PWRP for irrigation and recharge will be pursued. (PWD 2001 FWSMPU)

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

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

3.5 Groundwater Management

The Antelope Valley groundwater basin is in overdraft since pumping has exceeded the recharge rate every year since the early 1920s (LWRP 2020 Plan). A groundwater management plan currently does not exist for the basin as a whole, but the Antelope Valley pumpers were making an effort to create a basin management plan. This effort ended in 1999 when a farming company filed two lawsuits against water agencies (PWD 2001 FWMPU). A groundwater management plan has been developed specific for the RCSD service area only. Since the Antelope Valley basin is not yet adjudicated and has not been officially deemed in overdraft by DWR, there are no existing restrictions on pumping. However, water rights will be assigned as part of the adjudication process.

3.6 Water Use Trends

Population projections are often used to determine future demand by utilizing an average water demand (typically based on historic water use). LACWW40 water use per person averages about 333 gallons per day (gpd). RCSD average water use per person is about 170 gpd, and QHWD average water use per person is about 315 gpd. The average water use per capita for PWD is 240 gpd from 1999 to 2010, and 248 gpd from 2011 to 2020 (2001 PWD FWSMPU). It was assumed that 248 gpd/ capita is appropriate for 2025 and 2030. Using these values and the population projections from Table 2 in Section 2.6, the estimated future water usage is as presented in Table 8. These values could be reduced in the future with the implementation of stricter demand management measures, which could reduce the average use per person.

Table 8: Per Capita Water Use Projections (AF)

	2005	**2010**	**2015**	**2020**	**2025**	**2030**
LACWW40[1]	53,850	65,902	76,176	86,449	96,722	106,996
QHWD[1]	5,469	6,345	7,360	8,537	9,903	11,488
RCSD[1]	2,954	4,742	7,036	10,438	15,487	22,977
PWD[2]	28,454	35,131	40,597	44,892	49,187	53,482
Study Area	**90,727**	**112,120**	**131,169**	**150,316**	**171,299**	**194,943**

[1]Obtained from Draft 2005 Integrated Urban Water Management Plan for the Antelope Valley.

[2] Calculated using 2001 PWD FWSMPU per capita production numbers.

Recycled water use will benefit the users because it will be offered at a lower cost than potable water. The current costs of potable water for LACWW40 customers are presented in Section 3.3.5.

3.7 Quality of Water Supplies

3.7.1 Groundwater Water Quality

Groundwater quality is excellent within the principal aquifer but degrades toward the northern portion of the dry lakes areas. 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, and nitrates area a problem in some areas of the basin. The groundwater in the basin is used for agricultural, municipal and industrial uses.

As discussed in Section 2.4.1, arsenic has been observed in the groundwater for LACWW40, QHWD and RCSD. Arsenic levels above the MCL have been observed in approximately 18 wells for LACWW40, for which 6 wells have been placed in an inactive status. The remaining active wells with high arsenic levels are undergoing a partial abandonment process that will allow pumping only in arsenic free zones. Similarly, RCSD has observed levels of arsenic in the range of 11 to 14 ppb in some of its wells. RCSD is utilizing methods similar to LACWW40's methods to manage arsenic levels. It is not anticipated that the existing arsenic problem will lead to future loss of groundwater as a supply for the Antelope Valley.

The groundwater quality of PWD well water in Lancaster and Pearland subbasins and the San Andreas Rift Zone meets the current drinking water standards of US EPA and DHS as of the PWD 2001 FWSMPU. The 1998 – 2000 water quality data for arsenic in the PWD 2001 FWSMPU is below the 2001 US EPA revised arsenic MCL of 0.010 mg/l.

3.7.2 Surface Water Quality

As discussed in Section 2.4.2, Littlerock Reservoir is the only developed surface water source in the Antelope Valley. Littlerock Creek water quality data from a January 2000 sample is provided in Table 9 (PWD 2001 FWSMPU). According to PWD 2001 FWSMPU, there are no objectionable water quality characteristics. The single sample does not relate water quality during peak runoff periods, but it provides an indication of the water quality after settling occurs in Lake Palmdale.

Table 9: Littlerock Creek Water Quality (Single Sample in Jan 2000)[1]

Constituent	mg/l	Constituent	mg/l
Chemical Parameters			
Cations		Anions	
Calcium	32.7	Sulfate	**24.2**
Magnesium	14.2	Chloride	**7.4**
Sodium	22.4	Nitrate	**<2.0**
Potassium	2.5	Perchlorate	**ND**
Manganese	0.08		
Fluoride	ND		
Iron	ND		
Physical Parameters			
Total Hardness as $CaCO_3$	147	Specific Conductance	**360 µmho/cm**
Total Alkalinity as $CaCO_3$	148	Odor	**2 TON**
Total Dissolved Solids	192	Color	**10 Units**
pH	8.3 units	Turbidity	**1.8 NTU**
Radioactivity			
Gross Alpha	2.2 pCi/l		

[1]PWD 2001 FWSMPU, Table 4-2

3.8 Sources for Additional Water

3.8.1 Groundwater Recharge via Spreading Basins

Groundwater recharge via spreading basins was determined to be a feasible use for the tertiary treated recycled water from PWRP in the 2000 Palmdale Water Reclamation Concept Study (PWRCS) prepared by Kennedy/Jenks Consultants. The groundwater recharge concept includes recharging the Pearland and Buttes subbasins with tertiary effluent via spreading basins.

Groundwater recharge into the Antelope Valley basins would require compliance with the California Administrative Code Title 22 Division 4 Environmental Health (Wastewater Reclamation criteria) regulations and the Water Quality Control Plan for the Lahontan Region Basin Plan. RWQCB, in consultation with DHS, would establish discharge requirements.

Discharge requirements will likely involve the following issues: 1) The level of treatment must comply with DHS groundwater recharge regulations (draft form in 2000), which specify levels of treatment that are a function of the percentage of effluent combined with naturally occurring groundwater extracted for domestic water supply. 2) RWQCB could require demineralization within the treatment process if the antidegradation policy adopted by the State of California is strictly enforced. 3) The reduction of total organic carbon (TOC) and TDS are treatment issues that may have significant impacts on potential costs of a groundwater recharge project.

Other issues may arise in the future that will need to be considered.

3.8.2 Aquifer Storage and Recovery (ASR) Demonstration Project via Injection

LACWW40, in conjunction with USGS and AVEK, performed an ASR demonstration project in the City of Lancaster from 1994 to 1999. The goal of the project was to test the feasibility of injecting excess treated surface water supplies into the Lancaster subbasin and recovering groundwater supplies during high demand and/or drought. USGS conducted the majority of the investigation and produced the reports, while LACWW40 monitored water levels and water quality of the injected and extracted waters and prepared the monthly, quarterly and annual reports required by the waste discharge requirements (WDRs) issued by the RWQCB.

The project findings included that the shallow aquifer of the test area accepted water via injection much better than the deep aquifer and older wells may not be acceptable for injection. No significant chemical reactions were experienced that would clog the screen or gravel pack of the well. The main water quality issue was the temporary formation of trihalomethanes (THMs). (Discussions with LACWW40, 2005)

The ASR Demonstration Project concluded that a full-scale project will increase the Lancaster region's available water supply in a technically, economically and institutionally feasible way. The RWQCB adopted a Conditional Waiver of Waste Discharge

Requirements for the County of Los Angeles Department of Public Works Lancaster Sub-basin Full-scale Aquifer Storage and Recovery Project on October 13, 2004. The project will involve annual injection of up to 6,843 AF of AVEK's SWP water and extraction of 13,282 AF from the upper aquifer of the groundwater of the Lancaster subbasin. In an effort to further reduce formation of disinfection byproducts such as THMs, AVEK proposed to modify treatment facilities by June 2006. A five-year review of the effectiveness or failure of the project will start on October 13, 2009 until the project is terminated. (RWQCB Waiver No. R6V-2004-(PROPOSED))

Section 4: Wastewater Characteristics and Facilities

4.1 Wastewater Entities

LWRP, PWRP and RWWTP are the three wastewater treatment plants in the Antelope Valley study area. Figure 5 in Section 2 provides the WRP and WWTP locations. Currently, these three plants primarily provide secondary treated effluent. The only recycled water that is treated to a tertiary level is a small percentage of the wastewater at the LWRP through additional onsite facilities known as AVTTP. Effluent management is challenging in the Antelope Valley because the area is a closed basin with no river or other outlet to the Pacific Ocean. Effluent management options are restricted to methods such as reuse, evaporation and percolation. LWRP, PWRP and RWWTP will all provide tertiary treated effluent with future upgrades.

4.2 Major Facilities

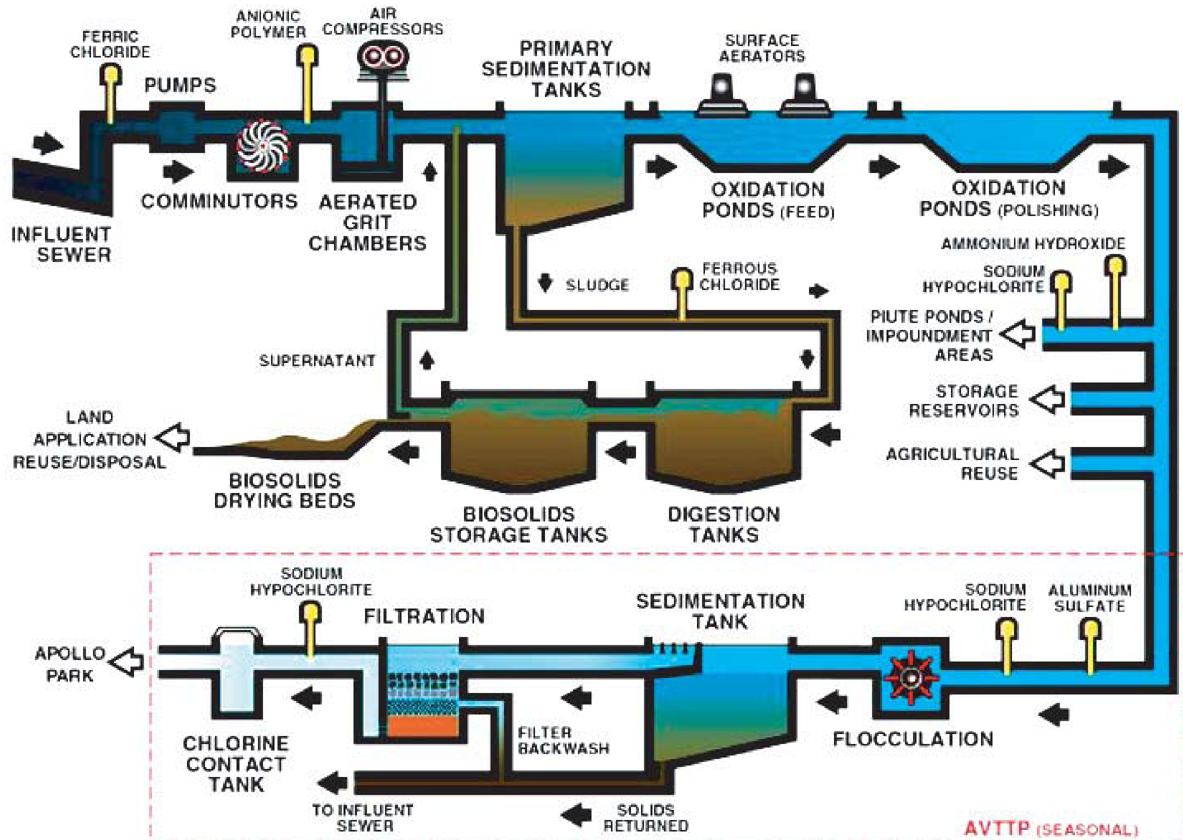
4.2.1 Lancaster Water Reclamation Facility

LWRP was built in 1959 and is located north of the City of Lancaster. County Sanitation District No. 14 of Los Angeles County owns, operates and maintains LWRP. The plant provides primary (via sedimentation) and secondary (via biological stabilization in oxidation ponds) treatment to all incoming wastewater. A portion of the effluent at LWRP is treated to a tertiary level, through additional onsite facilities, known as the Antelope Valley Tertiary Treatment Plant (AVTTP), to a small side-stream of secondary effluent by means of coagulation, dual-media gravity filtration, phosphorus removal, and chlorination. LWRP, which has a permitted capacity of 16.0 mgd, treated an average flow of 12.8 mgd in 2002. Figure 10 presents a schematic of LWRP's existing treatment facilities. Secondary treated recycled water produced at the LWRP is either:

- retained in storage reservoirs,
- conveyed to Nebeker Ranch for the irrigation of fodder crops,
- conveyed to Piute Ponds to maintain a minimum of 200 wetted acres of habitat and/or the adjacent Impoundment Areas to create a suitable environment for recreational duck hunting.

Tertiary treated effluent from the 0.6-mgd-capacity AVTTP is conveyed to Apollo Lakes Regional County Park (Apollo Park), as shown on Figure 11. The LWRP and AVTTP are currently regulated by the RWQCB-LR under Waste Discharge Requirements listed as Board Order R6V-2002-053 adopted in September 2002.

As described in the LWRP 2020 Facilities Plan (May 2004), LWRP will be upgraded and expanded to increase the primary, secondary and tertiary wastewater treatment, biosolids handling capacity and effluent management capacity to 21 mgd by 2008 and 26 mgd by 2014. (The improvements from 21 mgd to 26 mgd will be reevaluated in 2010-11 to respond to any changes in wastewater flow projections or other factors, i.e. increase in municipal recycled water reuse demands.) Primary treatment upgrades include an influent pump



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LWRP Existing Treatment Schematic

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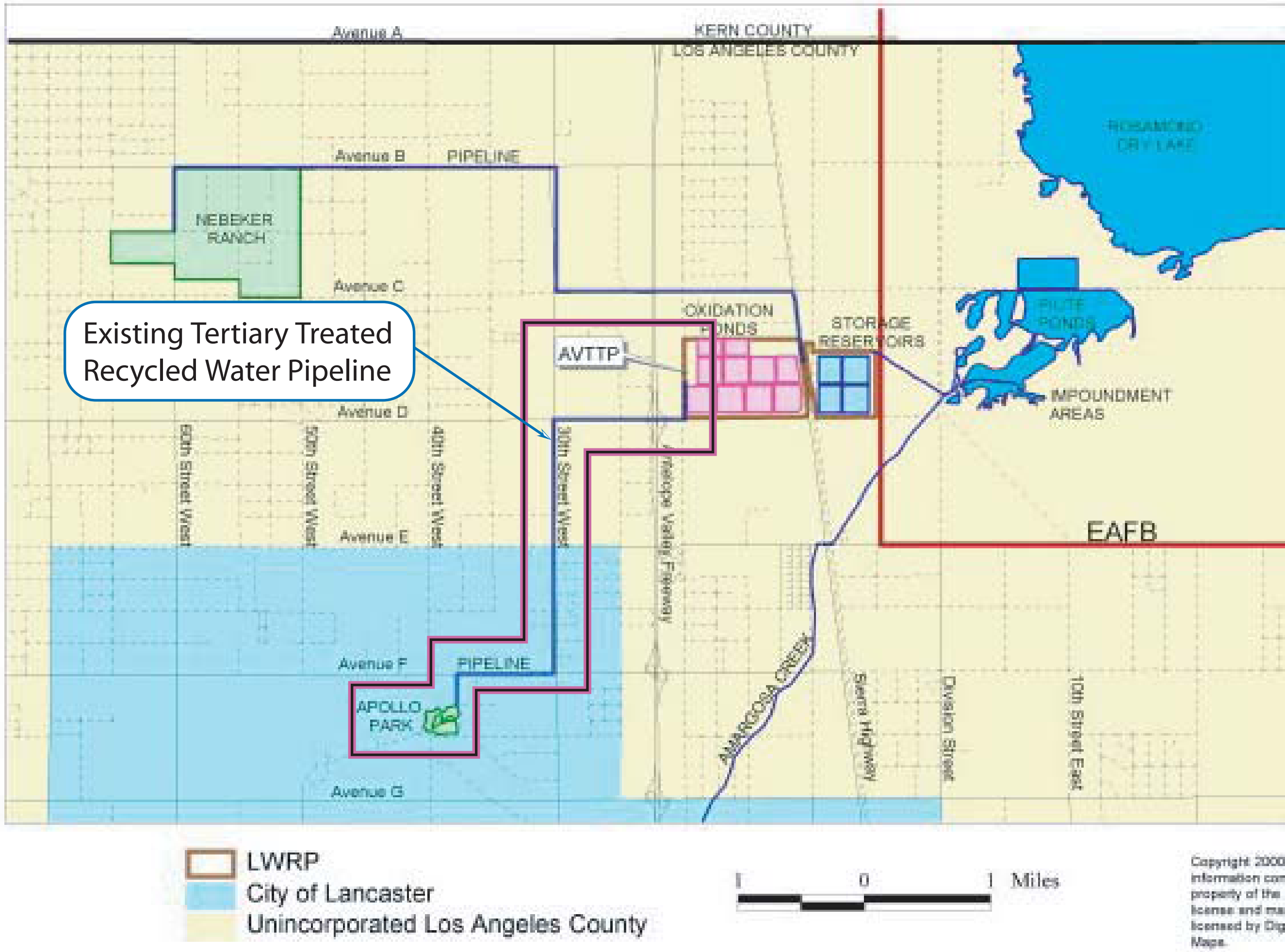
Figure No. 10

Source: LWRP 2020 Facilities Plan, May 2004, Figure ES-3.



Source: LWRP 2020 Facilities Plan, May 2004, Figure ES-2.

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Existing Tertiary Treated Recycled Water Pipeline from AVTTP to Apollo Park

K/J 0589030

Figure No. 11

station, aerated grit channels, primary sedimentation tanks, digestion tanks and drying beds. The existing 16 mgd oxidation pond secondary treatment facilities will be replaced by a 26 mgd CAS secondary and tertiary treatment facility. Portions of AVTTP will be partially replaced with more modern tertiary treatment technology. A dechlorination station will be constructed to improve the quality of effluent discharge to Piute Ponds.

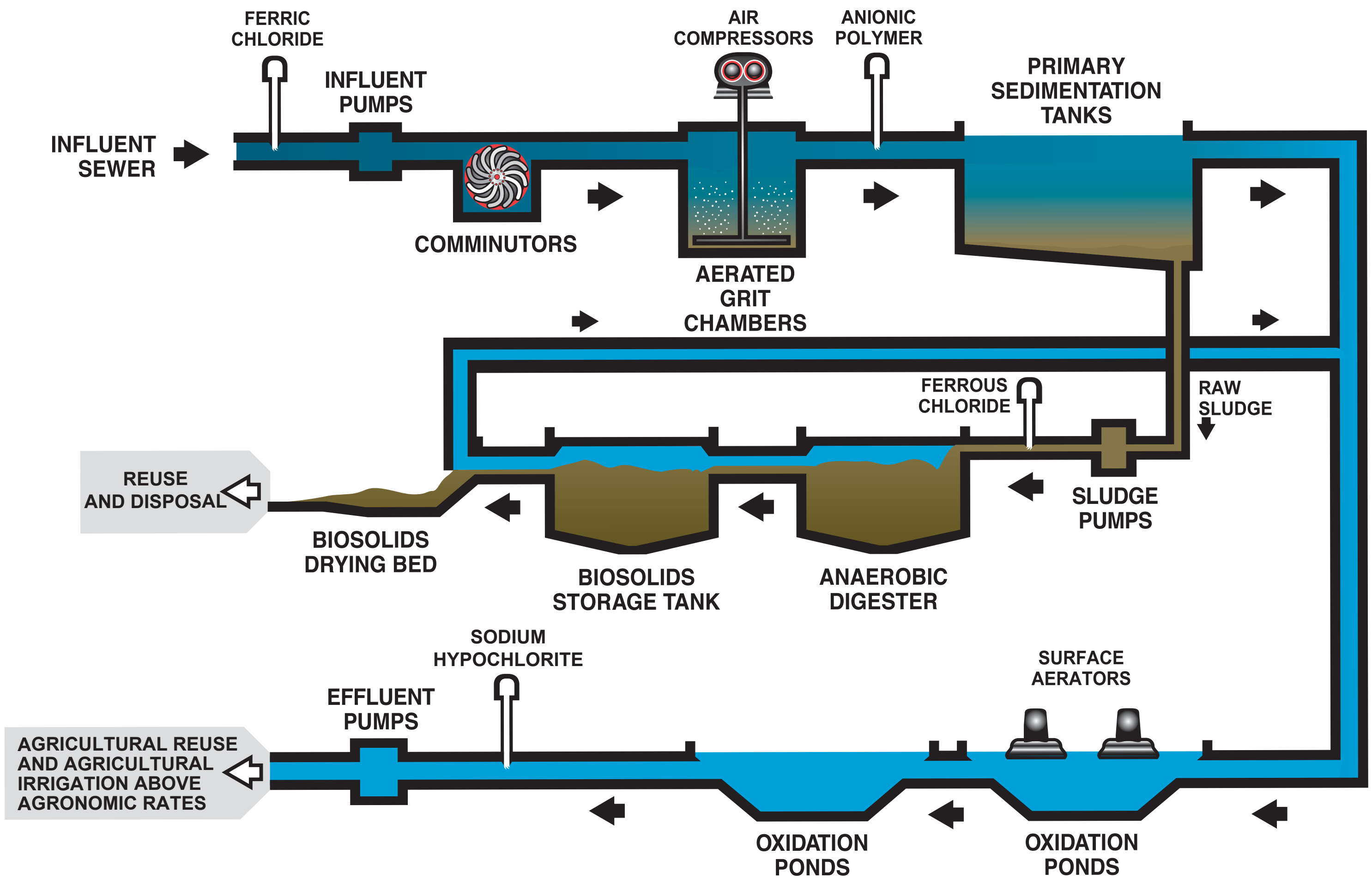
The effluent from the upgraded LWRP will be used for municipal reuse and discharged to Piute Ponds, Impoundment Areas, Apollo Park, storage reservoirs and agricultural reuse operations. Land will be acquired to provide the space for storage reservoirs and agricultural reuse. In addition, the City of Lancaster aims to implement a recycled water project to distribute 1.5 mgd of LWRP's tertiary treated recycled water to municipal users. The recycled water facilities described in this report would accommodate uses over a much larger area.

4.2.2 Palmdale Water Reclamation Facility

PWRP was built in 1953 with an original capacity of 0.75 mgd. The current permitted capacity for PWRP is 15.0 mgd. PWRP is located on two sites in an unincorporated County area, adjacent to the City of Palmdale. County Sanitation District No. 20 of Los Angeles County owns, operates and maintains PWRP. All wastewater receives primary treatment (via sedimentation) and secondary treatment (via biological stabilization in oxidation ponds). Chlorination is also provided by a temporary facility. PWRP treated an average flow of 9.4 mgd in 2004. The secondary treated effluent produced at the plant is either land applied or used to irrigate trees and fodder crops on land leased from Los Angeles World Airports (LAWA). Figure 12 is the existing treatment schematic for PWRP.

The RWQCB-LR revised the WDRs for PWRP in 2000, ordering District No. 20 to take action on suspected groundwater nitrate contamination due to historical land application practices. Furthermore, RWQCB-LR adopted Cleanup and Abatement Order No. R6V-2003-056 (CAO) and Cease and Desist Order No. R6V-2004-039 (CDO) in November 2003 and October 2004, respectively. The CAO requires District No. 20 and LAWA to clean up and abate the elevated nitrate levels identified in the groundwater beneath the land application sites. The CDO requires District No. 20 to eliminate land application of treated effluent by October 15, 2008, and complete construction of the new wastewater treatment and effluent management facilities necessary to prevent the discharge of nitrogenous compounds to the groundwater at levels that create a condition of pollution or violate the 1994 Water Quality Control Plan for the Lahontan Region (1994 Basin Plan) water quality objectives, by October 31, 2009.

The Final PWRP 2025 Facilities Plan and Environmental Impact Report (October 2005) proposes the recommended project to eliminate land application of treated effluent and to construct new wastewater treatment and effluent management facilities to address the CDO. The recommendations include increasing PWRP's capacity from 15.0 mgd to 22.4 mgd by 2013. Existing primary treatment facilities will be expanded, secondary treatment facilities of oxidation ponds would be replaced with CAS w/ nitrification-denitrification, and tertiary treatment facilities (filters), permanent disinfection facilities and solids management facility improvements would be included. Land will be purchased to accommodate the new storage reservoir construction and agricultural reuse pipeline facilities that should be completed by



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PWRP Existing Treatment Schematic

K/J 0589030

Figure No. 12

Source: Final Palmdale Water Reclamation Plant 2005 Facilities Plan and Environmental Impact Report, September 2005, Figure ES-3.

2008 and 2009, respectively. Tertiary wastewater will be produced by 2009 and municipal use of the tertiary treated recycled water is planned with LACWW40 and PWD.

4.2.3 Rosamond Wastewater Treatment Facility

The existing wastewater facilities at RWWTP include the headworks (grinder and influent pumps) and 15 ponds, which provide treatment (aeration), storage and disposal (evaporation). Upgrades to RWWTP in 1995 provided the capacity to provide undisinfected secondary treatment for the wastewater. The current average daily flow at RWWTP is 1.1 mgd, with a capacity of 1.3 mgd. There is no discharge from RWWTP, but treated wastewater can be used to irrigate non-food bearing trees onsite.

Projected wastewater flows for RWWTP are 1.8 mgd in 2010, and 2.34 mgd in 2018. To achieve the 1.8 mgd capacity needed in 2010, the proposed upgrades to RWWTP will increase the primary treatment (grit removal) capacity to 1.8 mgd, continue the operation of the existing 1.3 mgd secondary treatment pond plant, and add 0.5 mgd of new secondary and tertiary treatment facilities. The new 0.5 mgd tertiary treatment plant will be constructed in a manner that the plant can be expanded to handle a total of 1.0 mgd to meet flow projections of 2.34 mgd in 2018. Proposed plant improvements will provide grit removal, flow splitting, tie-in to the existing system, an extended aeration reactor basin, one (1) secondary clarifier, return and waste activated sludge pumping station, chemical feed facility, filters, ultraviolet disinfection, sludge drying beds, a control building, an effluent pump station and distribution system improvements.

The proposed treatment plant improvements design is complete and approved by the State of California; construction will begin when the funding is received. The recycled water will be of sufficient quality that it meets unrestricted use requirements and may be used for irrigating the landscapes of freeways, parks, schools, senior complexes and new home developments.

4.3 Water Quality of Effluent

The water quality of AVTTP effluent is provided in Table 10. Monitoring results and WDR limits, where applicable, are shown also.

Table 10: AVTTP Routine Disinfected Tertiary Effluent Monitoring Results for 2002

Constituent	Range	Average	Permit Limit
Total Coliform, Daily Grab (MPN/100 mL)	< 1a - < 1	< 1	23 (maximum)b
Total Coliform, 7-Day Median (MPN/100 mL)	< 1 - < 1	< 1	2.2 (maximum)b
Turbidity, 24-Hour Composite (NTU)	0.7 - 1.4	1.0	N/A
Turbidity, 30-Day Mean (NTU)	0.7 - 1.6	1.1	2.0 (maximum)
Turbidity, Time > 5 NTU (minutes)	0 - 0	0	72 (maximum)
MBAS (mg/L)	0.10 - 0.10	0.10	2 (maximum)
Soluble BOD (mg/L)	< 2 - 5	< 3	30 (average); 45 (maximum)
Soluble COD (mg/L)	22 - 41	26	N/A
Nitrate Nitrogen (mg/L-N)	0.80 - 8.16	3.50	N/A
Ammonia Nitrogen (mg/L-N)	< 0.01 - 1.8	< 0.3	N/A
Kjeldahl Nitrogen (mg/L-N)	0.2 - 3.1	< 0.7	N/A

(a) "<x" indicates constituent was not detected, with the detection limit being x.
(b) The number of coliforms must not exceed the permit limit per 100 mL in more than one sample during any 30-day period.

The effluent mineral characteristics at LWRP, PWRP and RWWTP for 2004 are provided in Table 11.

Table 11: Effluent Mineral Characteristics for LWRP, PWRP and RWWTP

Parameter (Annual Mean Values)	Unit	LWRP[1]	PWRP[1]	RWWTP[2]
Total Dissolved Solids	mg/l	548	520	590
Ammonia-N	mg/l	15.7	22	32
Calcium	mg/l	44	31.1	NA
Magnesium	mg/l	12.3	11.3	NA
Arsenic	mg/l	< 0.0022	< 0.001	0.007
Barium	mg/l	0.014	NA	NA
Aluminum	mg/l	< 0.09	NA	NA
Cadmium	mg/l	< 0.0004	< 0.0004	ND
Total Chromium	mg/l	< 0.010	< 0.010	ND
Hexavalent Chromium	mg/l	< 0.0001	NA	NA
Cobalt	mg/l	< 0.010	NA	NA
Iron	mg/l	0.275	NA	NA
Lead	mg/l	< 0.002	< 0.002	0.006
Manganese	mg/l	0.019	NA	NA
Mercury	mg/l	< 0.00004	< 0.00004	ND
Nickel	mg/l	< 0.020	< 0.020	ND
Potassium	mg/l	17	14.1	NA
Silver	mg/l	< 0.00036	< 0.00033	ND
Antimony	mg/l	< 0.0005	< 0.0005	ND
Beryllium	mg/l	< 0.0007	< 0.0005	ND
Molybdenum	mg/l	< 0.04	NA	NA
Thallium	mg/l	< 0.001	< 0.001	ND
Vanadium	mg/l	< 0.020	NA	NA
Sulfate	mg/l	80	69	NA
Chloride	mg/l	141	113	98
Total Hardness (as C_2CO_3)	mg/l	127	NA	NA
MBAS	mg/l	0.1	0.2	7.8
Copper	mg/l	< 0.010	NA	0.043
Selenium	mg/l	< 0.001	NA	ND
Sodium	mg/l	167	125	NA
Zinc	mg/l	0.067	NA	0.440

NA: not available
ND: None detected at DLR.
[1]2004 Annual Reports.
[2]BSK Analytical Laboratories Certificate of Analysis, Sample Date 07/20/04 of influent sewer.

4.4 Additional Facilities Needed to Comply with Waste Discharge Requirements

When LWRP, PWRP and RWWTP are upgraded to provide tertiary treated effluent, no additional treatment facilities will be required to comply with the waste discharge requirements.

4.5 Sources of Industrial or Other Problem Constituents

Industrial sources of pollutants will be controlled by implementing an industrial pretreatment program.

4.6 Existing Recycling Activities

As discussed in Section 3.3.4, there is only one current user of tertiary treated recycled water. A small percentage of the wastewater at the LWRP receives tertiary treatment through additional onsite facilities known as AVTTP. Tertiary treated effluent from the 0.6-mgd-capacity AVTTP is conveyed to Apollo Park, where it fills a series of recreational impoundments that are available to the public. Since the recreational demand exists primarily between April and October, AVTTP operates only about half of the year.

4.7 Existing Rights to Use of Treated Effluent after Discharge

LACWW40 is currently in negotiation with County Sanitation Districts of Los Angeles County (CSDLAC) to purchase the tertiary treated effluent from LWRP and PWRP and receive the rights for the reuse of the recycled water.

RCSD has the existing rights to use RWWTP's tertiary treated effluent after discharge since RCSD owns and operates RWWTP.

4.8 Wastewater flow variations

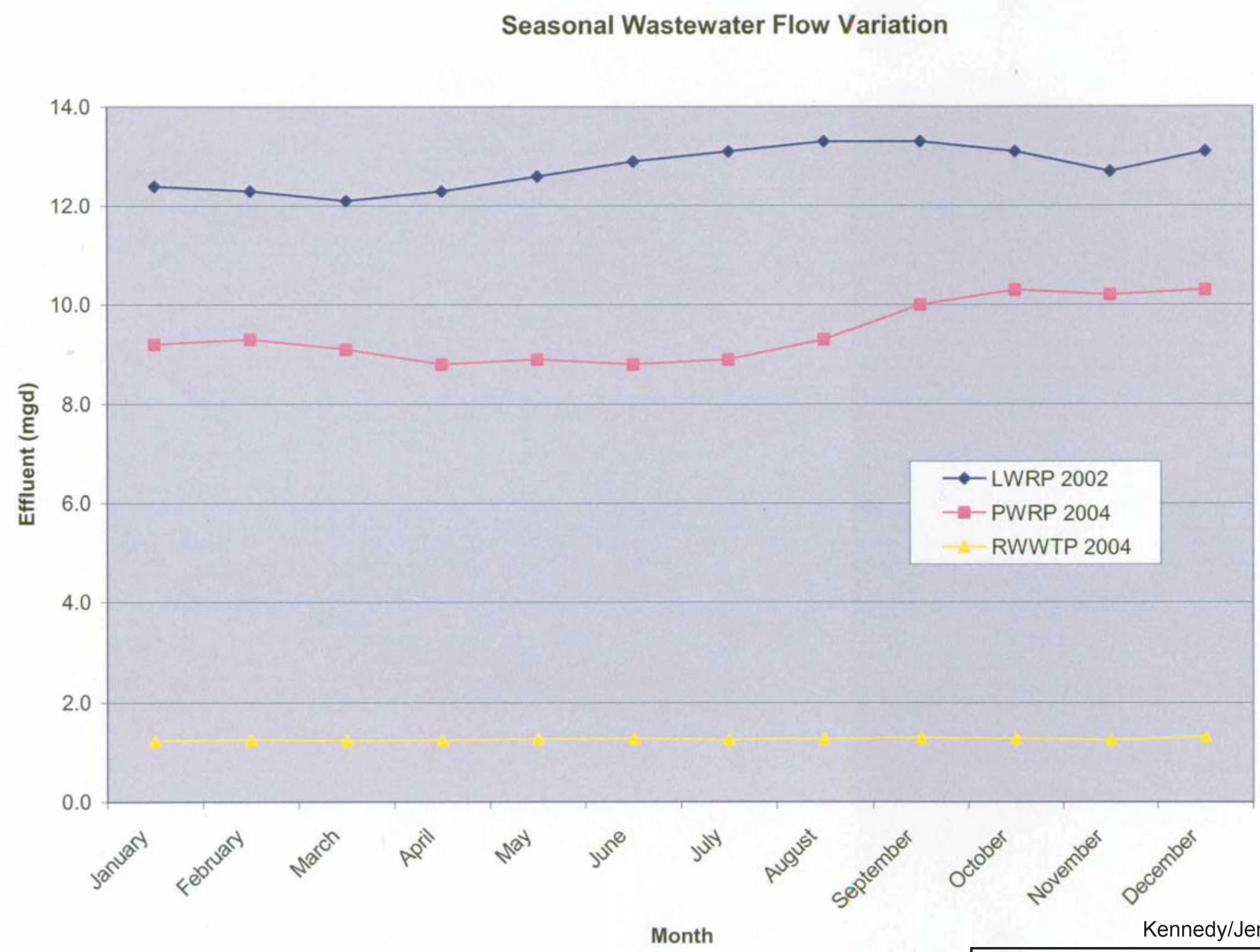
4.8.1 Seasonal Flow Variation

For 2002 at LWRP, the monthly flow averaged over the winter months (October – March) was about 0.3 MGD lower than the monthly flow averaged for the summer months (April – September), despite the majority of the storms occurring in the winter. Figure 13 shows the monthly flows from January 2002 – December 2002. During the winter months of this year (January 2002 – March 2002 and October 2002 – December 2002), Lancaster received 2.27 inches of rainfall and during the summer months (April 2002 – September 2002), they received only 0.03 inches.

For 2004 at PWRP, the monthly flow averaged over the winter months (October – March) was about 0.6 MGD higher than the monthly flow averaged for the summer months (April – September). Figure 13 shows the monthly flows from January 2004 – December 2004.

During the winter months of this year (January 2004 – March 2004 and October 2004 – December 2004), Palmdale received over 9 inches of rainfall and during the summer months (April 2004 – September 2004), the rainfall was 0.04 inches.

For 2004 for RWWTP, the wastewater flows were fairly constant throughout the entire year. The monthly flow averaged over the winter months (October – March) was 0.01 MGD less than the monthly flow average over the summer months (April – September). Assuming the 2004 rainfall data presented above for PWRP is applicable to RWWTP, the significantly higher rainfall in the winter appeared to have little effect on RWWTP's wastewater flows.



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Seasonal Wastewater Flow Variation

K/J 0589030

Figure No. 13

Section 5: Treatment Requirements for Discharge and Reuse

5.1 Water Quality Requirements for Potential Uses

Disinfected tertiary recycled water will be required for the planned irrigation areas in the Antelope Valley study area as described in the California Health Laws Related to Recycled Water (Purple Book). The Purple Book provides a single source of guidelines and requirements for recycled water usage in California. It is meant to be an aid to staff of the Drinking Water Program within the Department of Heath Services Division of Drinking Water and Environmental Management.

5.1.1 Disinfected Tertiary Recycled Water

Disinfected tertiary recycled water is to be used for:

- Parks and playgrounds
- School yards
- Residential landscaping
- Golf courses
- Cemeteries
- Freeway landscaping
- Ornamental nursery stock and sod farms where access by general public is not restricted.

Disinfected tertiary recycled water is defined in Section 60301.230 of the Title 22 Code of Regulations, Division 4. Environmental Health, Chapter 3 Water Recycling Criteria (and also contained in the Purple Book) as follows:

> "The filtered wastewater has been disinfected by either:
>
> - A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or
> - A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of the demonstration.

> The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed a Maximum Probable Number (MPN) of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30 day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters."

In the Antelope Valley service area, all the planned irrigation areas fall in this category for Phases 1A - 4.

5.2 Health-related Water Quality or Treatment Requirements

Currently all areas considered for irrigation with recycled water are being irrigated with or have potable water pipes tied into their irrigation systems. The Purple Book describes the different backflow preventers that are required to avoid cross-contamination of potable water with recycled water.

In addition, to keep pipes that convey recycled water distinct, the Purple Book references the requirements of the Health and Safety Code, Division 104. Environmental Health Services, Part 12. Drinking Water, Chapter 5. Water Equipment and Control, Article 2. Cross Connection Control by Water Users, Section 116815:

> "All pipes installed above or below the ground, on and after June 1, 1993, that are designed to carry recycled water, shall be colored purple or distinctively wrapped with purple tape."

Since the regulations compiled in the Purple Book are intended to protect public health, compliance with these regulations should result in public health protection.

5.3 Wastewater Discharge Requirements

As discussed previously in Section 2.7, the Antelope Valley study area is in Water Quality Control Board Region No. 6 (Lahontan). RWQCB has not issued updated WDRs for LWRP, PWRP and RWWTP to address the future tertiary treatment upgrades. WDR Nos. for the three plants are discussed below.

Discharges of treated wastewater from the LWRP are regulated by the RWQCB-LR under WDRs listed as Board Order R6V-2002-053 adopted in September 2002.

Discharges of treated wastewater from the PWRP are regulated by the RWQCB-LR under amended WDRs listed as Board Order 6-00-57, and amendments 6-00-57-A01, 6-00-57-A02 and 6-00-57-A03. Accompanying Monitoring Report Plans (MRPs) listed as Board Order 6-00-57-A01, and amendments 6-00-57-A02, 6-00-57-A03, and 6-00-57-A04 provide the monitoring and reporting requirements.

Significant WDR revisions for PWRP occurred in 2000 when RWQCB ordered CSDLAC District No. 20 (CSDLAC20) to take action on suspected groundwater nitrate contamination due to historical land application practices. RWQCB also adopted Cleanup and Abatement Order No. R6V-2003-056 (CAO) and Cease and Desist Order No. R6V-2004-039 (CDO) in November 2003 and October 2004, respectively. The CAO requires CSDLAC20 and LAWA to clean up and abate the elevated nitrate levels identified in the groundwater beneath the land application sites. The CDO requires CSDLAC20 to eliminate land application of treated effluent by October 15, 2008, and complete construction of the new wastewater treatment and effluent management facilities necessary to prevent the discharge of nitrogenous compounds to the groundwater at levels that create a condition of pollution or violate the 1994 Water Quality Control Plan for the Lahontan Region (1994 Basin Plan) water quality objectives, by October 31, 2009. (Final PWRP 2025 Plan EIR)

Rosamond WWTP is regulated by WDRs 6-95-107 and 6-96-107A1.

5.3.1 Water Quality Objectives (WQOs) and Effluent Limits

The updated WQOs and effluent limits for LWRP, PWRP and RWWTP with tertiary treatment upgrades are not available because the RWQCB has not issued revised WDRs. The anticipated effluent limits for recycled water at LWRP, PWRP and RWWTP are listed in Table 12. The preliminary design criteria for RWWTP's upgrade to tertiary treatment discussed only three tertiary effluent parameters: suspended solids, total BOD and turbidity. Concerns over nitrate levels in the area may require effluent limits for nitrates and other nitrogen species. All of the parameters and their corresponding levels apply to LWRP and PWRP.

5.4 Water Quality-related Requirements of the RWQCB

The water quality-related requirements of the RWQCB are documented in the Basin Plan and will be designated in the future WDRs. These water quality requirements serve to protect surface or ground water from problems resulting from recycled water use.

Table 12: Anticipated Tertiary Effluent Levels for LWRP, PWRP and RWWTP[1]

PARAMETER	UNIT	Level
Suspended Solids[1]	mg/l	5
Total Dissolved Solids	mg/l	550
Total BOD[1]	mg-N/l	5
Turbidity[1]	NTU	2
Ammonia	mg-N/l	1
Total Kjeldahl Nitrogen	mg-N/l	2
Nitrate+Nitrite	mg-N/l	8
Total Cyanides	µg/l	< 5
Total Phenols	µg/l	< 10
Total Trihalomethanes (THM)	µg/l	< 30
Calcium	mg/l	45
Magnesium	mg/l	12
Arsenic	mg/l	< 0.001
Barium	mg/l	0.01
Aluminum	mg/l	< 0.1
Cadmium	mg/l	< 0.0004
Total Chromium	mg/l	< 0.01
Hexavalent Chromium	mg/l	< 0.0001
Cobalt	mg/l	< 0.01
Iron	mg/l	< 0.3
Lead	mg/l	< 0.002
Manganese	mg/l	0.02
Mercury	mg/l	< 0.00004
Nickel	mg/l	< 0.020
Potassium	mg/l	17
Silver	mg/l	< 0.0005
Antimony	mg/l	< 0.0005
Beryllium	mg/l	< 0.0007
Molybdenum	mg/l	< 0.04
Thallium	mg/l	< 0.001
Vanadium	mg/l	< 0.02
Sulfate	mg/l	80
Chloride	mg/l	150
Total Hardness (as $CaCO_3$)	mg/l	130
MBAS	mg/l	0.1
Copper	mg/l	< 0.01
Selenium	mg/l	< 0.001
Sodium	mg/l	170
Zinc	mg/l	0.07
Boron	mg/l	1

[1]Suspended Solids, Total BOD and Turbidity are only tertiary effluent parameters described in RWWTP's preliminary design criteria for tertiary treatment upgrade.

Section 6: Recycled Water Market

6.1 Market Assessment Procedures

The Market Assessment approach is based on information received in discussions with the City of Palmdale, Palmdale Water District, City of Lancaster and Rosamond Community Services District.

The recycled water market assessment for the City of Palmdale is based on information in the 1995 Antelope Valley Water Resource Study by Kennedy/Jenks Consultants and the 1997 Metcalf & Eddy Draft Reclamation Concept and Feasibility Study. The 1997 report provided updated potential users and acreage, and used a unit application rate of 4.2 feet per year to determine the annual demand. In discussions with the City, an update to the 1997 Feasibility Study was completed. The peak day demands are calculated with a 2.2 peaking factor and 2.0 was used for the peak hour factor.

Palmdale Water District provided the recycled water user information, updated annual demands and estimates of usage for future schools and parks. Peaking factors of 2.2 and 2.0 were used to obtain peak day and peak hour demands from the annual demand information, respectively.

The recycled water market assessment for the City of Lancaster was performed by RMC Water and Environment. The information provided in the Draft Technical Memorandum (Draft TM) on the identification and evaluation of probable recycled water users by RMC Water and Environment (August 2005) is used for the City of Lancaster analysis. The Draft TM used a peak day factor of 2.0 and a peak hour factor of 3.0 for most users. Depending on the type of users, other various peaking factors were also used.

Rosamond Community Services District has not conducted any studies to identify any recycled water users at this time.

6.2 All Users or Categories of Potential Users

The potential recycled water users, annual demands, peak month, peak day and peak hour demands for City of Lancaster, City of Palmdale and the Palmdale Water District are presented below. Each potential user is identified with a site identification number. Potential users plan on using the tertiary treated water for landscape irrigation.

6.2.1 Antelope Valley

The overall estimated recycled water demand at buildout for the Antelope Valley is 17,491 AFY annually. This estimate incorporates recycled water demands for City of Palmdale, Palmdale Water District and City of Lancaster. Table 13 presents the breakdown of annual demands, peak month demands and peak day demands per agency.

It is estimated that the recycled water demand for Antelope Valley will vary seasonally according to the rainfall cycle associated with the region. During the winter months (October – March) when more rainfall is occurring, there will be less demand for recycled water for irrigation. During the summer months (April – September), the demand for recycled water will be high due to the higher temperatures and no rainfall.

Table 13: Antelope Valley Estimated Recycled Water Demand

Site/Project	Annual Demand at Buildout (AFY)	Annual Demand at Buildout (mgd)	Peak Month Demand (AF/mo)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour (mgd)	Comments
City of Palmdale	6,978	6.23	1,279	42.65	13.90	27.80	Used peak day factor of 2.2 and peak hour factor of 2.0.
Palmdale Water District	3,873	3.46	710	23.67	7.71	15.43	Used peak day factor of 2.2 and peak hour factor of 2.0.
City of Lancaster	6,640	5.93	1,094	36.47	11.88	35.53	Used Lancaster TM peak day factor of 2.0 and peak hour factor of 3.0.
Total Annual Demand	**17,491**	**15.6**	**3,083**	**103**	**33.5**	**78.8**	

6.2.2 City of Palmdale

The recycled water users for the City of Palmdale include mostly parks, schools, and golf courses. In addition, two future developments, Ritter Ranch and Anaverde, could potentially have a large recycled water demand. Table 14 shows the projected annual demand at buildout, peak day and peak hour demands of the potential major recycled water users. The total annual demand is projected to be 6,978 AFY.

Table 14: City of Palmdale Estimated Recycled Water Demand at Buildout

Site ID	Site/Project	Size (ac)	Unit Application Rate (ft/yr)	Annual Demand at Buildout (AFY)	Peak Month Demand (AF/mo)	Peak Day Demand* (AF/day)	Peak Day Demand* (mgd)	Peak Hour (mgd)
5065	Palmdale Business Park							
	Golf Course	236	4.20	991	181.72	6.06	1.97	3.95
5100	Antelope Valley Country Club	125	4.20	525	96.25	3.21	1.05	2.09
5002	Ritter Ranch (Future)							
	Parks	122	4.20	512	93.94	3.13	1.02	2.04
	Schools	121	4.20	508	93.17	3.11	1.01	2.02
	Golf Course	184	4.20	773	141.68	4.72	1.54	3.08
	Green Belts	75	4.20	315	57.75	1.93	0.63	1.25
5003	Anaverde (Future)							
	Golf Course	216	4.20	907	166.32	5.54	1.81	3.61
	Parks	160	4.20	672	123.20	4.11	1.34	2.68
	Schools	36	4.20	151	27.72	0.92	0.30	0.60
5004	Rancho Vista							
	Golf Course	135	4.20	567	103.95	3.47	1.13	2.26
	Parks	5	4.20	21	3.85	0.13	0.04	0.08
	<u>Schools - Existing</u>							
5128	Highlands High School	27	4.20	113	20.79	0.69	0.23	0.45
5134	Summerwind Elementary	7	4.20	29	5.39	0.18	0.06	0.12
5008	Rancho Vista Elementary	7	4.20	29	5.39	0.18	0.06	0.12
	<u>Parks - Existing</u>							
5009	Marie Kerr	60	4.20	252	46.20	1.54	0.50	1.00
	<u>Parks - Future</u>							
5010	Hillside	10	4.20	42	7.70	0.26	0.08	0.17
5005	Rancho Vista	4	4.20	17	3.08	0.10	0.03	0.07
5012	Warnack	132	4.20	552	101.26	3.38	1.10	2.20
	Subtotal Existing Annual Demand	602		2,528	464	15.45	5.04	10.07
	Subtotal Future Annual Demand	1,060		4,450	816	27.19	8.86	17.72
	Total Annual Demand	**1,662**		**6,978**	**1,279**	**42.7**	**13.9**	**27.8**

* Used a peak factor of 2.2

6.2.3 Palmdale Water District

Palmdale Water District provided the recycled water user information, updated annual demands at buildout and estimates of usage for future schools and parks. Table 15 displays the estimated recycled water demands for Palmdale Water District. As can be seen from the table, the projected annual demand for PWD is 3,873 AFY.

Table 15: PWD Estimated Recycled Water Demand at Buildout

Site ID	Site/Project	Size	Annual Demand	Unit Application Rate	Annual Demand at Buildout	Peak Month Demand	Peak Day Demand[1]		Peak Hour
		(ac)	(MG/yr)	(ft/yr)	(AFY)	(AF/mo)	(AF/day)	(mgd)	(mgd)
5013	College Park (Future)								
	Golf Course	184		4.20	773	141.68	4.72	1.54	3.08
	Parks	13		4.20	55	10.01	0.33	0.11	0.22
	School	100		4.20	420	77.00	2.57	0.84	1.67
5102	Desert Aire Golf Course (Existing)	40		4.20	168	30.80	1.03	0.33	0.67
	Schools - Existing								
5014	Barrel Springs		10.17		31	5.72	0.19	0.06	0.12
5015	Buena Vista		21.05		65	11.84	0.39	0.13	0.26
5122	Cactus K-8	10	10.26		31	5.77	0.19	0.06	0.13
5052	Chaparral Elementary	7	5.82		18	3.27	0.11	0.04	0.07
5016	Cimmaron		9.71		30	5.46	0.18	0.06	0.12
5118	Desert Rose Elementary	7	9.67		30	5.44	0.18	0.06	0.12
5017	Golden Poppy		14.16		43	7.97	0.27	0.09	0.17
5018	Joshua Hills		9.17		28	5.16	0.17	0.06	0.11
5019	Los Amigos		14.08		43	7.92	0.26	0.09	0.17
5020	Manzanita Elementary	7	7.77		24	4.37	0.15	0.05	0.09
5124	Mesa Intermediate	14	17.84		55	10.04	0.33	0.11	0.22
5021	Mesquite Elementary	7	9.28		28	5.22	0.17	0.06	0.11
5101	Palmdale High School	37	44.97		138	25.30	0.84	0.27	0.55
5022	Palmtree		13.61		42	7.66	0.26	0.08	0.17
5023	Pete Knight High School		72.33		222	40.69	1.36	0.44	0.88
5024	Phoenix High School		1.80		6	1.01	0.03	0.01	0.02

Site ID	Site/Project	Size	Annual Demand	Unit Application Rate	Annual Demand at Buildout	Peak Month Demand	Peak Day Demand[1]		Peak Hour
		(ac)	(MG/yr)	(ft/yr)	(AFY)	(AF/mo)	(AF/day)	(mgd)	(mgd)
5024	Phoenix High School		1.80		6	1.01	0.03	0.01	0.02
5025	Shadow Hills		53.54		164	30.12	1.00	0.33	0.65
5026	Tamarisk		7.03		22	3.96	0.13	0.04	0.09
5120	Tumbleweed Elementary	7	12.00		37	6.75	0.23	0.07	0.15
5027	Wildflower		9.92		30	5.58	0.19	0.06	0.12
5028	Yellen/Silpa		8.53		26	4.80	0.16	0.05	0.10
5121	Yucca Elementary	6	8.14		25	4.58	0.15	0.05	0.10
	Schools - Future								
5030	Ana Verde[2]		12.00		37	6.75	0.23	0.07	0.15
5031	Granite Hills[3]		14.16		43	7.97	0.27	0.09	0.17
5032	Ponderosa[4]		10.17		31	5.72	0.19	0.06	0.12
	Parks - Existing								
5105	Courson	8	9.13		28	5.14	0.17	0.06	0.11
5034	Desert Lawn Memorial	38	18.38		56	10.34	0.34	0.11	0.22
5107	Desert Sands	20	27.66		85	15.56	0.52	0.17	0.34
5035	Domenic Massari	40	58.26		179	32.78	1.09	0.36	0.71
5036	Dr. Robert C. St. Clair Parkway	4	6.68		21	3.76	0.13	0.04	0.08
5037	Joshua Hills	4	8.21		25	4.62	0.15	0.05	0.10
5038	Manzanita	5		4.20	21	3.85	0.13	0.04	0.08
5104	McAdam	20	28.84		89	16.23	0.54	0.18	0.35
5039	Pelona Vista Park	73	44.28		136	24.91	0.83	0.27	0.54
	Parks - Future								
5040	60th Street East/Avenue S-8	20		4.20	84	15.40	0.51	0.17	0.33
5041	72nd Street East/Avenue R-8	10		4.20	42	7.70	0.26	0.08	0.17
5042	70th Street East/Avenue R	10		4.20	42	7.70	0.26	0.08	0.17
5043	Desert Sands Expansion	7		4.20	29	5.39	0.18	0.06	0.12
5118	Palmdale	3		4.20	11	1.93	0.06	0.02	0.04
5045	Palmdale Oasis[5]	33	33.73		104	18.98	0.63	0.21	0.41
5046	Sam Yellen	25		4.20	105	19.25	0.64	0.21	0.42

Site ID	Site/Project	Size	Annual Demand	Unit Application Rate	Annual Demand at Buildout	Peak Month Demand	Peak Day Demand[1]		Peak Hour
		(ac)	(MG/yr)	(ft/yr)	(AFY)	(AF/mo)	(AF/day)	(mgd)	(mgd)
5047	Sierra Hwy Green Belt	4		4.20	16	2.85	0.09	0.03	0.06
5048	Tejon	19		4.20	78	14.33	0.48	0.16	0.31
	Other - Existing								
5049	American Indian Little League	5		4.20	21	3.85	0.13	0.04	0.08
5101	Palmdale Pony League	7		4.20	29	5.39	0.18	0.06	0.12
5051	Ponciltan Square	2		4.20	8	1.54	0.05	0.02	0.03
	Subtotal Exist Annual Demand				2,004	367	12.25	3.99	7.98
	Subtotal Future Annual Demand				1,869	343	11.42	3.72	7.44
	Total Annual Demand				**3,873**	**710**	**23.7**	**7.7**	**15.4**

[1]Used a peak factor of 2.2.
[2]Used Tumbleweed annual demand.
[3]Used Golden Poppy annual demand.
[4]Used Barrel Springs annual demand.
[5]Estimated annual demand.

6.2.4 City of Lancaster

The recycled water market assessment for the City of Lancaster is provided in the Draft TM on the identification and evaluation of probable recycled water users by RMC Water and Environment (August 2005). The results from the market assessment are listed in detail in Appendix B. Table 16 summarizes the results of the market assessment. In the TM, it was assumed that peak month demand is equal to peak day demand. As can be seen from Table 16, the projected annual demand at buildout for the City of Lancaster is 6,640 AFY.

Table 16: City of Lancaster's Estimated Recycled Water Demand at Buildout

Site ID	Site/Project	Size	Annual Demand at Buildout	Peak Day Demand	Peak Hour
		(ac)	(AFY)	(mgd)	(mgd)
	Existing Facilities Recycled Water Use				
1	Antelope Valley High School	58.6	67.21	0.1200	0.36
2	Apollo Park	89.8	179.20	0.3200	0.96

Site ID	Site/Project	Size (ac)	Annual Demand at Buildout (AFY)	Peak Day Demand (mgd)	Peak Hour (mgd)
3	Eastside Park	18.5	78.41	0.1400	0.42
4	El Dorado Park	13.4	68.00	0.1200	0.36
5	El Dorado School	6.3	11.20	0.0200	0.06
6	Fairgrounds Development	57.8	145.60	0.2600	0.78
7	Jane Reynolds Park	6.8	33.60	0.0600	0.18
8	Joshua Memorial Park	38.2	156.80	0.2800	0.84
9	Lancaster Cemetery	14.4	56.01	0.1000	0.30
10	Landfill	146.5	33.60	0.0900	0.27
11	Linda Verde School, E	10.0	22.40	0.0400	0.12
12	Mariposa Park	11.7	56.01	0.1000	0.30
13	Park View, E, M	19.8	56.01	0.1000	0.30
14	HWY 14	367.2	77.97	0.1392	0.42
15	Phoenix High School	4.0	11.20	0.0200	0.06
16	Antelope Valley College	113.8	483.40	0.8632	2.59
17	Armagosa School, M	14.3	60.74	0.1084	0.33
18	Carter Park	63.5	268.80	0.4800	1.44
19	City Park	69.4	163.00	0.3000	0.90
20	Cole Middle School	19.6	83.36	0.1488	0.45
21	Del Sur School, E, M	18.2	77.28	0.1380	0.41
22	Desert View, E	10.3	43.82	0.0782	0.23
23	Eastside HS (proposed)	68.6	291.20	0.5200	1.56
24	Fox Field Development*	87.5	371.70	0.6637	1.99
25	George Lane Park	13.7	58.30	0.1041	0.31
26	Good Shepard Cemetery	58.5	248.50	0.4437	1.33
27	Hull Park	9.7	41.09	0.0734	0.22
28	Proposed School 5	16.4	44.81	0.0800	0.24
29	Jack Northrop E, M	31.0	131.80	0.2353	0.71
30	Joshua School	17.3	73.46	0.1312	0.39
31	Joe Walker School, E	22.3	94.52	0.1688	0.51
32	Lancaster Golf Center	19.6	83.21	0.1486	0.45
33	Lancaster Municipal Stadium	5.2	22.09	0.0394	0.12
34	Lancaster School, H	37.0	157.20	0.2808	0.84
35	Lincoln School, E	10.7	45.54	0.0813	0.24

Site ID	Site/Project	Size (ac)	Annual Demand at Buildout (AFY)	Peak Day Demand (mgd)	Peak Hour (mgd)
36	Monte Vista, E	14.6	62.04	0.1108	0.33
37	Nancy Cory School, E	7.3	31.05	0.0554	0.17
38	National Soccer Center	155.7	661.10	1.1804	3.54
39	New Fairgrounds*	219.4	57.00	0.1000	0.30
40	Prime Desert Woodlands	64.3	272.90	0.4873	1.46
130A	City Maintenance	-	35.00	0.0554	0.06
130B	Street Cleaning	-	4.00	0.0061	0.01
	Existing Users Subtotal:		5020	8.99	26.85
Future Developments Recycled Water Use					
41	Proposed Park 1	18.6	79.14	0.1413	0.42
42	Proposed Park 2	14.9	63.08	0.1126	0.34
43	Proposed School 1	13.9	58.94	0.1052	0.32
44	Proposed School 2	21.9	93.20	0.1664	0.50
45	Proposed School 3	18.0	76.46	0.1365	0.41
46	Proposed School 4	14.2	60.39	0.1078	0.32
47	Proposed School 6	15.3	64.94	0.1159	0.35
48	Proposed School 7	10.0	42.67	0.0762	0.23
49	Proposed School 8	18.4	78.28	0.1398	0.42
50	Proposed School 9	18.7	79.28	0.1416	0.42
51	Quartz Hill High School	76.3	323.90	0.5784	1.74
52	Rawely Duntely Park	18.2	77.29	0.1380	0.41
53	Sierra School, E	9.0	38.33	0.0684	0.21
54	Skytower Park	13.0	55.01	0.0982	0.29
55	Sun Down School, E	8.9	37.77	0.0674	0.20
56	Tierra Bonita Park	28.7	121.80	0.2174	0.65
57	Tierra Bonita School	9.6	40.93	0.0731	0.22
58	Valley View School	14.3	60.54	0.1081	0.32
59	West Wind School, E	9.7	41.10	0.0734	0.22
60-283	Future Sites	6505	127	0.23	0.68
	Future Users Subtotal:	6856	1620	2.89	8.68
	Existing and Future Total		**6640**	**11.9**	**35.5**

6.3 Other Topics from Guidelines

As described in the guidelines, some of the other issues associated with recycled water delivery which are discussed in greater detail below include:

- estimated internal capital investment required (on-site conversion costs),
- needed water cost savings,
- desire to use recycled water,
- date of possible initial use of recycled water,
- present and future source of water and quantity of use,
- quality and reliability needs.

6.3.1 Estimated Internal Capital Investment Required (On-site Conversion Costs)

Estimated internal capital investment required to convert existing irrigation facilities for recycled water use will be determined at a later date when more information is available.

6.3.2 Needed Water Cost Savings

The users proposed for the Antelope Valley Recycled Water Project will benefit from the use of recycled water because recycled water will be at a lower cost than potable water. Since the proposed users would benefit from a reduction in their water costs by using recycled water, none of the proposed users are likely to reject the opportunity to use recycled water. All users are using or have planned to use a certain quantity of water, therefore the users have already accepted the cost of water into their operations and are not likely to make decisions regarding water use based on the necessity to save money. So any savings from recycled water would only benefit the users, therefore this topic is not applicable.

6.3.3 Desire to Use Recycled Water

The City of Palmdale, Palmdale Water District, City of Lancaster and Rosamond Community Services District are interested in recycled water for municipal reuse and have expressed interest through the conduct of this feasibility study as well as earlier studies.

6.3.4 Date of Possible Initial Use of Recycled Water

The date of initial use of recycled water is a function of when the recycled water distribution facilities are available since recycled water treatment facilities to produce Title 22 unrestricted use recycled water are already in the planning/design phase. If grant funding is obtained, it is estimated that the completion of each phase of the recycled water project construction is as follows:

- Phase 1A – June 2006
- Phase 1B - January 2010

- Phase 2 - April 2011
- Phase 3 - July 2012
- Phase 4 - October 2013

6.3.5 Present and Future Source of Water and Quantity of Use

Many of the future recycled water users are current water users relying on current sources of water, which include local groundwater, local surface water, and imported water from the SWP. As discussed in Section 3, LACWW40 is continuing to seek alternative water supplies through conservation, development of aquifer storage and recovery, and importing additional water to meet current and future needs reliably.

6.3.6 Quality and Reliability Needs

All of the potential users are irrigation customers who require water quality and quantity sufficient to meet the needs of landscaping. The recycled water, treated to a tertiary level and provided by LWRP, PWRP and RWWTP, is sufficient to the potential users' needs.

Recycled water is a highly reliable source of water because wastewater is being continually produced. It is expected that the recycled water facilities will be sufficiently reliable to meet the needs of landscaping. Landscape is expected to be able to tolerate short duration outages with limited impact.

6.3.7 Wastewater Disposal Methods

The wastewater disposal methods are similar at LWRP, PWRP and RWWTP with some variations. The planned upgrades at LWRP will allow for the tertiary treated effluent to be delivered for municipal reuse or to be discharged to Piute Ponds, Impoundment Areas, Apollo Park, storage reservoirs and agricultural reuse operations. The tertiary level of effluent of PWRP will be available as recycled water for delivery to municipal users or to be discharged to storage reservoirs and agricultural reuse operations. RWWTP will be able to produce secondary and tertiary treated effluent. The secondary treated effluent will be discharged to evaporation ponds, while the tertiary level effluent will be delivered for municipal reuse.

6.4 Logical Service Area

The logical service area for recycled water will be developed in four phases. Figure 14 (folded at the end of this document) displays the planned recycled water system by phase. The initial phase will construct the backbone pipeline from LWRP in the direction of the majority of the existing potential recycled water users. This area was chosen for Phases 1A and 1B to coordinate with recycling water plans that the City of Lancaster is completing in the near future. Also, the backbone pipeline for the recycled water distribution system will need to begin at the WRP. Phase 2 will construct the backbone pipeline from PWRP and provide reservoir storage and include distribution pipelines extending out from the backbone to additional large potential users. The recycled water pipeline routes in Phases 3 and 4 are designed to distribute to large potential recycled water users in areas not yet served in the service areas. The Phase 4 service area connects the Phase 1 backbone pipelines from the LWRP to the PWRP to provide for redundancy for recycled water delivery.

Section 7: Project Alternative Analysis

7.1 Planning and Design Assumptions

7.1.1 Phasing

Phasing of the recycled water infrastructure was performed using information developed in the Market Assessment, consideration of the topography in the project service area, and GIS files to locate proposed facilities, potential recycled water customers and the development of a logical installation of distribution facilities. This data assisted in defining a phased infrastructure that considers:

- Locations of existing or proposed effluent conveying pipelines for potential recycled water use or connection.
- System topography and hydraulic constraints.
- Existing potable water system pressure zones.
- Recycled water demand (Average Day demand).
- Potential clustering of recycled water users within a specific geographical area.

Phase 1A: Backbone Pipeline from LWRP

1. Serving users within approximately 1 mile of the Phase 1A pipelines.
2. Clusters exist where multiple recycled water customers can be served with minimal additional infrastructure due to close proximity of recycled water customers.

Phase 1B: Reservoir Storage and Extension to Large Users in Lancaster

1. Serving users within approximately 1 mile of the Phase 1 pipelines.
2. Clusters exist where multiple recycled water customers can be served with minimal additional infrastructure due to close proximity of recycled water customers.

Phase 2: Backbone Pipeline from PWRP and Reservoir Storage and Extension to Large Users

1. Serving users within approximately 1 mile of the Phase 2 pipelines.
2. Aggregate (with “clustering”) recycled water to maximize use near the proposed pipelines.
3. Adding storage as soon as possible to facilitate operation of the distribution system.

Phase 3: Reservoir Storage and Extension to Large Users in Palmdale

1. Serving users within approximately 1 mile of the Phase 3 pipelines.
2. Aggregate (with “clustering”) recycled water to maximize use near the pipelines.
3. Adding storage as soon as possible to facilitate operations.

Phase 4: LWRP and PWRP Interconnection

1. Complete the backbone system.
2. Connect the Lancaster and Palmdale systems.

7.1.2 Pipeline Sizing Criteria

The following criteria were developed in coordination with the LACWW40, the City of Lancaster, the City of Palmdale and the Palmdale Water District, the Market Assessment, and specific input from the individual water agencies as to what peaking factors should be used to determine the pipeline sizing.

1. Average day demands were used to load the base model as defined in the Market Assessment.

2. An average day with a peaking factor of 2.2 is applied to simulate Peak Day demands for the City of Palmdale and PWD. A peaking factor of 2.0 is used to calculate the City of Lancaster's Peak Day demands, in most cases.

3. Peak Hour is calculated from Peak Day with a factor of 2.0 applied for the City of Palmdale and PWD. For the City of Lancaster, a peaking factor of 3.0 was used to calculate the Peak Hour from the Peak Day, in most cases.

4. Average Day, Peak Day and Peak Hour demands are used to size pipelines using a hydraulic computer model.

5. Steady state analysis is used to target the above pipeline criteria.

6. Due to the large diameter pipeline required, internal pipeline diameter and friction coefficient for ductile iron pipe are used to model the system. A Hazen-Williams Coefficient of 130 is used in the model.

7. Minimum pressure (Pmin) in the recycled water system of 55 psi is desired for nodes under Average Day, Peak Day and Peak Hour demand conditions.

8. Fluctuations in maximum pressure (Pmax) in the recycled water system allow for maximum pressures of 185 psi with 55 to 150 psi being the optimum delivery pressure range.

9. Maximum Velocities under Peak Day demand conditions are 6 ft/sec.

10. For the potential recharge areas, adequate pipe capacity is provided to allow full WRP flow to the recharge areas.

7.1.3 Storage Sizing Criteria

The storage capacity is set equal to 30 percent of the Peak Day demand for the system.

NOTE: Storage volume for emergency (fire) conditions is assumed to be accounted for in the potable water system.

7.1.4 Pump Sizing Criteria

Pumping capacity will be based on flow requirements at Peak Day demand and necessary HGL, as determined by results of the hydraulic analysis.

7.1.5 Cost Basis: Estimates of Probable Capital Costs

A preliminary estimate of probable capital costs for each of the phases is developed based upon unit cost factors used in the 1995 Antelope Valley Water Resource Study (multiplied by a factor of 1.27 to account for price increases from 1995 to 2005), costing models developed for other similar projects, and minimum construction costs for a pump or storage facility as determined by Kennedy/Jenks project experience. Estimates of probable capital costs provided represent Order of Magnitude level costs as established by the American Association of Cost Engineers (AACE) and represent an accuracy of +50% to -30. Criteria and assumptions that were used to develop the estimates of probable costs include:

- Costs for "new pipe" alternative distribution are based on recent bid results and reflect a dramatic increase in pipeline cost in the current construction bidding climate. Raw costs are based on $13.00 per inch diameter and include allowance for all pipeline facilities (including valves, blow-offs, tunneling under railroads and major road crossings, etc.). With contractor overhead and profit and contingencies, the unit costs are $16.25 per inch diameter.
    - 14" pipelines - $182 per LF
    - 16" pipelines - $208 per LF
    - 24" pipelines - $312 per LF
    - 27" pipelines - $351 per LF
    - 36" pipelines - $468 per LF
    - 42" pipelines - $546 per LF
- Capital cost for the main pump stations is estimated using costs based on Kennedy/Jenks experience from similar facilities.
- Capital cost for the booster pump stations is estimated using a cost curve generated from data provided in the 1995 Antelope Valley Water Resources Study.
- Unit cost for reservoirs is from the 1995 Antelope Valley Water Resource Study at ($0.50/gal) and increased by a factor of 1.27 for 2005 to $0.64/gal, which included tanks, foundations, appurtenances, excavation, paving, fencing, landscaping and telemetry.
- Contingency costs of 10%, Engineering & Administration costs of 35%, and Contractor's Overhead & Profit costs of 15% the total construction costs are added to each proposed facility cost.

Actual construction costs will vary and are dependent on labor and material costs, competitive market conditions and the implementation schedule that exist at the time of construction.

7.2 Water Recycling Alternatives Evaluated

7.2.1 Treatment Alternatives

There are no specific treatment alternatives needed for recycled water since the recycled water entering the pipeline from the LWRP and the PWRP will already be at tertiary quality.

7.2.2 Pipeline Route Alternatives

The pipeline routes were selected primarily to minimize the distance from the LWRP and PWRP recycled water source and the recycled water use sites. The pipeline routes in the City of Lancaster optimized the use of existing recycled water pipes and routes to minimize costs and coordinate appropriately with the existing and planned recycled water system. During the design phase of this project, some refinements to the pipeline alignments may occur when more information becomes available.

Phasing, as detailed in Table 17, assumes users within 1 mile of either side of the recycled water pipelines, installed in each phase, are connected to the distribution system.

Table 17: Infrastructure Phasing

Project Component	Phase 1A	Phase 1B	Phase 2	Phase 3	Phase 4	Total
Pipeline	24,200 LF of 24 inch diameter pipeline	39,000 LF of 24-inch diameter pipeline	56,000 LF of 16-inch to 36-inch diameter pipeline	26,000 LF of 14- inch to 36-inch diameter pipeline	57,000 LF of 14-inch to 24-inch diameter pipeline	202,000 LF of 14-inch to 36-inch diameter pipeline
Main Pump Stations		1 @ 20,833 gpm	1 @ 15,555 gpm	None	None	1 @ 15,555 gpm 1 @ 20,833 gpm
Booster Pump Stations	None	None	None	None	1 @ 1,725 gpm 1@ 8,460 gpm	1 @ 1,725 gpm 1@ 8,460 gpm
Storage	None	1 @ 3.0 MG	None	None	1 @ 2.1 MG 1 @ 4.4 MG	9.5 MG
Annual AFY delivered	786	2,161	2,076	1,295	7,013	13,331

7.2.3 Alternative Markets

The alternative markets that were evaluated in the market assessment include agriculture, industry, construction irrigation, street cleaning, medians for highways, parks, schools, residential common areas, golf courses, sports complexes and cemeteries. The potential alternative recycled water use markets are discussed in Section 6.

7.2.4 Alternative Storage Locations

The recycled water storage locations were selected based on elevations. During the design phase of the project, alternative sites at the required elevations may be evaluated at each proposed reservoir location, if required.

7.2.5 Sub-alternatives of Selected Alternative

There are no sub-alternatives to the alternatives listed in Sections 7.2.1-7.2.4.

7.3 Non-recycled Water Alternatives

7.3.1 Other Potentially Viable New Sources of Water

Include groundwater and aquifer storage and recovery and are discussed in greater detail in Section 3.8.

7.3.2 Economic Costs of New Sources of Water

Alternative sources of water are limited to expanded use of imported water. The proposed project is intended to maximize use of local resources and the cost of imported water is not included in this analysis.

7.4 Water Conservation/Reduction

7.4.1 Analysis

To address future demand, the 2005 Integrated Urban Water Management Plan (IUWMP) for the Antelope Valley focuses on conservation measures, which will project demand reduction when all demand recommendations are implemented. The Final 2005 IUWMP will identify the projected demand reduction percentage. In the 2005 IUWMP, a supply deficit has been projected.

Water conservation measures that are part of the 2005 IUWMP are:

- Water survey programs for single-family residential and multifamily residential customers.
- Residential plumbing retrofit.

- System water audits, lead detection, and repair.
- Metering with commodity rates for all new connections and retrofit of existing connections.
- Large landscape conservation programs and incentives.
- High-efficiency washing machine rebate programs.
- Public information programs.
- School education programs.
- Conservation programs for commercial, industrial, and institutional accounts.
- Wholesale agency programs.
- Conservation pricing.
- Water conservation coordinator.
- Water waste prohibition.
- Residential ultra-low-flush toilet replacement programs

Through the implementation of the existing demand management measures (DMM), an estimated overall water savings can be achieved for the Antelope Valley. However, it is difficult to determine actual water savings since most conservation measures are voluntary. Typically when a shortage occurs, water customers increase their awareness of water usage and voluntarily reduce water demand even more to avoid water rationing. Since most of the DMM implemented for the Antelope Valley are still in the early stages, there is still a high potential to achieve further reduction if and when it is needed, like during a water shortage.

LACWW40 is a signatory to the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding (CUWCC MOU) for water conservation. As a signatory, LACWW40 is committing to implementation of best management practices demand management measures (DMM) to reduce potable water demands. Although use of recycled water is not a DMM, it will be significant with regard to reduction of potable water use.

7.4.2 Impact of Water Conservation/Reduction on Recycling

While conservation measures may help reduce the supply deficit, the measures will unlikely eliminate the deficit. Most likely, both water conservation and recycling will need to be encouraged and promoted to even come close to eliminating the deficit.

7.4.3 Recommendation

The City of Lancaster, the City of Palmdale and LACWW40 should continue with their water conservation efforts to achieve their goal of demand reduction in water supply to ensure additional water supplies will not be required. Concurrently, any water recycling should also be investigated due to the large water supply deficit that occurs, particularly in future years.

7.4.4 Implementation

The water conservation implementation is outlined in the 2005 Integrated UWMP for the Antelope Valley.

7.5 Pollution Control Alternatives (if applicable)

As described in Section 7.2.1 above, there is no additional treatment required for the use of recycled water. Treatment for pollution control is not an alternative in this project.

7.6 No Project Alternative

Without the implementation of the recycled water to the users in the Antelope Valley service area, they would continue to use potable water when needed, with the understanding that they are already over-pumping their groundwater basin and eventually this source will not be available. The LACWW40 and partner agencies understand the imperative to implement recycled water projects in order to meet future water demands therefore the no project alternative is not feasible.

7.7 Summary of Alternatives

Table 18 summarizes the two alternatives for this project; one is the proposed project and the other is the No Project Alternative.

Table 18: Summary of Alternatives

	Alternative #	**Treatment**	**Conveyance**	**Pump Stations**	**Storage**
Proposed Project	1	none	202,000 LF of 14-inch to 36-inch diameter pipeline	1 @ 1,725 gpm 1 @ 8,460 gpm 1 @ 15,555 gpm 1 @ 20,833 gpm	9.5 MG
No Project	2	none	none	none	none

7.7.1 Cost Tables for Each Alternative

Summary estimates of capital and operations and maintenance (O & M) for the alternatives listed above are shown in Table 19. The capital costs include materials and installation, taxes, contractor overhead and profit, as well as engineering design. The O & M costs include annual expenditures for manpower, equipment & materials, water, chlorination, miscellaneous, electrical power and maintenance of pipelines, tanks and pump stations.

Electrical power costs are calculated using typical power costs within California. Power consumption is calculated using the estimated flows and total dynamic heads (TDHs) for each pump station. The flows are assumed to be the annual average demand. The TDHs are estimated as the sum of the maximum static head for each cumulative phase plus 10% to account for minor and friction losses. It is assumed that pumps operate 6 hours per day (annual average).

Annual chlorination costs for the tertiary effluent at LWRP and PWRP are calculated assuming chlorine gas costs $450 per ton, is dosed at 25 mg/l and the effluent pump stations operate 6 hours per day.

The 8,460 gpm booster pump station planned for Phase 4 is proposed to provide the distribution system operators the flexibility to move water from the Lancaster system into the Palmdale system. No allowance for operating the facility is included in this operating cost in this report. The anticipated demand in both service areas can be accommodated by the recycled water produced at each WRP and the transfer of water would not normally be required.

Table 19: Estimated Capital and O&M Costs

Phase	Volume RW Delivered (AFY)	Capital Costs	Annual O&M Costs
Phase 1A	786	$4,027,000	N/A
Phase 1B	2,161	$27,958,000	$485,600
Phase 2	2,076	$33,316,000	$853,500
Phase 3	1,295	$17,168,000	$294,400
Phase 4	7,013	$36,715,000	$1,819,600
Total	**13,331**	**$119,184,000**	**$3,453,100**

* Costs are based on ENR CCI of 8290 (July 2005).

Detailed cost estimates for the facilities in each phase are provided in Appendix C.

7.7.2 Lists of Potential Users

The Antelope Valley recycled water project is intended to deliver recycled water 13,331 AFY to 202 use sites that includes schools, residential open spaces, parks, golf courses, cemeteries and sports complexes. These recycled water users are provided in Appendix D.

7.7.3 Economic Analysis for Each Alternative

A cost per acre-foot is calculated for each alternative by dividing the total annual cost (capital and O&M) of each alternative by the total volume of recycled water expected to be delivered. These values are shown in Table 20. More detailed planning-level cost estimating spreadsheets are found in Appendix E.

Table 20: Estimated Costs and Costs Per Acre-Foot

Phase	Volume RW Delivered (AFY)	Annual Capital Costs[1]	Annual O&M Costs	Total Annual Cost	Annual Cost/AF RW Delivered
Phase 1A	786	$270,700	N/A	N/A	N/A
Phase 1B	2,161	$1,879,300	$485,600	$2,639,000	$895
Phase 2	2,076	$2,239500	$853,500	$3,093,000	$1,490
Phase 3	1,295	$1,154,000	$294,400	$1,448,400	$1,119
Phase 4	7,013	$2,468,000	$1,819,600	$4,287,600	$611
Total	**13,331**	**$8,011,500**	**$3,453,100**	**$11,468,000**	**$860**

(1) Based on 20 years at 2.7%

7.7.4 Energy Analysis for Each Alternative

The energy associated with each alternative was incorporated into the capital and O&M costs. Annual energy was based on pumping costs. Construction energy is not expected to be a significant component of cost and was not considered.

7.7.5 Water Quality Impacts of Each Alternative

It is expected that the Antelope Valley recycled water project as proposed will improve receiving water quality by reducing the quantity of effluent being discharged to land disposal. Groundwater impacts are expected to be negligible since recycled water will be applied at agronomic rates. Nutrients are expected to be taken up by vegetation reducing the need for fertilizer applications.

7.8 Comparison of Alternatives and Recommended Alternative

The alternatives to be compared are the project as proposed and the non-recycled water alternative. Since the recycled water is coming from existing tertiary plants, there are no treatment alternatives. Because some of the effluent pipeline is already constructed from the LWRP and there are limited alternative routes between the LWRP and PWRP, there are no significant pipeline route alternatives. Regardless of whether the recycled water project is to proceed, the Antelope Valley will continue with ongoing water conservation programs.

The Antelope Valley Recycled Water Project as proposed is the recommended alternative because:

1. It reduces potable demands in an area of rapid growth.

2. It promotes the State's policies of beneficial reuse of recycled water to replace potable water where possible.

3. It helps to eliminate discharges to land disposal.

Section 8: Recommended Plan

8.1 All Proposed Facilities and Basis for Selection

The proposed facilities are selected based on an analysis of the service area demands, topography and desired operating pressures. The proposed system distributes recycled water throughout the service area and provides a backbone system that could accommodate minimum and maximum demands and allow significant deliveries of recycled water to recharge areas.

8.2 Preliminary Design Criteria and Refined Pipeline Routes

The preliminary design criteria for the recycled water supply system are provided in Table 21. The sizes of pipelines, pump stations, and storage depend on the peak demands of potential users for Phases 1A - 4. These demands are presented in Section 6. All pipelines will follow the most convenient and lowest cost routes which have been described above.

Table 21: Summary of Recycled Water System Criteria

System Components	Criteria
Recycled Water Supply	• **Assume project plant production for year 2025.**
Main Pump Stations	• **Pumps will operate 24 hours during peak day demands.** • **Size for peak day demands.**
Booster Pump Stations	• **To serve high zones, size for peak day demands.** • **To serve users from reservoirs, size for peak hour demands.**
Storage Reservoirs	• **Provide storage for 30% of peak day demand.** • **Reservoir elevations should be adequate to provide optimum delivery pressures to most users.** • **Provide surface storage adequate to meet peak season demands.**
Distribution System	• **Size to meet average day, peak day and peak hour demands.** • **Maximum design velocity is 6 feet per second.** • **Maximum system pressure: 185 psi.** • **Optimum delivery pressure range: 55 to 150 psi.**

8.3 Cost Estimate Based on Time of Construction

The cost estimate based on the anticipated year of construction for RW delivery as described in Section 6.3.4 is presented in Table 22.

Table 22: Costs at Time of Construction

	Estimated 2005 Costs	Estimated Year Construction Begins	Estimated Costs at Time of Construction*
Phase 1A	$4,027,000	2005	$4,027,000
Phase 1B	$27,958,000	2007	$30,239,000
Phase 2	$33,316,000	2008	$37,476,000
Phase 3	$17,168,000	2010	$20,887,000
Phase 4	$36,715,000	2011	$46,456,000

***Escalated at 4%**

8.4 All Potential Users

The same quantity and peak demand for the potential users described in Sections 6.2 and 7.7 are being used for design purposes. Most of the potential users are in the City of Lancaster and City of Palmdale. Commitments and agreements between the water reclamation plants, the water districts and municipal users are under discussion.

8.5 Reliability of Facilities as Compared to User Requirements

All facilities for the recycled water project will meet user requirements. The recycled water facilities for this project will be new and built to meet user requirements. When the new facilities are implemented into the project, they will be done so in a way to provide reliable facilities. Because the facilities are for irrigation, the level of reliability required is not as high as if for potable water at vital facilities such as hospitals or schools.

8.6 Implementation Plan

8.6.1 Coordination with Water/Recycled Water Suppliers

As discussed in Section 4.7, LACWW40 is in discussions with CSDLAC to purchase the tertiary treated effluent from LWRP and PWRP and receive the rights for the reuse of the recycled water. The City of Lancaster is also conducting discussions with CSDLAC for the purchase of recycled water.

Design of the recycled water pipeline, pump stations (including alarms and shut-off control systems), and other appurtenant equipment shall be closely coordinated with CSDLAC District No. 14 staff.

A coordination protocol will need to be established to communicate between the water reclamation plants and LACWW40 as water quality, water quantity and operation & maintenance issues arise.

8.6.2 Ability and Timing of Users to Join System

LACWW40 intends and is likely to adopt a mandatory use ordinance for recycled water, which will be forwarded to the State Board after adoption. Existing potential recycled water users are expected to join the recycled water system as soon as the facilities construction and user connections are complete and in operation.

LACWW40 and the surrounding water supply agencies will be considering the need to provide financial assistance to onsite retrofit costs.

8.6.3 Tentative Water Recycling Requirements of RWQCB

The RW treatment facilities are regulated by waste discharge requirements as discussed in Section 5.1. The use of RW will likely be regulated by a combination of WDR for the treatment facilities in combination with other WDRs for the RW users. Currently there are efforts in progress to establish state-wide general RW requirements.

8.6.4 Commitments from Potential Users

Commitments and agreements between the water reclamation plants, the water districts and potential users will be developed as the program is implemented. The other water agencies associated with the Antelope Valley have indicated their interest in the recycled water project with the letters found in Appendix F.

8.6.5 Water Rights Impact

As discussed in Section 4.7, LACWW40 is in discussions to purchase the tertiary treated effluent from LWRP and PWRP and receive the rights for the reuse of the recycled water.

8.6.6 Permits, Right-of-Way, Design, and Construction

Pipeline construction will require encroachment permits from the City of Lancaster, the City of Palmdale and the County of Los Angeles. Also, land for the proposed reservoirs and pump stations will have to be purchased either from the Cities or negotiated through potential developers. LACWW40 is seeking financial assistance from the State Water Resources Control Board in the form of grants for constructing Phases 1A - 4.

Encroachment permits for all work within the public rights-of-way will be needed from each involved agency prior to commencement of any construction. All traffic control requirements will be complied with as well.

The DHS Title 22 review and inspection will be completed, as necessary. LACWW40 will need to prepare the Recycled Water Rules and Regulations in accordance with Title 22 regulations, which could be adopted at the same time as the mandatory use ordinance.

8.6.7 Detailed schedule

A detailed schedule has been prepared and is attached as Figure 15.

8.7 Operational Plan

8.7.1 Responsible People

LACWW40 will establish a knowledgeable staff for their recycled water operations. The existing and new staff will be given appropriate training and responsibility for recycled water system operations & maintenance. An appropriate staff member will be assigned as a backflow prevention technician.

8.7.2 Necessary Equipment

Any necessary equipment will be purchased for proper operation & maintenance of the recycled water system.

8.7.3 Monitoring

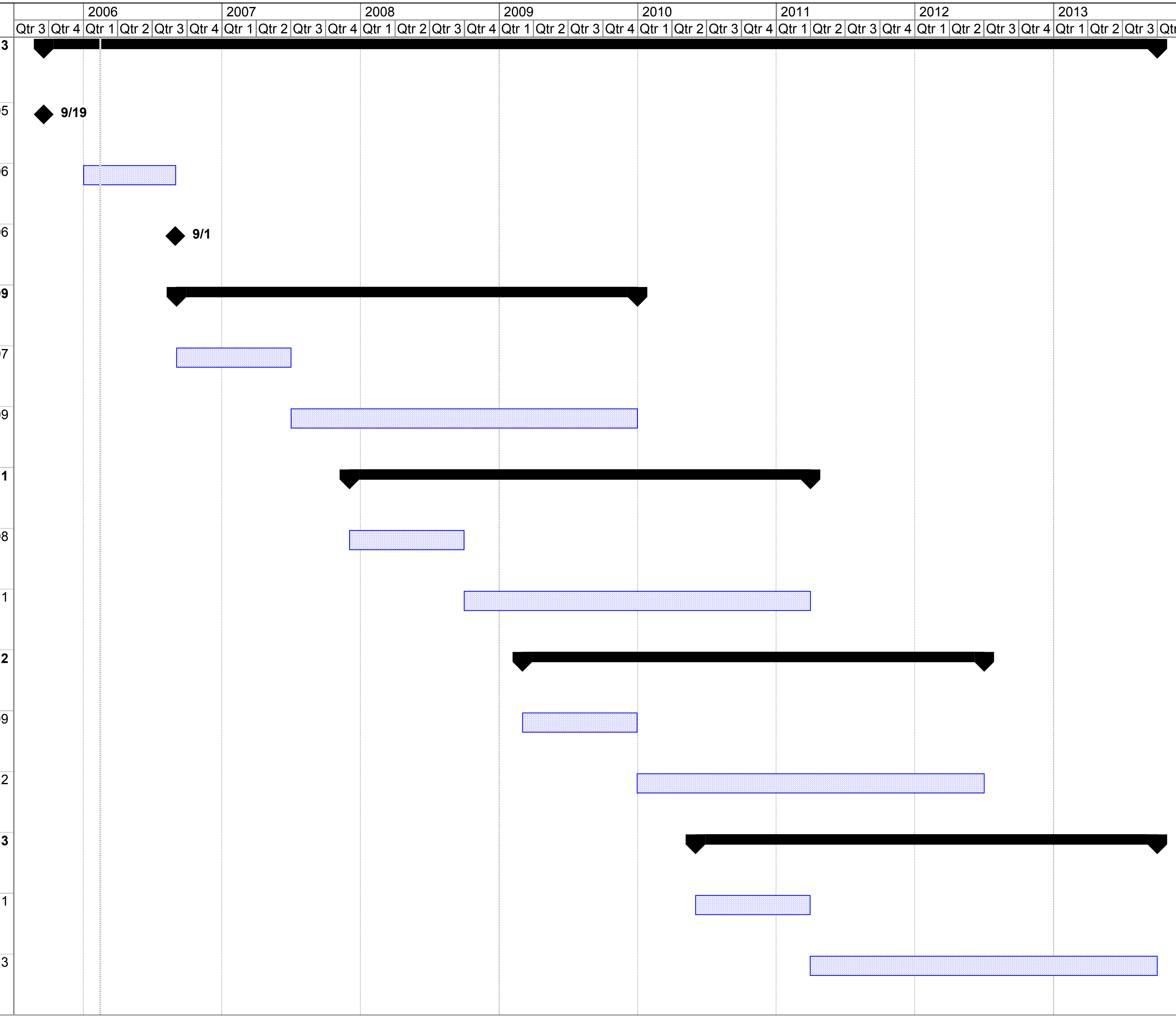
RWCQB requires that wastewater treatment plants (Producers) develop and implement a water reuse monitoring program as part of their General Water Reuse Requirements. When the User(s) is other than the Producer, delegation of responsibilities must be clearly spelled out and included in the Producer's Water Use Permits. The proposed reuse monitoring program requirements for LWPR, PWRP and RWWTP's recycled water have not been established by the RWCQB-LH at this time.

8.7.4 Irrigation Scheduling

For all potential users, irrigation scheduling should not change from the way they currently operate. The majority of the users will be irrigated at night to minimize interference with recreation, reduce evapotranspiration, improve irrigation efficiency and decrease waste. During periods of high temperatures, additional irrigation may occur outside this nighttime window to allow for longer irrigation to compensate for higher evapotranspiration.

Figure 15
Los Angeles County Waterworks District No. 40
Antelope Valley Recycled Water Project Schedule

ID		Task Name	Duration	Start	Finish
1		**Schedule Design and Construction**	**2097 days**	**Mon 9/19/05**	**Tue 10/1/13**
2		Facilities Planning Report	0 days	Mon 9/19/05	Mon 9/19/05
3		Prepare CEQA Document	175 days	Mon 1/2/06	Fri 9/1/06
4		Certify CEQA Document	0 days	Fri 9/1/06	Fri 9/1/06
5		**Phase 1B Project**	**869 days**	**Mon 9/4/06**	**Thu 12/31/09**
6		Design	216 days	Mon 9/4/06	Mon 7/2/07
7		Construction	653 days	Tue 7/3/07	Thu 12/31/09
8		**Phase 2 Project**	**869 days**	**Tue 12/4/07**	**Fri 4/1/11**
9		Design	216 days	Tue 12/4/07	Tue 9/30/08
10		Construction	653 days	Wed 10/1/08	Fri 4/1/11
11		**Phase 3 Project**	**869 days**	**Wed 3/4/09**	**Mon 7/2/12**
12		Design	216 days	Wed 3/4/09	Wed 12/30/09
13		Construction	653 days	Thu 12/31/09	Mon 7/2/12
14		**Phase 4 Project**	**869 days**	**Thu 6/3/10**	**Tue 10/1/13**
15		Design	216 days	Thu 6/3/10	Thu 3/31/11
16		Construction	653 days	Fri 4/1/11	Tue 10/1/13



Project: Project1-rev1
Date: Mon 2/13/06

Task		Progress		Summary		External Tasks		External Milestone	
Split		Milestone		Project Summary		External Milestone		Deadline	

Section 9: Construction Financing Plan and Revenue Program

9.1 Sources and Timing of Funds for Design and Construction

The Phase 1-4 Recycled Water Projects for the Antelope Valley are significant projects for the LACWW40 in meeting its water needs. The District hopes to be placed on the statewide priority list for construction grants for recycled water for these four phases of the project. The source of grant money would likely be the State of California as administered by the State Water Resources Control Board. The District has also established a recycled water capital reserve from connection fees collected from new development. The capital reserve, in addition to grant funding and SRF loans are critical for design and construction of these projects.

A draft annual revenue program for Phases 1A-4 is discussed below

9.1.1 Overview of Revenue Program and Construction Financing Plan

The Antelope Valley Recycling Project will provide recycled water for irrigation at the facilities listed in Table 17 from Section 7.2.2. Since LACWW40 is still currently evaluating whether there is a more cost-effective means of serving the Ultimate phase from another source, the Ultimate phase is not proceeding until the evaluation is complete.

9.1.1.1 Draft Revenue Program for Antelope Valley Recycled Water Project

As indicated earlier, LACWW40 is submitting a Financial Assistance Application to obtain 25% funding from the State Water Resources Control Board for the Antelope Valley Recycled Water Project. LACWW40 anticipates funding its 75% portion of Phases 1A-4 of the Antelope Recycled Water project through a combination of cash reserves specifically earmarked for recycled water projects and additional income from connection fees and interest. Table 23 identifies the preliminary cash and debt funded portions of the project.

9.1.1.2 Draft Construction Financing Plan

Table 24 provides a monthly cash flow that forecasts expenses during design and construction for Phases 1B through 4. All the sources of funds to meet those expenses for Phases 1B-4 of the project are not fully known at this time but are anticipated to include the cash reserves, connection fees, and interest described above.

Table 23: Draft Revenue Program for Antelope Valley Recycled Water Project

Year	2005	2006	2007	2008	2009	2010	2011	2012
Number of EDU's	1,800	5,400	9,000	12,600	16,200	19,800	23,400	27,000
Budgeted Growth	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
Connection Fee	$1,200	$1,248	$1,298	$1,350	$1,404	$1,460	$1,518	$1,579
Connection Fee Revenue	$2,160,000	$2,246,400	$2,336,256	$2,429,706	$2,526,894	$2,627,970	$2,733,089	$2,842,413
Accumulated Revenue	$2,160,000	$4,406,400	$6,742,656	$9,172,362	$11,699,257	$14,327,227	$17,060,316	$19,902,729

Escalation Rate = 4%

Table 24: Monthly Cash Flow Analysis

Phase	Total Cost	Begin Construction	End Construction	Duration (mo)	Ave. Cost per mo.	Ave. 3 mo. Cost
1B	$27,958,000	3-Jul-2007	31-Dec-2009	30	$931,933	$2,795,800
2	$33,316,000	1-Oct-2008	1-Apr-2011	30	$1,110,533	$3,331,600
3	$17,168,000	31-Dec-2009	2-Jul-2012	30	$572,267	$1,716,800
4	$36,715,000	1-Apr-2011	1-Oct-2013	30	$1,223,833	$3,671,500

	Phase 1B	Phase 2	Phase 3	Phase 4	Total/Year
Jul-07	$2,795,800				
Oct-07	$2, 795,800				$5,591,600
Jan-08	$2, 795,800				
Apr-08	$2, 795,800				$5,591,600
Jul-08	$2, 795,800				
Oct-08	$2, 795,800	$3,331,600			$8,923,200
Jan-09	$2, 795,800	$3,331,600			
Apr-09	$2, 795,800	$3,331,600			$12,254,800
Jul-09	$2, 795,800	$3,331,600			
Oct-09	$2, 795,800	$3,331,600			$12,254,800
Jan-10		$3,331,600	$1,716,800		
Apr-10		$3,331,600	$1,716,800		$10,096,800
Jul-10		$3,331,600	$1,716,800		
Oct-10		$3,331,600	$1,716,800		$10,096,800
Jan-11		$3,331,600	$1,716,800		
Apr-11			$1,716,800	$3,671,500	$10,436,700
Jul-11			$1,716,800	$3,671,500	
Oct-11			$1,716,800	$3,671,500	$10,776,600
Jan-12			$1,716,800	$3,671,500	
Apr-12			$1,716,800	$3,671,500	$10,776,600
Jul-12				$3,671,500	
Oct-12				$3,671,500	$7,343,000
Jan-13				$3,671,500	
Apr-13				$3,671,500	$7,343,000
Jul-13				$3,671,500	
					$3,671,500
Totals	**$27,958,000**	$33,316,000	$17,168,000	$36,715,000	**$115,157,000**

9.2 Pricing Policy for Recycled Water

The price that LACWW40 will charge the potential users is not known at this time, but it will be discounted slightly from the price of potable water to encourage users to take advantage of the recycled water.

9.3 Water Pollution Control Costs

The cost of recycled water is estimated to be $100 per acre foot. Actual costs will be determined when agreements are in place with the County Sanitation Districts of Los Angeles County.

9.4 Annual Projections

9.4.1 Fresh Water Prices

LACWW40's water pricing details are discussed in Section 3.3.5.

9.4.2 Recycled Water Used

In Section 8.6.7, the estimated dates for the construction completion for each phase are shown. This schedule assumes that funding to complete all phases of the project is available. With construction phases being completed over the course of seven years, from 2007 to 2013, the recycled water use will increase over those years. The recycled water use for each year is shown in Table 25.

Table 25: Recycled Water Annual Use

	Recycled Water Use		Cumulative Recycled Water Use	
Date	**AFY**	**MG/yr**	**AFY**	**MG/yr**
2005 – 2009 [1]	786	256	786	256
2010	2,161	704	2,947	960
2011	2,076	676	5,023	1,636
2012	1,295	422	6,318	2,058
2014	7,013	2,284	13,331	4,343

[1] Phase 1A projected to be operating in 2006.

9.4.3 Annual Costs of Recycling Project

For approximately the first twenty years, the users will likely be paying the initial capital costs for the construction of the recycled water facilities, as well as the O&M costs. Thereafter, the annual costs of the recycled water project will be the O&M costs only. These costs are described in Section 7.7.1.

9.4.4 Allocation of Costs to Users

The costs of both capital and O&M for delivery of recycled water will be included in the price that potential users will pay for a unit of water. As stated in Section 9.2, this price has not yet been confirmed but is anticipated to be less than potable water even when capital costs are included with the O&M costs. In addition, new users to the system may be charged a connection fee.

9.4.5 Unit Costs to Serve Users

The main category of users is irrigation, which includes several types of irrigation users such as parks, schools, roadways. Some dust control and other uses may also occur. Section 7.7.3 describes the annual cost per acre-foot of recycled water necessary to recover capital and O&M costs. The unit costs for recycled water to serve users will be such that capital recovery and O&M are funded to the greatest extent possible.

9.4.6 Unit Price of Recycled Water

The unit price of recycled water can be expected to rise over the years as costs of operations and maintenance increases. In addition, it is likely that if the potable rate increases, the same percentage increase would be applied to the recycled water prices.

9.4.7 Sensitivity Analysis to Underutilization of Recycled Water

The earlier phases of this project are not particularly sensitive to the underutilization of water because most of the users identified are existing users that are already using potable water. If the users do not use recycled water, they will still have to use potable water. In the later phases, there are some planned future users that will have to have their demands re-evaluated as the construction schedule gets closer. Because the Antelope Valley is such a high-growth area and the potable water is a limited resource, the underutilization of recycled water is not likely. However, alternative users may have to be found to use any excess recycled water.

9.5 Sunk Costs and Indebtedness

LACWW40 has established funding for this project through the connection fee program. Funding to recover capital will also likely occur from commodity charges for recycled water, which have yet to be set. There are no sunk costs currently associated with the project, which is the recycled water distribution and storage. The costs associated with treatment improvements to tertiary will not be directly born by LACWW40 but will be born by the sanitation agencies and are necessary to meet regulatory requirements and would not be characterized as a sunk cost.

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Appendix A

Existing Antelope Valley Recycled Water Report Summaries

Antelope Valley Water Resource Study

Kennedy/Jenks Consultants

November 1995

The primary objective of the Antelope Valley Water Group's water resource study was to develop consensus on a water resource management plan that addresses the need of the municipal and industrial purveyors to reliably provide the quantity and quality of water necessary to serve the growth projected by the planning agencies while concurrently addressing the need of agricultural users to have adequate supplies of reasonable cost irrigation water.

Water Conservation

Based on projections presented in this study, the water supply reliability of the Antelope Valley was below MWD's objectives. Without exceeding groundwater extractions of 59,100 acre-feet per year, the probability of meeting the estimated 1993 water demand was approximately 73 percent. Without a conservation program, by the year 1998 (projected population of 451,000), 100 percent of the water demand was estimated to be met only 50 percent of the time without overdrafting the groundwater basin. Similarly, by the year 2000 (projected population of 499,000), 100 percent of the potential water supplies would be required to meet the projected water demands without overdrafting the groundwater basin.

With a conservation program, by the year 2000, 100 percent of the water demand is estimated to be met only 50 percent of the time and by the year 2002 (projected population of 547,000), 100 percent of the potential water supplies would be required to meet the water demand.

The measures recommended for inclusion in the water conservation plan for the Antelope Valley are listed in Table ES-3 of this report. Because agricultural water use is expected to decline significantly during the planning period (1994-2020), the plan consists primarily of urban conservation programs developed for the City of Palmdale, City of Lancaster and Community of Rosamond. Evaluation of urban water conservation measures was performed utilizing the Department of Water Resources' (DWR) Water Plan computer software. Benefit to cost (B/C) analyses were performed for each recommended urban water conservation measure to determine cost effectiveness. The overall B/C ratios for the City of Palmdale, City of Lancaster, and Community of Rosamond were calculated to be 4.7, 3.0, and 4.5 respectively.

The Agricultural Water Suppliers Efficient Water Management Practices (EWMP) Act requires the Department of Water Resources (DWR) to establish an advisory committee to evaluate EWMPs aimed at agricultural water suppliers concerning conservation of irrigation water. Because the evaluation of the EWMPs will require detailed planning by each water agency and will include analysis of technical feasibility, social and district economic criteria and legal feasibility of each practice, an assessment of the impact of implementation of EWMPs (i.e., costs and water savings) is not currently available through the DWR. Therefore, until DWR's assessment of the EWMPs is complete, analyses of potential agricultural conservation measures for the Valley cannot be provided. However, based on the available case studies, an agricultural water conservation program can be recommended on a preliminary basis. It is recommended that a Mobile Agricultural Water Conservation Laboratory (Mobile Lab) program be established to serve agricultural areas in the Antelope Valley. The Mobile Lab operates under the leadership of the local Resource Conservation District, with technical and management assistance from the local Soil Conservation Services (SCS) Field Office. The Mobile Lab provides agricultural growers with individual, site-specific performance evaluations of their irrigation systems by measuring efficiency of the systems. Data are collected for the specific site for calculations on distribution uniformity and application efficiency. Based on an analysis of the results, recommendations or suggestions are made by the Mobile Lab team on management or physical changes to improve water use efficiency of the irrigation system.

Implementation of the urban conservation measures was assumed to begin in 1994 and continue through the year 2020. (Note that although conservation programs currently exist in the Antelope Valley, for purposes of estimating water savings using DWR's Water Plan software, the year 1994 was assumed to be the beginning of the planning period.) Estimated water savings from the urban measures range from 0.67 to 87,356 acre-feet for the City of Palmdale, 0.34 to 43,775 acre-feet for the City of Lancaster, and 0.34 to 7,821 acre-feet for the Community of Rosamond. The estimated water savings is shown as the total amount of water saved over the entire implementation period (1994 to 2020). Implementation of the agricultural conservation measure is assumed to begin in 1995 and continue through the year 2020. Estimated water savings for the agricultural measure is 68,800 acre-feet over the entire implementation period (1995 to 2020).

Use of Reclaimed Water

The Palmdale WRP, Lancaster WRP, Rosamond WRP, and Edwards AFB WRP have the greatest potential for expansion, as well as the highest projected flows in the year 2020. Therefore, discussion of reclaimed water use focuses on these four plants. Edwards AFB WRP is discussed to a lesser extent than the other three plants, because design of water reclamation facilities were already underway.

The Palmdale WRP is an undisinfected secondary treatment facility with a capacity of 8.0 mgd. The Lancaster WRP was the only facility in Antelope Valley supplying tertiary treated water (0.6 mgd design capacity). A majority of the plant's flow is treated to a secondary treatment level. Total capacity of the plant is 10.0 mgd (1994). The Rosamond WRP is a 2.0 mgd primary treatment facility (1994). RCSD was planning to convert the existing system to a 2.0 mgd tertiary treatment facility in 1996. The Edwards AFB WRP is a 1.5 mgd primary treatment facility (1994). Edwards AFB was designing a 2.5 mgd tertiary treatment facility that was scheduled to be constructed in 1995.

The average daily wastewater flow in the year 2020 is estimated to be 37.2 mgd for the Palmdale WRP and 29.8 mgd for the Lancaster WRP. The average daily wastewater flow in the year 2020 for the Rosamond WRP and the Edwards AFB WRP is estimated to be 3.0 and 2.5 mgd, respectively.

The total annual reclaimed water demand was approximately 35,600 acre-feet per year. Total peak month demand was estimated to be approximately 6,300 acre-feet, and total peak day demand was estimated to be 74 million gallons or 216 acre-feet.

The recommended conceptual plan was divided into 4 main reclaimed water systems:

- Palmdale and Lancaster Tertiary System (Tertiary System)
- Palmdale and Lancaster Secondary System (Secondary System)
- Rosamond System
- Edwards AFB System

The tertiary system would serve tertiary treated reclaimed water to approximately 34 users in three service zones. The secondary system would serve secondary treated reclaimed water to approximately 23 users in one service zone. The Rosamond system would serve tertiary treated water to approximately 20 users in one service zone. Main pump stations would be located at the reclaimed water supply. Each of the service zones would contain storage reservoirs, distribution system piping, and booster pump stations.

The estimated construction cost of the treatment facilities for the tertiary and the Rosamond systems are $24,417,000 and $7,731,000 respectively. The distribution facilities for the tertiary, secondary and Rosamond systems are $36,456,000, $67,486,000, and $8,296,000 respectively. The total cost for construction of the entire regional system was approximately $144,386,000 (1994 dollars).

Edwards AFB was currently (1994) designing a 2.5-mgd tertiary wastewater treatment plant. The following is a list of facilities for the planned reclaimed water distribution system:

- A 3,125 gallon per minute (gpm) main pump station at the wastewater treatment plant.
- A 3,125 gpm booster pump station.
- A 2.2 mg storage reservoir.
- Approximately 31,740 feet of polyvinyl chloride (PVC) pipe ranging from 4 to 18 inches in diameter.

The estimated capital cost of the planned distribution facilities is $6,300,000. Operation and Maintenance (O&M) costs were estimated to be $140,000 per year.

The unit costs for the reclaimed water distribution facilities for the tertiary, secondary and Rosamond systems are $858, $359 and $1,218 per acre-foot respectively (includes annualized capital). The unit costs for the treatment facilities for the tertiary and Rosamond systems are $999 and $1,649 per acre-foot respectively (includes annualized capital). Total unit costs (distribution and treatment) for the tertiary, secondary and Rosamond systems are $1,857, $359 and $2,867 per acre-foot, respectively.

Without exceeding groundwater extractions of 59,100 acre-feet per year, the probability of meeting the estimated 1993 water demand was approximately 73 percent. Without a conservation program and including the reclaimed water system identified in this report, by the year 1999 (projected population of 475,000), 100 percent of the water demand was estimated to be met only 50 percent of the time and by the year 2001 (projected population of 523,000), 100 percent of the potential water supplies would be required to meet the water demand. With a conservation program and including the reclaimed water system, by the year 2002 (projected population of 547,000),100 percent of the water demand is estimated to be met only 50 percent of the time and by the year 2004 (projected population of 595,000), 100 percent of the potential water supplies would be required to meet the water demand.

Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) include the following methods of storing and recovering water from the groundwater basin:

- Spreading/Infiltration - use of surface spreading basins to allow infiltration of water into the aquifer.
- Injection - use of new or existing wells for direct injection of water into the aquifer.
- In-lieu Use - use of an alternative source of water, other than groundwater, when available, and use of groundwater when the alternative source is unavailable.

The entire groundwater basin of the Antelope Valley is estimated to have 68 million acre-feet of storage, of which 13 million acre-feet was currently available (DWR, 1980). Approximately 55 million acre-feet of groundwater was estimated to remain in storage as of 1975. This stored water, however, may not be entirely accessible due to 1) uneconomical pumping depths, 2) distance between the groundwater basin and current users and 3) the potential for causing land subsidence.

At present, the principal source of recharge of the groundwater in the Antelope Valley is runoff, principally recharged in the foothills of the mountains. Numerous studies have been conducted to estimate natural recharge since 1924, some based on little data. The most recent studies estimate natural recharge at 31,200 to 59,100 acre-feet per year (USGS, 1993).

There are a variety of source waters that could be available for recharge into the groundwater of the Antelope Valley. They include:

- SWP
  - Treated potable water
  - Untreated water directly from the California Aqueduct
- Reclaimed Water (for spreading only)
  - Secondary treatment
  - Tertiary treatment

- Surface Water
  - Little Rock Creek and Little Rock Reservoir
  - Big Rock Creek
  - Amargosa Creek

The highest groundwater TDS level within the wells for which data were evaluated was 1,840 milligrams per liter (mg/L) in a well located on Edwards AFB where perched water tables and the accompanying high salts occur. The low groundwater TDS of 125 mg/L occurred in a well in the LACWW wellfield near Lancaster. The average TDS value was estimated at about 300 mg/L based on the wells for which water quality was evaluated.

Potential infiltration and injection sites should be assessed relative to the location of the existing facilities in order to minimize capital costs. In certain instances where it is necessary to control the ultimate storage location of the infiltrated or injected groundwater, fault and bedrock control of the groundwater impound may be a necessary characteristic that will need to be investigated further. In addition, it is important that the potential recharge site has good quality groundwater that will not compromise the quality of the water to be infiltrated or injected.

Based on the characteristics favorable to a good surface infiltration site and previous work that has been conducted in assessing infiltration sites, the following areas were focused on for more detailed analysis:

- Little Rock Creek
- Big Rock Creek
- Amargosa Creek
- West Antelope Subunit
- Groundwater recharge zones described in the Los Angeles County Department of Public Works (LACDPW) "Final Report on the Antelope Valley Comprehensive Plan of Flood Control and Water Conservation," dated June 1987.

Infiltration as a mechanism to recharge groundwater appears to be technically feasible. The sites with the highest potential for recharge by spreading appear to be:

- Amargosa Creek south of Avenue "N" between 10th Street West and Division Street (LACDPW Site).
- Little Rock Creek near Avenue "N" between 60th Street and 70th Street East, Department of Airport (DCA) Property.
- Amargosa Creek near Elizabeth Lake Road and 25th Street West.

Potential injection areas include the municipal wellfields within the existing LACWW and PWD municipal well fields. Specific areas within the well fields that have been assessed include:

- Potential LACDPW wells at Avenue K-8 and Division Street.
- Wells in USGS/LACWW/AVEK Injection Study.

Injection has not been extensively studied in the Valley; however, groundwater recharge by injection appears to be technically feasible. The existing wellfields could provide both the injection and extraction facilities necessary to conduct such a program. The specific areas that should be explored further because of their proximity to the distribution system and potential treated SWP water are:

- LACWW wells located:
  - South of A venue" K" between 10th Street West and Division Street (where USGS is conducting its injection study).
  - South of Avenue "L" between 10th Street West and Division Street (adjacent to the area above).
- PWD wells south of Avenue "P" between 20th Street East and 40th Street East.

It appears that treated SWP water should be generally acceptable for injection from a water quality perspective. However, more detailed water quality analyses will have to be conducted at the potential injection sites to gather current information on the condition of the aquifer water quality in these specific locations.

Depending on the results of the USGS's injection study, significant additional work will be required and should include, at a minimum, the following:

- Estimation of the actual volumes that could be injected at each site.
- Evaluation of aquifer behavior during injection and extraction and a determination of aquifer characteristics at specific sites.
- Evaluation of potential ground surface effects during injection and extraction.
- Determination of upgrades that may be required at each well and pump station.
- Evaluation of the operation of the injection/extraction system based on the availability of treated SWP water.
- Evaluation of the potential changes to water treatment plant operations that may be required to continue injection and extraction over the long-term.

Effects of Changes in Groundwater Levels

According to the USGS, groundwater levels in the Lancaster area have declined by as much as 200 feet from 1915 to 1988 (USGS, 1994). Conversely, well hydrographs maintained by AVEK and in cooperation with the USGS, indicate groundwater levels in portions of the Valley have risen in recent years. Declining groundwater levels over a long period of time generally indicate over-extraction from a groundwater basin; conversely, increasing groundwater levels over a long period of time may indicate under-extraction from a basin (or recovery from over-extraction).

Declining groundwater levels potentially result in two primary damages: 1) land subsidence and 2) increased pumping costs. Land subsidence is defined by USGS as the vertical lowering of the land surface over an area of many square miles (USGS, 1991) and may be the result of a variety of causes. In general, damages will be most pronounced when subsidence gradients (change in subsidence levels over a given distance) are high. Subsidence levels of up to 7 feet have occurred in some areas of Antelope Valley. USGS (1992) reported that as much as 2 feet of land subsidence had affected Antelope Valley by 1967 and was causing surface deformations at Edwards AFB. Fissures, cracks and depressions on Rogers Lakebed were affecting the use of the lakebed as a runway for airplanes and space shuttles. A study done by Geolabs - Westlake Village (1991) studied a 10 square mile area in Lancaster identified to have fissures and sinklike depressions. The report identified fissures ranging in width from one inch to slightly over one foot. The lengths of the fissures ranged mainly between 50-200 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 1 5 feet wide.

Increased pumping costs result directly from declining groundwater levels. As the pumping lift increases, so does the power cost to lift the water. As groundwater declines, additional pump bowls and larger motors may be necessary.

Potential damages attributable to increasing groundwater levels include waterlogging and water quality degradation. Waterlogging is defined as saturation of soil with water. The effects of waterlogging are dependent not only upon the elevation of the groundwater table but also on the soil type. Generally, the effects of waterlogging will be most noticeable in granular soils. Water quality degradation can result from nitrates being drawn down into the aquifers by rising groundwater levels and then being spread by depressions caused from over-pumping. Nitrates are the end product of aerobic stabilization of organic nitrogen and, as such, occur in polluted waters that have undergone self-purification. Nitrate in groundwater can come from fertilizer, poultry manure, or domestic wastewater. Nitrates can cause blue baby syndrome which can be fatal for infants.

Increasing groundwater levels have occurred in portions of the Valley. For most of these areas, no damage related to these increases has been identified, due to the fact the groundwater level is still significantly below the ground surface. However, for the Leona Valley area in the southern portion of the Valley, damages potentially attributable to increasing groundwater levels were identified in April 1993. The apparent damages appear to be typical and include waterlogging and water quality degradation.

Reclamation Concept and Feasibility Study (Draft Report)

Metcalf & Eddy

July 31, 1997

The purpose of this report was to develop a conceptual reclamation program and to evaluate the feasibility of its implementation. An analysis of reclaimed water use was included as part of a regional water supply study (*Antelope Valley Water Resource Study*, 1995) and this feasibility study was focused on a refinement of the previous analysis with an emphasis on providing reclaimed water to proposed projects being considered by the City, in addition to providing reclaimed water to existing parks, schools and golf courses.

The required facilities would include treatment upgrades at the existing CSDLAC treatment facility and a reclaimed water distribution system. The treatment upgrades include the addition of tertiary treatment facilities. The facilities would be located at the existing aerated and oxidation lagoon site and would require appropriate support facilities to accommodate operators and maintenance access. The following facilities were proposed to provide full tertiary treatment:

- Flocculation/clarification
- Sludge pump station and force main
- Filter pump station
- Gravity filters
- Extended chlorination

The system capacity used for this study was equal to the maximum day demand of 13.3 million gallons per day (mgd), providing operational storage to accommodate peak hour demands (26.5 mgd).

The conceptual distribution system was developed with the goal of limiting the number of zones, thereby reducing the number of booster pump stations required to deliver reclaimed water throughout the community. Three zones were proposed. The main zone, referred to as the Plant Zone, would serve the entire central portion of Palmdale and a portion of the new developed areas located to the south and west. Two additional zones would be created (South and West Zones), which would require booster pump stations to serve development located at higher elevations. The operational storage would be provided by a single reservoir within the Plant Pressure Zone. Sufficient capacity in the operating reservoir would be provided to enable peak hour demands to be met by a combination of water pumped from the treatment plant site and water delivered from the storage reservoir. The two pressure zones (West and South) would be served by booster pump stations designed to accommodate peak hour demands within those areas.

This distribution system would be a backbone system, which has been laid out to connect with all large users and to locate the transmission mains within reasonable proximity of all smaller users.

The total estimated capital cost (July 1997) for treatment, distribution, storage and pumping facilities is shown in **Table 1**.

Table 1

Palmdale Reclamation System
Estimated Capital Costs

Facilities	Estimated Cost
Treatment	$15,818,400
Distribution	$23,554,800
Pumping/Storage	$6,739,200
Total Estimated Cost	$46,112,400

The estimated annual operating costs (July 1997) are summarized in **Table 2**.

Table 2

Palmdale Reclamation System
Estimated Annual Operating Costs

Item	Estimated Cost
Labor	$327,600
Power	$823,300
Equipment	$125,000
Chemical/Materials	$298,900
Total Estimated Cost	$1,574,800

Palmdale Water Reclamation Concept Study

Kennedy/Jenks Consultants

June 2000

The purpose of the Water Reclamation Concept Study was to evaluate three potential conceptual uses of reclaimed water produced by the Palmdale Water Reclamation Facility Plant, owned and operated by County Sanitation Districts of Los Angeles County, District No. 20. The concepts considered included the following:

1. Discharge of effluent into existing sand and gravel pits located in the eastern portion of the City of Palmdale to create a recreational facility.

2. Recharge of local groundwater basins with highly treated effluent.

    - Option 1 – Excludes total dissolved solids (TDS) reduction (includes TOC reduction with granular activated carbon)

    - Option 2 – Includes TDS reduction with reverse osmosis

3. Discharge of highly treated effluent into Lake Palmdale, which serves as the forebay for the Palmdale Water District Water Treatment Plant.

Each of these alternatives was evaluated at the conceptual level in an effort to identify feasibility and preliminary costs.

The findings of the Study indicated that utilizing effluent for recreational purposes within gravel pits would not result in the utilization of a significant quantity of effluent. With this finding, such use was found not to be feasible unless combined with another alternative.

The introduction of highly treated effluent into Lake Palmdale was not considered feasible, as such discharge would not comply with the preliminary requirements established by the California Department of Health Services for a similar proposal developed by the City of San Diego.

The third alternative, discharge of highly treated effluent into local groundwater basins, was been found to be technically feasible and would have costs similar to alternative water supplies available within the Antelope Valley region.

Implementing a groundwater recharge program would require resolution of a number of key regulatory issues, the outcome of which could greatly impact the cost of the program.

These issues include:

- The level of treatment must comply with California Department of Health Services draft groundwater recharge regulations. Regulations specify levels of treatment that are a function of the percentage of effluent combined with naturally occurring groundwater extracted for domestic water supply.

- The Regional Water Quality Control Board in consultation with the Department of Health Services would establish discharge requirements for a proposed groundwater recharge program. The Regional Board could require demineralization within the treatment process if the antidegradation policy adopted by the State of California is strictly enforced.

The two significant treatment elements which have the greatest impact on potential costs include reduction of total organic carbon and total dissolved solids in treated effluent prior to groundwater recharge. It was recommended that these requirements be the focus of future studies as communities within the Antelope Valley move forward with a planned groundwater recharge program.

Capital costs for the groundwater recharge Options 1 and 2 are summarized in ***Table 1***. The total capital cost was estimated to range from $33 million to $45 million (June 2000), depending upon the need for the reduction of TDS.

Estimated operating costs (June 2000) for the groundwater recharge options are summarized in ***Table 2***. Estimated costs include labor, power and chemical and materials associated with each alternative.

Table 1

Groundwater Recharge Alternatives
Estimated Capital Costs

Option No.	Alternative and Improvements	Estimated Cost
1	Excludes TDS Reduction (includes TOC Reduction with Granular Activated Carbon)	
	Treatment (10 mgd)	$22,505,000
	Conveyance	8,650,000
	Recharge Sites	1,828,500
	Total Estimated Cost	**$32,983,500**
2	Includes TDS Reduction (with Reverse Osmosis)	
	Treatment (10.0 mgd)	$32,438,000
	Conveyance	8,650,000
	Recharge Sites	1,828,500
	Total Estimated Cost	**$42,916,500**

Table 2

Groundwater Recharge Alternatives
Estimated Annual Operating Costs

Option No.	Alternative and Expenses	Estimated Cost
1	Excludes TDS Reduction (includes TOC Reduction with Granular Activated Carbon)	
	Labor	$ 600,000
	Power	1,214,000
	Chemical/Materials	433,000
	Total Estimated Cost	**$2,063,000**
2	Includes TDS Reduction (with Reverse Osmosis)	
	Labor	$ 600,000
	Power	1,501,000
	Chemical/Materials	650,000
	Total Estimated Cost	**$2,751,000**

Lancaster Water Reclamation Plant 2020 Facilities Plan

Sanitation Districts of Los Angeles County

May 2004

The objectives of the LWRP 2020 Plan are as follows:

- Provide wastewater treatment and effluent management capacity adequate to meet the needs of District No. 14 through the year 2020 in an environmentally sound and cost-effective manner;
- Eliminate unauthorized effluent-induced overflows from Piute Ponds to Rosamond Dry Lake in the most expeditious manner possible and in consideration of the RWQCB-LR, in order to avoid any threatened nuisance condition as determined by EAFB;
- Ensure recycled water of sufficient quality and quantity is available to satisfy emerging municipal reuse needs; and
- Comply with the requirements to maintain Piute Ponds.

The major components of the LWRP 2020 Plan recommended project, *26 mgd CAS/Tertiary Treatment, Agricultural Reuse, and Storage Reservoirs*, are:

- Wastewater Treatment Facilities;
- Effluent Management Facilities;
- Municipal Reuse; and
- Maintenance of Piute Ponds.

Wastewater Treatment Facilities

The existing methods of primary treatment and biosolids handling at the LWRP will be expanded to a capacity of 26 mgd by constructing the following major components of the recommended project: an influent pump station, aerated grit channels, primary sedimentation tanks, digestion tanks, and drying beds.

A 26-mgd CAS secondary and tertiary treatment facility will be constructed in phases to replace the existing 16-mgd-capacity oxidation pond secondary treatment facilities. The CAS process will be operated in “nitrification-denitrification” mode to increase nitrogen removal from the wastewater. Tertiary treated effluent for municipal reuse projects, such as that of the City of Lancaster, will be provided from the new 26-mgd tertiary facility. The AVTTP, which currently provides tertiary-treated effluent to Apollo Park by treating up to 0.6-mgd of effluent from the oxidation ponds, will be partially decommissioned and replaced with more current tertiary treatment technology. A dechlorination station will be constructed in order to improve the quality of effluent that will be discharged to Piute Ponds. Nitrogen removal facilities may be constructed, and/or process modifications may be implemented, to further improve the quality of oxidation pond effluent during the interim period until CAS secondary treatment is online.

Construction of these facilities will require acquisition of additional land, since the current plant area is not large enough to accommodate the proposed facilities. Approximately 15 acres of land, some to the north and some to the west of the LWRP, will be acquired.

Effluent Management Facilities

Aside from the delivery of recycled water for municipal reuse, which is described in the following subsection, effluent from the LWRP will be managed via discharge to (1) Piute Ponds, (2) the Impoundment Areas, (3) Apollo Park, (4) storage reservoirs, and (5) agricultural reuse operations. Effluent delivery to Piute Ponds, the Impoundment Areas, and Apollo Park will remain relatively constant throughout the planning period since only the volume adequate to compensate for evaporative losses will be discharged to these locations. As influent to the LWRP increases throughout the planning period, the resultant increase in effluent flow will be managed by expanding agricultural and/or municipal reuse operations and constructing additional storage reservoirs, as discussed below:

- *Storage Reservoirs*

  Approximately 750 acres of land will be acquired for construction of effluent storage reservoirs. The storage reservoirs will have a total capacity of approximately 2,300 million gallons (7,059 acre-feet), a water depth of approximately 20 feet, and a freeboard of three feet. The top of the reservoir berms will be approximately 20 feet above grade. Native soils with a low permeability will be excavated and recompacted to construct the floors of the storage reservoirs in order to minimize tertiary-treated effluent infiltration. The decommissioned oxidation ponds, which will be emptied, cleaned, and repaired as necessary, will provide an effluent storage capacity of approximately 470 million gallons (1,442 acre-feet). The new storage reservoirs and converted oxidation ponds together will help increase the effluent management capacity of the LWRP to 26 mgd.

- *Agricultural Reuse Operations*

  Approximately 4,650 acres of land will be acquired by District No. 14 for the development of agricultural reuse operations. This will help increase the effluent management capacity of the LWRP to 26 mgd. A recycled water pipeline and a pump station will be constructed to convey recycled water to the agricultural sites. In an effort to ensure continuation of its existing agricultural reuse operations, District No. 14 is negotiating to acquire Nebeker Ranch. If District No. 14 succeeds in purchasing this 680-acre farm, then only 3,970 acres will need to be acquired for agricultural reuse operations.

Purchase of land for agricultural operations, rather than leasing, ensures that District No. 14 can meet its legal obligations under the WDRs for appropriate effluent management at all times. The proposed agricultural operations will be located within the agricultural site east of the LWRP. The precise locations of the agricultural operations will be determined during the land acquisition process. District No. 14 will develop agricultural reuse operations on land it acquires by entering into agreements with responsible and experienced farming entities. The methods of irrigation used will be ones that are permitted under Title 22 and are protective of the groundwater. District No. 14 will prepare an engineering report for DHS approval and obtain a recycled water reuse permit from the RWQCB-LR.

Municipal Reuse

District No. 14 will provide a sufficient quantity and quality of tertiary-treated effluent to the City of Lancaster, and any other entities, to meet municipal recycled water reuse demand. The City of Lancaster's goal is to implement a project to distribute up to 1.5 mgd (4.6 acre-feet per day) of recycled water to municipal users.

In addition to the City of Lancaster's recycled water reuse project, the development of a new municipal reuse project of a comparable size will ensure that the proposed agricultural reuse acreage will be adequate for managing the expected year 2020 flow rate of 26 mgd. If neither the City of Lancaster's nor any additional municipal reuse demand materializes, then District No. 14 may have to acquire approximately 800 additional acres of land in order to manage the surplus recycled water via agricultural reuse operations.

Maintenance of Piute Ponds

Piute Ponds will be preserved by (1) delivering a sufficient quantity of recycled water to the ponds to maintain the current habitat and (2) providing for periodic flushing of the ponds to ensure a healthy habitat. A detailed discussion on the maintenance of Piute Ponds, as well as preservation of the Amargosa Creek delta and the adjoining mud flats, is provided in the Final LWRP 2020 Plan EIR.

Project Implementation and Schedule

The recommended project will be implemented in two phases, which will be known as the Stage V and Stage VI expansions.

Stage V Expansion

Stage V will involve land acquisition and construction of facilities by 2008 that will increase the primary, secondary, and tertiary wastewater treatment and biosolids handling capacity of the LWRP to 21 mgd. Stage V will also involve land acquisition and construction of facilities by early 2007 that will increase the effluent management capacity of the LWRP to 21 mgd. The major effluent management facilities that will be constructed as part of Stage V include storage reservoirs, a recycled water pipeline, a pump station, and agricultural reuse operations. The 21-mgd capacity of the LWRP following completion of the Stage V expansion will be adequate through the year 2014.

Although all reasonable efforts are being made to have facilities in place to meet the RWQCB-LR deadline, all Stage V effluent management facilities will not be completed in time. District No. 14 will manage effluent from the LWRP by delivering recycled water to the existing effluent management sites (Piute Ponds, Impoundment Areas, Apollo Park, Nebeker Ranch, and existing storage reservoirs) and applying recycled water at defined irrigation rates on the Stage V agricultural reuse sites as they are established. During the winter months, District No. 14 will continue its present practice of controlled effluent discharge to Piute Ponds in a manner that does not create a threatened nuisance condition for EAFB. As the necessary facilities become operational, effluent-induced overflows onto Rosamond Dry Lake will be greatly reduced. All effluent overflows onto Rosamond Dry Lake will be eliminated after April 2009. District No. 14 is working with the RWQCB-LR and EAFB to ensure that continuation of controlled effluent overflows during this period does not create a threatened nuisance condition.

Stage VI Expansion

Stage VI will involve construction of facilities by 2014 that will increase the primary, secondary, and tertiary wastewater treatment, biosolids handling, and effluent management capacity of the LWRP from 21 mgd to 26 mgd.

The proposed facilities and timing of the Stage VI expansion will be reevaluated in 2010-11 to respond to any changes in wastewater flow projections or other factors affecting the recommended project. As municipal recycled water reuse projects that require tertiary-treated effluent increase, the agricultural reuse component of the recommended project will be adjusted accordingly.

Project Cost

The cost of the recommended project is presented as both the total capital cost and as an equivalent annual cost. Table ES-9 shows the capital cost breakdown of the recommended project for the Stage V expansion, Stage VI expansion, and the total project. Table ES-10 shows the equivalent annual project cost, which is comprised of the annualized capital cost and the anticipated annual O&M cost at 26 mgd, for the Stage V expansion, the Stage VI expansion, and the total project. Although the project costs will be incurred in future years, all amounts contained in the following tables are in 2003 dollars.

Table ES-9
Capital Cost Breakdown of the Recommended Project[a,b]

Project Component	LWRP		
	Stage V	Stage VI	Total
Preliminary - Influent Pump Station	$3,953,000	—	$3,953,000
Preliminary - Odor Control Stations	$779,000	—	$779,000
Preliminary - Ferrous Chloride Stations	$194,000	—	$194,000
Primary - Comminutors, Aerated Grit Channels	$277,000	$277,000	$554,000
Primary - Sedimentation Tanks	$2,737,000	$2,736,000	$5,473,000
Secondary (CAS) - Aeration Tanks, Return Activated Sludge	$13,348,000	$3,178,000	$16,526,000
Secondary (CAS) - Sedimentation Tanks, Waste Activated Sludge	$6,216,000	$1,480,000	$7,696,000
Secondary (CAS) - DAF Units	$782,000	$186,000	$968,000
Secondary (CAS) - Chemical Stations	$984,000	$234,000	$1,218,000
Secondary (CAS) - Piping	$3,950,000	$941,000	$4,891,000
Tertiary - Filters, Pumps, Backwash Recovery	$12,875,000	$3,066,000	$15,941,000
Tertiary - Piping	$1,317,000	$313,000	$1,630,000
Tertiary (Disinfection) - Chlorine Contact Tanks	$2,982,000	$710,000	$3,692,000
Tertiary (Disinfection) - Chlorination	$620,000	$148,000	$768,000
Biosolids Handling - Digestion Tanks	$7,528,000	$4,517,000	$12,045,000
Biosolids Handling - Drying Beds	$1,443,000	$444,000	$1,887,000
Effluent Management - Storage Reservoirs	$16,013,000	$8,006,000	$24,019,000
Effluent Management - Agricultural Operations	$9,758,000	—	$9,758,000
Effluent Management - Piping, Pump Station	$25,000,000	—	$25,000,000
Miscellaneous - Oxidation Pond Effluent N-Removal, Dechlorination	$2,130,000	—	$2,130,000
Miscellaneous - Roads, Fences, Culverts	$2,015,000	$1,008,000	$3,023,000
Miscellaneous - Plant Monitoring Wells	$853,000	—	$853,000
Miscellaneous - Laboratory Building	$2,147,000	—	$2,147,000
Land - Wastewater Treatment, Biosolids Handling	$75,000	—	$75,000[c]
Land - Storage Reservoirs	$3,750,000	—	$3,750,000[d]
Land - Agricultural Operations	$29,109,000	—	$29,109,000[e]
Land Acquisition Services	$5,075,000	—	$5,075,000
Relocation Expenses	$5,361,000	—	$5,361,000
Contingency for Mitigation	$11,399,000	—	$11,399,000
TOTAL CAPITAL COST	**$172,670,000**	**$27,244,000**	**$199,914,000**

(a) 2003 dollars.
(b) All costs, except land, land acquisition services, relocation expenses, and contingency for mitigation, include 10% for design.
(c) 15 acres @ $5,000 per acre.
(d) 750 acres @ $5,000 per acre.
(e) 4,650 acres @ $6,260 per acre.

Table ES-10
Equivalent Annual Cost of the Recommended Project[a]

Project Component	LWRP		
	Stage V	Stage VI	Total
Design	$10,718,000	$2,477,000	$13,195,000
Construction	$107,183,000	$24,767,000	$131,950,000
Land	$32,934,000	—	$32,934,000
Land Acquisition Services	$5,075,000	—	$5,075,000
Relocation Expenses	$5,361,000	—	$5,361,000
Contingency for Mitigation	$11,399,000	—	$11,399,000
Total Capital Cost	$172,670,000	$27,244,000	$199,914,000
Annualized Capital Cost[b]	$15,827,000	$2,497,000	$18,324,000
Annual O&M Cost[c]	$7,454,000	$1,636,000	$9,090,000
EQUIVALENT ANNUAL COST	**$23,281,000**	**$4,133,000**	**$27,414,000**

(a) 2003 dollars.
(b) Amortized at 6.625% annual interest rate for 20 years.
(c) Based on 21 mgd for Stage V facilities, 5 mgd for Stage VI facilities, and 26 mgd for Total facilities.

Revenue Program

A revenue program allocates costs and supplemental revenue as needed from the users of the system to ensure sufficient revenues for construction and subsequent operation of facilities.

The financial program of District No. 14 is based on maximum utilization of the existing sources of revenue, supplemented by revenues from two additional programs: (1) the Service Charge Program, which is applicable to existing users, and (2) the Connection Fee Program, which applies to new users and existing users who significantly increase their discharge flow and/or strength.

In order to prevent a large fluctuation in the service charge rates from year to year, District No. 14 utilizes outside financing to the extent possible to distribute the capital costs of projects over an extended period of time. The primary mechanism that District No. 14 uses is the SRF loan program. If the recommended project had to be funded in a single year, the cost per single -family home would probably be prohibitive for many homeowners. However, the time needed to complete Stage V of the recommended project, will be approximately five years. This will allow the project cost to be spread over this time period. Additionally, District No. 14 will distribute this cost over an even greater number of years by utilizing the SRF loan program as well as any available bond proceeds.

Projected Service Charge and Connection Fee Rates

It is projected that the service charge rate will have to increase from the current $67 per year per single-family home to approximately $220 per year per single-family home by fiscal year 2008-09. This translates to an increase of approximately $31 per year per single -family home for each year over the next five years. Additionally, it is projected that the connection fee rate will have to increase, in phased increments, from its current rate of $1,780 per single-family home to approximately $3,900 per single-family home over a five-year period that parallels the Stage V construction time frame. The current service charge rate of $67 per year per single-family home has been in effect for 11 years, since fiscal year 1993-94. Although a significant increase in the present rate is projected as a result of the cost to construct and operate the recommended project, the projected future rate of $220 per year per single -family home is within the range that other communities in California currently pay for wastewater treatment. The projected future rate of $220 per year is equal to the median rate charged in 2002 by all communities in California.

Final Palmdale Water Reclamation Plant 2025 Facilities Plan and Environmental Impact Report

Sanitation Districts of Los Angeles County

October 2005

The overall goal of the PWRP 2025 Plan is to identify a project that meets the wastewater treatment and effluent management needs of District No. 20 through year 2025 in a cost effective and environmentally sound manner. In order to meet the above-listed needs, the objectives of the PWRP 2025 Plan are as follows:

- Provide wastewater treatment capacity adequate to meet the needs of District No. 20 through the year 2025;
- Provide effluent management capacity adequate to meet the needs of District No. 20 through the year 2025;
- Provide a long-term solution for meeting water quality requirements set forth by regulatory agencies; and
- Provide a wastewater treatment and effluent management program that accommodates emerging recycled water reuse opportunities.

The major components of the recommended project are wastewater treatment facilities, effluent management facilities, and municipal reuse. Some processes of the wastewater treatment and effluent management facilities will be constructed to upgrade the treatment and effluent management level currently provided at the PWRP. For other processes, facilities will be expanded from 15.0 mgd to 22.4 mgd. These changes will be performed in stages, as described below.

Stage V

Stage V involves upgrading the existing wastewater treatment facilities by decommissioning the existing oxidation ponds and installing CAS with NDN and tertiary treatment filters. The agricultural reuse capacity of the PWRP would be expanded to 15.0 mgd by obtaining 840 acres of land for agricultural reuse operations and constructing storage reservoirs. District No. 20 will continue to seek municipal, industrial, and other public reuse opportunities for recycled water throughout the Stage V upgrade and expansion period, which would lessen the extent of agricultural reuse operations.

Wastewater Treatment Facilities

The proposed Stage V upgrade includes construction of facilities to upgrade the treatment capability of secondary treatment utilizing oxidation ponds with the installation of CAS aeration tanks, sedimentation tanks, and dissolved air flotation (DAF) units. Additional upgrades will be accomplished by: (1) installing tertiary treatment facilities consisting of tertiary filters and chemical treatment facilities, (2) expanding solids processing facilities by adding drying and/or mechanical solids thickening facilities, and

(3) constructing related facilities, such as an emergency generator, control and laboratory buildings, and associated piping and appurtenant structures. The existing PWRP headworks and primary treatment facilities will remain in service, as will the existing solids processing equipment. As noted previously, the existing 15.0 mgd-capacity oxidation ponds will be decommissioned.

The CAS process will be operated in NDN mode to increase nitrogen removal from the wastewater. Following the Stage V upgrades, the PWRP will produce treated effluent that will meet all the prescribed DHS standards for the beneficial reuse of tertiary treated recycled water.

The existing PWRP site has land available for all of the proposed treatment facilities. The new facilities for Stage V will be positioned next to the existing primary facilities on the southwest portion of the PWRP property at 30th Street East and Avenue P-8.

Agricultural Reuse Operations

Stage V will include the secured use of approximately 840 acres of additional land that will be needed to accommodate the 15.0 mgd flow projected by the year 2013. A new plant effluent force main (approximately 36 inches in diameter), a plant effluent pump station, an agricultural recycled water pump station, an agricultural recycled water force main, and an agricultural recycled water storage tank will be constructed to convey recycled water to the proposed storage reservoirs and agricultural reuse sites. The new agricultural reuse areas will require irrigation systems (e.g., center pivots), booster pumps, electrical sources, ancillary piping and conduit, and appurtenant structures.

As plant flow rates increase and exceed the capacity of the existing EMS with storage reservoirs on-line, additional agricultural reuse land will be developed. District No. 20 or contracted farming entities will be responsible for preparing the land, installing distribution lines and irrigation systems, and cultivating and harvesting crops in conformance with Title 22 of the California Code of Regulations (CCR). Agronomic irrigation rates will be used to protect groundwater quality. District No. 20 will prepare a recycled water reuse engineering report and obtain a recycled water reuse permit for the agricultural operations from the RWQCB-LR.

District No. 20 may also elect to enter into recycled water reuse contracts with farming entities on privately owned land. However, reliance on these types of contracts does not provide the assurance that adequate and cost-effective effluent management capacity will be available at all times. Secured use of land by District No. 20 for agricultural operations and ongoing support of municipal, industrial, and other public reuse opportunities are the best ways to ensure that District No. 20 can meet its legal obligations under the WDRs.

Storage Reservoirs

Approximately 700 acres are needed to construct six reservoirs. In Stage V, District No. 20 will acquire the land necessary for all six reservoirs though only four will actually be constructed during this stage. The new storage reservoirs will be rectangular and/or trapezoidal modules, each having a capacity of approximately 385 million gallons (MG). They will have a water depth of approximately 18 feet with approximately three feet of freeboard. The top of the reservoir berms will be as much as 25 feet above grade. The storage reservoirs will be constructed with a low-permeability synthetic liner to minimize infiltration.

Stage VI

Stage VI involves expanding both wastewater treatment and effluent management facilities to accommodate the projected increase in wastewater flow from 15.0 mgd to 22.4 mgd. District No. 20 will continue to seek municipal, industrial, and other reuse opportunities for recycled water throughout the Stage VI expansion period.

Wastewater Treatment Facilities

Construction of the Stage VI wastewater treatment components will not require acquisition of additional land. The current PWRP site located at 30th Street East and Avenue P-8 is large enough to accommodate the proposed wastewater treatment facilities.

The major wastewater treatment facilities planned for construction by 2013 as part of the Stage VI expansion from 15.0 mgd to 22.4 mgd include: (1) primary facilities consisting of influent pumps, comminutors, aerated grit channels, a grit channel blower, primary sedimentation tanks, primary sludge pumps, and a primary sludge grinder, (2) secondary facilities consisting of CAS aeration tanks, sedimentation tanks, and return and waste-activated sludge pump stations, and associated piping and appurtenant structures, (3) tertiary facilities consisting of tertiary filters and chemical pretreatment; (4) appropriate disinfection facilities, and (5) solids processing facilities consisting of an anaerobic digestion tank, a digested solids transfer pump, a ferrous chloride station, and appropriate dewatering facilities.

Effluent Management Facilities

As plant flows increase throughout the planning period, additional agricultural reuse operations will be developed to manage the increased volume of recycled water produced. Two additional storage reservoirs will be constructed as part of Stage VI. These reservoirs will be similar to those constructed in Stage V. Since District No. 20's lease agreement with LAWA expires in 2022, approximately 4,300 acres of additional agricultural land may be required in Stage VI to accommodate the projected 22.4 mgd of PWRP flow by 2025.

Municipal Reuse

The Los Angeles County Waterworks District No. 40 and PWD have expressed interest in implementing recycled water reuse projects for landscape irrigation and industrial purposes within their jurisdictions. District No. 20 has committed to provide a sufficient quantity of tertiary-treated recycled water to meet the demands of these municipal reuse projects.

Building the infrastructure (pipelines, pump stations, distribution systems, etc.) necessary to deliver recycled water from the PWRP to various end users, identifying and securing reuse sites, and preparing environmental documentation would be the responsibility of the Los Angeles County Waterworks District No. 40 and/or PWD. As demand for recycled water increases in the future, the Los Angeles County Waterworks District No. 40 and/or PWD would need to construct additional facilities to meet the increased demand. District No. 20, on its part, will assure the availability of tertiary-treated recycled water to meet emerging municipal reuse needs by diverting water from agricultural reuse when other beneficial uses become available.

Project Implementation and Schedule

As described above, the recommended project will be implemented in two stages. The Stage V storage reservoirs are scheduled for completion in October 2008 and the Stage V wastewater treatment upgrade and effluent reuse expansion are scheduled for completion in October 2009. The Stage VI wastewater treatment and effluent management expansions are both scheduled to be completed by the year 2013 based on the SCAG 2004 population projections.

Phased construction will allow District No. 20 to re-evaluate the planned facilities and other options for effluent management at an interim point between the two stages and determine whether any adjustments should be made. Adjustments may be needed to respond to any changes in wastewater flow projections or to new municipal, industrial, and other public recycled water reuse applications that emerge. If the projected wastewater flow rate during the planning period does not materialize as anticipated, the construction of the Stage VI facilities will be delayed accordingly. Alternatively, if the population in the planning area increases more rapidly than projected, the construction of the Stage VI facilities will likewise be accelerated. This approach will allow District No. 20 to integrate future recycled water reuse opportunities that may become feasible in subsequent phases of the project.

Project Cost

The total estimated capital cost in 2005 dollars is $271, 570,000. The estimated annual operating cost is $8,135,120.

Revenue Program

The Revenue Program provides for the equitable distribution of the costs associated with providing wastewater services to both existing and future users of the wastewater system. The Revenue Program is used to determine what revenue is required to provide sufficient funds for construction and subsequent O&M of facilities.

The Revenue Program of District No. 20 is based on maximum utilization of the existing sources of revenue, supplemented by revenues from (1) the Service Charge Program, which is applicable to existing users, and (2) the Connection Fee Program, which applies to new users and existing users who significantly increase their discharge flow and/or strength.

In order to prevent a large fluctuation in the service charge rates from year to year, District No. 20 plans to utilize outside financing to the maximum extent possible to distribute the capital costs of projects over an extended period of time. It is anticipated that financing will be composed of both SRF loans, to the maximum extent available, and revenue bonds. If the recommended project was to be funded on a pay as-you-go basis, the cost would have to be borne by the existing users and would be cost prohibitive for many homeowners. However, with the use of outside financing, District No. 20 will be able to distribute the project cost over 20 to 30 years, significantly reducing the immediate impact on system users.

Appendix B

Detailed Market Assessment Results for the City of Lancaster

Table B-1: City of Lancaster's Estimated Recycled Water Demand at Buildout

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
1	Antelope Valley High School	58.6	0.0600	67.21	0.1200	0.36
2	Apollo Park	89.8	0.1600	179.20	0.3200	0.96
3	Eastside Park	18.5	0.0700	78.41	0.1400	0.42
4	El Dorado Park	13.4	0.0600	68.00	0.1200	0.36
5	El Dorado School	6.3	0.0100	11.20	0.0200	0.06
6	Fairgrounds Development	57.8	0.1300	145.60	0.2600	0.78
7	Jane Reynolds Park	6.8	0.0300	33.60	0.0600	0.18
8	Joshua Memorial Park	38.2	0.1400	156.80	0.2800	0.84
9	Lancaster Cemetery	14.4	0.0500	56.01	0.1000	0.30
10	Landfill	146.5	0.0300	33.60	0.0900	0.27
11	Linda Verde School, E	10.0	0.0200	22.40	0.0400	0.12
12	Mariposa Park	11.7	0.0500	56.01	0.1000	0.30
13	Park View, E, M	19.8	0.0500	56.01	0.1000	0.30
14	HWY 14	367.2	0.0696	77.97	0.1392	0.42
15	Phoenix High School	4.0	0.0100	11.20	0.0200	0.06
16	Antelope Valley College	113.8	0.4316	483.40	0.8632	2.59
17	Armagosa School, M	14.3	0.0542	60.74	0.1084	0.33
18	Carter Park	63.5	0.2400	268.80	0.4800	1.44
19	City Park	69.4	0.1500	163.00	0.3000	0.90
20	Cole Middle School	19.6	0.0744	83.36	0.1488	0.45
21	Del Sur School, E, M	18.2	0.0690	77.28	0.1380	0.41
22	Desert View, E	10.3	0.0391	43.82	0.0782	0.23
23	Eastside HS (proposed)	68.6	0.2600	291.20	0.5200	1.56
24	Fox Field Development*	87.5	0.3319	371.70	0.6637	1.99
25	George Lane Park	13.7	0.0520	58.30	0.1041	0.31
26	Good Shepard Cemetery	58.5	0.2218	248.50	0.4437	1.33
27	Hull Park	9.7	0.0367	41.09	0.0734	0.22
28	Proposed School 5	16.4	0.0400	44.81	0.0800	0.24
29	Jack Northrop E, M	31.0	0.1176	131.80	0.2353	0.71
30	Joshua School	17.3	0.0656	73.46	0.1312	0.39
31	Joe Walker School, E	22.3	0.0844	94.52	0.1688	0.51
32	Lancaster Golf Center	19.6	0.0743	83.21	0.1486	0.45
33	Lancaster Municipal Stadium	5.2	0.0197	22.09	0.0394	0.12
34	Lancaster School, H	37.0	0.1404	157.20	0.2808	0.84
35	Lincoln School, E	10.7	0.0407	45.54	0.0813	0.24

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
36	Monte Vista, E	14.6	0.0554	62.04	0.1108	0.33
37	Nancy Cory School, E	7.3	0.0277	31.05	0.0554	0.17
38	National Soccer Center	155.7	0.5902	661.10	1.1804	3.54
39	New Fairgrounds*	219.4	0.0500	57.00	0.1000	0.30
40	Prime Desert Woodlands	64.3	0.2436	272.90	0.4873	1.46
41	Proposed Park 1	18.6	0.0707	79.14	0.1413	0.42
42	Proposed Park 2	14.9	0.0563	63.08	0.1126	0.34
43	Proposed School 1	13.9	0.0526	58.94	0.1052	0.32
44	Proposed School 2	21.9	0.0832	93.20	0.1664	0.50
45	Proposed School 3	18.0	0.0683	76.46	0.1365	0.41
46	Proposed School 4	14.2	0.0539	60.39	0.1078	0.32
47	Proposed School 6	15.3	0.0580	64.94	0.1159	0.35
48	Proposed School 7	10.0	0.0381	42.67	0.0762	0.23
49	Proposed School 8	18.4	0.0699	78.28	0.1398	0.42
50	Proposed School 9	18.7	0.0708	79.28	0.1416	0.42
51	Quartz Hill High School	76.3	0.2892	323.90	0.5784	1.74
52	Rawely Duntely Park	18.2	0.0690	77.29	0.1380	0.41
53	Sierra School, E	9.0	0.0342	38.33	0.0684	0.21
54	Skytower Park	13.0	0.0491	55.01	0.0982	0.29
55	Sun Down School, E	8.9	0.0337	37.77	0.0674	0.20
56	Tierra Bonita Park	28.7	0.1087	121.80	0.2174	0.65
57	Tierra Bonita School	9.6	0.0365	40.93	0.0731	0.22
58	Valley View School	14.3	0.0540	60.54	0.1081	0.32
59	West Wind School, E	9.7	0.0367	41.10	0.0734	0.22
60		0.1	0.0000	0.00	0.0000	0.00
61		0.9	0.0000	0.02	0.0000	0.00
62		1.3	0.0000	0.03	0.0000	0.00
63		9.2	0.0002	0.18	0.0003	0.00
64		10.1	0.0002	0.20	0.0004	0.00
65		6.0	0.0001	0.12	0.0002	0.00
66		8.8	0.0002	0.17	0.0003	0.00
67		5.0	0.0001	0.10	0.0002	0.00
68		9.9	0.0002	0.19	0.0003	0.00
69		9.5	0.0002	0.19	0.0003	0.00
70		9.6	0.0002	0.19	0.0003	0.00
71		7.9	0.0001	0.15	0.0003	0.00
72		7.2	0.0001	0.14	0.0003	0.00
73		4.9	0.0001	0.10	0.0002	0.00

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
74		4.5	0.0001	0.09	0.0002	0.00
75		10.3	0.0002	0.20	0.0004	0.00
76		9.9	0.0002	0.19	0.0003	0.00
77		10.9	0.0002	0.21	0.0004	0.00
78		4.7	0.0001	0.09	0.0002	0.00
79		4.7	0.0001	0.09	0.0002	0.00
80		4.4	0.0001	0.09	0.0002	0.00
81		7.5	0.0001	0.15	0.0003	0.00
82		9.1	0.0002	0.18	0.0003	0.00
83		5.3	0.0001	0.10	0.0002	0.00
84		4.8	0.0001	0.09	0.0002	0.00
85		8.6	0.0001	0.17	0.0003	0.00
86		8.9	0.0002	0.17	0.0003	0.00
87		9.5	0.0002	0.19	0.0003	0.00
88		14.8	0.0003	0.29	0.0005	0.00
89		18.2	0.0003	0.36	0.0006	0.00
90		14.7	0.0003	0.29	0.0005	0.00
91		19.7	0.0003	0.39	0.0007	0.00
92		14.6	0.0003	0.29	0.0005	0.00
93		19.3	0.0003	0.38	0.0007	0.00
94		19.3	0.0003	0.38	0.0007	0.00
95		19.3	0.0003	0.38	0.0007	0.00
96		19.2	0.0003	0.38	0.0007	0.00
97		13.4	0.0002	0.26	0.0005	0.00
98		14.1	0.0002	0.28	0.0005	0.00
99		17.6	0.0003	0.34	0.0006	0.00
100		19.7	0.0003	0.39	0.0007	0.00
101		17.9	0.0003	0.35	0.0006	0.00
102		17.0	0.0003	0.32	0.0006	0.00
103		16.3	0.0003	0.39	0.0007	0.00
104		19.9	0.0002	0.26	0.0005	0.00
105		13.5	0.0004	0.40	0.0007	0.00
106		20.2	0.0004	0.45	0.0008	0.00
107		23.1	0.0004	0.43	0.0008	0.00
108		21.8	0.0004	0.40	0.0007	0.00
109		20.2	0.0004	0.50	0.0009	0.00
110		25.4	0.0004	0.48	0.0009	0.00
111		24.4	0.0004	0.49	0.0009	0.00

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
112		25.1	0.0004	0.42	0.0007	0.00
113		21.3	0.0005	0.53	0.0009	0.00
114		27.0	0.0004	0.50	0.0009	0.00
115		25.3	0.0006	0.63	0.0011	0.00
116		32.1	0.0005	0.58	0.0010	0.00
117		29.7	0.0006	0.67	0.0012	0.00
118		34.4	0.0007	0.76	0.0014	0.00
119		38.9	0.0007	0.76	0.0013	0.00
120		38.6	0.0007	0.74	0.0013	0.00
121		37.9	0.0008	0.87	0.0015	0.00
122		44.1	0.0010	1.13	0.0020	0.01
123		57.7	0.0010	1.13	0.0020	0.01
124		57.7	0.0011	1.23	0.0022	0.01
125		62.6	0.0011	1.18	0.0021	0.01
126		60.0	0.0012	1.31	0.0023	0.01
127		67.0	0.0013	1.41	0.0025	0.01
128		71.8	0.0014	1.54	0.0027	0.01
129		78.6	0.0013	1.50	0.0027	0.01
130		76.5	0.0003	0.33	0.0006	0.00
131		2.5	0.0000	0.05	0.0001	0.00
132		9.4	0.0002	0.18	0.0003	0.00
133		4.7	0.0001	0.09	0.0002	0.00
134		17.4	0.0003	0.34	0.0006	0.00
135		22.7	0.0004	0.44	0.0008	0.00
136		41.8	0.0007	0.82	0.0015	0.00
137		9.6	0.0002	0.19	0.0003	0.00
138		40.4	0.0007	0.79	0.0014	0.00
139		39.2	0.0007	0.77	0.0014	0.00
140		17.0	0.0003	0.33	0.0006	0.00
141		29.7	0.0005	0.58	0.0010	0.00
142		8.5	0.0001	0.17	0.0003	0.00
143		4.8	0.0001	0.09	0.0002	0.00
144		20.2	0.0004	0.40	0.0007	0.00
145		11.5	0.0002	0.23	0.0004	0.00
146		18.0	0.0003	0.35	0.0006	0.00
147		8.6	0.0001	0.17	0.0003	0.00
148		77.2	0.0014	1.51	0.0027	0.01
149		38.3	0.0007	0.75	0.0013	0.00

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
150		7.5	0.0001	0.15	0.0003	0.00
151		861.5	0.0151	16.89	0.0302	0.09
152		169.2	0.0030	3.32	0.0059	0.02
153		2.0	0.0000	0.04	0.0001	0.00
154		37.7	0.0007	0.74	0.0013	0.00
155		30.6	0.0005	0.60	0.0011	0.00
156		19.5	0.0003	0.38	0.0007	0.00
157		19.4	0.0003	0.38	0.0007	0.00
158		25.1	0.0004	0.49	0.0009	0.00
159		20.1	0.0004	0.39	0.0007	0.00
160		29.1	0.0005	0.57	0.0010	0.00
161		21.7	0.0004	0.43	0.0008	0.00
162		2.6	0.0000	0.05	0.0001	0.00
163		19.5	0.0003	0.38	0.0007	0.00
164		3.0	0.0001	0.06	0.0001	0.00
165		9.7	0.0002	0.19	0.0003	0.00
166		4.9	0.0001	0.10	0.0002	0.00
167		9.7	0.0002	0.19	0.0003	0.00
168		18.9	0.0003	0.37	0.0007	0.00
169		5.0	0.0001	0.10	0.0002	0.00
170		4.7	0.0001	0.09	0.0002	0.00
171		43.0	0.0008	0.84	0.0015	0.00
172		19.5	0.0003	0.38	0.0007	0.00
173		29.4	0.0005	0.58	0.0010	0.00
174		10.5	0.0002	0.21	0.0004	0.00
175		79.3	0.0014	1.56	0.0028	0.01
176		28.2	0.0005	0.55	0.0010	0.00
177		5.1	0.0001	0.10	0.0002	0.00
178		78.1	0.0014	1.53	0.0027	0.01
179		20.1	0.0004	0.39	0.0007	0.00
180		17.9	0.0003	0.35	0.0006	0.00
181		57.2	0.0010	1.12	0.0020	0.01
182		7.1	0.0001	0.14	0.0002	0.00
183		0.9	0.0000	0.02	0.0000	0.00
184		2.3	0.0000	0.05	0.0001	0.00
185		9.6	0.0002	0.19	0.0003	0.00
186		39.8	0.0007	0.78	0.0014	0.00
187		15.0	0.0003	0.29	0.0005	0.00

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
188		38.5	0.0007	0.75	0.0013	0.00
189		19.4	0.0003	0.38	0.0007	0.00
191		9.9	0.0007	0.19	0.0014	0.00
192		38.8	0.0002	0.20	0.0003	0.00
193		10.0	0.0002	0.19	0.0004	0.00
194		9.9	0.0002	0.15	0.0003	0.00
195		7.7	0.0001	0.56	0.0003	0.00
196		28.6	0.0005	0.05	0.0010	0.00
197		2.5	0.0000	9.18	0.0001	0.00
198		468.3	0.0082	0.15	0.0164	0.05
199		7.5	0.0001	0.57	0.0003	0.00
200		29.2	0.0005	0.20	0.0010	0.00
201		10.1	0.0002	0.16	0.0004	0.00
202		8.0	0.0001	1.09	0.0003	0.00
203		55.7	0.0010	0.17	0.0019	0.01
204		8.8	0.0002	0.08	0.0003	0.00
205		4.1	0.0001	0.19	0.0001	0.00
206		9.6	0.0002	0.22	0.0003	0.00
207		11.4	0.0002	16.14	0.0004	0.00
208		823.5	0.0144	0.78	0.0288	0.09
209		39.8	0.0007	0.60	0.0014	0.00
210		30.4	0.0005	0.87	0.0011	0.00
211		44.2	0.0008	0.35	0.0015	0.00
212		17.7	0.0003	0.00	0.0006	0.00
213		0.1	0.0000	0.14	0.0000	0.00
214		7.3	0.0001	0.19	0.0003	0.00
215		9.7	0.0002	0.17	0.0003	0.00
216		8.9	0.0002	0.19	0.0003	0.00
217		9.7	0.0002	0.18	0.0003	0.00
218		9.3	0.0002	0.21	0.0003	0.00
219		10.5	0.0002	0.78	0.0004	0.00
220		39.6	0.0007	1.48	0.0014	0.00
221		75.3	0.0013	0.05	0.0026	0.01
222		2.4	0.0000	0.20	0.0001	0.00
223		10.0	0.0002	0.28	0.0004	0.00
224		14.4	0.0003	0.40	0.0005	0.00
225		20.2	0.0004	0.08	0.0007	0.00
226		4.1	0.0001	0.56	0.0001	0.00

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
227		28.5	0.0005	0.20	0.0010	0.00
228		10.2	0.0002	0.38	0.0004	0.00
229		19.3	0.0003	0.30	0.0007	0.00
230		15.3	0.0003	0.02	0.0005	0.00
231		0.8	0.0000	0.33	0.0000	0.00
232		16.7	0.0003	0.76	0.0006	0.00
233		38.9	0.0007	0.05	0.0014	0.00
234		2.6	0.0000	0.01	0.0001	0.00
235		0.4	0.0000	0.39	0.0000	0.00
236		20.0	0.0003	0.06	0.0007	0.00
237		3.1	0.0001	0.09	0.0001	0.00
238		4.8	0.0001	0.23	0.0002	0.00
239		11.6	0.0002	0.58	0.0004	0.00
240		29.8	0.0005	0.44	0.0010	0.00
241		22.3	0.0004	0.22	0.0008	0.00
242		11.4	0.0002	0.08	0.0004	0.00
243		4.0	0.0001	0.28	0.0001	0.00
244		14.4	0.0003	0.03	0.0005	0.00
245		1.3	0.0000	0.30	0.0000	0.00
246		15.3	0.0003	0.58	0.0005	0.00
247		29.6	0.0005	0.35	0.0010	0.00
248		17.8	0.0003	0.19	0.0006	0.00
249		9.7	0.0002	0.01	0.0003	0.00
250		0.6	0.0000	0.09	0.0000	0.00
251		4.4	0.0001	0.19	0.0002	0.00
252		9.9	0.0002	0.29	0.0003	0.00
253		14.7	0.0003	0.05	0.0005	0.00
254		2.7	0.0000	0.10	0.0001	0.00
255		4.9	0.0001	0.19	0.0002	0.00
256		9.6	0.0002	0.07	0.0003	0.00
257		3.6	0.0001	0.76	0.0001	0.00
258		38.9	0.0007	0.15	0.0014	0.00
259		7.5	0.0001	0.39	0.0003	0.00
260		20.1	0.0004	0.41	0.0007	0.00
261		20.7	0.0004	0.06	0.0007	0.00
262		3.1	0.0001	0.10	0.0001	0.00
263		5.0	0.0001	0.22	0.0002	0.00
264		11.1	0.0002	0.39	0.0004	0.00

Site ID	Site/Project	Size	Annual Demand at Buildout		Peak Day Demand	Peak Hour
		(ac)	(MG/yr)	(AFY)	(mgd)	(mgd)
265		20.1	0.0004	0.20	0.0007	0.00
266		10.2	0.0002	0.17	0.0004	0.00
267		8.7	0.0002	0.19	0.0003	0.00
268		9.6	0.0002	0.07	0.0003	0.00
269		3.8	0.0001	0.20	0.0001	0.00
270		10.1	0.0002	1.09	0.0004	0.00
271		55.6	0.0010	0.39	0.0019	0.01
272		19.9	0.0003	0.76	0.0007	0.00
273		39.0	0.0007	0.75	0.0014	0.00
274		38.3	0.0007	0.80	0.0013	0.00
275		41.0	0.0007	0.27	0.0014	0.00
276		13.8	0.0002	0.06	0.0005	0.00
277		3.2	0.0001	0.18	0.0001	0.00
278		9.1	0.0002	0.20	0.0003	0.00
279		10.0	0.0002	0.39	0.0004	0.00
280		20.1	0.0004	0.30	0.0007	0.00
281		15.1	0.0003	0.07	0.0005	0.00
282		3.8	0.0001	0.09	0.0001	0.00
283		4.8	0.0001	0.09	0.0002	0.00
	City Maintenance	-	0.0300	35.00	0.0554	0.0554
	Street Cleaning	-	0.0033	4.00	0.0061	0.0061
	Totals:	**8887**	**5.9**	**6640**	**11.88**	**35.53**

Appendix C

Detailed Cost Estimates

Total System Estimated Cost

TOTAL Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale	15,555	gpm	$2,353,000
Lancaster	20,833	gpm	$2,804,000
Subtotals	**36,388**	**gpm**	**$5,157,000**
2. Booster Pump Stations			
No. 1	1,725	gpm	$372,000
No. 2	8,460	gpm	$1,076,000
Subtotals	**10,185**	**gpm**	**$1,448,000**
3. Reservoirs			
No. 1	3.0	MG	$1,905,000
No. 2	4.4	MG	$2,794,000
No. 3	2.1	MG	$1,334,000
Subtotals	**9.5**	**MG**	**$6,033,000**
4. Distribution Pipelines			
42-inch DI	29,200	LF	$15,943,200
36-inch DI	31,100	LF	$14,554,800
27-inch DI	28,700	LF	$10,073,700
24-inch DI	92,400	LF	$28,828,800
16-inch DI	16,400	LF	$3,411,200
14-inch DI	10,500	LF	$1,911,000
16-24 inch increase	24,200	LF	$2,516,800
Subtotals	**232,500**	**LF**	**$77,239,500**
5. System Flushing & Testing	1	LS	$295,275
6. Chlorination of Tertiary Effluent	1	LS	$641,096
SUBTOTAL			**$90,813,871**
Contractor's OH & Profit (15%)			$13,622,081
Engineering/Admin (35%)			$31,784,855
Contingency (10%)			$9,081,387
TOTAL			**$145,302,194**

Total System Estimated Cost
Facilities Included in Grant Application

TOTAL Distribution Facilities	Quantity	Unit	1995 Dollars	2005 Dollars
1. Main Pump Stations				
Palmdale	15,555	gpm	$1,853,000	$2,353,000
Lancaster	20,833	gpm	$2,208,000	$2,804,000
Subtotals	**36,388**	**gpm**	**$4,061,000**	**$5,157,000**
2. Booster Pump Stations				
No. 1	1,725	gpm	$293,000	$372,000
No. 2	8,460	gpm	$847,000	$1,076,000
Subtotals	**10,185**	**gpm**	**$1,140,000**	**$1,448,000**
3. Reservoirs				
No. 1	3.0	MG	$1,500,000	$1,905,000
No. 2	4.4	MG	$2,200,000	$2,794,000
No. 3	2.1	MG	$1,050,000	$1,334,000
Subtotals	**9.5**	**MG**	**$4,750,000**	**$6,033,000**
4. Distribution Pipelines				
42-inch	0	LF	$0	$0
36-inch	31,100	LF	$5,598,000	$14,554,800
27-inch	28,700	LF	$3,874,500	$10,073,700
24-inch	91,400	LF	$10,968,000	$28,516,800
16-inch	16,400	LF	$1,312,000	$3,411,200
14-inch	10,500	LF	$735,000	$1,911,000
16-24-inch	24,200	LF	$968,000	$2,516,800
Subtotals	**202,300**	**LF**	**$23,455,500**	**$60,984,300**
Subtotal Rounded	**202,000**			
5. System Flushing & Testing	1	LS	$178,100	$226,187
6. Chlorination of Tertiary Effluent	1	LS	$504,800	$641,096
SUBTOTAL			**$34,089,400**	**$74,489,583**
Contractor's OH & Profit (15%)			$5,113,410	$11,173,437
Engineering/Admin (35%)			$11,931,290	$26,071,354
Contingency (10%)			$3,408,940	$7,448,958
TOTAL			**$54,543,040**	**$119,183,333**

Phase 1A Estimated Cost

PHASE 1 Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale	0	gpm	$0
Lancaster	0	gpm	$0
Subtotals	**0**	**gpm**	**$0**
2. Booster Pump Stations			
No. 1	0	gpm	
No. 2	0	gpm	
Subtotals	**0**	**gpm**	**$0**
3. Reservoirs			
No. 1	0.0	MG	
No. 2	0.0	MG	
No. 3	0.0	MG	
Subtotals	**0.0**	**MG**	**$0**
4. Distribution Pipelines			
42-inch	0	LF	$0
36-inch	0	LF	$0
27-inch	0	LF	$0
24-inch	0	LF	$0
16-inch	0	LF	$0
14-inch	0	LF	$0
16-24-inch increase	24,200	LF	$2,516,800
Subtotals	**24,200**	**LF**	**$2,516,800**
Subtotal Rounded	**24,000**		**2,517,000**
5. System Flushing & Testing	1	LS	$30,734
6. Chlorination of Tertiary Effluer	0	LS	$0
SUBTOTAL			**$2,547,534**
Contractor's OH & Profit (15%)			$382,130
Engineering/Admin (35%)			$891,637
Contingency (10%)			$254,753
TOTAL			**$4,076,054**
Total (Rounded)			**$4,076,000**

Phase 1B Estimated Cost

PHASE 1 Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale	0	gpm	$0
Lancaster	20,833	gpm	$2,804,000
Subtotals	**20,833**	**gpm**	**$2,804,000**
2. Booster Pump Stations			
No. 1	0	gpm	
No. 2	0	gpm	
Subtotals	**0**	**gpm**	**$0**
3. Reservoirs			
No. 1	3.0	MG	$1,905,000
No. 2	0.0	MG	
No. 3	0.0	MG	
Subtotals	**3.0**	**MG**	**$1,905,000**
4. Distribution Pipelines			
42-inch	0	LF	$0
36-inch	0	LF	$0
27-inch	0	LF	$0
24-inch	38,700	LF	$12,074,400
16-inch	0	LF	$0
14-inch	0	LF	$0
16-24-inch increase		LF	$0
Subtotals	**38,700**	**LF**	**$12,074,400**
Subtotal Rounded	**39,000**		**12,074,000**
5. System Flushing & Testing	1	LS	$49,149
6. Chlorination of Tertiary Effluer	1	LS	$641,096
SUBTOTAL			**$17,473,645**
Contractor's OH & Profit (15%)			$2,621,047
Engineering/Admin (35%)			$6,115,776
Contingency (10%)			$1,747,365
TOTAL			**$27,957,832**
Total (Rounded)			**$27,958,000**

Phase 2 Estimated Cost

PHASE 2 Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale	15,555	gpm	$2,353,000
Lancaster			
Subtotals	**15,555**	**gpm**	**$2,353,000**
2. Booster Pump Stations			
No. 1			
No. 2			
Subtotals	**0**	**gpm**	**$0**
3. Reservoirs			
No. 1	0.0	MG	$0
No. 2	0.0	MG	$0
No. 3	0.0	MG	$0
Subtotals	**0.0**	**MG**	**$0**
4. Distribution Pipelines			
42-inch	0	LF	$0
36-inch	10,500	LF	$4,914,000
27-inch	28,700	LF	$10,073,700
24-inch	0	LF	$0
16-inch	16,400	LF	$3,411,200
14-inch	0	LF	$0
16-24 inch increase	0	LF	$0
Subtotals	**55,600**	**LF**	**$18,398,900**
Subtotal Rounded	**56,000**		**$ 18,399,000**
5. System Flushing & Testing	1	LS	$70,612
SUBTOTAL			**$20,822,512**
Contractor's OH & Profit (15%)			$3,123,377
Engineering/Admin (35%)			$7,287,879
Contingency (10%)			$2,082,251
TOTAL			**$33,316,019**
TOTAL Rounded			$33,316,000

Phase 3 Estimated Cost

PHASE 3 Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale			
Lancaster			
Subtotals	**0**	**gpm**	**$0**
2. Booster Pump Stations			
No. 1			
No. 2			
Subtotals	**0**	**gpm**	**$0**
3. Reservoirs			
No. 1	0.0	MG	$0
No. 2	0.0	MG	$0
No. 3	0.0	MG	$0
Subtotals	**0.0**	**MG**	**$0**
4. Distribution Pipelines			
42-inch	0	LF	$0
36-inch	20,600	LF	$9,640,800
27-inch	0	LF	$0
24-inch	0	LF	$0
16-inch	0	LF	$0
14-inch	5,800	LF	$1,055,600
16-24 inch increase	0	LF	$0
Subtotals	**26,400**	**LF**	**$ 10,696,400**
Subtotal Rounded	**26,000**		**$ 10,696,000**
5. System Flushing & Testing	1	LS	$33,528
SUBTOTAL			**$10,729,928**
Contractor's OH & Profit (15%)			$1,609,489
Engineering/Admin (35%)			$3,755,475
Contingency (10%)			$1,072,993
TOTAL			**$17,167,885**
TOTAL Rounded			**$17,168,000**

Phase 4 Estimated Cost

PHASE 4 Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale			
Lancaster			
Subtotals	**0**	**gpm**	**$0**
2. Booster Pump Stations			
No. 1	1,725	gpm	$372,000
No. 2	8,460	gpm	$1,076,000
Subtotals	**10,185**	**gpm**	**$1,448,000**
3. Reservoirs			
No. 1	0.0	MG	$0
No. 2	4.4	MG	$2,794,000
No. 3	2.1	MG	$1,334,000
Subtotals	**6.5**	**MG**	**$4,128,000**
4. Distribution Pipelines			
42-inch	0	LF	$0
36-inch	0	LF	$0
27-inch	0	LF	$0
24-inch	52,700	LF	$16,442,400
16-inch	0	LF	$0
14-inch	4,700	LF	$855,400
16-24 inch increase	0	LF	$0
Subtotals	**57,400**	**LF**	**$17,297,800**
Subtotal Rounded	**57,000**		**$ 17,298,000**
5. System Flushing & Testing	1	LS	$72,898
SUBTOTAL			**$22,946,698**
Contractor's OH & Profit (15%)			$3,442,005
Engineering/Admin (35%)			$8,031,344
Contingency (10%)			$2,294,670
TOTAL			**$36,714,717**
Total Rounded			$ 36,715,000

Non-Grant Final Phase Estimated Cost

PHASE 5 - RECHARGE - Not in GRANT

Distribution Facilities	Quantity	Unit	2005 Dollars
1. Main Pump Stations			
Palmdale			
Lancaster			
Subtotals	**0**	**gpm**	**$0**
2. Booster Pump Stations			
No. 1		gpm	
No. 2		gpm	
Subtotals	**0**	**gpm**	**$0**
3. Reservoirs			
No. 1	0.0	MG	$0
No. 2	0.0	MG	$0
No. 3	0.0	MG	$0
Subtotals	**0.0**	**MG**	**$0**
4. Distribution Pipelines			
42-inch	29,200	LF	$15,943,200
36-inch	0	LF	$0
27-inch	0	LF	$0
24-inch	0	LF	$0
16-inch	0	LF	$0
14-inch	0	LF	$0
16-24 inch increase	0	LF	$0
Subtotals	**29,200**	**LF**	**$15,943,200**
5. System Flushing & Testing	1	LS	$37,084
SUBTOTAL			**$15,980,284**
Contractor's OH & Profit (15%)			$2,397,043
Engineering/Admin (35%)			$5,593,099
Contingency (10%)			$1,598,028
TOTAL			**$25,568,454**

Appendix D

Detailed Potential Users for Phases 1-4

Table D-1: Summary of Phased Users for Antelope Valley Recycled Water System

Phase	Number of Users Served	Cumulative Number of Users Served	Total Annual Demand AFY	Cumulative Annual Demand AFY	Peak Day Demand AF/D	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
1A	18	18	786	786	4.3	1.4	4.1
1	103	121	2,161	2,947	11.9	3.9	11.6
2	54	175	2,076	5,023	12.0	3.9	9.8
3	18	193	1,295	6,318	7.9	2.6	5.2
4	9	202	7,013	13,331	42.8	14.0	27.9
Total Demand Phases 1-4	**202**		**13,331**		**79.0**	**25.7**	**58.6**
All Remaining Phases	142	344	4,160	17,491	23.8	7.7	19.9
Total Demand	**344**		**17,491**		**102.7**	**33.5**	**78.6**

Table D-2: Phase 1A Users for Antelope Valley Recycled Water System

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
LANCASTER – EXISTING					
1	Antelope Valley High School	67.21	0.37	0.12	0.360
3	Eastside Park	78.41	0.43	0.14	0.420
6	Fairgrounds Development	145.62	0.80	0.26	0.780
9	Lancaster Cemetery	56.01	0.31	0.10	0.300
10	Landfill	33.60	0.18	0.09	0.090
11	Linda Verde School, E	22.40	0.12	0.04	0.120
12	Mariposa Park	56.01	0.31	0.10	0.300
15	Phoenix High School	11.20	0.07	0.02	0.060
18	Carter Park	268.80	1.48	0.48	1.440
LANCASTER – FUTURE					
28	Proposed School 5	44.81	0.25	0.08	0.240
100	-	0.39	0.002	0.001	0.002
136	-	0.82	0.005	0.001	0.004
182	-	0.14	0.001	0.000	0.001
207	-	0.22	0.001	0.000	0.001
246	-	0.30	0.002	0.001	0.002
254	-	0.05	0.000	0.000	0.000
264	-	0.22	0.001	0.000	0.001
267	-	0.17	0.001	0.000	0.001
	Subtotal Existing Demand	739	4.07	1.35	3.87
	Subtotal Future Demand	47	0	0	0
	Phase 1A Total Demand	**786**	**4.32**	**1.43**	**4.12**
	Subtotal Palmdale	0	0.00	0.00	0.00
	Subtotal Lancaster	786	4.32	1.43	4.12

Table D-3: Phase 1 Users for Antelope Valley Recycled Water System

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
LANCASTER – EXISTING					
4	El Dorado Park	67.21	0.37	0.12	0.360
5	El Dorado School	11.20	0.06	0.02	0.060
7	Jane Reynolds Park	33.60	0.19	0.06	0.180
8	Joshua Memorial Park	156.82	0.86	0.28	0.840
13	Park View, E, M	56.01	0.31	0.10	0.300
14	HWY 14	77.97	0.43	0.14	0.418
16	Antelope Valley College	483.44	2.65	0.86	2.590
17	Armagosa School, M	60.74	0.33	0.11	0.325
19	City Park	163.00	0.92	0.30	0.900
27	Hull Park	41.09	0.23	0.07	0.220
29	Jack Northrop E, M	131.80	0.73	0.24	0.706
30	Joshua School	73.46	0.40	0.13	0.393
32	Lancaster Golf Center	83.21	0.46	0.15	0.446
37	Nancy Cory School, E	31.05	0.17	0.06	0.166
40	Prime Desert Woodlands	272.90	1.50	0.49	1.462
LANCASTER – FUTURE					
45	Proposed School 3	76.46	0.419	0.137	0.410
46	Proposed School 4	60.39	0.331	0.108	0.323
52	Rawely Duntely Park	77.29	0.423	0.138	0.414
53	Sierra School, E	38.33	0.210	0.068	0.205
55	Sun Down School, E	37.77	0.207	0.067	0.202
58	Valley View School	60.54	0.335	0.108	0.324
59	West Wind School, E	41.10	0.225	0.073	0.220
60	-	0.00	0.000	0.000	0.000
61	-	0.02	0.000	0.000	0.000
62	-	0.03	0.000	0.000	0.000
66	-	0.17	0.001	0.000	0.001
67	-	0.10	0.001	0.000	0.001
68	-	0.19	0.001	0.000	0.001
69	-	0.19	0.001	0.000	0.001
70	-	0.19	0.001	0.000	0.001
71	-	0.15	0.001	0.000	0.001
72	-	0.14	0.001	0.000	0.001
73	-	0.10	0.001	0.000	0.001
74	-	0.09	0.000	0.000	0.000
75	-	0.20	0.001	0.000	0.001
76	-	0.19	0.001	0.000	0.001
77	-	0.21	0.001	0.000	0.001
90	-	0.29	0.002	0.001	0.002
91	-	0.39	0.002	0.001	0.002
92	-	0.29	0.002	0.001	0.002
93	-	0.38	0.002	0.001	0.002

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
94	-	0.38	0.002	0.001	0.002
95	-	0.38	0.002	0.001	0.002
99	-	0.34	0.002	0.001	0.002
108	-	0.40	0.002	0.001	0.002
109	-	0.50	0.003	0.001	0.003
110	-	0.48	0.003	0.001	0.003
111	-	0.49	0.003	0.001	0.003
112	-	0.42	0.002	0.001	0.002
116	-	0.58	0.003	0.001	0.003
117	-	0.67	0.004	0.001	0.004
120	-	0.74	0.005	0.001	0.004
122	-	1.13	0.006	0.002	0.006
126	-	1.31	0.007	0.002	0.007
128	-	1.54	0.008	0.003	0.008
130	-	0.33	0.002	0.001	0.002
131	-	0.05	0.000	0.000	0.000
133	-	0.09	0.001	0.000	0.000
137	-	0.19	0.001	0.000	0.001
147	-	0.17	0.001	0.000	0.001
153	-	0.04	0.000	0.000	0.000
154	-	0.74	0.004	0.001	0.004
155	-	0.60	0.003	0.001	0.003
157	-	0.38	0.002	0.001	0.002
160	-	0.57	0.003	0.001	0.003
161	-	0.43	0.002	0.001	0.002
162	-	0.05	0.000	0.000	0.000
163	-	0.38	0.002	0.001	0.002
166	-	0.10	0.001	0.000	0.001
169	-	0.10	0.001	0.000	0.001
170	-	0.09	0.001	0.000	0.000
171	-	0.84	0.005	0.002	0.005
174	-	0.21	0.001	0.000	0.001
175	-	1.56	0.009	0.003	0.008
177	-	0.10	0.001	0.000	0.001
184	-	0.05	0.000	0.000	0.000
191	-	0.76	0.005	0.001	0.004
195	-	0.15	0.001	0.000	0.001
205	-	0.08	0.000	0.000	0.000
209	-	0.78	0.005	0.001	0.004
213	-	0.00	0.000	0.000	0.000
214	-	0.14	0.001	0.000	0.001
215	-	0.19	0.001	0.000	0.001
222	-	0.05	0.000	0.000	0.000
223	-	0.20	0.001	0.000	0.001
228	-	0.20	0.001	0.000	0.001

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
231	-	0.02	0.000	0.000	0.000
235	-	0.01	0.000	0.000	0.000
236	-	0.39	0.002	0.001	0.002
245	-	0.03	0.000	0.000	0.000
249	-	0.19	0.001	0.000	0.001
250	-	0.01	0.000	0.000	0.000
253	-	0.29	0.002	0.001	0.002
257	-	0.07	0.000	0.000	0.000
260	-	0.39	0.002	0.001	0.002
261	-	0.41	0.002	0.001	0.002
262	-	0.06	0.000	0.000	0.000
268	-	0.19	0.001	0.000	0.001
269	-	0.07	0.000	0.000	0.000
271	-	1.09	0.006	0.002	0.006
277	-	0.06	0.000	0.000	0.000
282	-	0.07	0.000	0.000	0.000
283	-	0.09	0.001	0.000	0.001
	Subtotal Existing Demand	1,744	9.60	3.12	9.37
	Subtotal Future Demand	417	2.29	0.75	2.24
	Phase 1 Total Demand	**2,161**	**11.90**	**3.87**	**11.60**
	Subtotal Palmdale	0	0.00	0.00	0.00
	Subtotal Lancaster	2,161	11.90	3.87	11.60

Table D-4: Phase 2 Users for Antelope Valley Recycled Water System

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
PALMDALE - EXISTING					
5020	Manzanita Elementary	23.85	0.15	0.05	0.095
5021	Mesquite Elementary	28.48	0.17	0.06	0.113
5022	Palmtree	41.77	0.26	0.08	0.166
5024	Phoenix High School	5.52	0.03	0.01	0.022
5026	Tamarisk	21.57	0.13	0.04	0.090
5027	Wildflower	30.44	0.19	0.06	0.121
5036	Dr. Robert C. St. Clair Parkway	20.50	0.13	0.04	0.082
5049	American Indian Little League	21.00	0.13	0.04	0.084
5051	Ponciltan Square	8.40	0.05	0.02	0.033
5101	Palmdale High School	138.01	0.84	0.27	0.550
5102	Desert Aire Golf Course	168.00	1.03	0.33	0.669
5104	McAdam	88.51	0.54	0.18	0.353
5105	Courson	28.02	0.17	0.06	0.110
5107	Desert Sands	84.88	0.52	0.17	0.340
5118	Desert Rose Elementary	29.68	0.18	0.06	0.118
5120	Tumbleweed Elementary	36.83	0.23	0.07	0.147
5121	Yucca Elementary	24.98	0.15	0.05	0.100
5122	Cactus K-8	31.49	0.19	0.06	0.130
5124	Mesa Intermediate	54.75	0.33	0.11	0.218
PALMDALE - FUTURE					
5030	Ana Verde	36.83	0.23	0.07	0.147
5043	Desert Sands Expansion	29.40	0.18	0.06	0.117
5047	Sierra Hwy Green Belt	15.54	0.09	0.03	0.062
LANCASTER – EXISTING					
23	Eastside HS (proposed)	291.20	1.60	0.52	1.560
35	Lincoln School, E	45.54	0.25	0.08	0.244
38	National Soccer Center	661.11	3.63	1.18	3.541
LANCASTER – FUTURE					
48	Proposed School 7	42.67	0.235	0.076	0.229
54	Skytower Park	55.01	0.301	0.098	0.295
80	-	0.09	0.000	0.000	0.000
81	-	0.15	0.001	0.000	0.001
82	-	0.18	0.001	0.000	0.001
83	-	0.10	0.001	0.000	0.001
101	-	0.35	0.002	0.001	0.002
102	-	0.32	0.002	0.001	0.002
103	-	0.39	0.002	0.001	0.002
113	-	0.53	0.003	0.001	0.003
114	-	0.50	0.003	0.001	0.003
127	-	1.41	0.008	0.003	0.008

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
132	-	0.18	0.001	0.000	0.001
138	-	0.79	0.005	0.001	0.004
143	-	0.09	0.001	0.000	0.001
159	-	0.39	0.002	0.001	0.002
178	-	1.53	0.008	0.003	0.008
183	-	0.02	0.000	0.000	0.000
187	-	0.29	0.002	0.001	0.002
197	-	0.05	0.000	0.000	0.000
201	-	0.20	0.001	0.000	0.001
211	-	0.87	0.005	0.002	0.005
212	-	0.35	0.002	0.001	0.002
217	-	0.19	0.001	0.000	0.001
221	-	1.48	0.008	0.003	0.008
226	-	0.08	0.000	0.000	0.000
240	-	0.58	0.003	0.001	0.003
241	-	0.44	0.002	0.001	0.002
281	-	0.30	0.002	0.001	0.002
	Subtotal Existing Demand	1,885	10.90	3.53	8.89
	Subtotal Future Demand	191	1.10	0.36	0.91
	Phase 2 Total Demand	**2,076**	**12.00**	**3.89**	**9.80**
	Subtotal Palmdale	968	5.92	1.91	3.87
	Subtotal Lancaster	1,107	6.08	1.98	5.93

Table D-5: Phase 3 Users for Antelope Valley Recycled Water System

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
PALMDALE - EXISTING					
5015	Buena Vista	64.60	0.39	0.13	0.257
5016	Cimmaron	29.80	0.18	0.06	0.119
5017	Golden Poppy	43.46	0.27	0.09	0.173
5018	Joshua Hills	28.14	0.17	0.06	0.112
5019	Los Amigos	43.21	0.26	0.09	0.172
5023	Pete Knight High School	221.97	1.36	0.44	0.884
5025	Shadow Hills	164.31	1.00	0.33	0.654
5028	Yellen/Silpa	26.18	0.16	0.05	0.104
5035	Domenic Massari	178.79	1.09	0.36	0.712
5037	Joshua Hills	25.20	0.15	0.05	0.100
5052	Chaparral Elementary	17.86	0.11	0.04	0.071
PALMDALE - FUTURE					
5031	Granite Hills	43.46	0.27	0.09	0.173
5032	Poderosa	31.21	0.19	0.06	0.124
5040	60th Street East/Avenue S-8	84.00	0.51	0.17	0.335
5041	72nd Street East/Avenue R-8	42.00	0.26	0.08	0.167
5042	70th Street East/Avenue R	42.00	0.26	0.08	0.167
5045	Palmdale Oasis	103.51	0.63	0.21	0.412
5046	Sam Yellen	105.00	0.64	0.21	0.418
	Subtotal Existing Demand	844	5.14	1.68	3.36
	Subtotal Future Demand	451	2.75	0.90	1.80
	Phase 3 Total Demand	**1,295**	**7.89**	**2.57**	**5.15**
	Subtotal Palmdale	1,295	7.89	2.57	5.15
	Subtotal Lancaster	0	0.00	0.00	0.00

Table D-6: Phase 4 Users for Antelope Valley Recycled Water System

Site ID	Site/Project	Annual Average Demand (AFY)	Peak Day Demand (AF/day)	Peak Day Demand (mgd)	Peak Hour Demand (mgd)
PALMDALE – EXISTING					
5009	Marie Kerr	252.00	1.54	0.50	1.004
5065	Palmdale Business Park	991.20	6.06	1.97	3.948
5100	Antelope Valley Country Club	525.00	3.21	1.05	2.091
5128	Highlands High School	113.40	0.69	0.23	0.452
5134	Summerwind Elementary	29.40	0.18	0.06	0.117
PALMDALE – FUTURE					
5002	Ritter Ranch	2108.40	12.89	4.20	8.390
5003	Anaverde	1730.40	10.57	3.45	6.890
5013	College Park	1247.40	7.62	2.49	4.970
LANCASTER – FUTURE					
208	-	16.14	0.088	0.029	0.086
	Subtotal Existing Demand	1,911	11.68	3.80	7.61
	Subtotal Future Demand	5,102	31.17	10.17	20.34
	Phase 4 Total Demand	**7,013**	**42.85**	**13.97**	**27.95**
	Subtotal Palmdale	6,997	42.76	13.94	27.86
	Subtotal Lancaster	16	0.09	0.03	0.09

Appendix E

Detailed Financial Cost Estimates

Estimated Unit Cost by Phase

	Phase 1A & 1B	Phase 2	Phase 3	Phase 4	Subtotal
Capital recovery factor 20 years @ 2.7%	0.06722	0.06722	0.06722	0.06722	
Capital Cost	$ 32,034,000	$ 33,316,000	$ 17,168,000	$ 36,715,000	$ 119,233,000
Annual Capital Cost	$ 2,153,325	$ 2,239,502	$ 1,154,033	$ 2,467,982	$ 8,014,842
O&M	$ 485,641	$ 853,531	$ 294,399	$ 1,819,600	$ 3,453,171
total annual cost	$ 2,638,966	$ 3,093,033	$ 1,448,432	$ 4,287,582	$ 11,468,013
AF/year	2,947.5	2,075.8	1,294.7	7,013.3	13,331.3
$/AF	$ 895	$ 1,490	$ 1,119	$ 611	$ 860
mg/year	960.4	676.4	421.9	2285.3	4344.0

Unit costs per Cumulative Phase

	Phase 1A & 1B	Phases 1&2	Phases 1-3	Phases 1-4
Capital recovery factor 20 years @ 2.7%	0.06722	0.06722	0.06722	0.06722
Capital Cost	$ 32,034,000	$ 65,350,000	$ 82,518,000	$ 119,233,000
Annual Capital Cost	$ 2,153,325	$ 4,392,827	$ 5,546,860	$ 8,014,842
O&M	$ 485,641	$ 1,339,172	$ 1,633,571	$ 3,453,171
total annual cost	$ 2,638,966	$ 5,731,999	$ 7,180,431	$ 11,468,013
AF/year	2,947.5	5,023.3	6,318.0	13,331.3
$/AF	$ 895	$ 1,141	$ 1,137	$ 860
mg/year	960.4	1636.8	2058.7	4344.0

Note: Costs for a given phase are the sum of the given phase and all prior phases.

O&M Calculations

Assumptions:
1. Flow (AFY) = Annual Average Demand from P:\LA_County WW_40\recycled water\Phased User Table
2. TDH = (Maximum Static for given cumulative phase + 10%), then rounded up to nearest 0 or 5
3. Pumps will run 6 hours/day, which is 25% of the time.
4. Chlorination is chlorine gas dosed at 25mg/L and a cost of $450/ton.
5. Phase 4's PS 2 - 8460 gpm is not operational, as it will only be used when need to pump from Lancaster to Palmdale.

Phase 1A & 1B

NOTE: Flow = Annual Avg Demand

Pump station	Phase 1A & 1B TDH (ft)	Phase 1A & 1B Flow (gpm)	Flow (cfs)	Flow (AFY)	Hp	Power cost (per kw-hr)	Annual Cost w/ Pumps On 100% of Time	% Time Pumps On	Annual Cost w/ Pumps On __% of Time	Labor (50% power)	Equipment/materials (25% power)	Annual Water Cost @ ($100/AF)	Total Annual Chlorination Cost	Cumulative Total Annual O&M	Individual Total Annual O&M
Palmdale	125	0	0.0	0	0	$0.14	$0	25%	$0			$0	$33,020		
Lancaster	125	1826	6.6	2947	124	$0.14	$113,648	25%	$28,412			$294,700	$44,273		
PS 1 - 1725 gpm		NA because installed in Phase 4													
PS 2 - 8460 gpm		NA because install only if interconnect Palmdale and Lancaster's RW systems													
Annual Power cost				2947			$113,648		$28,412	$56,824	$28,412	$294,700	$77,293	$485,641	$485,641

Phase 2

Pump station	Phase 1&2 TDH (ft)	Phase 1&2 Flow (gpm)	Flow (cfs)	Flow (AF)	Hp	Power cost (per kw-hr)	Annual cost	% Time Pumps On	Annual Cost w/ Pumps On __% of Time	Labor (50% power)	Equipment/materials (25% power)	Annual Water Cost @ ($100/AF)	Total Annual Chlorination Cost	Cumulative Total Annual O&M	Individual Total Annual O&M
Palmdale	255	600	2.2	968	83	$0.14	$76,153	25%	$19,038			$96,800	$36,716		
Lancaster	440	2511	9.0	4054	602	$0.14	$550,310	25%	$137,578			$405,400	$48,500		
PS 1 - 1725 gpm		NA because installed in Phase 4													
PS 2 - 8460 gpm		NA because install only if interconnect Palmdale and Lancaster's RW systems													
Annual Power cost				5022			$626,463		$156,616	$438,524	$156,616	$502,200	$85,216	$1,339,172	$853,531

Phase 3

Pump station	Phase 1-3 TDH (ft)	Phases 1-3 Flow (gpm)	Flow (cfs)	Flow (AF)	Hp	Power cost (per kw-hr)	Annual cost	% Time Pumps On	Annual Cost w/ Pumps On __% of Time	Labor (50% power)	Equipment/materials (25% power)	Annual Water Cost @ ($100/AF)	Total Annual Chlorination Cost	Cumulative Total Annual O&M	Individual Total Annual O&M
Palmdale	300	1402	5.1	2263	229	$0.14	$209,448	25%	$52,362			$226,300	$41,661		
Lancaster	440	2511	9.0	4054	602	$0.14	$550,310	25%	$137,578			$405,400	$48,500		
PS 1 - 1725 gpm		NA because installed in Phase 4													
PS 2 - 8460 gpm		NA because install only if interconnect Palmdale and Lancaster's RW systems													
Annual Power cost				6317			$759,758		$189,940	$531,831	$189,940	$631,700	$90,161	$1,633,571	$294,399

Phase 4

Pump station	Phase 1-4 TDH (ft)	Phases 1-4 Flow (gpm)	Flow (cfs)	Flow (AF)	Hp	Power cost (per kw-hr)	Annual cost	% Time Pumps On	Annual Cost w/ Pumps On __% of Time	Labor (50% power)	Equipment/materials (25% power)	Annual Water Cost @ ($100/AF)	Total Annual Chlorination Cost	Cumulative Total Annual O&M	Individual Total Annual O&M
Palmdale	300	5736	20.7	9260	938	$0.14	$857,044	25%	$214,261			$926,000	$68,379		
Lancaster	440	2522	9.1	4071	605	$0.14	$552,618	25%	$138,154			$407,100	$48,565		
PS 1 - 1725 gpm	275	1069	3.9	1725	160	$0.14	$146,350	25%	$36,588			$172,500			
PS 2 - 8460 gpm		NA because install only if interconnect Palmdale and Lancaster's RW systems													
Annual Power cost				13331			$1,556,012		$352,416	$1,089,208	$389,003	$1,505,600	$116,944	$3,453,171	$1,819,600

Appendix F

Letters of Interest/Support from the Antelope Valley Water Agencies

ANTELOPE VALLEY-EAST KERN WATER AGENCY
AVEK
ESTABLISHED 1959

A PUBLIC AGENCY

August 1, 2005

The Honorable Michael D. Antonovich
Supervisor, Fifth District
County of Los Angeles
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Re: **LETTER OF SUPPORT FOR LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 40, ANTELOPE VALLEY, WATER RECYCLING FACILITIES PLANNING AND CONSTRUCTION PROGRAM GRANT APPLICATIONS**

Dear Supervisor Antonovich:

On behalf of the Antelope Valley-East Kern Water Agency, I am pleased to support the Los Angeles County Waterworks District No. 40, grant applications to the State Water Resources Control Board for the design and construction of a regional backbone recycled water system in the Antelope Valley.

The award of these grant funds would facilitate the construction of a recycled water system that would allow the use of tertiary treated waste water from the County Sanitation Districts of Los Angeles County. Because of the limited groundwater supply in the Antelope Valley and the unreliability of the imported water supply of the State Water Project water, recycled water is a valuable resource that must be developed to meet the Valley's projected increases in water demands.

The Antelope Valley-East Kern Water Agency will be partnering with the District and other stakeholders, to ensure that the proposed recycled water system meets the needs of the Antelope Valley.

Respectfully submitted,

Andy D. Rutledge
Board President

cc: State Water Resources Control Board,
Division of Financial Assistance
Los Angeles County Waterworks District No. 40,
Antelope Valley

6500 WEST AVENUE N • PALMDALE, CALIFORNIA 93551
(661) 943-3201 • FAX (661) 943-3204

WATER RECLAMATION
SOLID WASTE MANAGEMENT

COUNTY SANITATION DISTRICTS
OF LOS ANGELES COUNTY

1955 Workman Mill Road, Whittier, CA 90601-1400
Mailing Address: P.O. Box 4998, Whittier, CA 90607-4998
Telephone: (562) 699-7411, FAX: (562) 699-5422
www.lacsd.org

JAMES F. STAHL
Chief Engineer and General Manager

August 22, 2005

The Honorable Michael D. Antonovich
Supervisor, Fifth District
County of Los Angeles
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Dear Supervisor Antonovich:

Letter of Support for Los Angeles County Waterworks District No. 40, Antelope Valley, <u>Water Recycling Facilities Planning and Construction Program Grant Applications</u>

County Sanitation District Nos. 14 and 20 are pleased to support the grant applications of the Los Angeles County Waterworks District No. 40, Antelope Valley (District), to the State Water Resources Control Board for the design and construction of a regional backbone recycled water system in the Antelope Valley.

The award of these grant funds would facilitate the construction of a recycled water system that would allow the use of tertiary treated wastewater from the County Sanitation Districts' Lancaster and Palmdale Water Reclamation Plants. Because of the limited groundwater supply in the Antelope Valley and the unreliability of the imported water supply of the State Water Project water, recycled water is a valuable resource that should be developed to meet the Valley's projected increases in water demands.

County Sanitation District Nos. 14 and 20 will be partnering with the District, the Cities of Lancaster and Palmdale, and other stakeholders to provide recycled water that meets all regulatory requirements and to ensure that the proposed recycled water system meets the needs of the residents and businesses of the Antelope Valley.

Very truly yours,

James F. Stahl

JFS:ee

cc: Los Angeles County Waterworks
District No. 40, Antelope Valley

528 934

DOC#528934

City of Lancaster

44933 Fern Avenue
Lancaster, California 93534-2461
661-723-6000

August 10, 2005

The Honorable Michael D. Antonovich
Supervisor, Fifth District
County of Los Angeles
869 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, California 90012

Dear Supervisor Antonovich:

LETTER OF SUPPORT FOR LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 40, ANTELOPE VALLEY, WATER RECYCLING FACILITIES PLANNING AND CONSTRUCTION PROGRAM GRANT APPLICATIONS

On behalf of the City of Lancaster, I am pleased to support the Los Angeles County Waterworks District No. 40 grant applications to the State Water Resources Control Board for the design and construction of a regional backbone recycled water system in the Antelope Valley.

The award of these grant funds would facilitate the construction of a recycled water system that would allow the use of tertiary treated waste water from the County Sanitation Districts of Los Angeles County. Because of the limited groundwater supply in the Antelope Valley and the unreliability of the imported water supply of the State Water Project water, recycled water is a valuable resource that must be developed to meet the Valley's projected increases in water demands.

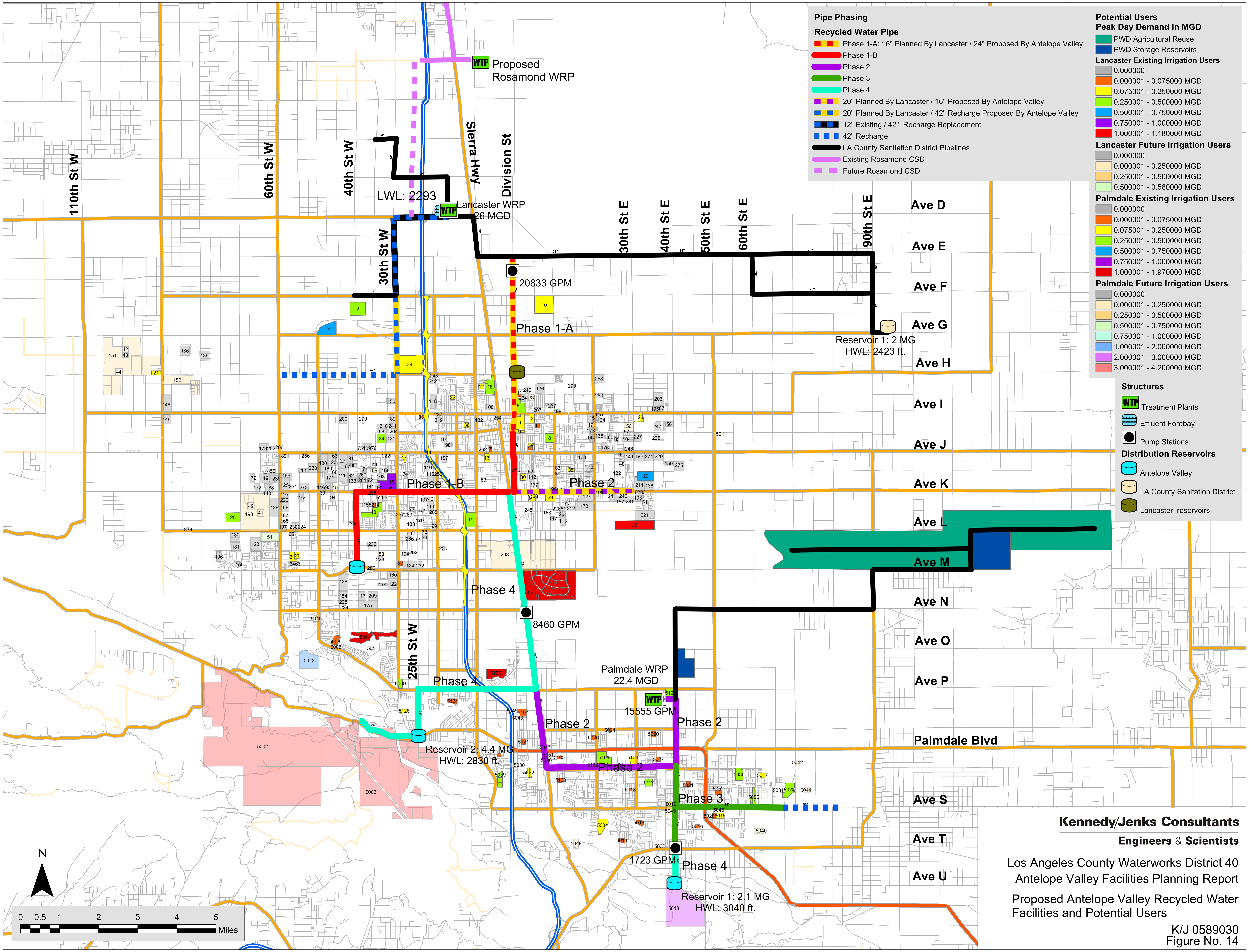
The City of Lancaster will be partnering with the District and other stakeholders, including the City of Palmdale, Antelope Valley East Kern Water Agency (AVEK), and Antelope Valley Water Purveyors Association to ensure that the proposed recycled water system meets the needs of the residents of the Antelope Valley.

Respectfully submitted,

James R. Williams, PE
Public Works Director

JRW/vp

Cc: State Water Resources Control Board, Division of Financial Assistance
✓ Los Angeles County Waterworks District No 40, Antelope Valley



Kennedy/Jenks Consultants
Engineers & Scientists

Los Angeles County Waterworks District 40
Antelope Valley Facilities Planning Report

Proposed Antelope Valley Recycled Water Facilities and Potential Users

K/J 0589030
Figure No. 14