WATER | ENERGY | LIFE

CITY OF RIVERSIDE

PUBLIC UTILITIES

Final 2010 Urban Water Management Plan

JULY 2011

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List of Acronyms and Abbreviations

Abbreviation	Definition
acre-ft	acre-foot or acre-feet
acre-ft/yr	acre-feet per year
ACS	American Community Survey
ATSDR	Agency for Toxic Substances and Disease Registry
Basin Plan	Water Quality Control Plan for the Santa Ana River Watershed
bgs	Below ground surface
BMP	Best Management Practice
Board	Riverside Board of Public Utilities
BTAC	Basin Technical Advisory Committee
ccf	One hundred cubic feet (100 ft^3)
CCR	California Code of Regulations
CDM	CDM Consultants
CDPH	State of California's Department of Public Health
cfs	cubic feet per second
CII	Commercial, Industrial and Institutional
CIP	Capital Improvement Program
City	City of Riverside
CUWCC	California Urban Water Conservation Council
DBCP	Dibromochloropropane
DBP	Disinfection byproduct
DMM	Demand Management Measure
DOF	State of California's Department of Finance
DSM	Demand Side Management
DU	Dwelling Unit
DWR	State of California's Department of Water Resources
EMWD	Eastern Municipal Water District
EIR	Environmental Impact Report
EOC	Emergency Operations Center
ERP	Emergency Response Plan
ET	Evapotranspiration

List of Acronyms and Abbreviations (Continued)

Abbreviation	Definition
FEMA	Federal Emergency Management Agency
ft-msl	feet above mean sea level
GAC	Granular activated carbon
GCC	Gage Canal Company
GIS	Geographic Information System
GWMP	Groundwater Management Plan
GWR	Groundwater Rule
gpcd	Gallons per capita per day
gpm	Gallons per minute
HAA5	Five haloacetic acids
HDR	Henningson, Durham, & Richardson, Inc.
HECW	High Efficiency Clothes Washer
HET	High Efficiency Toilet
HGCWD	Home Gardens County Water District
IDSE	Initial distribution system evaluation
IRWMP	Integrated Regional Water Management Plan
IX	Ion exchange
LAFCO	Riverside County Local Agency Formation Commission
LGF	Local Generating Facilities
LOC	Letter of Commitment
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
Meeks & Daley	Meeks and Daley Mutual Water Company
MFR	Multi-family Residential
MG	Million gallons
MGD	Million gallons per day
MOU	Memorandum of Understanding
MTBE	Methyl tertiary Butyl Ether
MWD	Metropolitan Water District of Southern California
MWH	Montgomery-Watson-Harza Engineering Consultants
NPDES	National Pollution Discharge Elimination System

List of Acronyms and Abbreviations (Continued)

Abbreviation	Definition
OCWD	Orange County Water District
OWOW	One Water One Watershed
PCE	Tetrachloroethylene
pCi/L	pico Curies per Liter
PHA	Public Health Assessments
PHG	Public Health Goal
PRP	Potentially Responsible Party
ppb	Parts per billion (micrograms per liter - µg/L)
PWS	Public Water System
RERC	Riverside Energy Resource Center
RHWC	Riverside Highland Water Company
RIX	City of San Bernardino and City of Colton's Rapid Infiltration and Extraction Treatment Plant
RO	Reverse Osmosis
ROR	Retrofit on resale
RWQCP	Riverside Regional Water Quality Control Plant
RPU	City of Riverside Public Utilities Department
SAR	Santa Ana River
SARWQCB	Santa Ana Regional Water Quality Control Board
SAWPA	Santa Ana Watershed Project Authority
SBVWCD	San Bernardino Valley Water Conservation District
SBX7-7	Senate Bill No. X7-7
SCAG	Southern California Association of Governments
SCADA	Supervisory Control and Data Acquisition System
SDWA	Safe Drinking Water Act
SFR	Single Family Residential
SMCL	Secondary Maximum Contaminant Level
SOI	Sphere of Influence

List of Acronyms and Abbreviations (Continued)

Abbreviation	Definition
SWA	Source Water Assessment
SWP	State of California's State Water Project
SWPP	Source Water Protection Plan
SWRCB	State of California's Water Resources Control Board
TCE	Trichloroethylene
TDS	Total Dissolved Solids
TOU	Time of Use
TTHM	Trihalomethanes
UCR	University of California, Riverside
UF	Ultrafiltration
ULFT	Ultra-low Flush Toilet
Urban MOU	MOU Regarding Urban Water Conservation in California
USAWRA	Upper Santa Ana Water Resources Association
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
UWMP	Urban Water Management Plan
VA	Vulnerability Assessment
Valley District	San Bernardino Valley Municipal Water District
WARN	Water Agency Response Network
WMWD	Western Municipal Water District
WSCP	Water Supply Contingency Plan
WTP	Water Treatment Plant

EXECUTIVE SUMMARY

ES.1 Plan Preparation

The City of Riverside Public Utilities Department (RPU) prepared its 2010 Urban Water Management Plan (UWMP) in accordance with the *Urban Water Management Planning Act*, sections 10610 through 10656 of the California Water Code.

This UWMP summarizes RPU's projected retail and wholesale water demands and characterizes the source waters available to meet those demands for the years 2015 to 2035. The plan also describes the reliability of RPU's water supplies and discusses RPU's water shortage contingency plan during a catastrophic event or drought conditions.

RPU encouraged participation in this plan by surrounding water management agencies, water retailers, public agencies, and members of its community. The draft plan was available at the RPU office located at 3901 Orange Street, Riverside CA 92501 or as a PDF on the RPU website (www.riversidepublicutilities.gov) prior to the public hearing. The final 2010 UWMP will also be available at the RPU office located at 3901 Orange Street, Riverside CA 92501 or as a PDF on the RPU website.

ES.2 Water Demands

In 2010, the total water use within the RPU service area was down to approximately 83,300 acre-ft from about 94,500 acre-ft in 2005. Table ES-1 shows the projected water demands within the RPU service area over the next twenty-five years. These projected water demands account for the planned conservation measures described in Section 3.4, which includes about 3,100 acre-ft and 10,000 acre-ft of water savings through conservation and natural replacement[1] by 2015 and 2020, respectively. By 2035, RPU's water demand is projected to reach about 120,000 acre-ft.

Table ES-1: RPU's Water Demands

Water Demand	2005 (acre-ft)	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Retail Water Deliveries [1]	64,695	58,861	71,850	76,800	80,900	85,300	88,200
Wholesale Deliveries	14,030	13,071	14,500	15,500	15,500	15,500	15,500
Additional Water Uses and Losses	15,785	11,326	11,700	15,100	15,400	15,800	16,100
Total Water Demand [2]	94,510	83,257	98,050	107,400	111,800	116,600	119,800

1. Retail water deliveries includes recycled water used for direct use.
2. Total water demand includes potable water wheeled to WMWD.

[1] Natural replacement of warn-out water fixtures (i.e. toilets, showerheads, and washing machines) will occur within the RPU service area. Old fixtures will be replaced with new high-efficiency fixtures, which will result in reduced water demand.

Retail water deliveries include potable and recycled water sales to retail customers within the RPU service area. Wholesale deliveries include potable and non-potable water sales to other water retailers. RPU wholesales potable water to the Home Gardens County Water District (HGCWD) and deliveries potable water to the Gage Canal Company (GCC) at the upper connection to the Gage Canal. RPU wholesales non-potable water to Western Municipal Water District (WMWD) and deliveries non-potable water to the GCC at the lower connection to the Gage Canal. Additional water uses and losses include recycled water deliveries to RPU for groundwater augmentation, potable water wheeled to WMWD, and system losses (i.e. unaccounted for water).

In accordance with the requirements of Senate Bill No. X7-7 (i.e. Water Conservation Bill of 2009), water retailers must establish an urban water use target for 2020, which reduces their urban per capita water use by 20-percent, and must establish an interim urban water use target for 2015, which reduces their urban per capita water use by 10-percent. In addition, water retailers are required to develop a water use reduction plan to describe the measures that will be implemented to meet the interim and urban water use targets.

As part of this plan, RPU established its interim and urban water use targets for 2015 and 2020 in accordance with the Water Conservation Bill of 2009. The interim and urban water use targets for the RPU service area are 238 gallons per capita per day (gpcd) and 211 gpcd, respectively. RPU intends to meet the conservation requirements of the Water Conservation Bill of 2009 through increased use of recycled water and implementation of additional conservation measures.

In 2010, the annual daily per capita water use in the RPU service area was 206 gpcd. Although RPU currently meets the 2015 and 2020 urban water use targets, it still plans to reduce its potable water demand by about 4,200 acre-ft (i.e. 2,400 acre-ft through conservation, 740 acre-ft through natural replacement, and 1,050 acre-ft through recycled water reuse) between 2010 and 2015 to ensure the 2015 interim urban water use target is met and to work towards meeting its reduction goals for 2020.

ES.3 Water Supplies

RPU's water supply consists primarily of groundwater from the Bunker Hill Basin, Riverside North, and Riverside South. Additional sources of water available to RPU include groundwater from the Rialto-Colton Basin, recycled water from the City of Riverside's Regional Water Quality Control Plant (RWQCP), and imported water from WMWD through a connection at the Metropolitan Water District of Southern California's (MWD) Henry J. Mills Treatment Plant (Mills WTP).

RPU plans to augment its existing water supplies through three conjunctive use projects: Seven Oaks Dam Conservation Project, Riverside North Aquifer Storage and Recovery Project, and Pellissier Ranch Aquifer Storage and Recovery Project; and, through increased use of recycled water.

Table ES-2 shows the source waters available to RPU through 2035.

Table ES-2: RPU's Water Supplies

Water Supplies	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)	2035 (acre-ft/yr)
Existing Supplies					
Groundwater (Bunker Hill Basin)	53,426	53,426	53,426	53,426	53,426
Groundwater (Rialto-Colton Basin)	2,700	2,700	2,700	2,700	2,700
Groundwater (Riverside North)	13,500	13,500	13,500	13,500	13,500
Groundwater (Riverside South)	28,600	28,600	28,600	28,600	28,600
Total Existing Supplies	98,226	98,226	98,226	98,226	98,226
Planned Supplies					
Seven Oaks Dam Conservation (Phase 1)	2,000	4,000	4,000	4,000	4,000
Riverside North Aquifer Storage and Recovery	3,500	3,500	3,500	3,500	3,500
Pellissier Ranch Aquifer Storage and Recovery [1]	0	10,000	10,000	10,000	10,000
Recycled Water (RWQCP)	3,650	5,800	5,800	5,800	5,800
Total Planned Supplies	9,150	23,300	23,300	23,300	23,300
Available Supplies					
Imported Water (MWD via WMWD)	21,700	21,700	21,700	21,700	21,700
Total Available Water Supply	129,076	143,226	143,226	143,226	143,226

1. The Pellissier Ranch Aquifer Storage and Recovery project includes 6,000 acre-ft/yr of groundwater and stormwater recharge, and 4,000 acre-ft/yr of recycled water recharge.

Seven Oaks Dam Conservation Project. The Western-San Bernardino Judgment permits RPU to acquire additional water rights in the Bunker Hill Basin through "new conservation". RPU has provided some of the funding for conservation storage of water from the Santa Ana River (SAR) behind the Seven Oaks Dam. RPU estimates its share of water from this project will reach, on average, approximately 4,000 acre-ft/yr (CDM, 2009). In 2010, the new yield from this conjunctive use project was about 2,000 acre-ft. The full yield from this project is anticipated to be available by 2020.

Riverside North Aquifer Storage and Recovery Project. RPU, in conjunction with WMWD and the Valley District, have proposed the construction of an inflatable rubber dam in the Santa Ana River about 2 miles southwest of the I-215/I-10 interchange. The dam will be inflated to capture lower storm flows and recharge the stormwater within the riverbed. The dam will also be used to divert up to 100 cfs to the Riverside Canal. The recharge that occurs behind the rubber dam will help sustain groundwater supplies for RPU's nearby Flume wells. Peak storm flows will not be

captured or reduced. On average, the project is projected to yield about 10,800 acre-ft/yr of additional surface water recharge in the Riverside Basin and could divert up to 5,500 acre-ft/yr to the Riverside Canal. RPU anticipates, on average, about 3,500 acre-ft/yr of recharge from this conjunctive use project.

Pellissier Ranch Aquifer Storage and Recovery Project. RPU plans to augment groundwater supplies from Riverside South by constructing a recharge facility at the Pellissier Ranch site. Recycled and diluent water will be recharged via surface spreading at this facility. The project will require the construction of a recycled water pipeline from the RWQCP to Pellissier Ranch. This pipeline will also supply recycled water for landscape irrigation (i.e. direct use) where economically feasible. Direct use along the proposed pipeline route is anticipated to be about 1,170 acre-ft/yr. This conjunctive use project is anticipated to recharge 10,000 acre-ft (i.e. 6,000 acre-ft of diluent water and 4,000 acre-ft of recycled water) by 2020.

Planned Recycled Water Projects. RPU plans to expand its recycled water program over the next decade to include additional direct use customers and a groundwater augmentation project. Based on the *2011 Recycled Water Facilities Plan* and a written analysis by RPU's Water Resources Department, RPU has identified two recycled water reuse projects: the Arlington-Central Avenue Recycled Water Project and the Pellissier Ranch Aquifer Storage and Recovery Project. The Arlington-Central Avenue Recycled Water Project will deliver about 1,050 acre-ft/yr of recycled water to meet direct use demands. The Arlington-Central Avenue Recycled Water Project will also deliver 2,600 acre-ft and 3,600 acre-ft of recycled water to WMWD by 2015 and 2020, respectively.

ES.4 Water Supply Reliability

RPU's source waters include groundwater, recycled water, and imported water. RPU plans to augment groundwater production through conjunctive use projects that recharge both surface water and recycled water.

Local groundwater supplies account for most of RPU's water supplies, with approximately 60-percent originating from the Bunker Hill Basin, which is adjudicated. RPU's water rights are based on the long-term safe yield from the Bunker Hill Basin, which includes wet, dry, and normal periods. RPU's wells are generally located in the section of the basin with the greatest thickness of water bearing layers. Thus, RPU's water supply from the Bunker Hill Basin is considered reliable during single and multi-year dry periods. As part of the *2011 Riverside Basin Groundwater Management Plan* the safe yield for the Riverside and Arlington basins were established based on 43 years of historical production and hydrologic conditions (1965 to 2007). This period includes wet, dry, and normal periods and is considered to be representative of long-term mean climatological conditions. The calibrated numerical groundwater model of the Riverside and Arlington basins determined the safe yield to be 27,200 acre-ft in Riverside North and 35,100 acre-ft in Riverside South.

RPU intends to augment natural recharge in the Bunker Hill and Riverside basins through conjunctive use projects. The quantity of surface water recharge from these projects is dependent on the hydrologic conditions in the Santa Ana River Watershed. However, in wet years above average recharge will occur and in dry years below average recharge will occur. These projects each have inherent storage capacity, whether it is storage capacity behind the Seven Oaks Dam or storage capacity within a groundwater basin. Therefore, over a single or multi-year dry period the quantity of

supply from these projects will only be slightly reduced, because in the dry years, supplemental water will be pulled from storage.

The primary source of recycled water is local groundwater that has gone through the potable distribution system and the sewage treatment plant. RPU plans to reuse the available volume of recycled water from the RWQCP and considers this supply to be 100-percent reliable during single or multi-year dry periods.

RPU is contracted to receive State Water Project water from MWD through WMWD. The *2009 State Water Project Reliability Report* estimates a decrease in water delivery reliability from the State Water Project over the next 20 years. The 2009 report indicates that on a long-term average basis, State Water Contractors can expect about 60-percent of their annual maximum entitlement. RPU has implemented several measures to maximize the use of local water resources and eliminate reliance on imported water.

ES.5 Water Shortage Contingency Plan

Currently, the City of Riverside (City) has a Water Shortage Ordinance (i.e. Water Rule No. 9, included in Appendix L), which briefly explains how the City will manage a shortage of water supply. The City's draft Water Conservation Ordinance, which will go before Council in 2011 for adoption, expands on the Water Shortage Ordinance and will amend the Riverside Municipal Code Title 14. The draft Water Conservation Ordinance, includes a detailed description of unreasonable uses of water, RPU's Water Conservation Program, responses to water shortage emergencies, and enforcement and severability.

The Water Conservation Ordinance establishes a Water Conservation Program which uses four stages to address conditions and needs. The Water Conservation Stage shall be set by City Council action. Table ES-3 describes the four water conservation stages.

Table ES-3: Water Conservation Stages

Stage No.	Water Supply Conditions	Supply Shortage %	Rationing Type
1	Normal Water Supply	0	Voluntary
2	Minimum Water Shortage	10 to 15	Voluntary
3	Moderate Water Shortage	15 to 20	Mandatory
4	Severe Water Shortage	20 to 50	Mandatory

In addition to water supply shortages caused by drought conditions, there are other major hazards that can degrade the quality and/or impact the quantity of water available to the RPU water system. These include: regional power outages, earthquakes, liquefaction, floods, chemical spills, groundwater contamination, and terrorist acts. Some of these hazards could also adversely impact the distribution systems, such as the major transmission mains or reservoirs. Interruptions to water supplies from any of the above mentioned hazards may be limited to days or even months, except for groundwater contamination, which could last several years.

RPU has implemented several measures to improve the reliability of its water system. Actions taken to prepare for a catastrophe include:

- Establishing criteria for a proclamation of water shortage
- Developing alternate sources of water supplies
- Establishing contacts and mutual aid agreement with other agencies
- Establishing an Emergency Response Team/Coordinator
- Preparing an Emergency Response Plan (ERP)
- Developing public awareness programs

In 2008, The City updated its ERP, which incorporates the RPU Water System Emergency Response Plan.

SECTION 1 – PLAN PREPARATION

The City of Riverside Public Utilities Department (RPU) prepared its 2010 Urban Water Management Plan (UWMP) in accordance with the *Urban Water Management Planning Act*, sections 10610 through 10656 of the California Water Code. Appendix A contains the most recent version of the *Urban Water Management Planning Act*.

1.1 Coordination

RPU's service area is centrally located within the Santa Ana River Watershed as shown in Figure 1-1. RPU shares water resources (i.e. groundwater basins) with several public agencies and private water retailers. This arrangement requires on-going coordination between the water management agencies and local water retailers for sustainable long term planning of these resources.

In addition to collaborating with the water management agencies and surrounding water retailers, RPU values the continued partnership with its community and has developed procedures to inform the general public of current events and provides a forum by which its constituents can share ideas and provide feedback.

1.1.1 Agency Coordination

Pursuant to the *Urban Water Management Planning Act*, RPU sent a Notice of Preparation letter to the surrounding water management agencies, water retailers, and public agencies to inform them that RPU was in the process of preparing its 2010 UWMP. The Notice of Preparation letter also contained details related to the availability of the draft plan, comment period, and public hearing. Appendix B contains a copy of the Notice of Preparation letter that was sent on March 23, 2011, approximately 100 days prior to the public hearing.

RPU requested input, data, and comments from many water retailers while preparing this plan. Table 1-1 shows a summary of RPU's coordination efforts.

RPU provided a copy of its draft 2010 UWMP to the agencies listed in Table 1-1 and requested comments. RPU will provide a copy of its Final 2010 UWMP (i.e. adopted plan) to the agencies listed in Table 1-1 within 60 days of the plan being submitted to the California Department of Water Resources (DWR).

1.1.2 Public Participation

RPU communicates water supply information to the community throughout the year. For example, RPU provides water highlights at one of the two monthly Riverside Board of Public Utilities (Board) meetings. These highlights include information on current water news and data related to daily water production and consumption, peak and average water consumption, and daily temperature and rainfall. In addition, RPU regularly encourages public water awareness and water conservation at the Board meetings and on its website www.riversidepublicutilities.gov.

A special effort was made while developing this plan to include the community and local public interest groups. RPU posted information on the RPU website and in meeting agendas related to its presentation on the draft 2010 UWMP to the Water Committee of the Board, and legal public notices[2] for the public hearing were published in the local newspapers and posted at City of Riverside's (City) offices, the main branch of the City's library, and on the City and RPU website. The notice that was published in advance of the public hearing is contained in Appendix B. Copies

[2] Legal notices were published in accordance with Section 6066 of the Government Code.

of the draft UWMP were available at the RPU Office located at 3901 Orange Street, Riverside CA 92501 or as a PDF on the RPU website prior to the public hearing.

RPU will make available for review copies its Final 2010 UWMP to the general public at the RPU office located at 3901 Orange Street, Riverside CA 92501 or as a PDF on the RPU website within 30 days of the plan being submitted to DWR. A final copy of the adopted UWMP will be posted online at: http://www.riversideca.gov/utilities/water-umwp.asp.

Table 1-1: Coordination Efforts

Coordinating Agencies	Participated in Developing the Plan	Was Sent a Copy of the Notice of Preparation	Was Notified of the Public Hearing	Was Sent a Copy of the Draft Plan	Commented on the Draft Plan	Attended the Public Hearing	Not Involved / No Information
Water Management Agency							
San Bernardino Valley Municipal Water District		X	X				
Surrounding Water Retailers							
City of San Bernardino Water Department		X	X				
City of Rialto		X	X				
City of Colton		X	X				
City of Loma Linda		X	X				
City of Redlands		X	X				
City of Corona		X	X				
City of Norco		X	X				
Western Municipal Water District		X	X				
Eastern Municipal Water District		X	X				
West Valley Water District		X	X				
East Valley Water District		X	X				
Rubidoux Community Services District		X	X				
Jurupa Community Services District		X	X				
Home Gardens County Water District		X	X				
Gage Canal Company		X	X				
Riverside Highlands Water Company		X	X				
Meeks and Daley Water Company		X	X				
Fontana Water Company		X	X				
Public Agencies							
County of Riverside		X	X				
City of Riverside - Planning Department	X	X	X				
San Bernardino Valley Water Conservation District		X	X				
General Public			X			X	

1.2 Preparation

RPU prepared this 2010 UWMP with input from water management agencies, local and regional planning agencies, water retailers, wastewater agencies, consultants, and the community. RPU also worked closely with other departments within the City while developing this plan. Specifically, the City's Community Development Department (i.e. the Planning Division) and the Public Works Department provided data regarding annexations and the Riverside Regional Water Quality Control Plant (RWQCP), respectively.

The following is a list of planning documents that were prepared by RPU and its consultants with collaboration from the surrounding water management agencies, public agencies, and water retailers:

- Water Supply Plan, (RPU, 2004)
- Urban Water Management Plan, (RPU, 2005)
- Water Systems Master Plan, (MWH, 2005)
- Upper Santa Ana River Watershed Integrated Regional Water Management Plan, (Valley District, 2007)
- Recycled Water Transmission Main Alignment Study, (Brown and Caldwell, 2008)
- Water Supply Plan, (CDM, 2009)
- Water Use Efficiency Master Plan, (Kennedy/Jenks, 2010)
- Water Master Plan Update, (RPU, 2010)
- Recycled Water Facilities Plan, (HDR, 2011)
- Recycled Water Program Outline (RPU, 2011)
- Riverside-Arlington Groundwater Flow Model (WRIME, 2011)
- Draft Riverside Basin Groundwater Management Plan, (WRIME, 2011)

Data from these documents form the basis of the information contained in this plan.

The *2004 Water Supply Plan* and *2005 Water Systems Master Plan* forecasts the water demands of the City through 2025, based on future land use data provided by the City's Planning Division and population data provided by the Southern California Association of Governments (SCAG). These plans also identified the various source waters available to RPU to meet these projected demands. Subsequent updates to these plans extended the demand and supply projections through 2030.

The *2008 Recycled Water Transmission Main Alignment Study* evaluated the feasibility of using recycled water to meet landscape irrigation demands (i.e. direct use) at targeted sites within the RPU service area. The *2011 Recycled Water Facilities Plan* expanded on the 2008 study and included additional direct use sites and identified potential groundwater augmentation projects. The 2011 plan outlines the recycled water distribution infrastructure needed to meet the recycled water reuse projections discussed in the *2010 Water Master Plan* and *2009 Water Supply Plan*.

The *2010 Water Use Efficiency Master Plan* analyzed the requirements of Senate Bill No. 7 X-7 (Water Conservation Bill of 2009) and identified a range of water conservation programs and recycled water reuse projects to realize water savings and collectively achieve at least a 20-percent reduction in per capita water demand by 2020.

As mentioned above, RPU made available for review copies its draft 2010 UWMP to the general public at the RPU office located at 3901 Orange Street, Riverside CA 92501 or as a PDF on the RPU website, sent copies of its draft plan to the surrounding agencies listed in Table 1-1, and submitted copies of its draft plan to the Water Committee for review and comment. At the June 27, 2011 Water Committee meeting, which was open to the public, a presentation on the draft 2010 UWMP was given by RPU staff and the plan was discussed by the Committee.

The draft UWMP was revised to reflect comments received from the Water Committee and other stakeholders. Comments received prior to and at the public meeting were incorporated into the draft Final UWMP.

1.3 Adoption

The draft Final UWMP was presented to the Board at a public hearing on July 1, 2011 and to the City Council for adoption on July 26, 2011. Appendix C contains the City Council resolution adopting the 2010 UWMP.

1.4 Implementation

A copy of the Final 2010 UMWP adopted by the City Council was forwarded to the DWR and other specified agencies as required by the *Urban Water Management Planning Act*. Table 1-1 lists the agencies that will receive a copy of the adopted plan. The Final 2010 UWMP will be submitted to the California State Library within 30 days of submittal to DWR. RPU will make available for review copies its Final 2010 UWMP to the general public at the RPU office located at 3901 Orange Street, Riverside CA 92501 or as a PDF on the RPU website within 30 days of the plan being filed with DWR. A final copy of the adopted UWMP will be posted online at: http://www.riversideca.gov/utilities/water-umwp.asp.

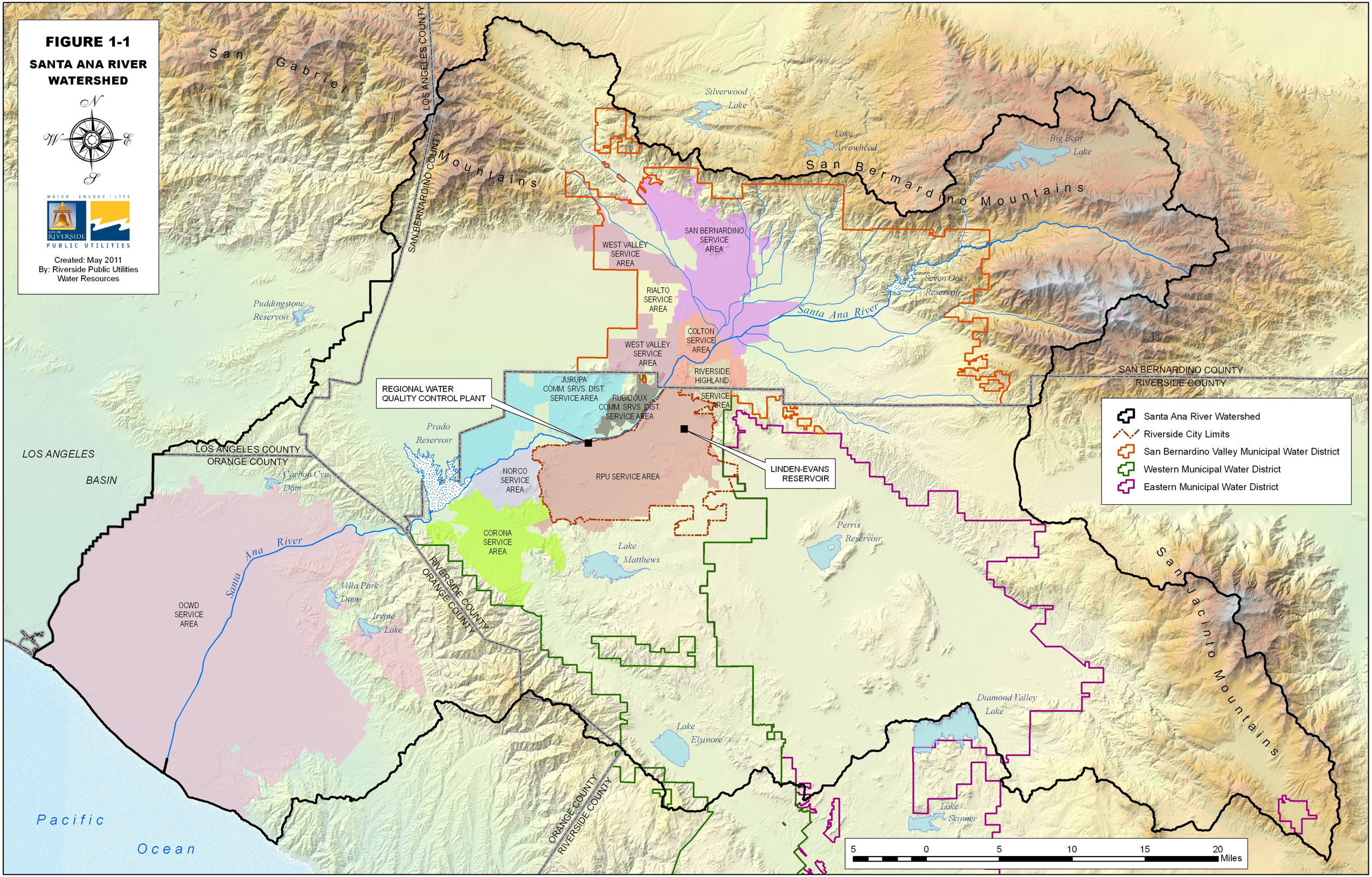
FIGURE 1-1
SANTA ANA RIVER WATERSHED
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
San Gabriel Mountains
LOS ANGELES COUNTY
SAN BERNARDINO COUNTY
Silverwood Lake
Lake Arrowhead
Big Bear Lake
San Bernardino Mountains
SAN BERNARDINO SERVICE AREA
WEST VALLEY SERVICE AREA
RIALTO SERVICE AREA
COLTON SERVICE AREA
WEST VALLEY SERVICE AREA
RIVERSIDE HIGHLAND SERVICE AREA
JURUPA COMM. SRVS. DIST. SERVICE AREA
RUBIDOUX COMM. SRVS. DIST. SERVICE AREA
Seven Oaks Reservoir
Santa Ana River
Puddingstone Reservoir
REGIONAL WATER QUALITY CONTROL PLANT
LINDEN-EVANS RESERVOIR
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
Santa Ana River Watershed
Riverside City Limits
San Bernardino Valley Municipal Water District
Western Municipal Water District
Eastern Municipal Water District
LOS ANGELES BASIN
LOS ANGELES COUNTY
ORANGE COUNTY
Prado Reservoir
Carbon Cyn. Dam
NORCO SERVICE AREA
RPU SERVICE AREA
CORONA SERVICE AREA
Perris Reservoir
Lake Matthews
Villa Park Dam
Irvine Lake
OCWD SERVICE AREA
RIVERSIDE COUNTY
ORANGE COUNTY
San Jacinto Mountains
Diamond Valley Lake
Lake Elsinore
Lake Skinner
ORANGE COUNTY
RIVERSIDE COUNTY
Pacific Ocean
5 0 5 10 15 20
Miles

SECTION 2 – SYSTEM DESCRIPTION

2.1 Background

RPU is the municipally-owned utility that provides potable, non-potable, and recycled water at retail to customers primarily within the City of Riverside. The water utility can trace its heritage directly back to the founding of the Riverside Colony as an agricultural community in 1870. In that year a preliminary survey was made for a canal (Riverside Upper Canal) to irrigate groves of Mulberry trees, and a notice of water appropriation was posted for diverting water, via gravity, from the Santa Ana River. An additional canal (Riverside Lower Canal) was constructed in 1874 and increased Riverside's capacity of carrying water to 5,000 miner's inches (about 56,100 gpm). In 1883, the City of Riverside was incorporated, in part to free up control of water and land sales from the privately held Riverside Land & Irrigating Company. In 1884, a compromise between the Riverside Land & Irrigating Company and local irrigators led to the creation of the Riverside Water Company. The agreement made the Riverside Water Company the default water supplier for most of the Riverside area. By the late 1880s, surface diversions from the Santa Ana River were inadequate for the Riverside Water Company's needs, so artesian wells were drilled to augment water supply. Wells were constructed throughout Riverside and San Bernardino counties. In 1913, Riverside voters approved a $1,115,000 bond issue to purchase three water companies and establish its municipal water department. The purchase included; Riverside Water Company, Artesia Water Company, and the Henry P. Kyes water system. As early as 1956, the City of Riverside started buying stock in the Gage Canal Company (GCC). In 1965, the City of Riverside acquired the GCC and all of its production, transportation, and distribution assets by condemnation. Since 1959, the City of Riverside's entire water supply has come from underground sources and remains essentially the same to this day. The service area of the original Riverside Upper Canal developed as a highly productive agricultural area specializing in citrus crops. In recent years urbanization has increasingly encroached on agricultural land. As a result, there has been a dramatic shift in water use from agricultural irrigation to domestic, municipal, and industrial applications.

2.2 Service Area

The RPU service area is located within the Santa Ana River Valley approximately 60 miles east of Los Angeles and 100 miles north of San Diego. The RPU service area is approximately 75 square miles, of which approximately 70 square miles are located in Riverside's City limits. The remaining 5 square miles consist mainly of unincorporated land within the County of Riverside. The area within Riverside's City boundaries is approximately 80 square miles, of which approximately 10 square miles are served by water retailers other than RPU. The other potable water retailers within the City include Western Municipal Water District (WMWD, 9 square miles), Eastern Municipal Water District (EMWD, 1 square mile), and the Riverside Highland Water Company (RHWCO, 0.25 square miles). Figure 2-1 shows the RPU service area, Riverside City boundaries, and the surrounding water retailers.

2.2.1 Service Area Boundaries and Physical Description

The RPU service area is bounded on the north by the City of Colton; on the east by the RHWCO and WMWD; on the south by WMWD; and on the west by Home Gardens County Water District (HGCWD), City of Corona, City of Norco, Rubidoux Community Services District, and the Jurupa Community Services District as shown in Figure 2-1.

In November 2007, the City adopted General Plan 2025[3]. General Plan 2025 anticipates approximately 38,100 new dwelling units (DUs) and 1.5 square miles of new non-residential development within the City's northern and southern spheres of influence (SOI). Figure 2-2 shows the proposed Land Use Policy Map under the General Plan 2025. Figure 2-3 shows the areas being considered for possible annexation into the City.

The RPU service area overlies portions of several groundwater basins, including Riverside North, Riverside South, the Arlington Basin, and the Chino Basin. Figure 2-4 shows the RPU service area relative to these groundwater basins.

The Santa Ana Regional Water Quality Control Board (SARWQCB) divided the groundwater resources of the Santa Ana River Watershed into management zones for water quality management, and these boundaries are slightly different than the groundwater basin boundaries. Figure 2-5 shows the RPU service area relative to the Water Quality Control Plan for the Santa Ana River Watershed (Basin Plan[4]) management zones. The Riverside Basin contains six management zones, Riverside A through F, and each has different water quality objectives for total dissolved solids (TDS) and nitrate.

The surface elevation within the RPU service area ranges from more than 1,900 feet above mean sea level (ft-msl) in the northeast to less than 700 ft-msl in the southwest. The Santa Ana River is the main watercourse that drains the RPU service area. Other major tributaries includes the Spring Brook, Tequisquite Arroyo, Prenda, Woodcrest, Mockingbird, and Hole Lake drainages.

2.2.2 Climate

The RPU service area is located in the southwest arid region of the United States. The climate typically exhibits hot, dry summers and mild, wet winters. Climate is a primary factor that influences water demand within the RPU service area. Annual precipitation totals vary substantially from year to year as shown in Table 2-1 and Figure 2-6. Over the period of 1948 through 2010 the annual average precipitation in the RPU service area was about 9.5 inches. Figure 2-6 illustrates the annual precipitation time history and shows the variability of wet and dry periods. Figure 2-6 shows that the annual average air temperature has been gradually increasing over the past 60 years.

Table 2-2 and Figure 2-7 provide average monthly climatic data in the RPU service area over the period of approximately 1948 to 2010 and shows that most rainfall occurs during the months of November through April. The hottest and driest period of the year is from June through September. It is not unusual during the summer months to have several consecutive days that the daily temperature exceeds 100°F.

[3] City of Riverside's General Plan 2025 (http://www.riversideca.gov/planning/gp2025program).

[4] Board Resolution R8-2004-0001 (http://www.waterboards.ca.gov/santaana/board_decisions/adopted_orders /orders/2004/04_001.pdf).

Table 2-1: Average Annual Climatological Data for the RPU Service Area

Year [1]	Total Precipitation [2] (inches)	Average Air Temperature [2] (F)	Total Evapotranspiration (ETo) [3, 4] (inches)	Average Relative Humidity [3] (%)	Average Wind Speed [3] (mph)	Average Soil Temperature [3] (F)
1948	2.5	N/A	N/A	N/A	N/A	N/A
1949	8.0	N/A	N/A	N/A	N/A	N/A
1950	6.6	N/A	N/A	N/A	N/A	N/A
1951	4.9	N/A	N/A	N/A	N/A	N/A
1952	N/A	N/A	N/A	N/A	N/A	N/A
1953	N/A	N/A	N/A	N/A	N/A	N/A
1954	N/A	N/A	N/A	N/A	N/A	N/A
1955	N/A	N/A	N/A	N/A	N/A	N/A
1956	6.8	63.8	N/A	N/A	N/A	N/A
1957	13.2	64.1	N/A	N/A	N/A	N/A
1958	12.2	65.5	N/A	N/A	N/A	N/A
1959	5.6	66.3	N/A	N/A	N/A	N/A
1960	6.2	64.3	N/A	N/A	N/A	N/A
1961	3.4	63.6	N/A	N/A	N/A	N/A
1962	7.0	62.5	N/A	N/A	N/A	N/A
1963	12.7	63.4	N/A	N/A	N/A	N/A
1964	6.4	62.7	N/A	N/A	N/A	N/A
1965	17.2	62.0	N/A	N/A	N/A	N/A
1966	9.8	63.4	N/A	N/A	N/A	N/A
1967	10.7	65.1	N/A	N/A	N/A	N/A
1968	6.2	64.2	N/A	N/A	N/A	N/A
1969	17.6	62.4	N/A	N/A	N/A	N/A
1970	9.7	62.6	N/A	N/A	N/A	N/A
1971	5.9	62.8	N/A	N/A	N/A	N/A
1972	4.0	64.4	N/A	N/A	N/A	N/A
1973	10.4	63.2	N/A	N/A	N/A	N/A
1974	8.3	64.4	N/A	N/A	N/A	N/A
1975	6.3	63.8	N/A	N/A	N/A	N/A
1976	10.0	65.5	N/A	N/A	N/A	N/A
1977	10.2	65.3	N/A	N/A	N/A	N/A
1978	21.9	64.7	N/A	N/A	N/A	N/A
1979	12.9	64.9	N/A	N/A	N/A	N/A
1980	15.8	65.5	N/A	N/A	N/A	N/A
1981	8.1	66.0	N/A	N/A	N/A	N/A
1982	15.1	61.6	N/A	N/A	N/A	N/A
1983	22.9	65.1	N/A	N/A	N/A	N/A
1984	5.7	66.7	N/A	N/A	N/A	N/A
1985	6.5	64.8	36.5	48.9	10.2	75.2
1986	9.2	65.2	70.2	47.8	4.3	66.6
1987	8.8	63.8	57.0	57.0	4.6	63.9
1988	8.1	64.9	58.2	55.3	4.6	63.5
1989	4.4	64.7	57.1	55.6	4.4	56.4
1990	5.3	65.1	56.2	54.0	4.4	60.0
1991	12.0	64.8	55.4	55.8	4.3	59.5
1992	13.8	66.0	53.5	58.2	4.3	62.5
1993	17.9	65.1	54.0	58.2	4.2	65.0
1994	9.0	64.8	55.4	49.3	4.1	63.5
1995	18.1	65.6	56.6	43.4	4.0	65.6
1996	9.5	66.3	58.8	49.3	4.0	66.2
1997	10.0	66.7	58.4	54.4	3.9	66.4
1998	18.2	64.4	53.5	54.9	3.5	68.5
1999	4.5	64.8	57.7	51.4	4.0	66.7
2000	5.8	66.9	58.6	54.6	3.9	66.2
2001	8.7	65.9	55.5	57.9	3.8	65.6
2002	3.8	65.4	57.7	52.3	4.0	64.1
2003	9.7	66.7	54.5	56.3	3.9	64.2
2004	12.4	66.1	57.9	52.2	4.0	63.6
2005	15.2	66.1	54.5	54.1	3.9	63.0
2006	6.0	66.4	57.8	49.1	4.0	63.0
2007	4.1	66.6	59.4	47.2	4.2	62.7
2008	7.7	66.5	59.8	46.8	3.6	63.8
2009	3.0	68.8	57.5	47.4	4.1	63.4
2010	9.1	65.6	53.1	51.9	4.1	63.0
Min	2.5	61.6	36.5	43.4	3.5	56.4
Max	22.9	68.8	70.2	58.2	10.2	75.2
Average	9.6	64.9	56.3	52.4	4.3	64.3
Total	564.5	---	1,465	---	---	---

1. For the period of January though December.
2. Data is from the Western Regional Climate Center (WRCC) - Riverside Citrus Experimental Station. The WRCC is part of the regional climate center program, which is administered by the National Oceanic and Atmospheric Administration (NOAA).
3. Data is from the California Irrigation Management Information System (CIMIS) - Station No. 044 at the University California of Riverside.
4. Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is an indicator of how much water your crops, lawn, garden, and trees need for healthy growth and productivity. ET from a standardized grass surface is commonly denoted as ETo.

Figure 2-6: Average Annual Climatological Data for the RPU Service Area

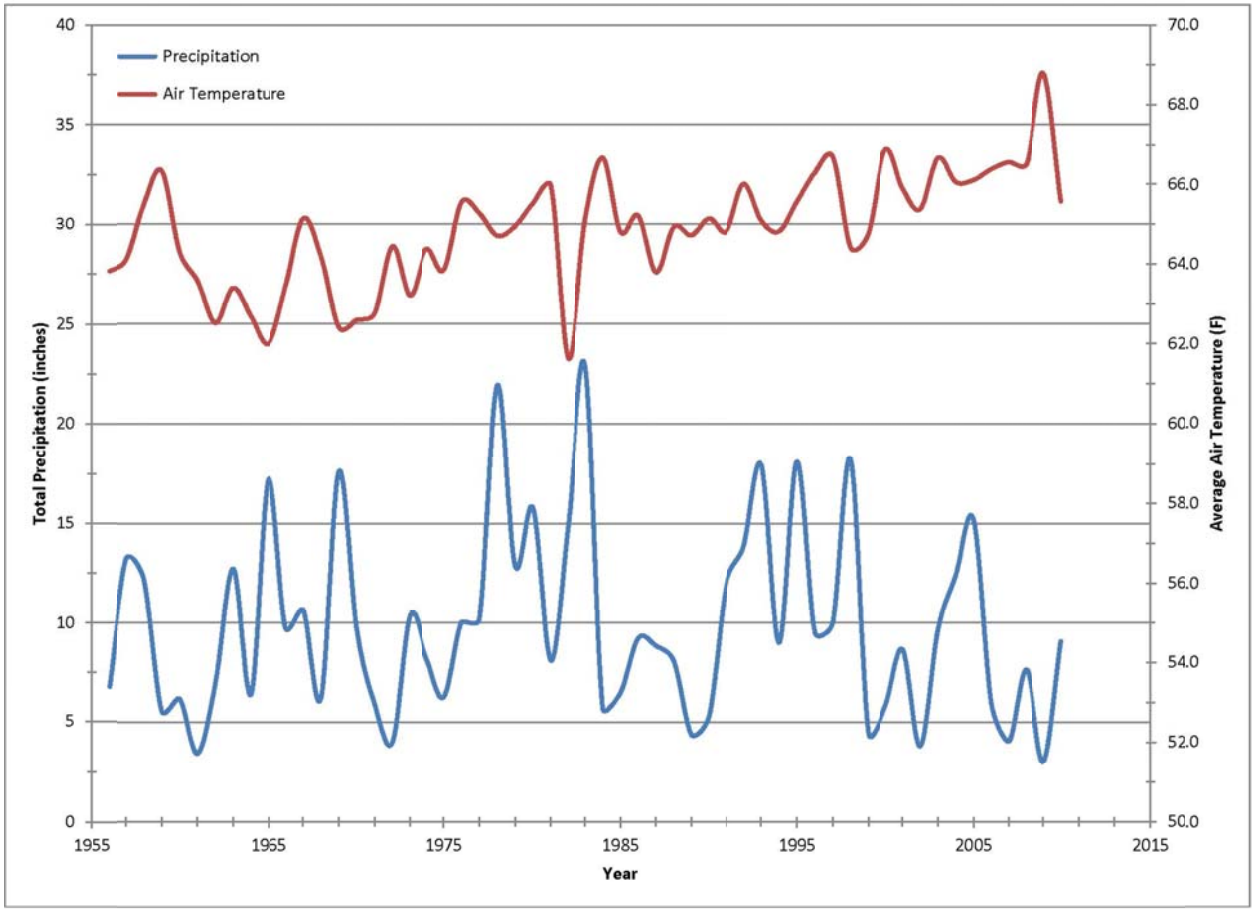

Table 2-2 shows that the average annual total precipitation, based on monthly averages, is about 9 inches; and that the average annual total ETo[5] is about 57 inches. Therefore, about 48 inches (or 4 acre-ft/yr per acre) of supplemental water is required to maintain a healthy lawn in the RPU service area.

2.2.3 Population

As discussed earlier in this section, the RPU service area is approximately 75 square miles, of which approximately 70 square miles are located in Riverside's City boundaries. Historical population data and regional planning documents for the City, RPU, and the other water retailers that serve water within the City boundaries were used in conjunction with aerial photography, geographic information system (GIS), tax records, and water billing records to determine the ratio between the population within the RPU service area to that of the City. This ratio was then applied to the most recent SCAG population projections[6] for the City of Riverside to determine the population within the RPU service area. Table 2-3 shows the population projections through 2035 for the City and RPU water service area, and the projected annual growth rate.

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[5] Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is an indicator of how much water your crops, lawn, garden, and trees need for healthy growth and productivity. ET from a standardized grass surface is commonly denoted as ETo.

[6] SCAG population projects are from the "Adopted 2008 RTP Growth Forecast, by City" data.

Table 2-2: Average Monthly Climatological Data for the RPU Service Area

Month	Average Precipitation [1] (inches)	Average Air Temperature [2] (F)	Total Evapotranspiration (ETo) [3] (inches)	Average Relative Humidity [3] (%)	Average Wind Speed [3] (mph)	Average Soil Temperature [3] (F)
January	1.9	54.1	2.6	49.5	4.1	51.7
February	2.0	55.6	2.9	52.1	4.1	53.8
March	1.5	57.6	4.3	53.9	4.1	57.9
April	0.7	61.5	5.3	54.5	4.4	61.5
May	0.2	66.1	6.2	57.7	4.4	68.1
June	0.1	71.4	6.7	56.0	4.3	72.4
July	0.0	77.4	7.4	53.0	4.1	75.7
August	0.1	77.9	7.1	50.6	3.9	76.2
September	0.2	74.6	5.5	52.0	3.7	72.6
October	0.3	67.5	3.9	55.0	3.7	66.4
November	0.8	59.5	3.0	48.1	4.0	58.6
December	1.2	54.4	2.4	48.5	4.1	52.0
Min	0.0	54.1	2.4	48.1	3.7	51.7
Max	2.0	77.9	7.4	57.7	4.4	76.2
Average	0.7	64.8	4.8	52.6	4.1	63.9
Total	9.0	- - -	57.1	- - -	- - -	- - -

1. Data is from the Western Regional Climate Center (WRCC) - Riverside Citrus Experimental Station for the period of 1948 to 2010. The WRCC is part of the regional dimate center program, which is administered by the National Oceanic and Atmospheric Administration
2. Data is from the WRCC - Riverside Citrus Experimental Station for the period of 1956 to 2010.
3. Data is from the California Irrigation Management Information System (CIMIS) - Station No. 044 at the University California of Riverside for the period of 1985 to 2010.

The population within the City boundaries is projected to increase from 304,000 in 2010 to 386,000 in 2035. The population within the RPU service area is projected to increase from 287,000 in 2010 to 364,000 in 2035, which corresponds to an average annual growth rate of just over one-percent for the next twenty-five years.

2.2.4 Demographics

Demographic factors that can influence future water demand include land use, relative proportion of single-family residences to multi-family residences, population density, economic characteristics (e.g., income levels, employment rate), and the composition of customer types.

2.2.4.1 Land Use

The City's land use is divided between residential and non-residential. Current residential land use is divided into nine sub categories: hillside, very low density, low density, medium density, medium-high density, high density, very high density, semi-rural, and rural residential. Non-residential land use categories include: agriculture, commercial, downtown specific plan, industrial, business/office park, office, public facilities and institutions, parks, natural open space, other recreation, and mixed use. Commercial development is divided into general and regional. Mixed use is divided into neighborhood, village, and urban. Table 2-4 presents the land use categories along with their typical and maximum density, in dwelling units per acre.

Figure 2-7: Average Monthly Climatological Data for the RPU Service Area

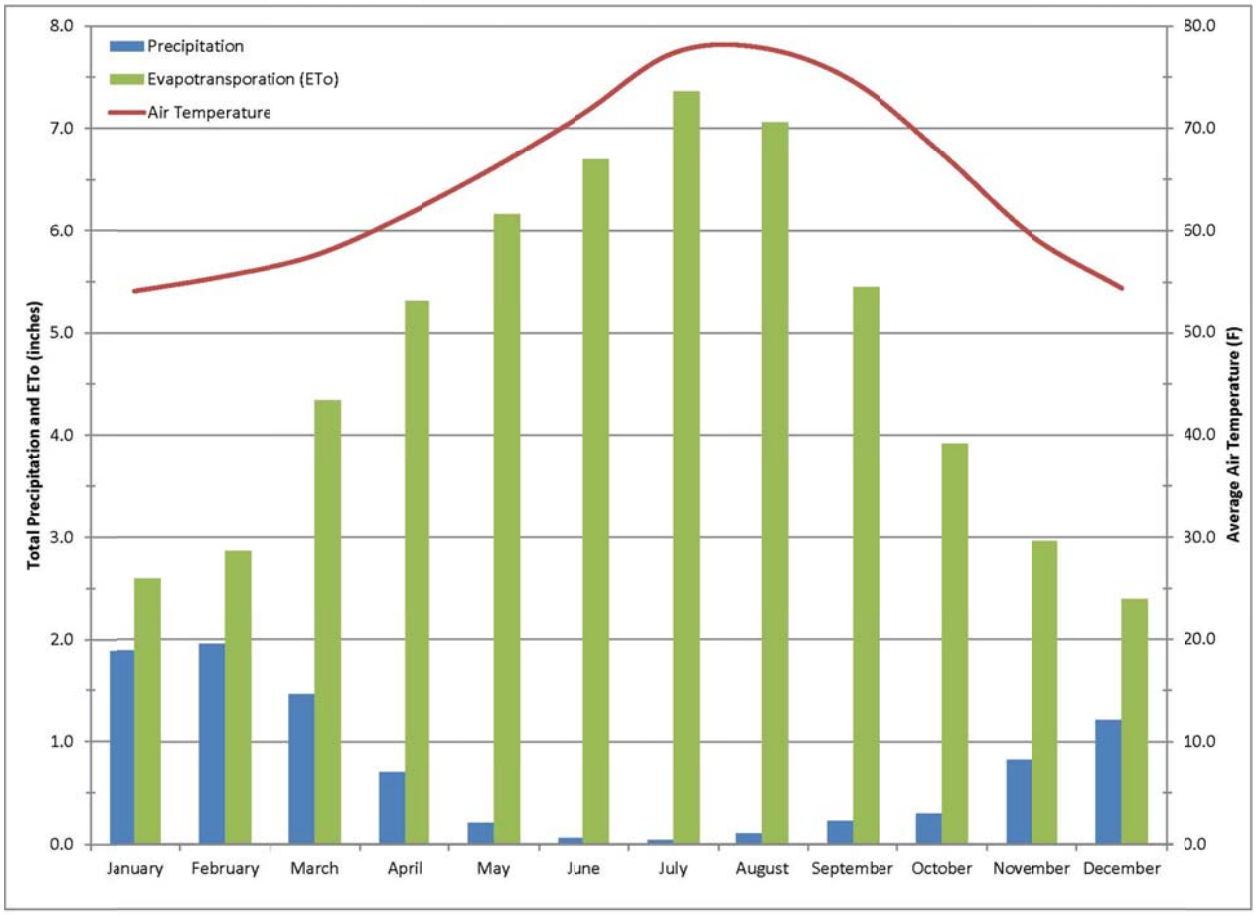


Table 2-3: Population Projections

Year	Population within the Riverside City Boundaries [1]	Population within the Riverside Public Utilities Service Area [2]	Annual Growth Rate [3]
2010	304,000	287,000	2.4%
2015	313,000	295,000	0.6%
2020	335,000	316,000	1.4%
2025	353,000	333,000	1.1%
2030	373,000	352,000	1.1%
2035	386,000	364,000	0.7%

1. Population estimates within the Riverside City boundaries are based on data from the Southern California Association of Governments (SCAG)and the Riverside General Plan 2025.

2. Assumes the RPU service area continues to be the same ratio of the City's population (94.4-percent).

3. Annual growth rate was calculated on a compound basis over the preceding 5-year period.

Table 2-4: Land Use Category Densities

Land Use Categories	Typical Density (Floor Area Ratio)	Maximum Density (Floor Area Ratio)	Typical Density (DU per acre)	Maximum Density (DU per acre)
Residential				
Agricultural and Rural Residential	N/A	N/A	0.2	0.2
Hillside Residential	N/A	N/A	0.2	0.6
Very Low Density Residential	N/A	N/A	1.0	2.5
Semi-Rural Residential	N/A	N/A	1.5	2.5
Low Density Residential	N/A	N/A	3.0	5.0
Medium Density Residential	N/A	N/A	4.0	6.5
Medium-High Density Residential	N/A	N/A	12.0	15.0
High Density Residential	N/A	N/A	20.0	25.0
Very High Density Residential	N/A	N/A	40.0	40.0
Commercial, Industrial, Office				
Commercial - Regional	0.2	0.3	N/A	N/A
Industrial	0.2	0.5	N/A	N/A
Commercial - Neighborhood	0.3	0.4	N/A	N/A
Commercial - General	0.4	0.5	N/A	N/A
Business/Office Park	0.4	0.5	N/A	N/A
Office	0.5	1.5	N/A	N/A
Downtown Specific Plan	N/A	N/A	25.0	50.0
Non-Urban/Community Support				
Parks	N/A	N/A	N/A	N/A
Other Recreation	N/A	N/A	N/A	N/A
Public Faculties and Institutions	N/A	N/A	N/A	N/A
Open Space	N/A	N/A	N/A	N/A
Mixed Use				
Mixed Use -Neighborhood	N/A	N/A	10.0	10.0
Mixed Use - Urban	N/A	N/A	30.0	30.0
Mixed Use - Village	N/A	N/A	40.0	40.0

The RPU service area is approximately 80-percent built out and contains about 15-percent vacant land available for development. The 2005 Water Master Plan describes three categories of growth for ultimate build out: (1) development within the remaining vacant land, (2) increased density within areas already developed as defined in the City's General Plan 2025, and (3) water demand associated with growth and expansion at the University of California Riverside (UCR).

2.2.4.2 Retail Customer Accounts

RPU's retail customer accounts are divided into six sub categories: residential, commercial, industrial, dedicated irrigation, City irrigation, and UCR. Table 2-5 shows the water consumption by end user for fiscal year 2010.

Table 2-5: Water Consumption by End User (2010)

Account Type	Precentage of Total Water Demand
Residential	61%
Commercial	16%
Industrial	17%
City Irrigation	2%
Dedicated Irrigation	3%
UCR	1%

2.3 Current Water Supply Facilities and Conservation

RPU's water system serves approximately 63,500 service connections in the City of Riverside and surrounding areas. The system has four major components: raw water supply, potable water distribution, non-potable distribution, and recycled water distribution.

2.3.1 Raw Water Supply

RPU has water rights in the Bunker Hill Basin, Rialto-Colton Basin, Riverside North, and Riverside South per the Western-San Bernardino Judgment[7]. A copy of the Western-San Bernardino Judgment is included in Appendix D. Currently, RPU extracts groundwater from the Bunker Hill Basin, Riverside North, and Riverside South to meet its water demands. Groundwater extracted from the Bunker Hill Basin, Riverside North, and Riverside South is conveyed to RPU's potable or non-potable distribution systems depending on the well location and local water quality. Raw groundwater from many of RPU's wells receives treatment prior to entering the potable distribution system. Figure 2-8 shows the raw water supply wells, conveyance lines, and treatment facilities.

RPU also has the ability to purchase imported State Water Project water from WMWD through a connection at the Metropolitan Water District of Southern California's (MWD) Henry J. Mills Treatment Plant (Mills WTP). Up to 30 cubic feet per second (cfs) or 19.4 million gallons per day (mgd) of imported water can be purchased from WMWD through an existing agreement. Treated imported water from the Mills WTP is conveyed directly to RPU's potable distribution system. Historically, imported water has only been purchased during the peak demand months, when needed.

[7] WMWD vs. ESBCWD, et al., Case No. 78426 (i.e. the Western-San Bernardino Judgment) describes the groundwater pumping rights in the Colton, Riverside, and San Bernardino Area and is administered by the two-person Western-San Bernardino Watermaster.

2.3.1.1 Wells

RPU has sixty-two active wells, forty-seven monitoring wells (water level and water quality), and about twenty-two non-active wells spread across the Bunker Hill Basin, Rialto-Colton Basin, Riverside North, Riverside South, and the Arlington Basin.

2.3.1.2 Treatment

RPU has five active regional water treatment plants (i.e. Tippecanoe, Raub, Sunnyside, John W. North, and Palmyrita) and two active local water treatment systems (i.e. Gage 46-1R and Gage 66-1). The treatment facilities located in the RPU service area consist of granular activated carbon (GAC), ion exchange (IX), ultrafiltration (UF), or a combination of IX followed by GAC.

Groundwater is chlorinated in the raw water supply portion of RPU's system (i.e. prior to it entering the potable distribution portion of the system).

2.3.1.3 Conveyance

Potable groundwater is conveyed south (i.e. down gradient) to the Linden Evans Reservoir prior to distribution. Many of RPU's wells are not located within its service area boundary, therefore large transmission pipelines (i.e. Waterman, Gage, and Palmyrita) are needed to convey water from the surrounding groundwater basins to its service area. The raw water pipelines vary in size, with the largest being 60-inches in diameter. About 45-percent of the system is fed by gravity and the remainder requires booster stations.

2.3.2 Potable Distribution

RPU's potable distribution system consists of approximately 940 miles of pipeline ranging from 2 to 72 inches in diameter, thirty-nine pressure zones, sixteen storage reservoirs with an approximate total volume of 108 million gallons (MG), twenty-two pressure reducing stations, and thirty-nine booster stations. Figure 2-9 shows RPU's potable distribution system. In 2010, RPU delivered about 58,601 acre-ft of potable water to its retail customers.

2.3.3 Non-Potable Distribution

RPU's non-potable distribution system consists of the Riverside Canal and the Olivewood Booster Station. Figure 2-10 shows RPU's non-potable distribution system. In 2010, RPU delivered about 9,802 acre-ft of non-potable water to its wholesale customers.

2.3.4 Recycled Water Distribution

RPU's recycled water distribution system consists of a small network of recycled water pipelines to direct users. Figure 2-11 shows RPU's recycled water distribution system. In 2010, RPU delivered about 260 acre-ft of tertiary treated recycled water its retail customers.

2.3.5 Conservation

In 1997, RPU signed the Memorandum of Understanding Regarding Urban Water Conservation in California (Urban MOU), which requires the implementation of 14 Best Management Practices (BMPs) for water conservation. As a signatory of the Urban MOU, RPU is required to report regularly on its implementation efforts with regards to each of the 14 BMPs. These reports are archived in an online BMP Reporting Database at the California Urban Water Conservation Council website and are publicly available.

Since 1997, RPU has been systematically implementing the water conservation BMPs outlined in the Urban MOU. Over the past few years, RPU has reduced the amount of unaccounted water (i.e.

BMP 3), performed residential and large landscape water surveys (BMP 1 and 5), and continues to offer rebates and direct install programs for ultra-low flush toilets and high-efficiency toilets. In 2010, RPU expanded its Residential Plumbing Retrofit Program (BMP 2) by launching a Precision Nozzle Replacement Pilot Program, which provides customers with free high-efficiency sprinkler head nozzles. The precision series spray nozzles have proven to provide up to 20-percent water savings per head without adjusting controllers or run times. Within just three weeks of launching the pilot, the City of Riverside and their partner agency, WMWD had depleted both agency's program budgets totaling, $100,000 due to overwhelming popularity. The pilot program resulted in an estimated lifetime water savings of about 930 acre-ft with just 2-percent participation from residential customers.

Other conservation programs such as the Waterwise Landscape and Artificial Turf Replacement Rebate Programs have resulted in the replacement of nearly 50,850 square-ft of existing lawn with water efficient, California friendly plants from 2009-2010. These and other rebate programs provide customers financial incentives to become more water efficient.

2.4 Planned Improvements

2.4.1 Potable Distribution

The *2010 Water Master Plan* provides RPU with an evaluation of its water system's ability to adequately and reliably distribute water under existing and future conditions through 2030. The evaluation specifically addresses issues that will arise from the reduction in future potable water demands due to RPU's aim to reduce per capita water use by at least 20-perecent by 2020. The report developed a tiered Capital Improvement Program (CIP) for the potable distribution system.

The CIP recommends adding about 42 MG of additional storage, 4 pump stations, a pressure reducing system, and adding or replacing about 23 miles of distribution pipeline over the next 20 years. In addition, the CIP recommends upgrading 4 existing pump stations and 1 pressure reducing system. A CIP for the raw water supply system was not included in this report. Figure 2-12 shows some of the planned improvements to water supply and potable distribution systems. A detailed discussion of the planned facilities improvements for the raw water supply and potable distribution systems are presented in Section 4.1.

2.4.2 Non-Potable Distribution

The *2009 Water Supply Plan* identifies a project that would replace deliveries of potable water from the Bunker Hill Basin with non-potable water from the Riverside Basin. The Upper Gage Exchange project would deliver non-potable water at the upper connection to the Gage Canal for use at UCR and the Canyon Crest Country Club Golf Course. This project will enable RPU to convey all of its production from the Bunker Hill Basin to the Linden Evans Reservoir for potable use.

The *2011 Recycled Water Facilities Plan* identifies a project that would replace deliveries of non-potable water from the Riverside Basin with recycled water from the RWQCP. The Arlington-Central Avenue Recycled Water Project would deliver recycled water to WMWD for direct use and recharge in the Arlington Basin.

Figure 2-13 shows the planned improvements to the non-potable distribution system. A detailed discussion of the planned facilities improvements for the non-potable distribution system is presented in Section 4.1.

2.4.3 Recycled Water Distribution

The 2010 Water Use Efficiency Master Plan analyzed the requirements of the Water Conservation Bill of 2009 and calculates the urban water use targets[8] for the RPU service area in 2015 and 2020. The plan recognizes the amount of recycled water reuse described in the *2009 Water Supply Plan* and evaluates the amount of additional water conservation needed to meet RPU's urban water use targets. The *2011 Recycled Water Facilities Plan* investigated the non-potable demands within the RPU service area, the amount of surplus recycled water available for reuse, and a potential groundwater augmentation project that incorporates recycled water. The proposed baseline alternative in the *2011 Recycled Water Facilities Plan* is consistent with amount of recycled water reuse described in the *2009 Water Supply Plan* (i.e. 10,000 acre-ft/yr). The Facilities Plan evaluates additional reuse alternatives that would use up to 20,000 acre-ft/yr of recycled water and describes the recycled water distribution facilities needed for each of the reuse alternatives. The Facilities Plan developed a Capital Improvement Program (CIP) for the recycled water distribution system. Figure 2-14 shows the proposed recycled water distribution facilities and reuse areas. A detailed discussion of the planned facilities improvements for the recycled water distribution system is presented in Section 4.2.

2.4.4 Conservation

The *2010 Water Use Efficiency Master Plan* evaluates RPU's existing conservation program and develops a Water Use Efficiency Program that identifies additional water conservation measures. The program presents monitoring, information and technical support, incentives, policy, and other conservation recommendations for the residential, large landscape, and commercial sectors in the RPU service area. Included in the Water Use Efficiency Program under incentives, are such programs as the Precision Sprinkler Nozzle Water Use Efficiency Program. This popular program is anticipated to achieve a lifetime water savings in excess of 5,000 acre-feet through an advanced sprinkler-nozzle retrofit rebate.

[8] Urban water use targets establish the annual total production goals for compliance years 2015 and 2020, based on reduced per capita water use as required by the Water Conservation Bill of 2009.

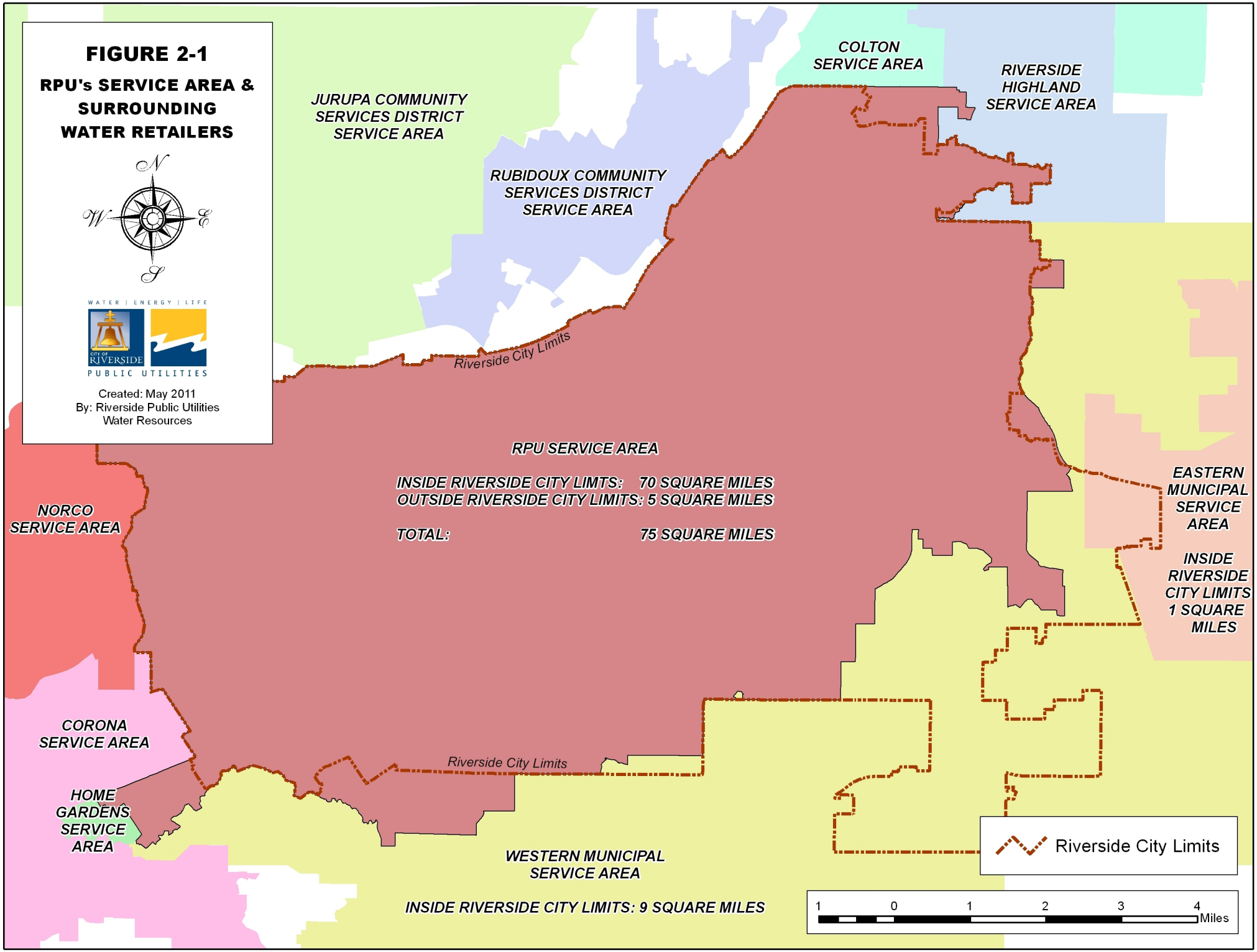


FIGURE 2-1
RPU's SERVICE AREA & SURROUNDING WATER RETAILERS
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
JURUPA COMMUNITY SERVICES DISTRICT SERVICE AREA
RUBIDOUX COMMUNITY SERVICES DISTRICT SERVICE AREA
COLTON SERVICE AREA
RIVERSIDE HIGHLAND SERVICE AREA
Riverside City Limits
RPU SERVICE AREA
INSIDE RIVERSIDE CITY LIMTS: 70 SQUARE MILES
OUTSIDE RIVERSIDE CITY LIMITS: 5 SQUARE MILES
TOTAL: 75 SQUARE MILES
NORCO SERVICE AREA
EASTERN MUNICIPAL SERVICE AREA
INSIDE RIVERSIDE CITY LIMITS 1 SQUARE MILES
CORONA SERVICE AREA
Riverside City Limits
HOME GARDENS SERVICE AREA
WESTERN MUNICIPAL SERVICE AREA
INSIDE RIVERSIDE CITY LIMITS: 9 SQUARE MILES
Riverside City Limits
1 0 1 2 3 4 Miles

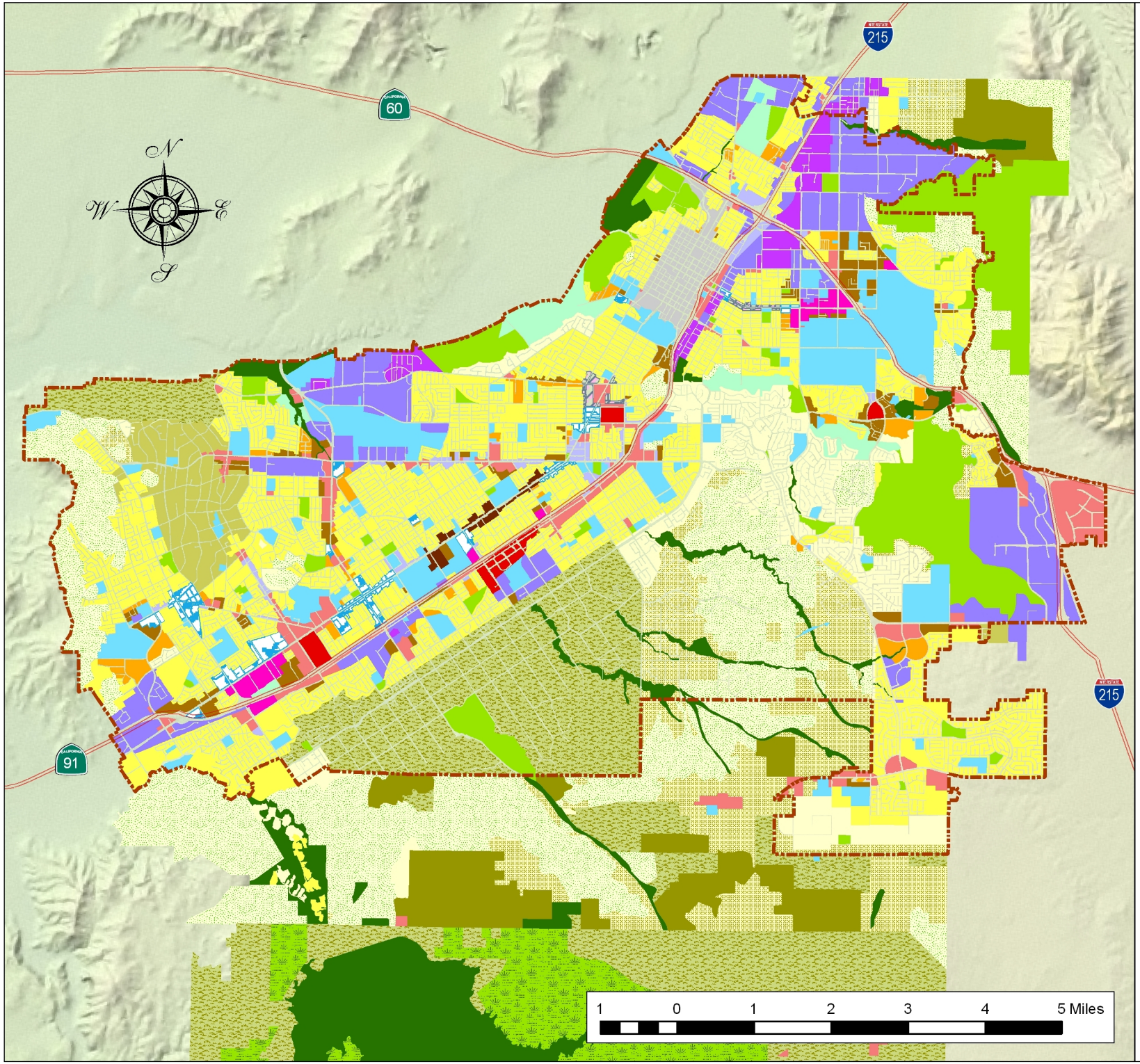


FIGURE 2-2

CITY OF RIVERSIDE's LAND USE POLICY MAP

WATER | ENERGY | LIFE

CITY OF RIVERSIDE PUBLIC UTILITIES

Created: May 2011
By: Riverside Public Utilities
Water Resources

Riverside City Limits

General Plan 2025

Draft Land Use Element

- A - Agricultural
- A/RR - Agricultural/Rural Residential
- B/OP - Business/Office Park
- C - Commercial
- CRC - Commercial Regional Center
- DSP - Downtown Specific Plan
- HDR - High Density Residential
- HR - Hillside Residential
- I - Industrial
- LDR - Low Density Residential
- MDR - Medium density Residential
- MHDR - Medium High density Residential
- MU-N - Mixed Use - Neighborhood
- MU-U - Mixed Use - Urban
- MU-V - Mixed Use - Village
- O - Office
- OS - Open Space/Natural Resources
- OSP - Orangecrest Specific Plan
- P - Public Park
- PF - Public facilities/Institutional
- PR - Private Recreation
- RAT - Kangaroo Rat Habitat
- SRR - Semi Rural Residential
- VHDR - Very High Density Residential
- VLDR - Very Low Density Residential

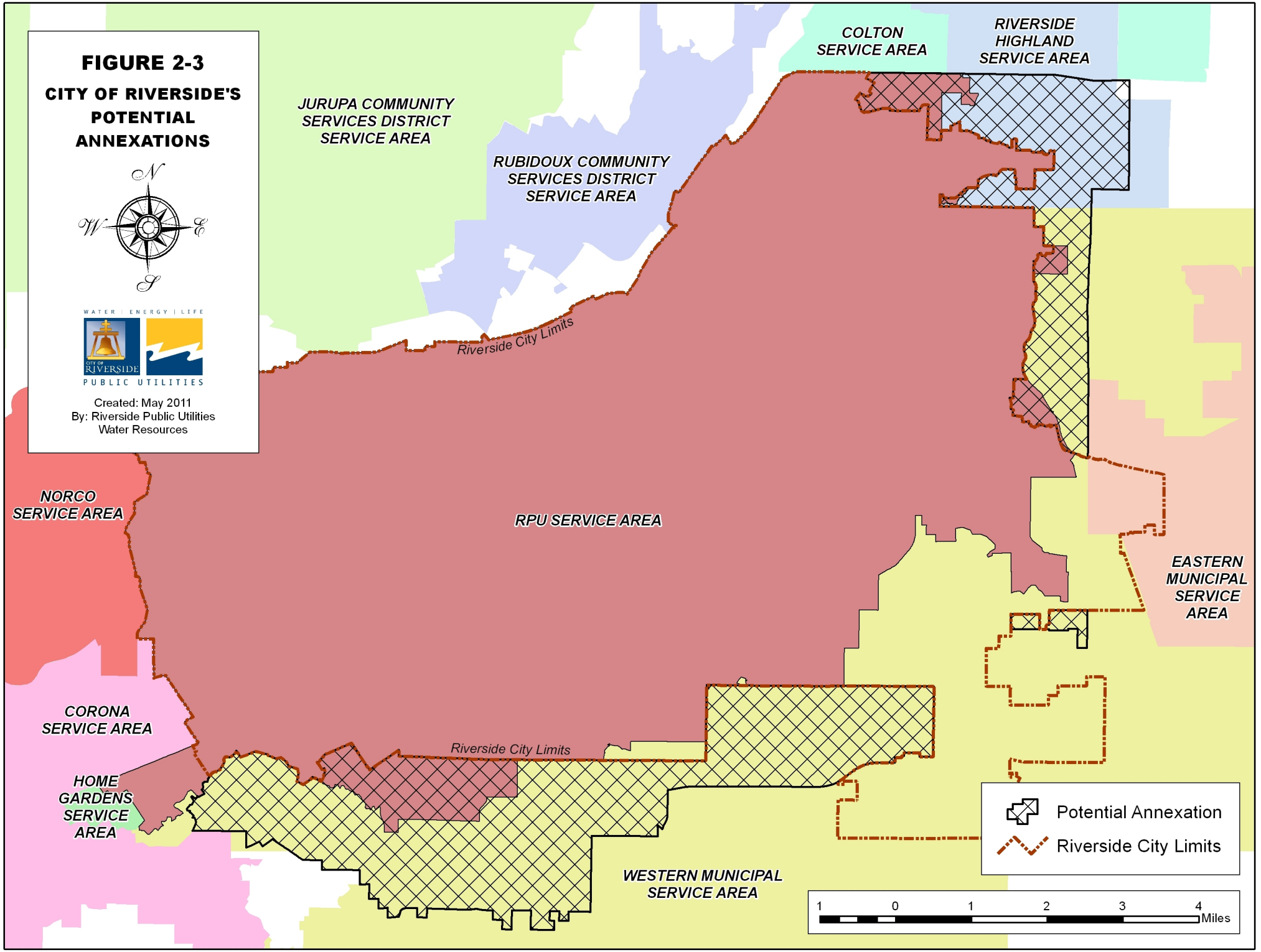


FIGURE 2-3
CITY OF RIVERSIDE'S POTENTIAL ANNEXATIONS
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
JURUPA COMMUNITY SERVICES DISTRICT SERVICE AREA
RUBIDOUX COMMUNITY SERVICES DISTRICT SERVICE AREA
COLTON SERVICE AREA
RIVERSIDE HIGHLAND SERVICE AREA
Riverside City Limits
NORCO SERVICE AREA
RPU SERVICE AREA
EASTERN MUNICIPAL SERVICE AREA
CORONA SERVICE AREA
Riverside City Limits
HOME GARDENS SERVICE AREA
WESTERN MUNICIPAL SERVICE AREA
Potential Annexation
Riverside City Limits
1 0 1 2 3 4 Miles

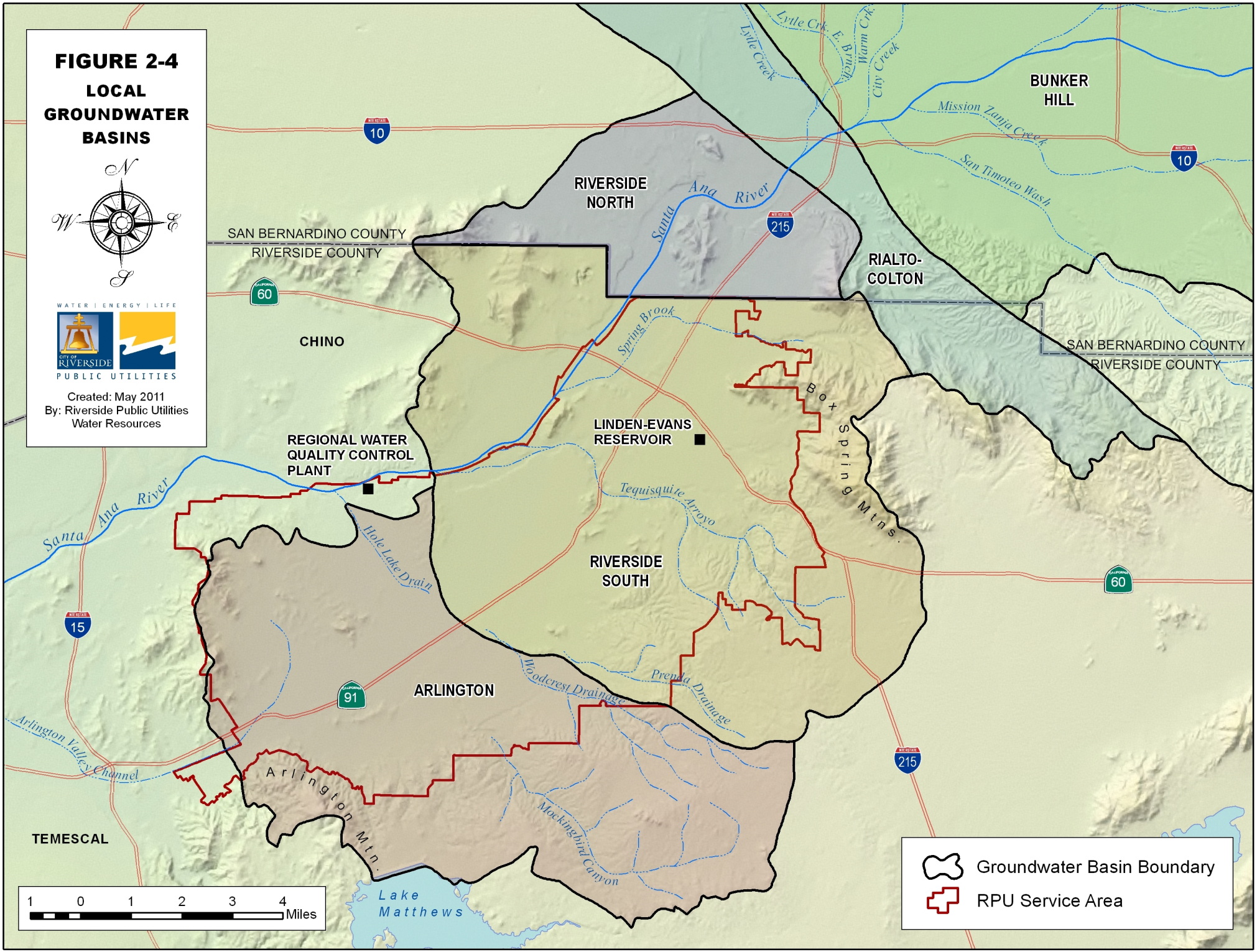


FIGURE 2-4
LOCAL GROUNDWATER BASINS
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
BUNKER HILL
RIVERSIDE NORTH
RIALTO-COLTON
CHINO
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
REGIONAL WATER QUALITY CONTROL PLANT
LINDEN-EVANS RESERVOIR
RIVERSIDE SOUTH
ARLINGTON
TEMESCAL
Lake Matthews
Box Spring Mtns.
Arlington Mtn.
Santa Ana River
Lytle Creek
Lytle Crk.
E. Blvd.
Warm Crk.
City Creek
Mission Zanja Creek
San Timoteo Wash
Spring Brook
Tequisquite Arroyo
Hole Lake Drain
Hoodcrest Drainage
Prenda Drainage
Mockingbird Canyon
Arlington Valley Channel
10
215
60
15
91
1 0 1 2 3 4 Miles
Groundwater Basin Boundary
RPU Service Area

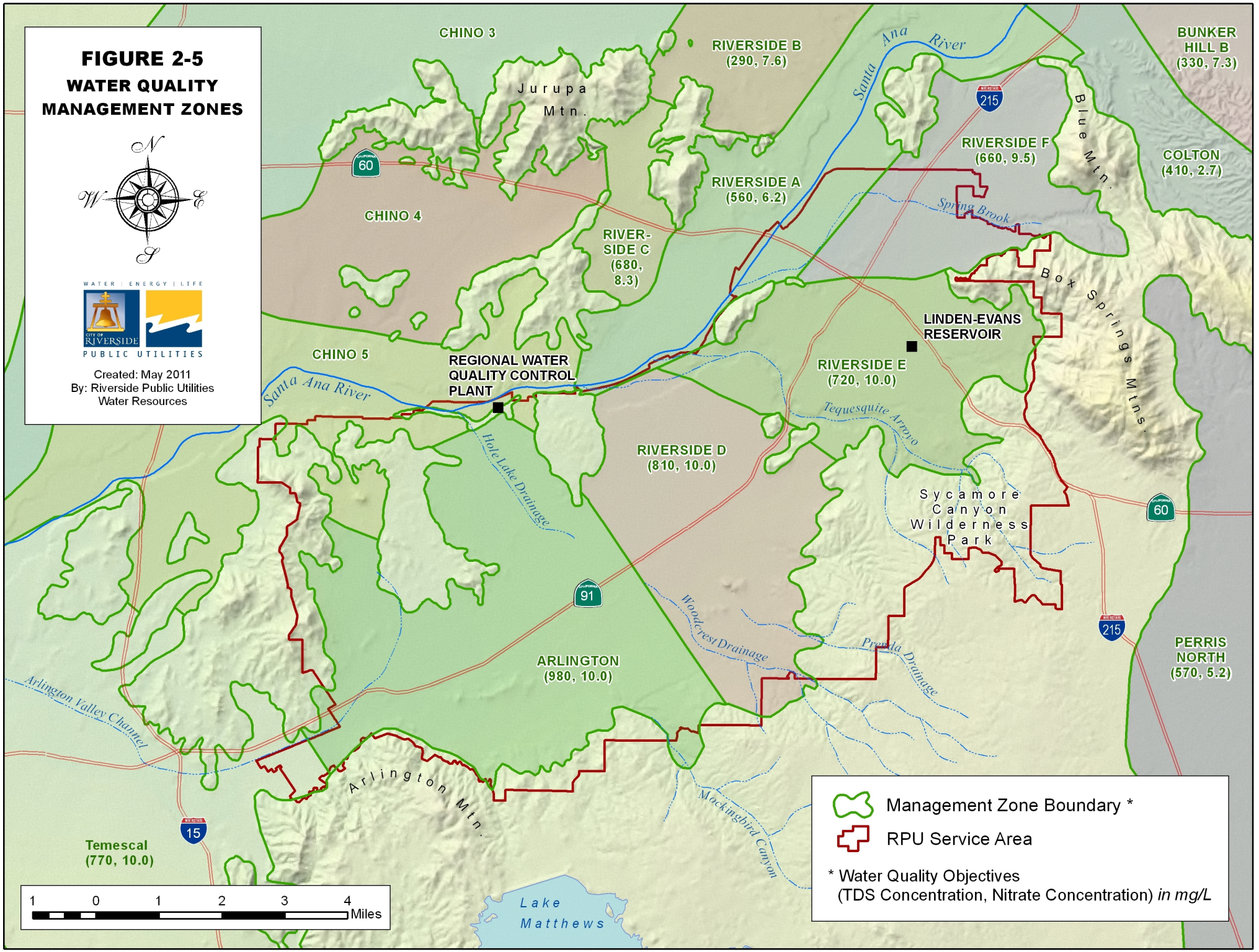


FIGURE 2-5
WATER QUALITY MANAGEMENT ZONES
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
CHINO 3
Jurupa Mtn.
RIVERSIDE B (290, 7.6)
Santa Ana River
BUNKER HILL B (330, 7.3)
Blue Mtn.
RIVERSIDE F (660, 9.5)
COLTON (410, 2.7)
RIVERSIDE A (560, 6.2)
Spring Brook
CHINO 4
RIVER-SIDE C (680, 8.3)
Box Springs Mtns.
LINDEN-EVANS RESERVOIR
CHINO 5
REGIONAL WATER QUALITY CONTROL PLANT
RIVERSIDE E (720, 10.0)
Santa Ana River
Tequesquite Arroyo
Hole Lake Drainage
RIVERSIDE D (810, 10.0)
Sycamore Canyon Wilderness Park
Woodcrest Drainage
Prenda Drainage
ARLINGTON (980, 10.0)
PERRIS NORTH (570, 5.2)
Arlington Valley Channel
Arlington Mtn.
Mockingbird Canyon
Temescal (770, 10.0)
Lake Matthews
60
91
215
15
1 0 1 2 3 4 Miles
Management Zone Boundary *
RPU Service Area
* Water Quality Objectives
(TDS Concentration, Nitrate Concentration) in mg/L

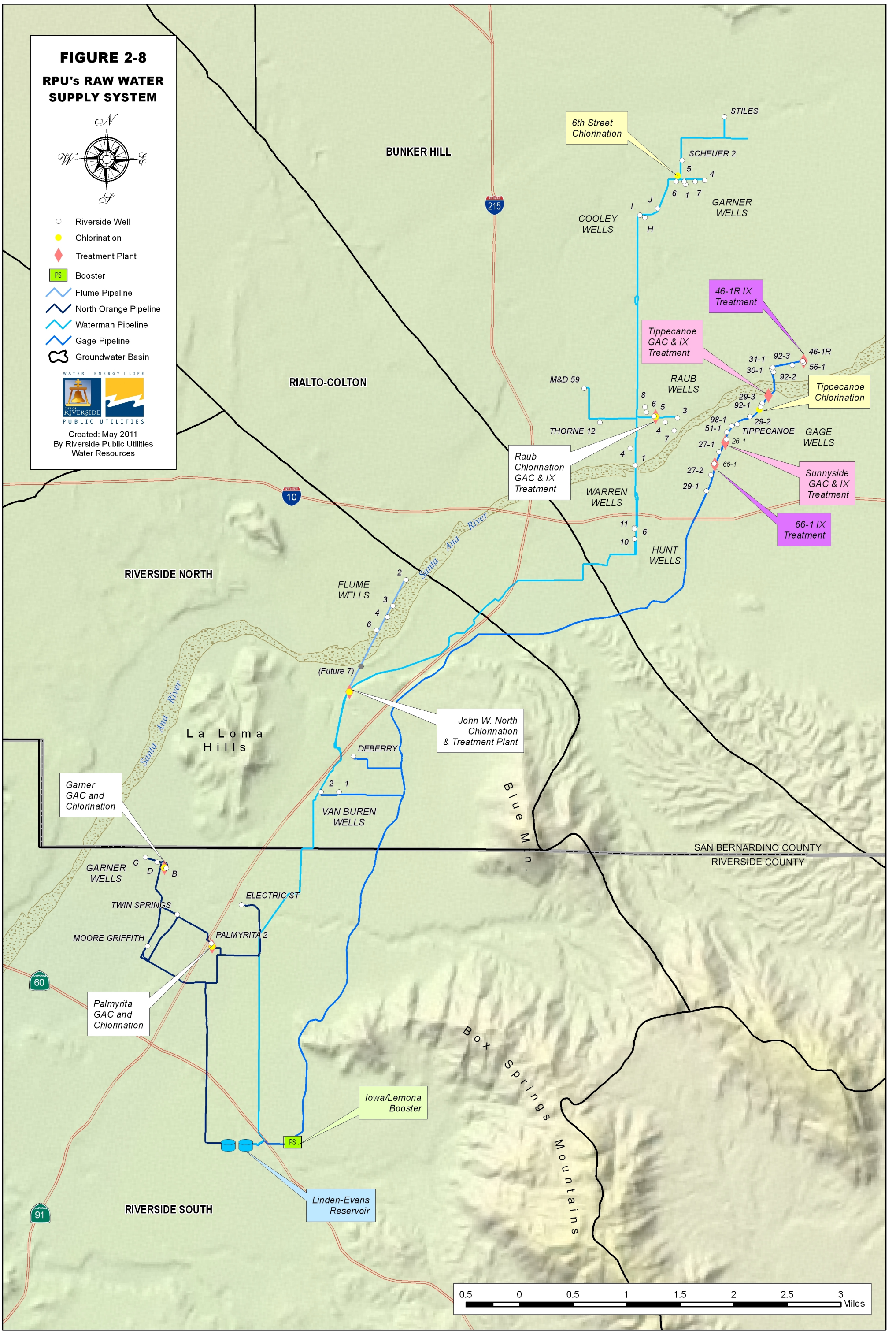


FIGURE 2-8
RPU's RAW WATER SUPPLY SYSTEM
Riverside Well
Chlorination
Treatment Plant
Booster
Flume Pipeline
North Orange Pipeline
Waterman Pipeline
Gage Pipeline
Groundwater Basin
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By Riverside Public Utilities
Water Resources
BUNKER HILL
RIALTO-COLTON
RIVERSIDE NORTH
RIVERSIDE SOUTH
La Loma Hills
Blue Mtn.
Box Springs Mountains
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
Santa Ana River
215
10
60
91
STILES
SCHEUER 2
6th Street Chlorination
GARNER WELLS
COOLEY WELLS
RAUB WELLS
M&D 59
THORNE 12
Raub Chlorination GAC & IX Treatment
46-1R IX Treatment
Tippecanoe GAC & IX Treatment
Tippecanoe Chlorination
TIPPECANOE
GAGE WELLS
Sunnyside GAC & IX Treatment
66-1 IX Treatment
WARREN WELLS
HUNT WELLS
FLUME WELLS
(Future 7)
John W. North Chlorination & Treatment Plant
DEBERRY
VAN BUREN WELLS
Garner GAC and Chlorination
GARNER WELLS
TWIN SPRINGS
MOORE GRIFFITH
ELECTRIC ST
PALMYRITA 2
Palmyrita GAC and Chlorination
Iowa/Lemona Booster
Linden-Evans Reservoir
0.5 0 0.5 1 1.5 2 2.5 3 Miles

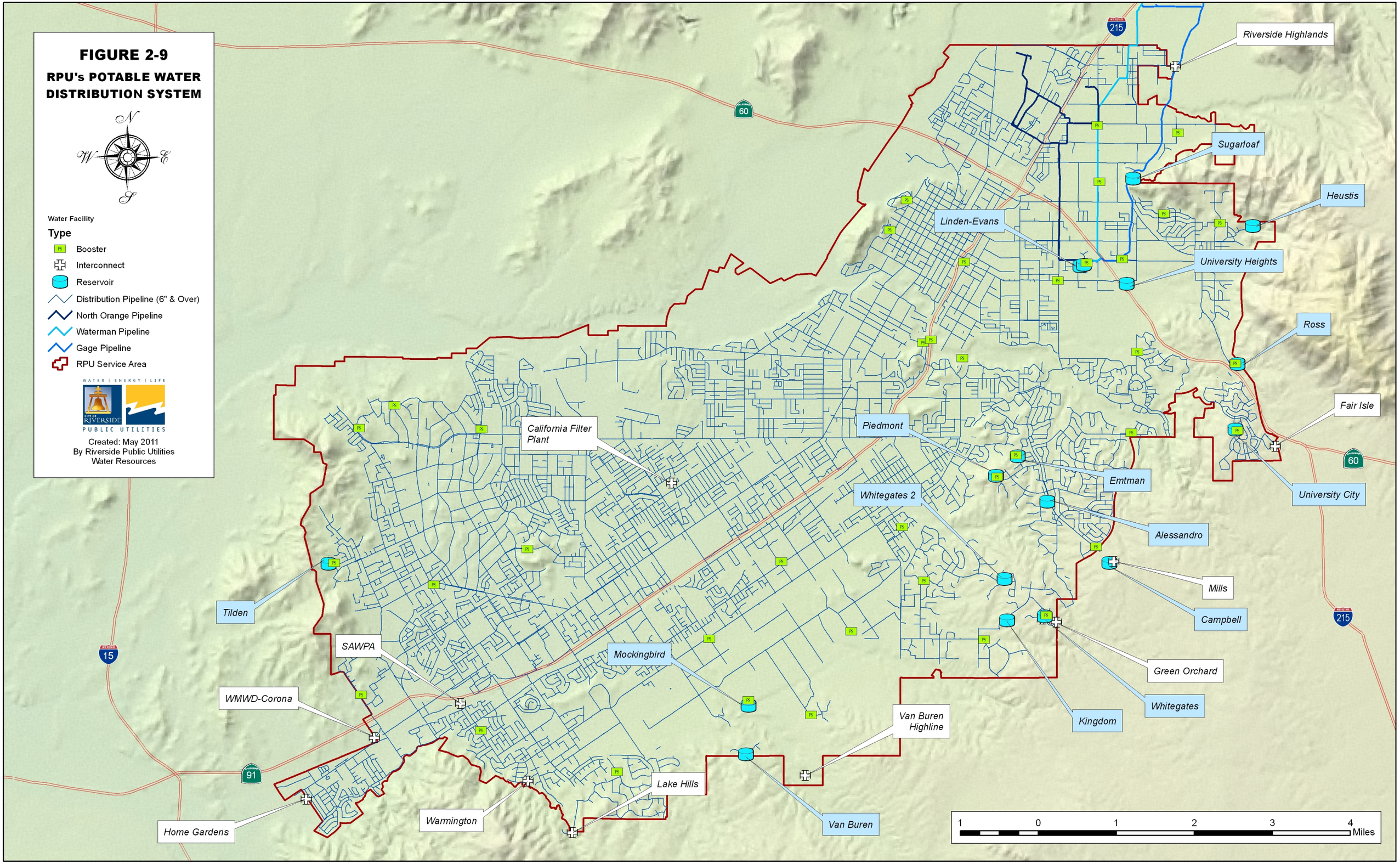
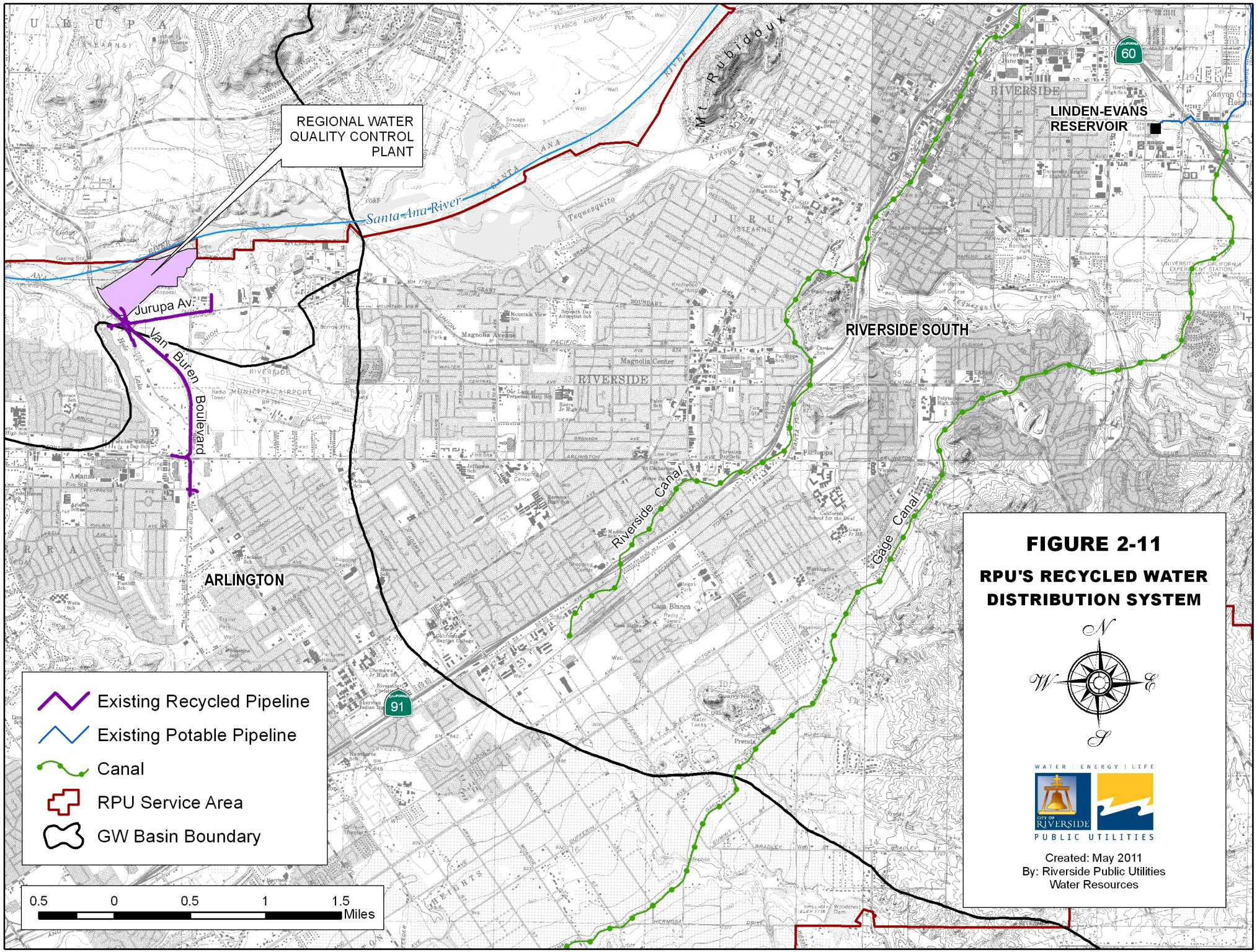


FIGURE 2-9
RPU's POTABLE WATER DISTRIBUTION SYSTEM
N
W
E
S
Water Facility
Type
Booster
Interconnect
Reservoir
Distribution Pipeline (6" & Over)
North Orange Pipeline
Waterman Pipeline
Gage Pipeline
RPU Service Area
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By Riverside Public Utilities
Water Resources
Riverside Highlands
Sugarloaf
Heustis
Linden-Evans
University Heights
Ross
Fair Isle
California Filter Plant
Piedmont
Emtman
University City
Whitegates 2
Alessandro
Mills
Campbell
Tilden
SAWPA
Mockingbird
Green Orchard
Whitegates
Kingdom
WMWD-Corona
Van Buren Highline
Lake Hills
Warmington
Van Buren
Home Gardens
215
60
15
91
1 0 1 2 3 4 Miles

FIGURE 2-10
RPU'S NON-POTABLE WATER DISTRIBUTION SYSTEM
N
W
E
S
PS Booster
Existing Potable Pipeline
Existing Non-Potable Pipeline
Canal
GW Basin Boundary
RIALTO-COLTON
BUNKER HILL
RIVERSIDE NORTH
La Loma Hills
SAN BERNARDINO CNTY.
RIVERSIDE CNTY.
Santa Ana River
Box Springs Mountain
Olivewood Booster
LINDEN-EVANS RESERVOIR
REGIONAL WATER QUALITY CONTROL PLANT
Gage Canal
Riverside Canal
RIVERSIDE SOUTH
ARLINGTON
10
215
60
91
WATER | ENERGY LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By Riverside Public Utilities
Water Resources
1 0 1 2 3 4 Miles


REGIONAL WATER QUALITY CONTROL PLANT
Santa Ana River
Jurupa Av.
Van Buren Boulevard
ARLINGTON
RIVERSIDE
RIVERSIDE SOUTH
LINDEN-EVANS RESERVOIR
Riverside Canal
Gage Canal
Existing Recycled Pipeline
Existing Potable Pipeline
Canal
RPU Service Area
GW Basin Boundary
0.5 0 0.5 1 1.5 Miles
FIGURE 2-11
RPU'S RECYCLED WATER DISTRIBUTION SYSTEM
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources

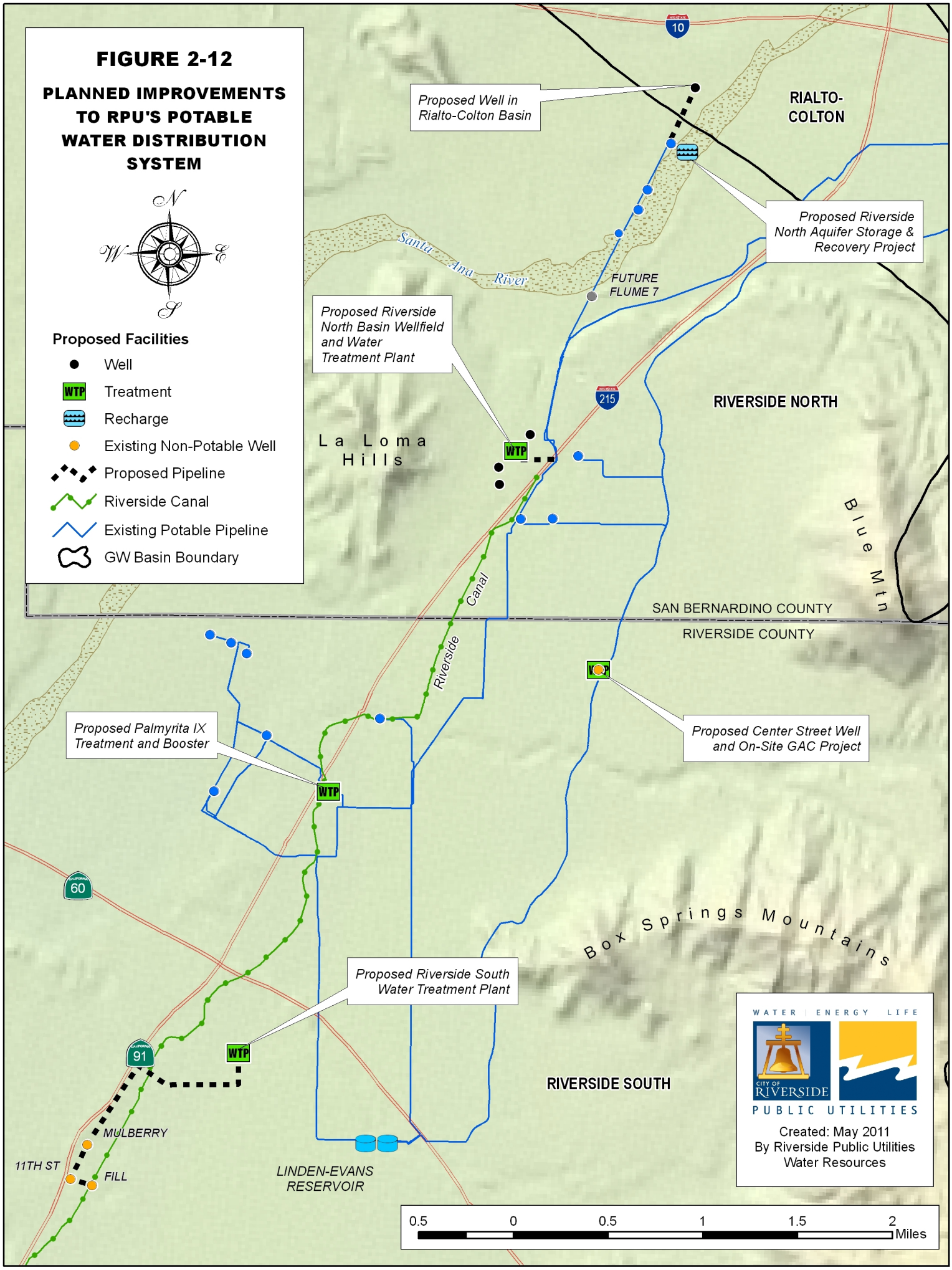


FIGURE 2-12
PLANNED IMPROVEMENTS TO RPU'S POTABLE WATER DISTRIBUTION SYSTEM
N
W
E
S
Proposed Facilities
Well
Treatment
Recharge
Existing Non-Potable Well
Proposed Pipeline
Riverside Canal
Existing Potable Pipeline
GW Basin Boundary
Proposed Well in Rialto-Colton Basin
RIALTO-COLTON
Proposed Riverside North Aquifer Storage & Recovery Project
Santa Ana River
FUTURE FLUME 7
Proposed Riverside North Basin Wellfield and Water Treatment Plant
RIVERSIDE NORTH
La Loma Hills
WTP
Blue Mtn
Riverside Canal
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
Proposed Center Street Well and On-Site GAC Project
Proposed Palmyrita IX Treatment and Booster
Box Springs Mountains
Proposed Riverside South Water Treatment Plant
RIVERSIDE SOUTH
MULBERRY
11TH ST
FILL
LINDEN-EVANS RESERVOIR
10
215
60
91
WATER | ENERGY LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By Riverside Public Utilities
Water Resources
0.5 0 0.5 1 1.5 2
Miles

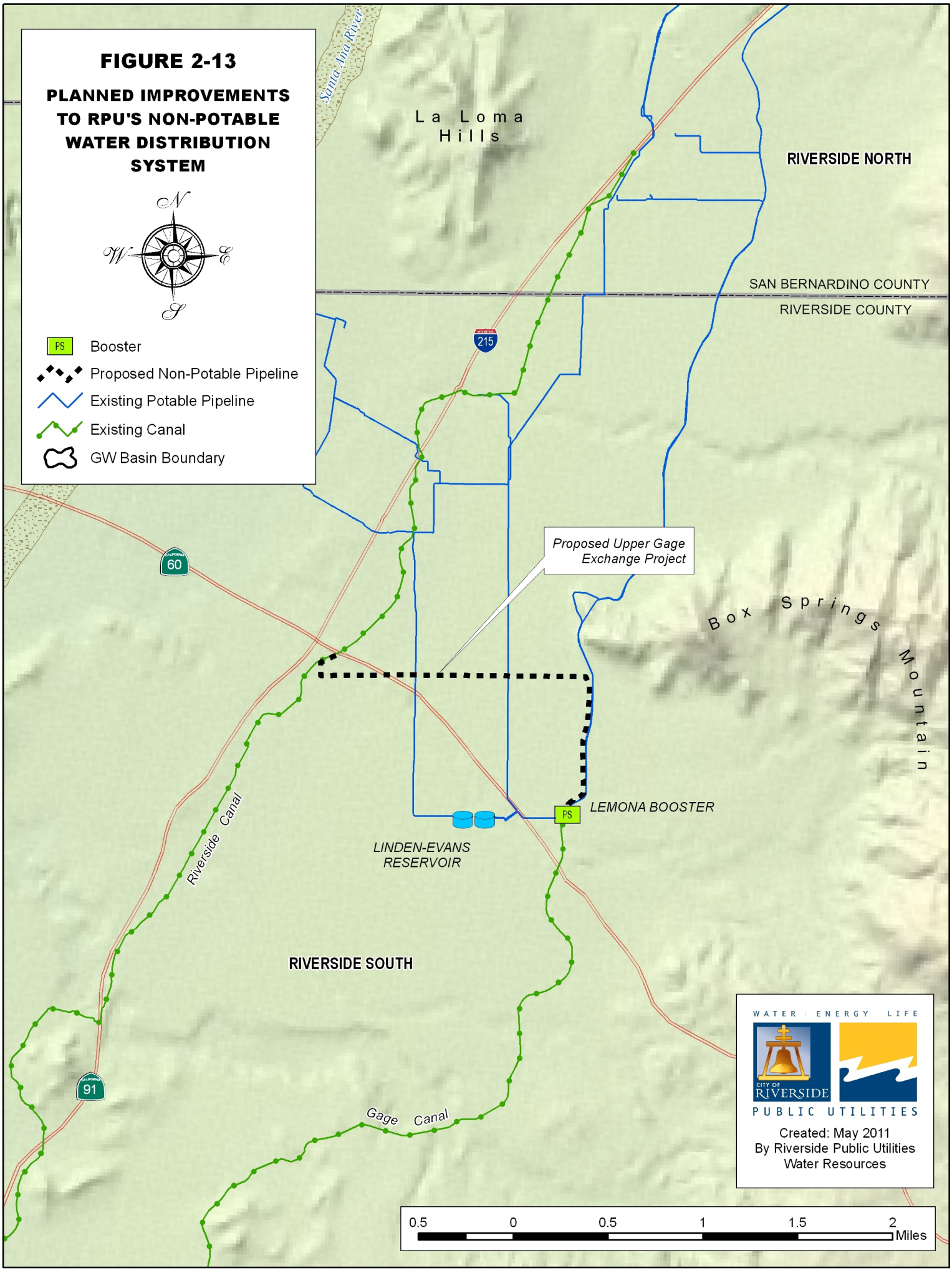


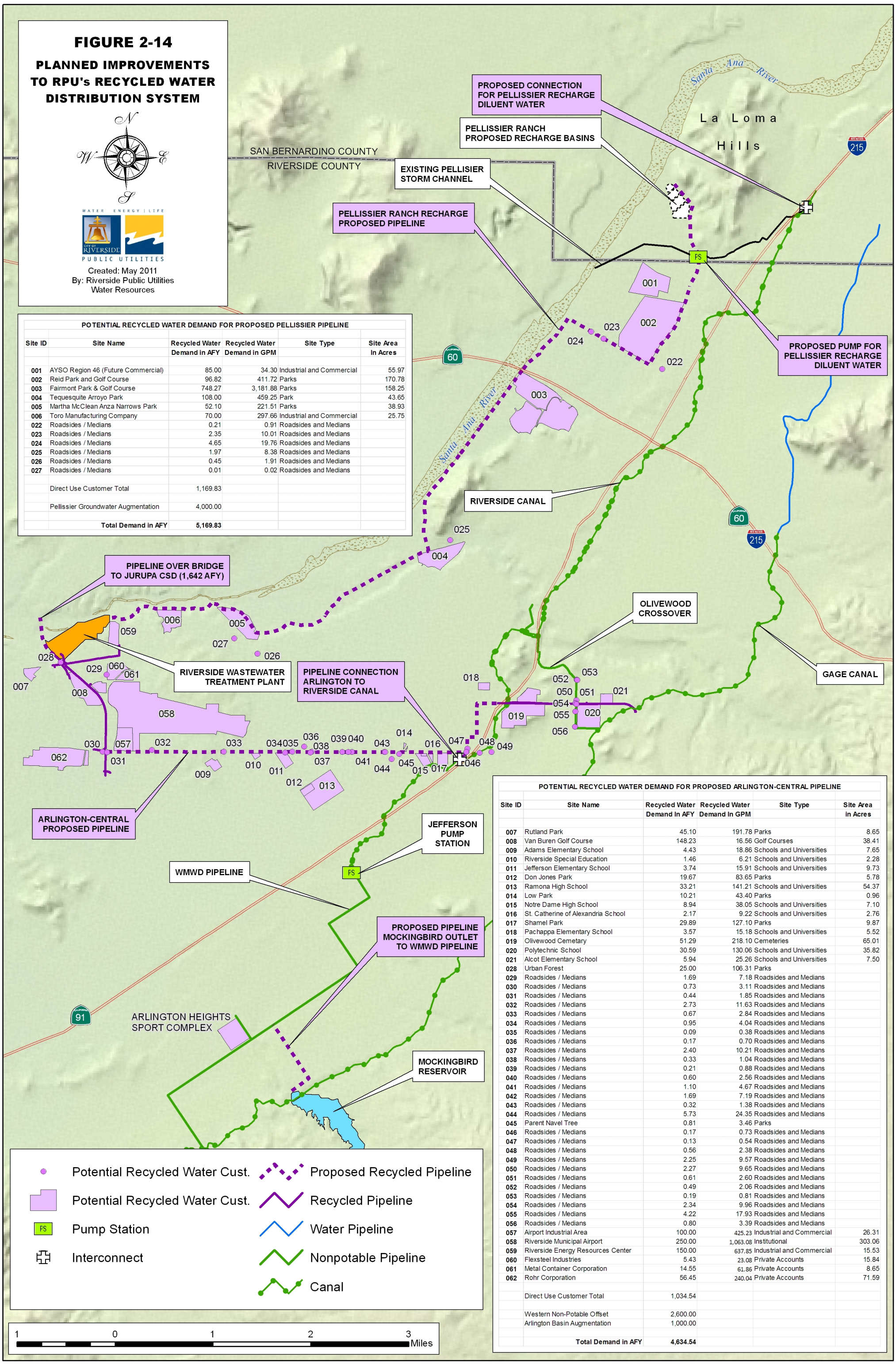
FIGURE 2-13
PLANNED IMPROVEMENTS TO RPU'S NON-POTABLE WATER DISTRIBUTION SYSTEM
N
W
E
S
FS Booster
Proposed Non-Potable Pipeline
Existing Potable Pipeline
Existing Canal
GW Basin Boundary
Santa Ana River
La Loma Hills
RIVERSIDE NORTH
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
215
60
Proposed Upper Gage Exchange Project
Box Springs Mountain
LEMONA BOOSTER
PS
LINDEN-EVANS RESERVOIR
Riverside Canal
RIVERSIDE SOUTH
91
Gage Canal
WATER | ENERGY LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By Riverside Public Utilities
Water Resources
0.5 0 0.5 1 1.5 2
Miles

FIGURE 2-14

PLANNED IMPROVEMENTS TO RPU's RECYCLED WATER DISTRIBUTION SYSTEM

WATER ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES

Created: May 2011
By: Riverside Public Utilities
Water Resources



POTENTIAL RECYCLED WATER DEMAND FOR PROPOSED PELLISSIER PIPELINE

Site ID	Site Name	Recycled Water Demand in AFY	Recycled Water Demand in GPM	Site Type	Site Area in Acres
001	AYSO Region 46 (Future Commercial)	85.00	34.30	Industrial and Commercial	55.97
002	Reid Park and Golf Course	96.82	411.72	Parks	170.78
003	Fairmont Park & Golf Course	748.27	3,181.88	Parks	158.25
004	Tequesquite Arroyo Park	108.00	459.25	Park	43.65
005	Martha McClean Anza Narrows Park	52.10	221.51	Parks	38.93
006	Toro Manufacturing Company	70.00	297.66	Industrial and Commercial	25.75
022	Roadsides / Medians	0.21	0.91	Roadsides and Medians	
023	Roadsides / Medians	2.35	10.01	Roadsides and Medians	
024	Roadsides / Medians	4.65	19.76	Roadsides and Medians	
025	Roadsides / Medians	1.97	8.38	Roadsides and Medians	
026	Roadsides / Medians	0.45	1.91	Roadsides and Medians	
027	Roadsides / Medians	0.01	0.02	Roadsides and Medians	
	Direct Use Customer Total	1,169.83			
	Pellissier Groundwater Augmentation	4,000.00			
	Total Demand in AFY	**5,169.83**			

POTENTIAL RECYCLED WATER DEMAND FOR PROPOSED ARLINGTON-CENTRAL PIPELINE

Site ID	Site Name	Recycled Water Demand In AFY	Recycled Water Demand In GPM	Site Type	Site Area in Acres
007	Rutland Park	45.10	191.78	Parks	8.65
008	Van Buren Golf Course	148.23	16.56	Golf Courses	38.41
009	Adams Elementary School	4.43	18.86	Schools and Universities	7.65
010	Riverside Special Education	1.46	6.21	Schools and Universities	2.28
011	Jefferson Elementary School	3.74	15.91	Schools and Universities	9.73
012	Don Jones Park	19.67	83.65	Parks	5.78
013	Ramona High School	33.21	141.21	Schools and Universities	54.37
014	Low Park	10.21	43.40	Parks	0.96
015	Notre Dame High School	8.94	38.05	Schools and Universities	7.10
016	St. Catherine of Alexandria School	2.17	9.22	Schools and Universities	2.76
017	Shamel Park	29.89	127.10	Parks	9.87
018	Pachappa Elementary School	3.57	15.18	Schools and Universities	5.52
019	Olivewood Cemetary	51.29	218.10	Cemeteries	65.01
020	Polytechnic School	30.59	130.06	Schools and Universities	35.82
021	Alcot Elementary School	5.94	25.26	Schools and Universities	7.50
028	Urban Forest	25.00	106.31	Parks	
029	Roadsides / Medians	1.69	7.18	Roadsides and Medians	
030	Roadsides / Medians	0.73	3.11	Roadsides and Medians	
031	Roadsides / Medians	0.44	1.85	Roadsides and Medians	
032	Roadsides / Medians	2.73	11.63	Roadsides and Medians	
033	Roadsides / Medians	0.67	2.84	Roadsides and Medians	
034	Roadsides / Medians	0.95	4.04	Roadsides and Medians	
035	Roadsides / Medians	0.09	0.38	Roadsides and Medians	
036	Roadsides / Medians	0.17	0.70	Roadsides and Medians	
037	Roadsides / Medians	2.40	10.21	Roadsides and Medians	
038	Roadsides / Medians	0.33	1.04	Roadsides and Medians	
039	Roadsides / Medians	0.21	0.88	Roadsides and Medians	
040	Roadsides / Medians	0.60	2.56	Roadsides and Medians	
041	Roadsides / Medians	1.10	4.67	Roadsides and Medians	
042	Roadsides / Medians	1.69	7.19	Roadsides and Medians	
043	Roadsides / Medians	0.32	1.38	Roadsides and Medians	
044	Roadsides / Medians	5.73	24.35	Roadsides and Medians	
045	Parent Navel Tree	0.81	3.46	Parks	
046	Roadsides / Medians	0.17	0.73	Roadsides and Medians	
047	Roadsides / Medians	0.13	0.54	Roadsides and Medians	
048	Roadsides / Medians	0.56	2.38	Roadsides and Medians	
049	Roadsides / Medians	2.25	9.57	Roadsides and Medians	
050	Roadsides / Medians	2.27	9.65	Roadsides and Medians	
051	Roadsides / Medians	0.61	2.60	Roadsides and Medians	
052	Roadsides / Medians	0.49	2.06	Roadsides and Medians	
053	Roadsides / Medians	0.19	0.81	Roadsides and Medians	
054	Roadsides / Medians	2.34	9.96	Roadsides and Medians	
055	Roadsides / Medians	4.22	17.93	Roadsides and Medians	
056	Roadsides / Medians	0.80	3.39	Roadsides and Medians	
057	Airport Industrial Area	100.00	425.23	Industrial and Commercial	26.31
058	Riverside Municipal Airport	250.00	1,063.08	Institutional	303.06
059	Riverside Energy Resources Center	150.00	637.85	Industrial and Commercial	15.53
060	Flexsteel Industries	5.43	23.08	Private Accounts	15.84
061	Metal Container Corporation	14.55	61.86	Private Accounts	8.65
062	Rohr Corporation	56.45	240.04	Private Accounts	71.59
	Direct Use Customer Total	1,034.54			
	Western Non-Potable Offset	2,600.00			
	Arlington Basin Augmentation	1,000.00			
	Total Demand in AFY	**4,634.54**			

SECTION 3 – WATER DEMANDS

RPU supplies water to retail and wholesale customers, exchanges water with the GCC, and delivers water owned by WMWD to WMWD. RPU's retail customers are described in Section 2.2. RPU wholesales potable water to the HGCWD and non-potable water to WMWD.

Through an existing agreement, RPU exchanges water with GCC. The City of Riverside owns about 60-percent of the shares (i.e. 8,474 shares of the 14,055) of the GCC and all of its facilities (i.e. wells, pipelines, canals, and reservoirs). Per the agreement, GCC staff operates the facilities associated with the Gage Canal. GCC receives all of its water supply from RPU owned wells and serves water to its agricultural customers via the Gage Canal. The GCC service area is completely within the RPU service area. For the purposes of this report, GCC is treated as a wholesale customer because the "exchange" that occurs between RPU and GCC is actually a water rights exchange and the production reported by RPU in Section 4 of this plan accounts for water served to both RPU's retail customers and water delivered to the Gage Canal.

WMWD has water stored in the Bunker Hill Bain. Through an existing agreement, RPU extracts and delivers groundwater from the Bunker Hill Basin to WMWD via its potable distribution system. RPU wheels water to WMWD but does not typically sell potable water to them except during emergency situations. However, RPU does sell non-potable water to WMWD via the Riverside Canal.

RPU's potable distribution system delivers water (i.e. groundwater and imported water) to retail customers, the Gage Canal, HGCWD, and WMWD. RPU's non-potable distribution system delivers groundwater to the Gage Canal and WMWD. RPU's recycled water distribution system delivers recycled water to a small number of retail customers. All of RPU's customers are metered.

Water loss within the distribution systems (i.e. system losses or unaccounted for water), though not explicitly a demand, is described in this section of the report. Water deliveries plus unaccounted for water equals water supply.

3.1 Historical Water Demands

Historical water demands on RPU's distribution systems can be divided into two parts: retail water use in the RPU service area and deliveries to other water retailers. The 16-year period from 1995 to 2010 was evaluated to determine the base daily per capita water use within the RPU service area.

3.1.1 Retail Water Use within the RPU Service Area

Over the period of 1995 to 2010, retail water use fluctuated between about 56,600 to 71,500 acre-ft/yr. Over the past five years, the average annual water use was about 66,300 acre-ft. Figure 3-1 shows the historical retail water use in the RPU service area by customer class.

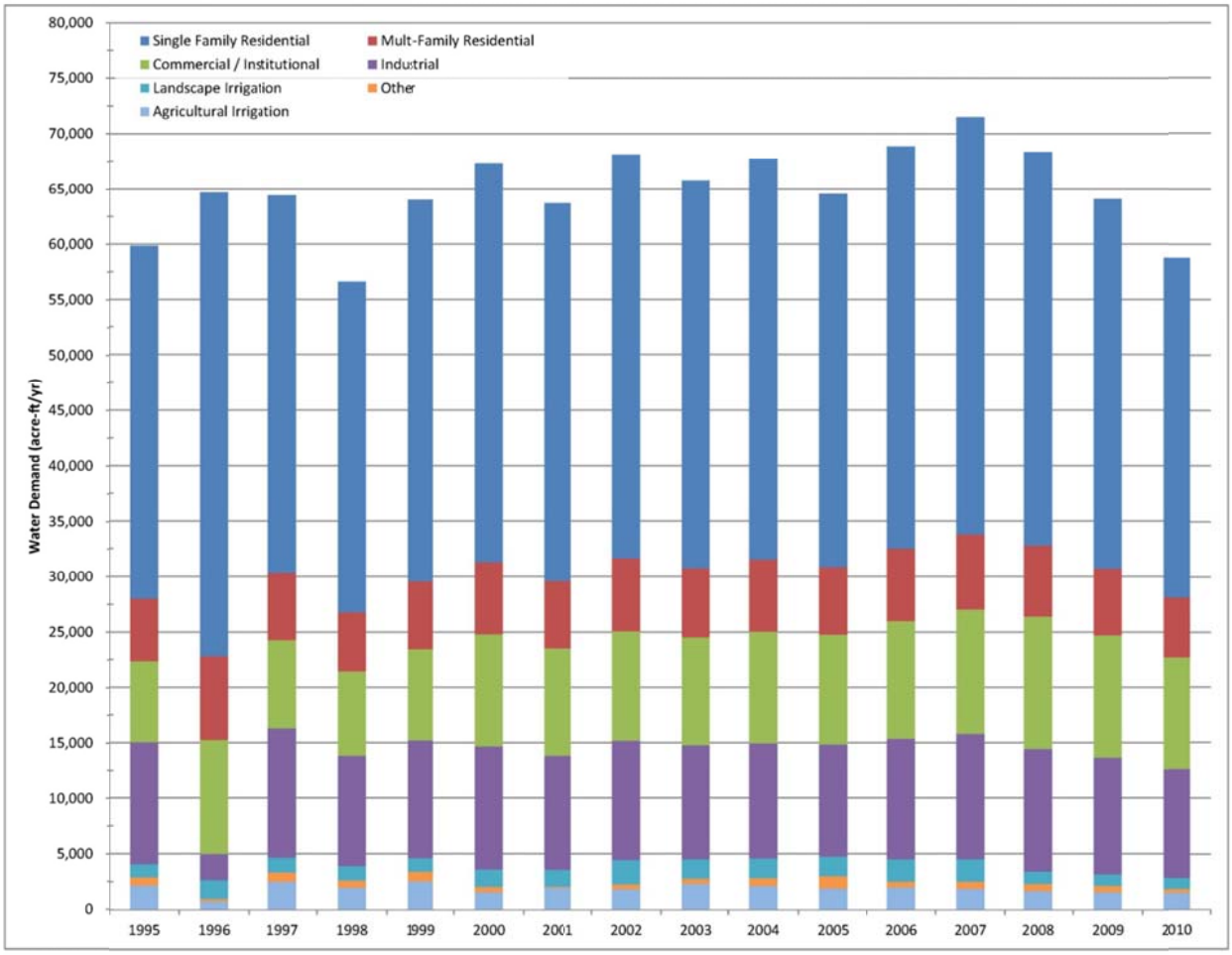
RPU's retail customer accounts are as follows: residential (i.e. single family and multi-family), commercial, industrial, dedicated irrigation, City irrigation, and UCR. Annually, the data from RPU's accounting system is converted to the customer classes described in DWR's Public Water System Statistics worksheet. Generally, the conversion is as follows:

- residential accounts are included in the single family residential customer class;
- commercial and the UCR accounts are included in the commercial / institutional customer class;
- industrial accounts are included in the industrial customer class;

- non-agricultural dedicated irrigation and the City irrigation accounts are included in the landscape irrigation customer class;
- temporary meters and miscellaneous accounts are included in the other customer class;
- and, agricultural dedicated irrigation accounts are included in the agricultural irrigation customer class.

The historical water use and delivery data used in this report is from RPU's accounting system (i.e. billing records).

Figure 3-1: Historical Retail Water Use in the RPU Service Area



RPU evaluated the number of residential accounts, residential population density, service area population, and water use according to billing records for the period of 2003 to 2008 to characterize its residential accounts. RPU estimates that the residential accounts are composed of about 97.8-percent single family residential accounts and 2.2-percent multi-family residential accounts; and that water use was about 84.8 and 15.2-percent, respectively. The average water consumption of single and multi-family residential accounts was calculated to be 0.73 and 5.82 acre-feet/yr, respectively. Therefore, the water use percentages of 84.8 and 15.2-percent were applied to RPU's historical residential water use information to determine the amount of water use for single and multi-family accounts.

Currently, single and multi-family residential water use makes up about 60-percent of the total water use in the RPU service area. Commercial, industrial, and institutional uses account for approximately 35-percent of total water use and dedicated irrigation uses accounts for the remaining 5-percent. Figures 3-2 and 3-3 show the breakdown of current water use by sector as well as indoor versus outdoor uses. These figures represent water deliveries to retail customers in the RPU service area for calendar year 2010. Over 50-percent of RPU's total water use is for irrigation demands (i.e. outside use). Conservation measures to reduce outdoor water use will be discussed later in this section.

Figure 3-2: Water Consumption by End User (2010)

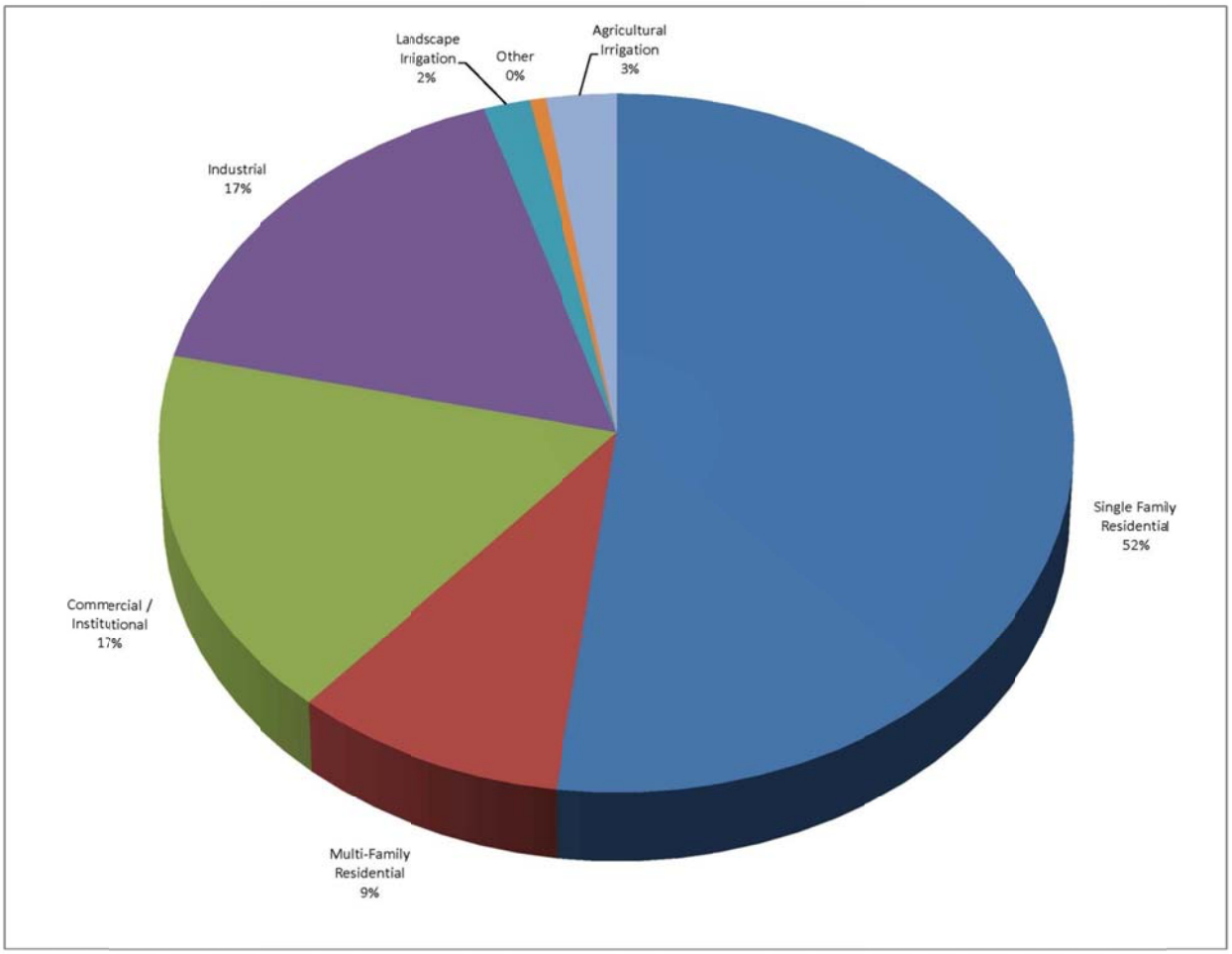
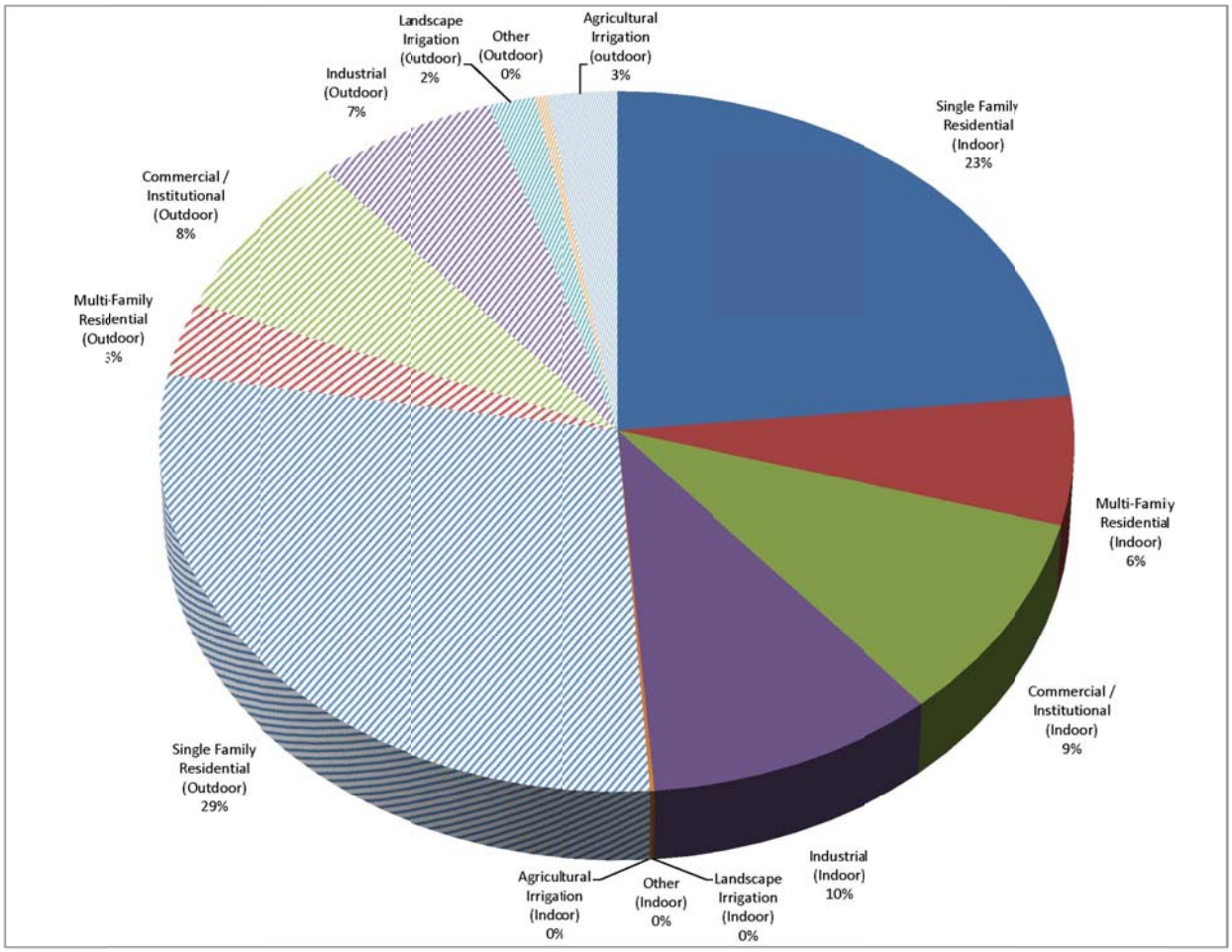


Figure 3-3: Indoor vs. Outdoor Water Consumption



3.1.2 Deliveries to Other Water Retailers

Table 3-1 shows the historical potable water deliveries to other water retailers. For the period of 1995 to 2010, potable water deliveries to other water retailers fluctuated between about 4,700 and 10,100 acre-ft/yr. Over the past five years, the average annual delivery to other water retailers was about 6,800 acre-ft.

Table 3-1: Historical Potable Water Deliveries to Other Water Retailers

Calendar Year	Wholesale Deliveries		Wheeled	Total Potable Water Delivered to Other Water Retailers
	Home Gardens County Water District (acre-ft)	Gage Canal Company (Upper Connection) (acre-ft)	Western Municipal Water District (acre-ft)	(acre-ft)
1995	221	*4,700* [1]	635	5,556
1996	251	*4,700* [1]	1,112	6,063
1997	291	*4,700* [1]	1,203	6,194
1998	360	*4,700* [1]	2,038	7,098
1999	381	*4,700* [1]	4,986	10,066
2000	305	*4,700* [1]	3,143	8,148
2001	383	*4,700* [1]	2,472	7,556
2002	392	*4,700* [1]	2,509	7,601
2003	399	5,923	1,481	7,803
2004	428	7,933	60	8,422
2005	428	4,094	217	4,740
2006	434	5,018	285	5,736
2007	447	4,731	0	5,178
2008	392	4,221	1,006	5,619
2009	384	4,902	3,457	8,743
2010	370	4,632	3,777	8,779

1. The deliveries to GCC from 1995 to 2002 are estimated based on historically deliveries to the GCC.

3.1.3 Total Water Demand

Table 3-2 shows the total water demand on RPU's potable distribution system and estimates for system losses (i.e. unaccounted for water). Unaccounted for water is estimated by subtracting the sum of the total water deliveries (i.e. retail water use and deliveries to other water retailers) from the total water supply (i.e. groundwater, recycled water, and imported water).

For the period of 1995 to 2010, unaccounted for water fluctuated between about 1,300 to 15,600 acre-ft/yr. Over the past five years, the average annual volume of unaccounted for water was about 11,400 acre-ft. In July of 2010, RPU initiated an audit of its water supply based on the American Water Works Association's M-36 Water Audit method to investigate and describe measures to reduce the quantity of unaccounted for water in its system. Measures to reduce the quantity of unaccounted for water is further discussed in Section 6.

Table 3-2: Retail Water Use, Deliveries to Other Water Retailers, and Unaccounted for Water

Calendar Year	Retail Water Demands								Potable Water Deliveries to Other Water Retailers	Un-accounted for Water (System Losses)	Recycled Water Used to Meet Retail Water Demands	Total Potable Water Supply [1]
	Single Family Residential (acre-ft)	Multi-Family Residential (acre-ft)	Commercial / Institutional (acre-ft)	Industrial (acre-ft)	Landscape Irrigation (acre-ft)	Other (acre-ft)	Agricultural Irrigation (acre-ft)	Total Retail Water Demands (acre-ft)	(acre-ft)	(acre-ft)	(acre-ft)	(acre-ft)
1995	31,835	5,706	7,273	10,990	1,204	674	2,182	59,863	5,556	5,788	0	71,207
1996	41,933	7,516	10,300	2,287	1,705	228	737	64,705	6,063	1,314	0	72,083
1997	34,094	6,111	7,905	11,678	1,316	784	2,539	64,428	6,194	5,668	0	76,290
1998	29,821	5,345	7,584	9,981	1,255	618	2,000	56,603	7,098	10,690	0	74,391
1999	34,451	6,175	8,174	10,647	1,353	797	2,579	64,175	10,066	8,579	144	82,676
2000	36,032	6,459	10,129	11,089	1,676	485	1,571	67,441	8,148	7,169	144	82,613
2001	34,106	6,113	9,661	10,293	1,599	94	1,989	63,854	7,556	9,592	132	80,870
2002	36,500	6,542	9,889	10,756	2,275	450	1,844	68,256	7,601	10,024	144	85,737
2003	35,019	6,277	9,681	10,286	1,858	437	2,323	65,880	7,803	8,048	123	81,608
2004	36,186	6,486	10,074	10,383	1,908	646	2,158	67,841	8,422	14,382	137	90,507
2005	33,714	6,043	9,919	10,135	1,926	1,029	1,929	64,695	4,740	15,568	148	84,854
2006	36,347	6,515	10,620	10,878	2,103	500	2,031	68,994	5,736	13,884	145	88,470
2007	37,696	6,757	11,251	11,289	2,124	618	1,904	71,639	5,178	12,069	146	88,740
2008	35,590	6,379	11,942	11,067	1,232	642	1,676	68,527	5,619	9,885	173	83,856
2009	33,409	5,988	11,016	10,525	1,129	576	1,588	64,231	8,743	13,390	136	86,227
2010	30,593	5,484	10,065	9,769	1,088	337	1,526	58,861	8,779	7,549	260	74,929

1. Total potable water supply includes water delivered to the GCWC (upper connection) and water wheeled to WMWD. Total water supply excludes recycled water used to meet retail water demands.

Table 3-3 shows the number of accounts and water use by sector for calendar years 2005 and 2010. The information shown in this table is from RPU's accounting system, except for the information on single and multi-family residential accounts, which were modified as described earlier in this section.

Table 3-3 shows that the number of accounts within the RPU service area increased from 2005 to 2010, while the total water use decreased over that period. RPU contributes the decrease in water use to climate (i.e. 2010 was a relatively cool year with above average participation), increased conservation measures, and social factors (i.e. downturn in the economy).

Table 3-3: Actual Retail Water Deliveries by Sector

Water Use by Sector	Metered		Not Metered		Total Volume (acre-ft)
	No. of Accounts	Volume (acre-ft)	No. of Accounts	Volume (acre-ft)	
2005					
Single Family Residential	51,741	33,714	0	0	33,714
Multi-Family Residential	1,164	6,043	0	0	6,043
Commercial / Institutional	3,991	9,919	0	0	9,919
Industrial	367	10,135	0	0	10,135
Landscape Irrigation [1]	326	1,926	0	0	1,926
Other	106	1,029	0	0	1,029
Agricultural Irrigation	260	1,929	0	0	1,929
Total	57,955	64,695	0	0	64,695
2010					
Single Family Residential	56,393	30,593	0	0	30,593
Multi-Family Residential	1,269	5,484	0	0	5,484
Commercial / Institutional	4,545	10,065	0	0	10,065
Industrial	429	9,769	0	0	9,769
Landscape Irrigation [1]	492	1,088	0	0	1,088
Other	132	337	0	0	337
Agricultural Irrigation	274	1,526	0	0	1,526
Total	63,534	58,861	0	0	58,861

1. Landscape irrigation includes water use meet with both potable and recycled water.

3.2 Baselines and Targets

RPU established urban water use targets for 2015 and 2020 in accordance with the Water Conservation Bill of 2009 (SBX7-7). Recycled water made up less than 10-percent of RPU's retail water deliveries in 2008, thus the legislation requires a ten year baseline period. Table 3-4 shows the time periods selected for the 10-year and 5-year baseline calculations.

3.2.1 Base Daily Per Capita Water Use

In 2010, RPU prepared a *Water Use Efficiency Master Plan* to determine its base daily per capita water use, conservation targets, and to identify measures to meet its water use reduction goals. As discussed in Section 2.2, historical population data and regional planning documents for the City, RPU, and the other water retailers that serve water within the City boundaries were used in conjunction with aerial photography, GIS, tax records, and billing records to determine the population within the RPU service area. Population and housing unit data for the City of Riverside is based on information from the California Department of Finance (DOF) and SCAG. Water supply and demand data is from RPU's annual production reports and accounting system.

Table 3-4: Base Period Ranges

Base Period	Parameter	Value	Units
10-Year Base Period	2008 Total Water Deliveries [1]	78,238	acre-ft
	2008 Total Volume of Recycled Water Delivered	173	acre-ft
	2008 Recycled Water as a Percentage of Total Deliveries	0.2%	
	Number of Years in Base Period	10	years
	Beginning Year for Base Period	1999	
	Ending Year for Base Period	2008	
5-Year Base Period	Number of Years in Base Period	5	years
	Beginning Year for Base Period	2004	
	Ending Year for Base Period	2008	

1. Total water deliveries includes only retail water use. This volume excludes water deliveries to other water retailers.

3.2.1.1 Methodology 1: Gross Water Use

Table 3-5 shows gross water use for the RPU service area. RPU's water supply consists primarily of groundwater from the Bunker Hill and Riverside basins. Additional supplies include recycled water from the City's RWQCP and imported water from WMWD. Water delivered to agricultural customers was included in the urban water demand because these customers, although designated as agricultural customers, receive water from RPU's potable system and use that water to meet both potable and irrigation demands. Deliveries to other water retailers were deducted from the total water supply to determine gross water use.

For the period of 1995 to 2010, gross water use in the RPU service area fluctuated between about 65,700 to 83,600 acre-ft/yr. Over the past five years, the average annual gross water use was about 74,500 acre-ft.

3.2.1.2 Base Daily Per Capita Water Use

Gross water use from Table 3-5 was compared to the population within the RPU service area to determine the annual daily per capita water use for each of the base years. Table 3-6 shows the annual daily per capita water use for each of the base years and the averages for the base period range. The base daily per capita water use for the 10-year base period is 264 gallons per capita per day (gpcd). The base daily per capita water use for the 5-year base period is 266 gpcd.

3.2.2 Urban Water Use Target

RPU analyzed Methods 1 through 3 to determine its urban water use target, and Method 1 (80-percent of the base daily per capita water use) was selected to be the optimal method. Therefore, the urban water use target was calculated by multiplying the base daily per capita water use for the 10-year base period by 80-percent. Thus, the urban water use target for the RPU service area for 2020 is 211 gpcd.

Table 3-5: Gross Water Use

Calendar Year	Potable Water Supply			Deductions	Gross Water Use After Deductions
	Potable Groundwater Production (acre-ft)	Purchased Imported Water (acre-ft)	Total Potable Water Supply (acre-ft)	Potable Water Deliveries to Other Water Retailers (acre-ft)	(acre-ft)
1995	71,141	66	71,207	5,556	65,651
1996	71,814	269	72,083	6,063	66,020
1997	76,032	258	76,290	6,194	70,096
1998	74,118	273	74,391	7,098	67,293
1999	82,605	71	82,676	10,066	72,609
2000	82,245	368	82,613	8,148	74,466
2001	79,891	979	80,870	7,556	73,314
2002	85,090	648	85,737	7,601	78,136
2003	80,264	1,344	81,608	7,803	73,805
2004	87,423	3,084	90,507	8,422	82,086
2005	81,688	3,166	84,854	4,740	80,114
2006	86,185	2,285	88,470	5,736	82,733
2007	87,085	1,655	88,740	5,178	83,562
2008	83,817	39	83,856	5,619	78,238
2009	86,227	0	86,227	8,743	77,484
2010	74,929	0	74,929	8,779	66,150

3.2.3 Urban Water Use Target Compared to the 5-Year Base Period

Per Table 3-6, the base daily per capita water use for the 5-year base period is 266 gpcd. 95-percent of the base daily per capita water use for the 5-year base period is 253 gpcd. Therefore, no adjustment to the urban water use target was required.

Table 3-6: Base Daily Per Capita Water Use

Calendar Year	City of Riverside			Adjustments		RPU Service Area						
	Population Within the Riverside City Boundaries [1]	Average Density	Housing Units Within the Riverside City Boundaries	Housing Units Within the Riverside City Boundaries Served by Other Water Retailers	Housing Units Outside the Riverside City Boundaries Served by RPU	Total Housing Units Served by RPU	Total Population Within the RPU Service Area	Gross Water Use Within the RPU Service Area		Annual Daily Per Capita Water Use	Base Daily Per Capita Water Use (10-Year Average)	Base Daily Per Capita Water Use (5-Year Average)
								(acre-ft)	(mgd)	(gpcd)	(gpcd)	(gcpd)
1995	239,066	2.949	81,067	4,069	3,633	80,631	237,780	65,651	58.6	246		
1996	240,629	2.955	81,431	4,255	3,676	80,852	238,918	66,020	58.9	247		
1997	243,352	2.975	81,799	4,494	3,701	81,006	240,993	70,096	62.6	260		
1998	246,469	2.990	82,431	4,779	3,720	81,372	243,303	67,293	60.1	247		
1999	250,385	3.006	83,295	5,138	3,750	81,907	246,213	72,609	64.8	263		
2000	254,212	3.017	84,260	5,555	3,838	82,543	249,032	74,466	66.5	267		
2001	262,159	3.046	86,067	7,067	3,861	82,861	252,394	73,314	65.4	259		
2002	270,781	3.074	88,088	7,362	3,899	84,625	260,136	78,136	69.8	268		
2003	277,150	3.102	89,346	7,998	3,942	85,290	264,568	73,805	65.9	249		
2004	281,173	3.117	90,206	8,546	4,049	85,709	267,156	82,086	73.3	274	258	
2005	286,563	3.107	92,231	9,071	4,120	87,280	271,180	80,114	71.5	264	260	
2006	288,984	3.085	93,674	9,400	4,119	88,393	272,692	82,733	73.9	271	262	
2007	291,812	3.057	95,457	9,464	4,208	90,201	275,744	83,562	74.6	271	263	
2008	296,191	3.042	97,367	9,726	4,255	91,896	279,548	78,238	69.8	250	**264**	**266**
2009	300,430	3.073	97,764	9,822	4,314	92,256	283,504	77,484	69.2	244	262	260
2010	303,871	3.087	98,439	9,925	4,379	92,893	286,751	66,150	59.1	206	256	248

1. Population estimates within the Riverside City boundaries are based on data from the DOF, SCAG, and the Riverside General Plan 2025.

3.2.4 Interim Urban Water Use Target

The interim urban water use target was calculated by adding the base daily per capita water use for the 10-year base period to the urban water use target and then dividing the total by two. For the RPU service area, the interim urban water use target for 2015 is 238 gpcd (i.e. the sum of 211 gpcd and 266 gpcd divided by two).

Both the urban water use target and the interim urban water use target were determined independently without forming a regional alliance with other agencies.

RPU intends to meet the conservation requirements of the Water Conservation Bill of 2009 through increased use of recycled water and implementation of additional conservation measures. This is discussed in Section 3.4.

3.3 Water Demand Projections

Historically, RPU has calculated water demand projections for its service area using land use planning information. According to the *2009 Water Supply Plan*, the annual potable water demand in

the RPU service area (i.e. retail water use plus water deliveries to other water retailers) in 2015 and 2020 were projected to be about 86,700 acre-ft and 90,900 acre-ft, respectively. These projections were developed prior to the State implementing the Water Conservation Bill of 2009. The Water Conservation Bill of 2009 requires that water demand projections for water retailers meet or exceed their per capita urban water use targets. For 2015, RPU projects the potable water use within its service are to be about 70,800 acre-ft (i.e. 214 gpcd) based on potable water use in 2010 and the slow economic recovery currently seen in the RPU service area. RPU recalculated its future retail water demand for 2020 and beyond using its urban water use target. Table 3-7 shows population and potable retail water demand projections for the RPU service area through 2035.

Table 3-7: Potable Retail Water Use Projections

Year	Population within the Riverside City Boundaries [1]	Population within the Riverside Public Utilities Service Area [2]	Urban Water Use Targets	Projected Potable Water Use Within the RPU Service Area	
			(gpcd)	(mgd)	(acre-ft)
2015 [3]	313,000	295,000	214	63.2	70,800
2020	335,000	316,000	211	66.6	74,600
2025	353,000	333,000	211	70.2	78,700
2030	373,000	352,000	211	74.2	83,100
2035	386,000	364,000	211	76.8	86,000

1. Population estimates within the Riverside City boundaries are based on data from the DOF, SCAG, and the Riverside General Plan 2025.

2. Assumes the RPU service area continues to be the same ratio of the City's population (94.4-percent).

3. RPU projects that its water demand in 2015 will be less than the 78,800 acre-ft (i.e. 238 gpcd) due to the slow economic recovery currently seen in the RPU service area.

Table 3-8 shows the projected retail water demand, by sector, for the RPU service area through 2035. These values are based on allocating the projected annual potable water demands from Table 3-7 by the percentage of total water use for each sector. In Table 3-8, the number of urban retail accounts is based on the population growth rates described in Section 2.2.

3.3.1.1 Low-Income Household Water Use and Projected Demands

A significant portion of the residential sector in the RPU service area is comprised of low-income households. The General Plan 2025 defines a low-income household as a household that earns 0 to 80-percent of the median family income. The City's population was composed of about 40-percent and 39-percent of low-income households in 1990 and 2000, respectively. The American Community Survey (ACS, 2009) provides annual demographics for the City; and it indicated that the percentage of low-income households was about 39-percent in 2009. RPU's accounting system does not track the number of low-income households; therefore, the projections were estimated by applying the historical demographic information to the projected urban retail water demands. Table 3-9 shows the projected water demand of low-income households in the RPU service area. Low-income single and multi-family households account for approximately 18 and 3-percent of the total retail water demand in the RPU service area, respectively.

Table 3-8: Retail Water Use Projections by Sector

Water Use by Sector	Metered		Not Metered		Total [1]
	No. of Accounts	Volume (acre-ft)	No. of Accounts	Volume (acre-ft/yr)	Volume (acre-ft)
2015					
Single Family Residential	58,578	37,344	0	0	37,344
Multi-Family Residential	1,318	6,694	0	0	6,694
Commercial / Institutional	4,721	12,286	0	0	12,286
Industrial	446	11,925	0	0	11,925
Landscape Irrigation	511	1,328	0	0	1,328
Other	137	411	0	0	411
Agricultural Irrigation	285	1,863	0	0	1,863
Total	65,995	71,850	0	0	71,850
2020					
Single Family Residential	62,748	39,916	0	0	39,916
Multi-Family Residential	1,412	7,155	0	0	7,155
Commercial / Institutional	5,057	13,133	0	0	13,133
Industrial	477	12,746	0	0	12,746
Landscape Irrigation	547	1,419	0	0	1,419
Other	147	440	0	0	440
Agricultural Irrigation	305	1,991	0	0	1,991
Total	70,693	76,800	0	0	76,800
2025					
Single Family Residential	66,123	42,047	0	0	42,047
Multi-Family Residential	1,487	7,537	0	0	7,537
Commercial / Institutional	5,329	13,834	0	0	13,834
Industrial	503	13,427	0	0	13,427
Landscape Irrigation	577	1,495	0	0	1,495
Other	155	463	0	0	463
Agricultural Irrigation	321	2,097	0	0	2,097
Total	74,496	80,900	0	0	80,900
2030					
Single Family Residential	69,896	44,334	0	0	44,334
Multi-Family Residential	1,572	7,947	0	0	7,947
Commercial / Institutional	5,633	14,586	0	0	14,586
Industrial	532	14,157	0	0	14,157
Landscape Irrigation	610	1,576	0	0	1,576
Other	164	488	0	0	488
Agricultural Irrigation	340	2,211	0	0	2,211
Total	78,746	85,300	0	0	85,300
2035					
Single Family Residential	72,279	45,842	0	0	45,842
Multi-Family Residential	1,626	8,217	0	0	8,217
Commercial / Institutional	5,825	15,082	0	0	15,082
Industrial	550	14,638	0	0	14,638
Landscape Irrigation	631	1,630	0	0	1,630
Other	169	505	0	0	505
Agricultural Irrigation	351	2,287	0	0	2,287
Total	81,431	88,200	0	0	88,200

1. Total retail water use includes recycled water used to meet direct use demands.

Table 3-9: Water Demand Projections for Low-Income Households

Water Use Sector	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Single Family Residential	14,564	15,567	16,398	17,290	17,878
Multi-Family Residential	2,611	2,790	2,939	3,099	3,205
Total	17,175	18,358	19,338	20,390	21,083

3.3.2 Wholesale to Other Water Retailers

RPU wholesales potable water to HGCWD. HGCWD serves about 800 domestic customers located between Riverside and Corona with a water service area of about 230 acres. HGCWD owns a well in the Arlington Basin, but because of poor water quality in that basin, it relies on water from RPU to meet its demands. HGCWD service area is considered "built-out"; therefore, its water demand is projected to remain constant through 2035.

RPU delivers potable water to the Gage Canal (i.e. GCC's non-potable distribution system). Potable water produced from RPU owned wells in the Bunker Hill Basin is delivered to the Gage Canal via the upper connection. RPU has investigated a project (i.e. the Upper Gage Exchange) to construct a booster station and pipeline to convey non-potable water from the Riverside Canal to the Gage Canal. This project would eliminate potable water deliveries to the upper connection of the Gage Canal. The Upper Gage Exchange Project is further described in Section 4.

RPU also delivers non-potable water to the Gage Canal to satisfy the remaining non-potable demands of GCC's customers. Non-potable groundwater produced from RPU owned wells is delivered from the Riverside Canal to the Gage Canal via the Olivewood Booster Station (i.e. the lower connection).

RPU wholesales non-potable groundwater to WMWD and delivers it via the Riverside Canal. RPU plans to reduce the demand on the Riverside Canal by 2015, by wholesaling recycled water to WMWD rather than continuing to deliver non-potable water. RPU plans to deliver recycled water to WMWD through the proposed Arlington-Central Avenue Recycled Water Project, which is further described in Section 4.

Table 3-10 shows the projected water sales from RPU to other water retailers. RPU projects to sell about 400 acre-feet of potable water to HGCWD and between 2,600 to 3,600 acre-ft of non-potable water (i.e. initially non-potable groundwater but ultimately recycled water) to WMWD annually through 2035.

3.3.3 Additional Water Uses and Losses

Water conveyed (i.e. wheeled) to WMWD and system losses that occur within the distribution systems are characterized in this section. In addition, RPU plans to recharge recycled water in the Riverside Basin via the Pellissier Ranch Aquifer Storage and Recovery Project to augment groundwater production.

WMWD has water stored in the Bunker Hill Bain. Through an existing agreement, RPU extracts and delivers WMWD's water from the Bunker Hill Basin to WMWD via its potable distribution system. Deliveries to WMWD are discussed in this section to account for its effects on RPU's total water demand.

Unaccounted for water (i.e. system losses) is the difference between the volume of water produced (i.e. water supply) and the volume of water delivered (i.e. water use). Fire protection (i.e. firefighting, training exercises, and hydrant flushes), meter/accounting errors, water theft, and leaks contribute, at least partially, to the volume of water that is unaccounted for by RPU's accounting system. For the period of 1995 to 2010 unaccounted for water ranged between 2 to 22-percent of the total water demand. Over that period, the average annual volume of unaccounted for water was about 13.3-percent[9] as a percentage of total water demand. Other water agencies in Southern California have reported slightly lower percentages (i.e. about 8 to 10-percent of the total water supply) for unaccounted for water in their distribution systems (MWH, 2005). In July 2010, RPU initiated an audit of RPU's water supply based on the American Water Works Association's M-36 Water Audit method to investigate and describe measures to reduce the quantity of unaccounted for water. Based on results of the 2010 Water Audit, in 2011, RPU launched an unaccounted water study to analyze system losses in an effort to target suspect water loss areas. A task force of various water division disciplines including management, field personnel, analysts, engineers, and SCADA operators was assembled to evaluate losses by isolating data from designated zones of the water system. The unaccounted water study will provide RPU with an analysis from which capital improvement decisions can be made to best recapture any unaccounted water losses. RPU estimates that unaccounted for water in 2010 was about 10.1-percent as a percentage of total water supply.

Table 3-11 shows projections for unaccounted for water through 2035. The unaccounted for water projections are based on the anticipated percentage of unaccounted for water and the projected total water demands within the RPU service area.

[9] Unaccounted for water is generally discussed as a percentage of total water supply. Over the period of 1995 to 2010, RPU's average annual volume of unaccounted for water was about 11.6-percent as a percentage of total water supply.

Table 3-10: Wholesale to Other Water Retailers

Wholesale Customer	2005 (acre-ft)	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Home Gardens County Water District [1]	428	370	400	400	400	400	400
Gage Canal Company (upper connection) [2]	4,094	4,632	4,700	4,700	4,700	4,700	4,700
Gage Canal Company (lower connection) [3]	7,283	6,608	6,800	6,800	6,800	6,800	6,800
Western Municipal Water District [4]	2,225	1,461	2,600	3,600	3,600	3,600	3,600
Total	14,030	13,071	14,500	15,500	15,500	15,500	15,500

1. RPU delivers potable water to HGCWD.

2. RPU delivers potable water at the upper connection to the Gage Canal. Once the Upper Gage Exchange Project is complete, RPU plans to deliver non-potable groundwater at the upper connection.

3. RPU delivers non-potable water at the lower connection to the Gage Canal.

4. RPU delivers non-potable water to WMWD. Once the Arlington-Central Avenue Recycled Water Project is complete, RPU plans to deliver recycled water to WMWD.

Table 3-11: Unaccounted for Water

Calendar Year	Potable Retail Water Use [1] (acre-ft)	Potable Water Wholesale Deliveries (acre-ft)	Potable Water Wheeled to WMWD (acre-ft)	Total Water Deliveries (acre-ft)	Estimated Volume [2] of Unaccounted for Water	
					%	(acre-ft)
2015	70,800	400	4,200	75,400	10.0%	7,500
2020	74,600	400	4,200	79,200	8.7%	6,900
2025	78,700	400	4,200	83,300	8.7%	7,200
2030	83,100	400	4,200	87,700	8.7%	7,600
2035	86,000	400	4,200	90,600	8.7%	7,900

1. Potable retail water use excludes retail water demands meet with recycled water.

2. RPU plans to reduce the amount of unaccounted for water lost in its system over the next decade through implementing BMP 3: Unaccounted Water of RPU's Conservation Program. More information on this reduction plan is provided in Section 6.

Reducing the quantity of unaccounted for water within the RPU distribution systems is part of the additional water conservation measures to be implemented over the next decade.

Table 3-12 shows the additional water uses and losses not accounted for in retail water use and wholesale projections.

Table 3-12: Additional Water Uses and Losses

Water Use	2005 (acre-ft)	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Recycled Water Reuse [1]	0	0	0	4000	4000	4000	4000
Potable Water Wheeled to WMWD	217	3,777	4,200	4,200	4,200	4,200	4,200
Unaccounted for Water (System Losses)	15,568	7,549	7,500	6,900	7,200	7,600	7,900
Total	15,785	11,326	11,700	15,100	15,400	15,800	16,100

1. Includes recharge of recycled water associated with the Pellissier Ranch Groundwater Augmentation Project.

3.3.4 Total Water Use

Table 3-13 shows the total water use for the RPU service area through 2035.

Table 3-13: Total Water Use

Water Use	2005 (acre-ft)	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Retail Water Deliveries [1]	64,695	58,861	71,850	76,800	80,900	85,300	88,200
Wholesale Deliveries	14,030	13,071	14,500	15,500	15,500	15,500	15,500
Additional Water Uses and Losses	15,785	11,326	11,700	15,100	15,400	15,800	16,100
Total Water Use [2]	94,510	83,257	98,050	107,400	111,800	116,600	119,800

1. Retail water deliveries includes recycled water used for direct use.
2. Total water use includes potable water wheeled to WMWD.

3.3.5 Imported Water

In the past, RPU purchased small quantities of treated State Water Project water from WMWD, primarily to meet peak water demands within the higher elevations of the RPU service area during very hot summer days. During emergencies (i.e. major transmission main repairs), RPU has sometimes purchased additional imported water. RPU has a contractual agreement with WMWD for up to 30 cfs or 21,700 acre-ft/yr of imported water. A copy of the agreement between WMWD and RPU is included in Appendix E. RPU did not receive imported water from WMWD in 2009 or 2010 and does not plan to purchase imported water in the future, except during emergencies or significant drought conditions. Table 3-14 shows the projected imported water purchases by RPU through 2035.

Table 3-14: Projected Imported Water Purchases

Wholesaler	Contracted Volume (cfs)	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Western Municipal Water District	30	0	0	0	0	0	0

3.4 Water Use Reduction Plan

RPU is required to meet or exceed the interim and urban water use targets in 2015 and beyond to comply with the Water Conservation Bill of 2009. RPU intends to reduce its urban per capita water use by being more aggressive with its recycled water reuse efforts and conservation programs over the next decade to comply with this legislation.

As previously discussed, based on historical water use and land use planning information, the *2009 Water Supply Plan* projected potable water demands through 2030 and for RPU's ultimate demand. The potable water projections included both retail water use and deliveries to HGCWD. Table 3-15 shows the potable water projections less 400 acre-ft/yr to remove the water deliveries to HGCWD. Table 3-15 also shows the urban water use targets and the differences between the two projections. RPU will need to reduce its total annual water demand by these quantities in order to meet the required reduction in per capita water use.

Table 3-15: Required Retail Water Demand Reductions

Water Demand	2015 [1] (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Potable Water Demands per RPU's 2009 Water Supply Plan (Includes Urban Retail Water Use)	70,800	90,500	94,300	98,800	98,800
Revised Potable Retail Water Use (per Table 3-7) (per the Requirements of Water Conservation Bill of 2009)	70,800	74,600	78,700	83,100	86,000
Difference (Required Retail Water Demand Reduction)	0	15,900	15,600	15,700	12,800

1. The 2015 water demand projections have been modified to reflect the slow economic recovery currently seen in the RPU service area.

3.4.1 Historical Reduction in per Capita Water Demand

From RPU's peak annual daily per capita water use in 2004, RPU has implemented additional conservation programs to reduce its overall water demand. In addition to the conservation programs, the demand within the RPU service area was reduced due to social factors stemming from the recent recession. Table 3-6 shows that RPU currently has an annual daily per capita water use of 206 gpcd, which meets the 2015 interim urban water use target. RPU understands that the portion of historical reduction associated with the economic downturn will return, but estimates this will occur slowly over the next decade. Thus, RPU believes the potable water demand projection for 2015 shown in the *2009 Water Supply Plan* does not account for the slow recovery currently seen in the economy, and therefore overestimates this demand. However, the economy can recover by

2020, and therefore RPU plans to meet the potable water demand projections from the *2009 Water Supply Plan* for 2020 and beyond.

Although RPU currently meets the 2015 and 2020 urban water use targets, it still plans to reduce its retail water demand by about 4,200 acre-ft between 2010 and 2015 to ensure the 2015 interim urban water use target is met and to work towards meeting its reduction goals for 2020.

3.4.2 Planned Recycled Water Projects

RPU plans to expand its recycled water program over the next decade to include additional direct use customers and a groundwater augmentation project. Based on the *2011 Recycled Water Facilities Plan* and a White Paper prepared by RPU's Water Resources Department, RPU has identified two recycled water reuse projects: the Arlington-Central Avenue Recycled Water Project and the Pellissier Ranch Aquifer Storage and Recovery Project. Table 3-16 and Figure 2-14 show the planned recycled water reuse projects and their associated water savings.

Table 3-16: Planned Recycled Water Projects

Planned Projects	Projected Water Savings by 2015 (acre-ft)	Projected Water Savings by 2020 (acre-ft)
Arlington-Central Avenue Recycled Water Project [1]	3,650	4,650
Pellissier Ranch Aquifer Storage and Recovery Project [2]	0	5,150
Total	3,650	9,800

1. Includes 1,050 acre-ft/yr of recycled water for direct use. Includes 2,600 acre-ft and 3,600 acre-ft of recycled water for deliveries to WMWD in 2015 and 2020, respectively.

2. Includes 1,150 acre-ft and 4,000 acre-ft of recycled water for direct use and groundwater augmentation, respectively.

Recycled water used for direct use and recharge will offset RPU's potable water demands. Recycled water delivered to WMWD will offset RPU's non-potable water demands, but will not reduce its urban per capita water use.

3.4.3 Planned Conservation Efforts

RPU's historical water demands and past conservation efforts were analyzed in the *2010 Water Use Efficiency Master Plan* and a range of new conservation measures were developed and evaluated. Future conservation measures were prioritized according to effectiveness (i.e. the quantity of reduced water use) and cost.

The *2010 Water Use Efficiency Master Plan* developed a water conservation strategy to achieve 10,000 acre-ft/yr of savings by 2020. From an initial list of seventy-seven conservation measures representing all reasonably known conservation devices, practices, and policies, twenty quantifiable

measures were recommended within a 4-tier program. RPU plans to implement the first two tiers, or Group 1 and 2 projects, over the next decade.

The single family residential sector is the largest water user within the RPU service area, accounting for over 50-percent of consumption. Furthermore, over half of the water used in this sector is for landscape irrigation. High irrigation water use is not uncommon in the Inland Empire and is largely the reason that per capita water use is so high in this region. Therefore, the single family residential sector will be a key target for RPU's conservation efforts, both in and out door.

Water use in the commercial, industrial, and institutional sectors is also significant at nearly 35-percent of consumption. Additionally, water use per account is high in the commercial, industrial, and institutional sectors and highly weighted towards a few top customers (i.e. less than 0.5-percent of the total customers represent nearly 15-percent of the total water usage). Targeting high users in the commercial, industrial, and institutional sectors addresses large uses with only a few projects.

Table 3-17 provides a brief description of the proposed water conservation measures and the estimated water savings for each.

Table 3-17: Planned Conservation Measures

Programs	Type	Description	Projected Water Savings by 2015 (acre-ft/yr)	Projected Water Savings by 2020 (acre-ft/yr)
Group 1				
	Residential	Single Family Residential Surveys - Top 5-percent of Customers	200	480
	Residential	Precision Nozzles	1,500	3,000
	Residential	Toilet Rebates	200	400
	Large Landscape	Dedicated Irrigation Surveys	0	770
	Large Landscape	Commercial, Industrial, Institutional Surveys and Weather Based Irrigation Controllers - Top 5-percent of Customers	0	870
	Large Landscape	Commercial, Industrial, Institutional Precision Nozzles	0	270
	Commercial, Industrial, Institutional	Commercial, Industrial, Institutional and Multi-Family Residential - Clothes Washer Rebates	0	120
	Commercial, Industrial, Institutional	Commercial, Industrial, Institutional - Toilet Installs	0	290
	Foundational	Unaccounted Water (i.e. System Losses)	500	1,000
Group 1 Total			2,400	7,200
Group 2				
	Residential	Single Family Residential Surveys - Top 5 to 10-percent of Customers	0	270
	Residential	Single Family Residential Surveys - Clothes Washer Rebates	0	210
	Large Landscape	Commercial, Industrial, Institutional Surveys and Weather Based Irrigation Controllers - Top 5 to 10-percent of Customers	0	200
	Commercial, Industrial, Institutional	Commercial, Industrial, Institutional Surveys Performance-Based Program - Top 5-percent of Customers	0	660
Group 2 Total			0	1,340
Total			2,400	8,540

In addition to the planned conservation measures, natural replacement of warn-out water fixtures (i.e. toilets, showerheads, and washing machines) will occur within the RPU service area. Old fixtures will be replaced with new high-efficiency fixtures, which will result in reduced water demand. The *2010 Water Use Efficiency Master Plan* estimates that natural replacement will reduce water use by about 1,480 acre-ft by 2020 as shown in Table 3-18.

Table 3-18 Natural Replacement Rates of Residential Fixtures

Fixtures	Life Expectancy (years)	Corresponding Natural Replacement Rate (%)	Estimated Savings Through Natural Replacement by 2020 (acre-ft)
Toilets (3.5 gpf)	25	4%	550
Showerheads (2.5 gpm)	7	14%	70
Washing Machines	16	6.25%	860
Total			1,480

3.4.4 Water Use Reduction Summary

Table 3-19 summarizes RPU's planned water use reductions to meet the requirements of the Water Conservation Bill of 2009.

Table 3-19: Planned Water Use Reductions

Planned Reduction Strategy	Projected Water Savings by 2015 (acre-ft)	Projected Water Savings from 2015 to 2020 (acre-ft)	Total Water Savings by 2020 (acre-ft)
Recycled Water Reuse Projects [1]	1,050	5,150	6,200
Conservation Programs	2,400	6,140	8,540
Natural Replacement	740	740	1,480
Total	4,190	12,030	16,220

1. By 2015, RPU plans to increase its use of recycled water by delivering 1,050 acre-ft for direct use. By 2020, RPU plans to further increase the use of recycled water by delivering 2,200 acre-ft and 4,000 acre-ft of recycled water for direct use and groundwater augmentation, respectively.

SECTION 4 – WATER SUPPLIES

Currently, RPU's source waters include groundwater, recycled water, and imported water. RPU extracts groundwater from the Bunker Hill Basin, Riverside North, and Riverside South. RPU's source of recycled water is from the City's RWQCP. RPU maintains an imported water connection at the Mills WTP, but no longer relies on imported supplies, except during emergency situations. RPU has an existing agreement with WMWD to receive up to 30 cfs or 21,700 acre-ft/yr of imported water from the Mills WTP on an as needed basis.

Table 4-1 shows the projected total water supply available to RPU to meet the projected water demands described in Section 3.

Table 4-1: Current and Projected Water Supply

Source Waters	Wholesaler Supplied	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Groundwater	NO	98,226	103,726	115,726	115,726	115,726	115,726
Recycled Water [1]	NO	260	3,650	5,800	5,800	5,800	5,800
Exchanges In	NO	0	0	0	0	0	0
Imported Water from WMWD	YES	21,700	21,700	21,700	21,700	21,700	21,700
Total Water Supply		120,186	129,076	143,226	143,226	143,226	143,226

1. The values shown for recycled water include supplies used to meet direct use demands and wholesale deliveries to WMWD. These values exclude recycled water used for groundwater augmentation.

4.1 Groundwater

Historically, RPU has used groundwater to meet nearly all of its retail and wholesale water demands. Over the next 25 years, RPU plans to increase the use of recycled water, but local groundwater will remain the largest source of water within its water supply portfolio as shown in Table 4-1.

4.1.1 Groundwater Rights

The judgment in Western Municipal Water District of Riverside County et al., v East San Bernardino County Water District et al., entered April 17, 1969 (Western-San Bernardino Judgment), established the entitlements and groundwater replenishment obligations of the two major water agencies, Valley District and WMWD, relating to groundwater basins in their jurisdictions: the San Bernardino, Riverside, and Colton Groundwater Areas (these areas are defined by DWR as the Bunker Hill Groundwater Basin, Rialto-Colton Groundwater Basin, and the northern portion of the Riverside-Arlington Groundwater Basin). The Riverside Basin is split by the 1969 Western Judgment based on county boundaries into Riverside North (San Bernardino County) and Riverside South (Riverside County).

The case was brought forth following concerns over the increasing groundwater withdrawals up-gradient of the Bunker Hill Dike (San Jacinto Fault) for use within San Bernardino and Redlands as well as for export to Riverside County. This case was initially linked to a broader case involving the Chino and San Bernardino Basins, as well as the diversions of surface water and pumping of underflow from the Santa Ana River and its tributaries.

The adjudication resulted in the naming of the Western-San Bernardino Watermaster (Watermaster) consisting of two persons, one nominated by Valley District and the other by Western, appointed by

the presiding judge. The Watermaster prepares an annual report documenting the previous water year's pumping and export activities. In addition, groundwater elevation, streamflow, and water quality are documented.

The Western-San Bernardino Judgment also required the Watermaster to establish base extraction rights and export rights based on the average annual extractions and exports over the 5-year period from 1959 through 1963.

Bunker Hill Basin

The City and GCC have combined export water rights of 49,542 acre-ft/yr from the Bunker Hill Basin. The City also holds shares of Meeks & Daley Mutual Water Company (Meeks & Daley) and Riverside Highland Water Company (RHWC) through ownership of their stocks. Currently, the City owns 2,908 acre-ft/yr and 440 acre-ft/yr of Meeks & Daley and RHWC water rights in the Bunker Hill Basin, respectively. The City uses UCR's water rights (536 acre-ft/yr) from the Bunker Hill Basin and supplies that water to UCR through its potable distribution system. Therefore, RPU has entitlement to produce and export up to 53,426 acre-ft/yr from the Bunker Hill Basin pursuant to the Western-San Bernardino Judgment. Table 4-2 shows RPU's total annual export water rights from the Bunker Hill Basin.

Table 4-2: RPU's Total Export Water Right from the Bunker Hill Basin

Named Entity	Export Water Rights from the Bunker Hill Basin (acre-ft/yr)
City of Riverside (including the Gage Canal Water Company)	49,542
Meeks and Daley Mutual Water Company (as shareholder)	2,908
Riverside Highland Water Company (as shareholder)	440
University of California Riverside (by agreement)	536
RPU's Total Water Rights from the Bunker Hill Basin	53,426

Rialto-Colton Basin

The basis for establishment of extraction rights stipulated within the Western-San Bernardino Judgment was groundwater production over the 5-year period from 1959 through 1963 (Base Period). For the Rialto-Colton Basin, the base period extraction is set only for that which is used within Riverside County. Provided that the minimum groundwater elevations within the Rialto-Colton Basin are maintained by Valley District, extractions from the Rialto-Colton Basin for use within San Bernardino Valley are not limited.

In the Rialto-Colton Basin, the Western-San Bernardino Judgment set a 5-year Base Period Average of 11,731 acre-ft, of which 8,235 acre-ft was extracted by San Bernardino County entities, 115 acre-ft was extracted by Riverside County entities for use in San Bernardino County, and 3,381 acre-ft was extracted by Riverside County entities for use in Riverside County. 3,381 acre-ft was established as the base period extraction for use of Rialto-Colton Basin groundwater in Riverside County.

In the Rialto-Colton Basin for use in Riverside County, should extractions exceed the base period extraction over a 5- year period, or by more than 20-percent in a single year, WMWD is responsible for replenishment in the following year equal to the excess extractions over a 20-percent peaking allowance, unless credits are available from previous years due to production below the base period extraction or to importing water. As of the 2009 Watermaster Annual Report, WMWD has credits of 82,994 acre-ft for the Rialto-Colton Basin for use in Riverside County.

Riverside Basin

The basis for establishment of extraction rights stipulated within the Western-San Bernardino Judgment was groundwater production in the Riverside Basin over the 5-year period from 1959 through 1963. The Western-San Bernardino Judgment divides the Riverside Basin into two areas, based on jurisdictional boundaries: the portion of the Riverside Basin in San Bernardino County (Riverside North) and the portion of the Riverside Basin in Riverside County (Riverside South).

For Riverside North, the base period extraction is set only for that which is used within Riverside County. Provided that the minimum groundwater elevations within Riverside North are maintained by the Valley District, extractions from Riverside North for use within San Bernardino Valley are not limited.

In Riverside North, the Western-San Bernardino Judgment set a 5-year Base Period Average of 33,729 acre-ft, of which 9,609 acre-ft was extracted by San Bernardino County entities, 3,035 acre-ft was extracted by Riverside County entities for use in San Bernardino County, and 21,085 acre-ft was extracted by Riverside County entities for use in Riverside County. 21,085 acre-ft was established as the base period extraction for use of Riverside North groundwater in Riverside County.

In Riverside North for use in Riverside County, should extractions exceed the base period extraction over a 5- year period, or by more than 20-percent in a single year, WMWD is responsible for replenishment in the following year equal to the excess extractions over a 20-percent peaking allowance, unless credits are available from previous years due to production below the base period extraction or to importing water. As of the 2009 Watermaster Annual Report, WMWD has credits of 345,341 acre-ft for Riverside North for use in Riverside County.

For Riverside South, the Western-San Bernardino Judgment set a 5-year Base Period Average and base period extraction of 29,633 acre-ft for use in Riverside County. In Riverside South, should extractions exceed the base period extraction over a 5-year period, or by more than 20-percent in a single year, WMWD is responsible for replenishment in the following year equal to the excess extractions over a 20 percent peaking allowance, unless credits are available from previous years due to production below the base period extraction or to importing water. As of the 2009 Watermaster Annual Report, WMWD has credits of 23,776 acre-ft for Riverside South.

Arlington Basin

The City can also extract water from the Arlington Basin. Since the Arlington Basin is located at the southern part of the City and has high TDS, the City currently does not produce water from the Arlington Basin. The City may use the Arlington Basin as a source of water supply in the future if the costs for alternative new supplies make treatment of water from this source cost-effective. The Arlington Basin is not adjudicated.

RPU, in collaboration with WMWD, the Valley District, SAWPA, and other local water purveyors is working on a groundwater management plan (GWMP) for the Riverside and Arlington basins to establish the "safe yield" of these basins and to develop sustainable operating scenarios.

4.1.2 Description of Groundwater Basins

RPU has produced water from the following groundwater basins: Bunker Hill, Rialto-Colton, and Riverside (North and South). Many agencies have studied these groundwater basins and provided estimates of basin characteristics. Table 4-3 summarizes the typical storage characteristics of each of the basins.

Table 4-3: Storage Characteristics of Groundwater Basins

Groundwater Basin	Surface Area (acres)	Storage Capacity (acre-ft)	Depth (feet)	Average Safe Yield (acre-ft/yr)
Bunker Hill	89,600	5,976,000	> 1,200	232,100
Rialto-Colton	7,680	2,517,000	> 1,000	17,675
Riverside North	14,080	660,000	600 - 700	27,200
Riverside South	25,600	986,000	> 400	35,100
Arlington	14,080	280,000	> 100	6,000
Total	151,040	10,419,000	- - -	318,075

4.1.2.1 Bunker Hill Basin

The Bunker Hill Basin is a valley-fill aquifer comprised of 6 confining and water-bearing hydrogeologic units (USGS Open file 2005-1278). The Bunker Hill Basin lies between the San Andreas and San Jacinto Faults. Table 4-3 lists some of the basin characteristics. The primary source of recharge for the Bunker Hill Basin is runoff from precipitation in the San Bernardino Mountains to the north and San Gabriel Mountains to the northwest. Wastewater discharge and imported water contribute to smaller amounts of groundwater recharge.

The "natural safe yield" for the Bunker Hill Basin was determined as part of the Western-San Bernardino Judgment as 232,100 acre-ft. The safe yield was determined by annual extractions during the 1959-63 base period of the judgment. The Watermaster maintains a data collection and analysis program to provide a basis for future determination of safe yield (Annual Report of the Western-San Bernardino Watermaster).

Both the Valley District and the SBVWCD are active in recharging the Bunker Hill Basin. The Valley District is the fifth largest State Water Project contractor with an annual entitlement of 102,600 acre-ft, of which a portion is delivered for recharge. The SBVWCD is active in recharging groundwater supplies along the upper Santa Ana River and Mill Creek. From 1969 to 2007, SBVWCD recharged an average of 13,920 acre-ft of water annually. In 2007, SBVWCD recharged 4,651 acre-ft of water. Native stormwater has lower levels of total dissolved solids (TDS) and nitrates than imported water. Water quality issues within the Bunker Hill Basin are discussed in Section 5.

For the 2008 Calendar year, Watermaster documented 251,681 acre-ft of extractions from the San Bernardino Basin Area. For calendar year 2009, the Valley District calculated the annual change in storage for the Bunker Hill Basin to be approximately -78,400 acre-ft. The cumulative change in storage for Bunker Hill Basin since 1934 has been calculated to be approximately -433,000 acre-ft, a downward trend since 1999 (Change In Groundwater Storage for the San Bernardino Basin Area, Calendar Years 1934 to 2009, SBVMWD). Figure 4-1 shows the conceptual groundwater level contours in the Bunker Hill Basin for fall of 2010. Figure 4-2 shows the difference in groundwater levels in the Bunker Hill Basin from 2007 to 2010.

4.1.2.2 Rialto-Colton Basin

The Rialto-Colton basin is bounded by the San Jacinto fault to the northeast, Rialto-Colton fault to the southwest, San Gabriel Mountains to the northwest, and Badlands to the southeast. The Rialto-Colton basin consists of 4 hydrostratigraphic units with the water-bearing units expressing unconfined to partly confined properties (USGS Water-Resources Investigations Report 00-4243). Table 4-3 lists some of the characteristics of the basin. Subsurface outflow from the Bunker Hill Basin to the Rialto-Colton Basin ranges from 4,000 to 25,000 acre-ft/year (USGS Open file 2005-1278). Additional groundwater recharge includes mountain runoff, seepage from the Santa Ana River, and imported water. During the 1959-63 base period of the Western-San Bernardino Judgment, 11,731 acre-ft of extractions were verified. Watermaster reported 19,687 acre-feet of extractions for calendar year 2008. The Western-San Bernardino Judgment imposes recharge obligations on the Valley District to maintain water levels within the Rialto-Colton Basin. As described in the Judgment, WMWD can also incur a recharge obligation in the Rialto-Colton Basin if the total production exported to Riverside County exceeds the base right. Figure 4-1 shows the conceptual groundwater level contours in the Rialto-Colton Basin for fall of 2010. Figure 4-2 shows the difference in groundwater levels in the Rialto-Colton Basin from 2007 to 2010.

4.1.2.3 Riverside and Arlington Basins

The Riverside basin is bounded by the Rialto-Colton fault to the north, Arlington basin to the south, Box Spring Mountains to the east, and Chino basin to the west. The Riverside basin is an alluvial fill, unconfined basin. Underflow from the Rialto-Colton basin accounts for 24,600 acre-ft/year on average. Additional recharge occurs from the Santa Ana River, wastewater discharge, and precipitation. During the Western-San Bernardino Judgment, the Riverside basin was divided along county boundaries into the Riverside North and Riverside South sub-basins. Pursuant to the Western-San Bernardino Judgment, the Valley District is obligated to maintain a threshold groundwater level in Riverside North. As described in the Judgment, WMWD can incur a recharge obligation in Riverside North if the total production exported to Riverside County exceeds its base right. Figure 4-3 shows the conceptual groundwater level contours in the Riverside and Arlington basins for fall of 2010. Figure 4-4 shows the difference in groundwater levels in the Riverside and Arlington basins from 2007 to 2010.

The Riverside Basin Groundwater Management Plan estimated a range of safe yields for wet, dry, and average year using a calibrated numerical groundwater flow model of the Riverside and Arlington basins, and determined the average safe yield to be 27,200 acre-ft in the Riverside North and 35,100 acre-ft in the Riverside South. For the 2008 calendar year, Watermaster accounted for 30,678 acre-ft of extractions in the Riverside North and 31,201 acre-ft in the Riverside South.

The Arlington Basin consists of alluvial deposits and is located between Riverside South and the Temescal Basin. Recharge occurs as underflow from Riverside South and the Temescal Basin, precipitation, imported water, and irrigation and stormwater runoff. The Arlington Basin is not currently used by RPU due to the high levels of total dissolved solids and nitrates.

4.1.3 Overdraft Status of Groundwater Basins

In California, groundwater management is a local responsibility. It is the responsibility of the local groundwater or water management agency to decide whether a basin is in an overdraft condition (DWR, 2003). DWR does not identify any of the basins utilized by RPU (i.e. Riverside-Arlington [8-2.03], Rialto-Colton [8-2.04], and Bunker Hill [8-2.06]) as overdrafted, nor projected to be overdrafted in its Bulletin 118.

Table 4-4 shows the status of the various groundwater basins based on the most recent conditions available to RPU in December 2010. All the sub-basins are of Groundwater Budget "Type A". Type A – indicates one of the following: (1) a groundwater budget exists for the basin or enough components from separate studies could be combined to give a general indication of the basin's groundwater budget, (2) a groundwater model exists for the basin that can be used to calculate a groundwater budget, or (3) actual groundwater extraction data exist for the basin" (DWR, 2003).

Table 4-4: Overdraft Status of Groundwater Basins

Groundwater Basin	Current Status	Projected Status	Replenishment Obligation	Remarks
Bunker Hill	Overdrafted	In Overdraft	Required	The Valley Water District manages this groundwater basin.
Rialto-Colton	Overdrafted	In Overdraft	Required	The Valley Water District manages this groundwater basin. RPU does not currently extract water from this basin.
Riverside North	Overdrafted	In Overdraft	Required	The groundwater basin is managed by RPU through its groundwater management plan.
Riverside South	Not Overdrafted	In Overdraft	Not Currently	The groundwater basin is managed by RPU through its groundwater management plan.
Arlington	Overdrafted	In Overdraft	Required	The groundwater basin is managed by WMWD. RPU does not currently extract water from this basin.

USAWRA's 2007 IRWMP determined that the San Bernardino Basin, which includes Bunker Hill and Rialto-Colton, is being overdrafted but there are sufficient supplies from the SWP to meet the replenishment obligations (USAWRA, 2007). The *2011 Riverside Groundwater Management Plan* shows that Riverside North is currently overdrafted, and both Riverside North and South are projected to be overdrafted. The Valley District is obligated per the Western-San Bernardino Judgment to

maintain water levels in the Bunker Hill and Rialto-Colton basins, and in Riverside North. WMWD is required to replenish excess extractions above the base period extractions in the Rialto-Colton Basin, Riverside North, and Riverside South as specified in the Judgment. The Arlington Basin is being overdrafted and will be managed by WMWD.

RPU contributes to several efforts to monitor and manage the surrounding groundwater basins. RPU participates in independent groundwater level and quality monitoring in the Bunker Hill, Riverside, and Arlington basins. In addition, all groundwater production is metered and extractions are reported to the Western-San Bernardino Watermaster.

RPU's future projects described below, aim to conserve supplies and promote groundwater recharge to avoid overdraft conditions.

4.1.4 Historical Groundwater Production

Currently, RPU has forty-four active potable wells and one active non-potable well in the Bunker Hill Basin, seven potable and two non-potable active wells in Riverside North, and nine potable and nineteen non-potable active wells in Riverside South. RPU has wells in the Rialto-Colton and Arlington basins, but currently does not produce water from these basins.

Table 4-5 summarizes RPU's groundwater extractions, by basin, between 2005 and 2010. During this period, production fluctuated between about 84,700 and 96,800 acre-ft/yr, with an average annual production of 91,600 acre-ft.

Table 4-5: Historical Groundwater Production

Water Supply Sources	Metered or Unmetered	2005 (acre-ft)	2006 (acre-ft)	2007 (acre-ft)	2008 (acre-ft)	2009 (acre-ft)	2010 (acre-ft)
Bunker Hill Basin [1]	Metered	56,814	58,228	60,660	57,463	55,245	53,379
Colton-Rialto Basin	Metered	0	0	0	0	0	0
Riverside North	Metered	7,749	11,545	6,598	11,713	14,091	11,141
Riverside South	Metered	23,668	22,002	25,859	25,749	27,490	20,211
Total		88,231	91,775	93,117	94,925	96,826	84,731
Percentage of Total Water Supply		96.4%	97.4%	98.1%	99.8%	99.9%	99.9%

1. Production from the Bunker Hill Basin includes potable water wheeled to WMWD.

Table 4-5 shows that RPU has not had difficulty maximizing its water rights from the Bunker Hill Basin, as production over the past six years has averaged about 56,700 acre-ft/yr. Pursuant to the Western-San Bernardino Judgment, the Valley District and WMWD made available excess groundwater production to RPU and others. Between 2005 and 2010, the average extraction by RPU from Riverside North and Riverside South was about 10,500 acre-ft/yr and 24,200 acre-ft/yr, respectively.

The higher production levels from the Bunker Hill Basin are not expected to be available in the future under normal circumstances; therefore, it is assumed that RPU will be limited to its water right of 53,426 acre-ft/yr; unless increased through other projects or programs.

4.1.5 Groundwater Management Plan

Groundwater management activities are undertaken in cooperation with local agencies including the WMWD, Valley District, Santa Ana Water Project Authority (SAWPA), and the SBVWCD. The court appointed the Western-San Bernardino Watermaster to manage and report on the conditions of the local groundwater basins. Annually, the Valley District publishes an engineering report to determine the replenishment requirements for the Bunker Hill Basin in the ensuing water year.

In 2005, the Upper Santa Ana Water Resources Association (USAWRA) formed the Basin Technical Advisory Committee (BTAC), with the Valley District as the lead agency, to develop an Integrated Regional Water Management Plan (IRWMP) for the Upper Santa Ana River Watershed with a grant from DWR. The IRWMP was completed in 2007 and focuses on long-term management of groundwater resources in the Bunker Hill and Rialto-Colton basins and the reduction of reliance on imported water. A copy of the IRWMP is included in Appendix F. Currently, BTAC meets monthly with the primary purpose of managing resources to optimize groundwater recharge and extraction activities.

The Valley District has established target ranges for groundwater level management within Bunker Hill Basin, and is obligated under the Western-San Bernardino Judgment to maintain water levels in Rialto-Colton Basin and Riverside North.

In 2010, SAWPA adopted its One Water One Watershed (OWOW) Integrated Regional Water Management Plan for the entire Santa Ana River watershed. RPU participated in the OWOW plan preparation.

RPU assists in regional groundwater management as a member of both USAWRA and BTAC. RPU, in collaboration with WMWD, the Valley District, and other water retailers that produce water from the Riverside Basin is developing a GWMP for Riverside North and Riverside South. The purpose of the plan is to improve sustainability by managing the quantity and quality of groundwater resources. The *2011 Riverside Basin Groundwater Management Plan* is currently in draft form and is anticipated to be complete by the end of 2011. The plan will be provided to DWR once it is complete. WMWD is also developing a GWMP for the Arlington Basin.

4.1.6 Planned Groundwater Supply Projects and Programs

RPU has identified the following projects to insure historical levels of production are maintained and to increase future water supplies:

- Seven Oaks Dam Conservation Project (Phase 1)
- Riverside North Aquifer Storage and Recovery Project
- Pellissier Ranch Aquifer Storage and Recovery Project
- Rialto-Colton Groundwater Production Project

The expected yield and schedule from the planned projects are summarized in Table 4-6. With the exception of the Rialto-Colton Groundwater Project, all of the proposed projects rely on surface water recharge and are dependent on the hydrologic conditions in the Santa Ana River Watershed. In wet years, above average recharge will occur; and in dry years, below average recharge will occur. These projects each have inherent storage capacity, whether it is storage capacity behind the Seven Oaks Dam or storage capacity within a groundwater basin. Therefore, over a three-year dry period the quantity of supply from these projects will only be slightly reduced, because in those dry years, supplemental water will be pulled from storage. Historically, RPU's groundwater supply has been

reliable through multi-dry year periods because its production is only a fraction of the water stored in the surrounding groundwater basins. These new water supply projects utilize the same storage capacity within these basins.

Table 4-6: Future Water Supply Projects

Project Name	Projected Start Date	Projected Completion Date	Normal-Year Supply (acre-ft/yr)	Single-Dry Year Supply (acre-ft/yr)	Multi-Dry Year First Year Supply (acre-ft/yr)	Multi-Dry Year Second Year Supply (acre-ft/yr)	Multi-Dry Year Third Year Supply (acre-ft/yr)
Seven Oaks Dam Conservation (Phase 1) [1]	2008	2020	4,000	4,000	4,000	4,000	3,000
Riverside North Aquifer Storage and Recovery	2009	2015	3,500	3,500	3,500	3,500	1,200
Pellissier Ranch Aquifer Storage and Recovery	2012	2020	10,000	10,000	10,000	10,000	10,000
Rialto-Colton Groundwater Production	2015	2030	2,700	2,700	2,700	2,700	2,700
Total			20,200	20,200	20,200	20,200	16,900

1. 2,000 acre-ft/yr of new supply is available from the Seven Oaks Dam Project beginning in 2010.

4.1.6.1 Seven Oaks Dam Conservation Project (Phase 1)

The Western-San Bernardino Judgment permits RPU to acquire additional water rights in the Bunker Hill Basin through "new conservation". RPU has provided some of the funding for conservation storage of water from the Santa Ana River (SAR) behind the Seven Oaks Dam; the dam was completed in 1999. In 2010, the State Water Resources Control Board approved the water rights applications filed by WMWD and the Valley District to appropriate up to 200,000 acre-ft annually from the SAR. A copy of the approved water rights application is contained in Appendix G. WMWD and the Valley District have developed an Environmental Impact Report which has been certified. RPU will participate in the development of spreading basins to facilitate recharge into the local groundwater basins for future extraction. RPU already has infrastructure available to extract and deliver this additional supply. RPU estimates its share of water from this project at approximately 4,000 acre-ft/yr (CDM, 2009). In 2010, the new yield from this conjunctive use project was about 2,000 acre-ft. The full yield from this project is anticipated to be available by 2020.

The amount of water available for this project in any given year will be highly variable as it depends on local hydrologic conditions in the Santa Ana River Watershed. According to the updated Santa Ana River Water Right Applications Community Report (January 2007), the project will provide an annual average between 10,000 and 27,000 acre-ft/yr.

Under the Western-San Bernardino Judgment, groundwater rights will be increased by the respective shares in new conservation (72.05 percent by the Valley District and 27.95 percent by the Riverside County entities). Based on these percentages, the additional water available to the Riverside County entities may range from 2,795 ac-ft/yr to 7,546 acre-ft/yr; most of this additional water will be available to RPU. RPU estimates that it will receive an average of 4,000 acre-ft/yr of additional water supply from this project.

Environmental issues associated with the diversion and use of additional flows have been addressed through the certification of the Final Environmental Impact Report for the Santa Ana River Water Rights Applications for Supplemental Water Supply. This final EIR was certified under the Valley District's Resolution 929 during a joint meeting between the Valley District and WMWD's Board of Directors on March 21, 2007.

The facilities required for this project include: spreading basins and conveyance channels in the easterly portion of the Bunker Hill Basin. Additional production from the Bunker Hill Basin will be produced across most months and therefore, will not require the construction of additional extraction and transmission facilities by RPU. This project is considered feasible since it is already in the early stages of implementation by the Valley District, WMWD, and RPU.

4.1.6.2 Riverside North Aquifer Storage and Recovery Project

RPU, in conjunction with WMWD and the Valley District, have proposed the construction of an inflatable rubber dam in the Santa Ana River about 2 miles southwest of the I-215/I-10 interchange. The dam will be inflated to capture lower storm flows and recharge the stormwater within the riverbed. The dam will also be used to divert up to 100 cfs into the Riverside Canal. The recharge will help sustain groundwater supplies for RPU's nearby Flume wells. Peak storm flows will not be captured or reduced. The feasibility of this project relies on the effectiveness of recharge within the Santa Ana River as well as the quantity and quality of available stormwater which will vary from year to year. In addition, the proposed site is a protected habitat for the Santa Ana Sucker Fish and the project will require compliance with EPA regulations. The project is projected to recharge between 5,800 acre-ft/yr and 17,000 acre-ft/yr depending on the hydrologic conditions in the Santa Ana River Watershed. On average, the project is projected to yield about 10,800 acre-ft/yr of additional surface water recharge in the Riverside Basin and divert about 5,500 acre-ft/yr to the Riverside Canal. RPU anticipates, on average, about 3,500 acre-ft/yr of recharge from this conjunctive use project.

The facilities required for this project include: an inflatable dam across the Santa Ana River, a diversion structure, and conveyance structures. This project is part of RPU's long-term water supply plan for the Riverside Basin.

4.1.6.3 Pellissier Ranch Aquifer Storage and Recovery Project

RPU plans to augment groundwater supplies from Riverside South by constructing a recharge facility at the Pellissier Ranch site. The Pellissier Ranch site is actually located in Riverside North near the southern edge of the sub-basin boundary; however, water recharged at this facility will flow down gradient and be recovered by RPU in Riverside South. Recycled and diluent water will be recharged via surface spreading at this facility. Stormwater and groundwater from the Bunker Hill Basin will provide the diluent source to meet the California Department of Public Health (CDPH) and the SARWQCB requirements for recycled water recharge. The project will require the construction of a recycled water pipeline from the RWQCP to Pellissier Ranch. This pipeline will also supply recycled water for landscape irrigation (i.e. direct use) where economically feasible. Direct use along the proposed pipeline route is anticipated to be about 1,170 acre-ft/yr. This conjunctive use project is anticipated to recharge 10,000 acre-ft (i.e. 6,000 acre-ft of diluent water and 4,000 acre-ft of recycled water) by 2020. This project is discussed further in Section 4.2.

4.1.6.4 Rialto-Colton Groundwater Production Project

The Rialto-Colton Groundwater Production Project will increase RPU's production capacity form that basin by about 2,700 acre-ft/yr. RPU plans to complete this project by 2030.

The facilities required for this project include: one 2,000 gpm production well, 12,000 feet of 12-inch diameter pipeline to connect the new well to the San Bernardino Transmission Main, and 600 feet of 20-inch diameter casing under freeway. Initially, the Johnson No. 4 well will be connected to the Riverside Canal to supply irrigation water. Ultimately, RPU plans to develop a potable groundwater source from the Rialto-Colton Basin as part of its long-term water supply plan.

4.1.6.5 Additional Projects to Increase Water Supply Reliability

RPU is considering the following projects to assure production is maximized for potable deliveries, imported water purchases are minimized if not eliminated, and historical production levels are maintained:

Upper Gage Exchange Project. Currently, about 4,700 acre-ft of potable groundwater extracted from the Bunker Hill Basin is conveyed to the Gage Canal to meet non-potable demands. RPU plans to develop the Upper Gage Exchange Project to substitute potable groundwater from the Bunker Hill Basin with non-potable groundwater from Riverside North.

As demand for potable water in the RPU service area increased over the years, deliveries of potable groundwater to the Gage Canal to meet irrigation demands have decreased. Deliveries to the Gage Canal have been substituted by non-potable sources from RPU's Riverside Canal. Nearly all of the irrigation demands in the lower portion of the Gage Canal are met by non-potable deliveries from the Riverside Basin through the Riverside Canal via the Olivewood Booster Station. However, approximately 4,700 acre-ft/yr of potable groundwater from the Bunker Hill Basin is delivered to the upper portion of the Gage Canal. These deliveries are used to meet non-potable demands at the University of California Riverside and at the Canyon Crest Country Club Golf Course. Deliveries to these two users cannot be met through the Riverside Canal (i.e. the Olivewood Booster Station) as they are located upstream of the delivery point.

To convert the use of potable water by GCC customers connected to the upper portion of the Gage Canal, RPU plans to deliver non-potable water to the Gage Canal via the Upper Gage Exchange Project. This will enable RPU to convey all of its production from the Bunker Hill Basin to the Linden Evans Reservoir for potable use.

The facilities required for this project include: one pump station with four 50HP boosters and about 12,000 feet of 18-inch diameter pipeline. The conversion of Gage Canal deliveries from the Bunker Hill Basin to non-potable groundwater from the Riverside Basin is an integral part of the long-term planning of available supply sources to RPU.

Increase Hydraulic Capacity of Palmyrita Plant. This project consists of making minor hydraulic modifications to the Palmyrita WTP to increase the delivery capacity of the plant. The implementation of this project will provide 2,000 acre-ft/yr of additional water supply; in addition, it will enhance the peak delivery capacity during the summer months, which will further reduce RPU's need to purchase imported water.

The Palmyrita WTP treats groundwater from four wells in Riverside South (Moore Griffith, Electric Street, Garner B, and Palmyrita Wells) to remove DBCP. The capacity of the Palmyrita WTP is 11,250 gpm, but due to head losses through the plant, the four wells only produce approximately 8,000 gpm. Installation of an in-line booster pump at the existing site will result in an increase in production to approximately 10,000 gpm. This project has been approved with a Letter of Commitment (LOC) from the State for 50-percent funding.

The facilities required for this project include an on-site booster station at the Palmyrita WTP. Implementation of this project would increase RPU's production capacity from the Riverside Basin.

Add Ion Exchange Treatment at the Palmyrita Plant. The addition of Ion Exchange treatment to the Palmyrita WTP will increase production at this plant by about 2,000 acre-ft/yr.

Nitrate concentrations above the MCL occur at several of the production wells that feed the Palmyrita WTP. The addition of an ion exchange train at this plant will allow for increased production from the combined wells, particularly during the winter months when production typically has to be curtailed to achieve RPU's blending goals.

The facilities required for this project include: site work, piping, and an Ion Exchange treatment train. This project would increase the overall production from the Riverside Basin.

Maximize JW North WTP Capacity. Under this project, the capacity of the John W. North WTP will be increased from the current 10.0 mgd capacity to approximately 11.5 to 12.0 mgd. This project will yield an additional 1,000 acre-ft/yr from the Riverside Basin.

The John W. North WTP is an ultra-filtration plant that treats groundwater production from four wells that are considered to be under the direct influence of surface water. The plant was initially designed for a 10.0 mgd treatment capacity; however, the design allowed for a future expansion to approximately 11.5 to 12.0 mgd.

The facilities required for this project include: a 2,000 gpm well and piping from the new well to the 30-inch Flume Pipeline. This project will increase the overall production from the Riverside Basin.

Construct a Groundwater Treatment Plant in Riverside South. This project consists of constructing a new well head treatment facility for three existing wells in Riverside South, near downtown Riverside. The implementation of this project will provide approximately 5,000 acre-ft/yr of additional production capacity from this basin.

The construction of a new groundwater treatment plant in Riverside South has been considered by RPU for a number of years. Based on the preliminary analysis of local groundwater quality, the recommended processes for this plant would include approximately 50-percent reverse osmosis (RO) and 50-percent granular activated carbon (GAC) treatment.

The facilities required for this project will include: a new 6.0 mgd (4,100 gpm) WTP, rehabilitating three existing wells (i.e. Cunningham, First Street, Fill), pipelines to connect the three wells to the proposed WTP, a pipeline to deliver treated water to the Linden-Evans Reservoir, and a brine line to convey RO brine to the SARI line.

Construct New Wells and a Potential new Groundwater Treatment Plant in Riverside North. This project consists of constructing new wells, and if necessary a new WTP in Riverside North in the vicinity of the existing EVMWD Palm well. The implementation of this project will provide an additional 5,000 acre-ft/yr of production capacity from this basin.

The facilities required for this project will include: three new wells in the general vicinity of the Palm well and interconnecting piping between the wells, the Riverside Canal, and the Waterman transmission pipeline. This project will increase the overall production from the Riverside Basin.

Center Street Well Development and On-Site DBCP Treatment. This project will equip the existing Center Street well which is located on the southwest corner of Center Street and Michigan Avenue. Historical monitoring data from this well indicates that DBCP treatment using GAC will be necessary to produce potable groundwater. The implementation of this project will provide an additional 2,000 ac-ft/yr of production capacity from this basin. Capital costs for the construction of a GAC treatment plant at this well site will be partially paid by the parties responsible for the DBCP contamination. In addition, the responsible parties will be responsible for the operation and maintenance of the GAC vessels.

The facilities required for this project include: equipping the existing well, pipelines between the Center Street well, on-site treatment, the Gage transmission pipeline, and an on-site GAC treatment facility. This project will increase the overall production from the Riverside Basin.

4.1.7 Projected Groundwater Production

Table 4-7 shows the projected groundwater production between 2015 and 2035. RPU intends to fully utilize its water rights from the Bunker Hill Basin plus the quantity of water available through its conjunctive use project. RPU plans to increase the use of recycled water as described above. The balance of RPU's water supply will come from the Rialto-Colton Basin, Riverside North, and Riverside South. RPU's conjunctive use projects in the Riverside Basin will augment the yield of the basin and allow RPU to increase production over historical levels.

Production and recharge associated with RPU's conjunctive use projects will be coordinated with the Valley District and WMWD to prevent adverse effects on groundwater levels and quality. RPU anticipates being able to mitigate any unforeseen incremental contamination issues stemming from increased production through existing or future wellhead treatment facilities and/or through blending. Water quality is discussed in Section 5.

The percentage of groundwater to total water supply is expected to decline due to increased use of recycled water. Note the primary source of the recycled water is local groundwater that has gone through the potable water system and sewage treatment plant.

Table 4-7: RPU's Projected Groundwater Production (Assumes 10-percent reduction in potable water demand from Conservation and Recycled Water Reuse by 2015 and 20-percent by 2020)

Groundwater Sources	2015 [1] (acre-ft)	2020 [2] (acre-ft)	2025 [2] (acre-ft)	2030 [2] (acre-ft)	2035 [2] (acre-ft)
Bunker Hill Basin [3]	59,626	61,626	61,626	61,626	61,626
Rialto-Colton Basin	2,700	2,700	2,700	2,700	2,700
Riverside North	17,000	17,000	17,000	17,000	17,000
Riverside South	15,074	20,274	24,674	29,474	32,674
Total	94,400	101,600	106,000	110,800	114,000
Percentage of Total Water Supply	96.3%	94.6%	94.8%	95.0%	95.2%

1. In 2015, RPU plans to recharge 2,000 acre-ft of water in the Bunker Hill Basin and 3,500 acre-ft in Riverside North through its conjunctive use projects.
2. By 2020, RPU plans to recharge 4,000 acre-ft of water in the Bunker Hill Basin, 3,500 acre-ft in Riverside North, and 10,000 acre-ft in Riverside South through its conjunctive use projects.
3. Production from the Bunker Hill Basin includes 4,200 acre-ft of water owned by WMWD.

4.2 Recycled Water

4.2.1 Wastewater Collection and Treatment

The City of Riverside Public Utilities Department and Public Works Department conjointly manage and plan wastewater and recycled water operations and programs. The Public Works Department operates and maintains a municipal wastewater tertiary treatment plant – the Riverside Regional Water Quality Control Plant (RWQCP). The City also operates and maintains the wastewater collection system shown in Figure 4-5. The wastewater collection system includes approximately 800 miles of gravity sewers ranging in size from 6 to 48 inches in diameter. Currently, the average daily wastewater inflow to the RWQCP is about 34 million gallons per day (MGD), or about 38,100 acre-ft/yr, and the capacity of the plant is 40 MGD. Upgrades are being designed to increase the capacity to 46 MGD by 2015 and improved treatment processes (e.g. membrane biological reactors) will be added. The ultimate plant capacity is anticipated to be 52 MGD. The Public Works Department anticipates the final plant expansion to occur in 2026.

The service area of the RWQCP extends beyond the water service area of RPU as shown in Figure 4-5. RWQCP facilities provide primary, secondary, and tertiary treatment to sewage influent from the City of Riverside, and other unincorporated areas of Riverside County served by the Jurupa, Rubidoux, Highgrove, and Edgemont Community Services Districts.

The *2011 Recycled Water Facilities Plan* projected recycled water volumes based on historical population growth taking into account the recent economic downturn by assuming a low growth scenario. Table 4-8 shows the historical and projected volumes of recycled water in acre-ft/yr.

Table 4-8: Historical and Projected Quantities of Recycled Water Available for Reuse

Type of Wastewater	2005 (acre-ft)	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Raw Wastewater Collected and Treated in the RPU Service Area	37,200	38,100	42,600	47,200	49,500	52,400	53,800
Treatment Plant Losses [1]	3,000	3,000	3,400	3,800	4,000	4,200	4,300
Available Volume that Meets Recycled Water Standards (Tertiary Treatment)	34,200	35,000	39,200	43,400	45,500	48,200	49,500

1. Treatment plant losses are estimated at 8-percent of the influent flow. This is based on recent RWQCP records.

4.2.2 Wastewater Disposal

The Orange County Judgment (Superior Court, 1969) required the City to annually discharge 15,250 acre-ft (13.38 MGD) of effluent from the RWQCP to the Santa Ana River to assist WMWD in meeting its discharge obligations downstream of Prado Dam. Historically, the State Water Resources Control Board (SWRCB) granted the City's wastewater change petition, allowing the City to divert and put to use up to 11,000 acre-ft of effluent historically discharged to the Santa Ana River. A copy of the SWRCB's order is included in Appendix J. In addition, the SWRCB extended the area in which recycled water could be used to include the City limits, the RPU service area, and the Jurupa Area Plan boundary.

The new discharge requirement limits the amount of recycled water available for use. The amount of available recycled water will increase with population growth over time and RPU projects that the recycled water supply will be sufficient to meet the projected demands of its recycled water program.

RPU plans to maximize the use of recycled water beyond the planned projects described below. Ultimately, the City intends to further develop its recycled water program and potentially sell surplus recycled water to surrounding retail suppliers.

Table 4-9 summarizes the projected discharge from RWQCP to the Santa Ana River. Tertiary treated effluent is blended with other flows within the Santa Ana River and naturally replenishes downstream aquifers. Some downstream water agencies, such as the Orange County Water District (OCWD), divert flow from the Santa Ana River to spreading basins to facilitate additional replenishment of their aquifers.

Table 4-9: Wastewater Discharges to the Santa Ana River

Method of Disposal	Treatment Level	2010 [1] (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Projected Recycled Water Reuse	Tertiary	260	3,650	9,800	9,800	9,800	9,800
Surplus Recycled Water Available for Reuse or to be Marketed to Surrounding Water Retailers	Tertiary	- - -	10,550	8,600	10,700	13,400	14,700
Projected Discharge to the Santa Ana River	Tertiary	34,740	25,000	25,000	25,000	25,000	25,000

1. Actual values are provided for 2010.

4.2.3 Historical Recycled Water Reuse

Table 4-10 shows the current uses of recycled water compared to use projections from the 2005 UWMP.

Table 4-10: Comparison of Actual Recycled Water Reuse in 2010 to that Projected in the 2005 UWMP

Use Type	2010 Actual Use (acre-ft)	2005 Projection for 2010 (acre-ft)
Landscape Irrigation	120	2
Golf Course Irrigation	140	140
Industrial	0	126
RERC Power Plant	0	110
Other	0	823
Total	260	1,201

The 2005 UWMP projected use of about 1,200 acre-feet of recycled water for non-potable uses by 2010; however, only about 260 acre-feet of recycled water was actually reused. Recycled water reuse was limited by the available recycled water infrastructure. The recycled water infrastructure for the Riverside Energy Resource Center (RERC) has not yet been completed. "Other" recycled water uses included a Recycled Water Agricultural Program to deliver recycled water to the GCC and WMWD. The facilities required to make these deliveries have not been completed. RPU plans to construct the Arlington-Central Avenue Recycled Water Project to provide recycled water to RERC and WMWD. This project is discussed in the following section.

4.2.4 Planned Recycled Water Reuse Projects

Potential uses of recycled water within the RPU service area include landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, and groundwater recharge.

RPU prepared the *2011 Recycled Water Faculties Plan* to determine the feasibility of recycled water reuse throughout the RPU service area and to evaluate groundwater augmentation with recycled water. The ultimate cost to serve direct use costumers throughout the RPU service area and groundwater augmentation was estimated at more than $540 million dollars. After evaluating the *2011 Recycled Water Faculties Plan*, RPU management decided to expand its recycled water program with two key projects rather than moving forward with a service-area wide approach. The two projects include the Arlington-Central Avenue Recycled Water Project and the Pellissier Ranch Aquifer Storage and Recovery Project.

4.2.4.1 Arlington-Central Avenue Recycled Water Project

This project allows recycled water use in the RPU service area to be expanded within a relatively short time frame (less than 3 years) and provides 2,600 acre-ft/yr of recycled water to WMWD for direct use, and an additional 1,000 acre-ft/yr for recharge within the Arlington Basin. The deliveries of recycled water to WMWD will off-set current groundwater production by RPU from the Riverside Basin.

The proposed pipeline alignment allows for approximately 1,050 acre-ft/yr of recycled water to be distributed to adjacent or nearby RPU customers for direct use. Figure 2-14 provides a list of potential customers and their estimated recycled water demand. Preliminary analysis of the pipeline for this project suggests that 19,500 feet of 24-inch diameter pipeline is required from the intersection of Arlington Avenue and Van Buren Boulevard to the intersection of Arlington Avenue and Riverside Avenue. At the intersection of Arlington Avenue and Riverside Avenue, the 24-inch line will bifurcate into a 10-inch line which will convey approximately 1,000 acre-ft/yr south to the Riverside Canal, and a 16-inch line which will convey recycled water north and east to tie into the existing 8-inch recycled water pipeline within Central Avenue. Short segments of pipe, approximately 1,700 feet and 3,300 feet will branch off of the 24-inch transmission main to convey recycled water to Adams Elementary School and Ramona High School, respectively.

Recycled water delivered to the Riverside Canal will be conveyed downstream for recharge in the Arlington Basin by WMWD. Recharge in the Arlington Basin will help improve water quality, the safe yield of the basin, and production to the Arlington Desalter.

4.2.4.2 Pellissier Ranch Aquifer Storage and Recovery Project

This project provides a longer-term (3 to 7 years) project to convey approximately 4,000 acre-ft/yr of recycled water to the Pellissier Ranch parcel for recharge. In addition, approximately 1,170 acre-ft/yr of direct use will be supplied to adjacent and nearby customers along the pipeline route.

The major components of this project include the following: approximately 47,000 feet of new 24-inch diameter pipeline for recycled water, approximately 4,500 feet of 30-inch diameter pipeline for diluent water, two canal turnout structures, five production wells, and a pump station to convey diluent water to the Pellissier Ranch site from the Riverside Canal.

Preliminary analysis suggests that the pipeline for this project will be 24-inches in diameter to meet the direct use demands along the pipeline alignment and to convey up to 6,000 acre-ft/yr of recycled water for recharge. It is estimated that a total of 10,000 acre-ft/yr (recycled plus diluent water) can be recharged at the site at an initial diluent ratio of about 3:1 (diluent to recycled water). Over time, it is anticipated that this ratio will decrease to 1:1 or more with regulatory approval. The sources of diluent water will be excess groundwater production from the Bunker Hill and Rialto-Colton basins and storm flows captured and diverted into the Riverside Canal. A canal turnout structure will be

needed to divert water from the Riverside Canal into the Pellissier Ranch Storm Channel as shown in Figure 2-14. A second turnout is needed in conjunction with a pump station where the 24-inch recycled water line intersects the existing Pellissier Storm Channel as shown in Figure 2-14. The pump station will be capable of conveying approximately 8,000 gpm from the Pellissier Storm Channel to the recharge basins at Pellissier Ranch site, via an existing 30-inch diameter transmission main.

The exact locations and dimensions of the recharge basins at Pellissier Ranch will be determined after a detailed hydrogeological investigation is performed. Environmental considerations/ constraints may also impact the placement and design of the recharge basins.

4.2.4.3 Project Implementation

In 2011, RPU's Water Resources Division prepared a written analysis which outlined the following sequence of actions needed to implement the Arlington-Central Avenue Recycled Water Project and the Pellissier Ranch Aquifer Storage and Recovery Project:

- Develop a Financial Plan for each phase of the projects. This will include an evaluation of the project costs, the funding sources that will pay the capital and O&M costs, and the anticipated annual revenues.
- Develop a Recycled Water Marketing and Connections Plan for each phase of the projects – The tasks required for adding a new recycled water customer include an initial site assessment, water audit, documentation of irrigation, plant condition, development of system drawings, preparation of connection details, preparation of an engineer's report, retrofitting the site with signs and marking the system purple, performing a cross-connection shutdown test, and connecting the onsite recycled water system.
- Hydrogeological investigation to determine optimal locations and design for the recharge basins and groundwater production wells at Pellissier Ranch.
- Geotechnical investigation and potholing to verify pipeline alignments.
- Preliminary engineering designs of transmission mains, canal turnout structures, pump station, recharge basins, and production wells.
- Initial studies.
- CEQA and other environmental permitting.
- Complete final designs and solicit bids for construction.

RPU anticipates that two separate Initial Studies will be performed to determine potential environmental impacts from the Arlington-Central and Pellissier Ranch projects. Based on the findings of the Initial Studies either a Mitigated Negative Declaration or an EIR will be prepared as needed.

4.2.5 Projected Recycled Water Reuse

The *2011 Recycled Water Faculties Plan* estimates that about 6.2 MGD (6,900 acre-feet per year) of tertiary treated recycled water is available in 2010 for non-potable uses and groundwater augmentation after adjusting for downstream discharge obligations, potential losses, and in-plant use. This supply is expected to increase to about 21.9 MGD (24,500 acre-ft/yr) by 2035.

Table 4-11 shows the planned recycled water reuse through 2035. RPU's recycled water program is projected to meet about 1,050 and 2,200 acre-ft of direct use demands by 2015 and 2020, respectively. RPU plans to recharge about 4,000 acre-ft/yr of recycled water by 2020. RPU plans to

deliver about 2,600 acre-ft and 3,600 acre-ft of recycled water to WMWD by 2015 and 2020, respectively.

Table 4-11: Projected Recycled Water Reuse

Use Type	Description	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Direct Use - Irrigation	Landscape Irrigation along the Arlington-Central and Pellissier Pipelines	900	2,050	2,050	2,050	2,050
Direct Use - Industrial	Riverside Energy Resources Center	150	150	150	150	150
In-Direct Use	Groundwater Recharge at Pellissier Ranch	0	4,000	4,000	4,000	4,000
Wholesale	Recycled Water delivered to WMWD	2,600	3,600	3,600	3,600	3,600
Total		3,650	9,800	9,800	9,800	9,800

4.2.6 Incentive Programs to Encourage Use of Recycled Water

Establishing standards for the use of recycled water is one of the policies included in the City's General Plan 2025. RPU has experience developing marketing and incentive programs for services it provides such as electricity and water. In March 2006, the City Council adopted a resolution modifying recycled water rates (Appendix H). Existing customers are charged a commodity rate of $0.80 per hundred cubic feet (ccf), which is lower than the $1.26 per ccf for existing customers under the irrigation metered service (WA-3). In addition, the Recycled Water Reuse Ordinance is designed to encourage recycled water use (Appendix I). Table 4-12 shows projected use of recycled water expected from such incentives.

Table 4-12: Methods to Encourage Recycled Water Reuse

Actions	2010 (acre-ft)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Financial Incentives and Recycled Water/Non-Potable Water Rules	210	760	1,760	1,760	1,760	1,760

4.3 Desalinated Water Opportunities

The Arlington Basin provides a local source of brackish water. WMWD owns and operates the Arlington Desalter to improve groundwater quality and supply water to the City of Norco using five wells in the western part of the basin. The Arlington Basin is not adjudicated and is downstream of RPU's major water reservoirs.

RPU does not produce nor plan to produce potable water from the Arlington Basin and has no immediate plans for desalination as of 2010. Nitrates and Total Dissolved Solids (TDS) levels in blended water served by RPU are lower than their respective Maximum Contaminant Level (MCL) and Secondary MCL (SMCL). RPU will consider desalting groundwater from Riverside South when less expensive and less energy intensive sources are not adequate to meet demand.

4.4 Water Exchanges and Transfers

RPU plans to develop a water exchange program with GCC by 2017. Currently, GCC uses 4,700 acre-ft of potable supplies from the Bunker Hill Basin for agricultural irrigation at UCR and landscape irrigation at the Canyon Crest Country Club Golf Course. RPU intends to replace that quantity of potable water with non-potable water via the proposed Upper Gage Exchange Project. Table 4-13 summarizes RPU's transfer and exchange opportunities.

Table 4-13: Transfer and Exchange Opportunities

Transfer Agency	Transfer or Exchange	Short or Long Term	Proposed Volume (acre-ft/yr)
Gage Canal Company	Exchange (via the Upper Gage Exchange Project)	Long Term	4,700

4.5 Imported Water

In the past, RPU has purchased imported water from WMWD. WMWD is a wholesale purchaser of imported water from the State Water Project (SWP) through the Metropolitan Water District of Southern California (MWD). WMWD has contractual rights to imported water from MWD. Table 4-14 shows the projected imported water purchases by RPU from WMWD.

Imported water is treated in Riverside at the Mills WTP operated by MWD. RPU can take deliveries of imported water through two primary connections: the Mills connection and the Van Buren connection. Both connections have a capacity of 30 cfs. RPU has a contractual agreement with WMWD for the service right to 30 cfs or 21,700 acre-ft/yr of imported water from the SWP. RPU's agreement to purchase wholesale water from WMWD is provided in Appendix E.

Table 4-14: Wholesale Supplies

Wholesale Sources	Contracted Volume (cfs)	2015 (acre-ft)	2020 (acre-ft)	2025 (acre-ft)	2030 (acre-ft)	2035 (acre-ft)
Imported Water from WMWD	30	0	0	0	0	0

4.6 Surplus Water Supplies

RPU has water rights from the Bunker Hill Basin and has entitlement to produce water from the Rialto-Colton Basin, Riverside North, and Riverside South per the Western-San Bernardino Judgment. RPU plans to augment its current water supplies through the following projects:

- 4,000 acre-ft/yr of recharge from the Seven Oaks Dam Conservation Project;
- 3,500 acre-ft/yr of recharge from the Riverside North Aquifer Storage and Recovery Project;
- 10,000 acre-ft/yr of recharge (6,000 acre-ft/yr of diluent water and 4,000 of recycled water) from the Pellissier Ranch Aquifer Storage and Recovery Project;
- 4,700 acre-ft/yr of non-potable water delivered to the GCC, which will offset potable water demands on RPU's system from the Upper Gage Exchange Project;

- 1,050 and 2,200 acre-ft/yr of recycled water for direct use within the RPU service area from the Arlington-Central Avenue Recycled Water Project and the Pellissier Ranch Aquifer Storage and Recovery Project in 2015 and 2020, respectively;
- And, 2,600 and 3,600 acre-ft/yr of recycled water for wholesale to WMWD in 2015 and 2020, respectively.

In the event that additional water supply is needed beyond what is described in this plan, RPU will meet those requirements from increased production from the Rialto-Colton Basin, Riverside North, and Riverside South or through imported water purchases from WMWD.

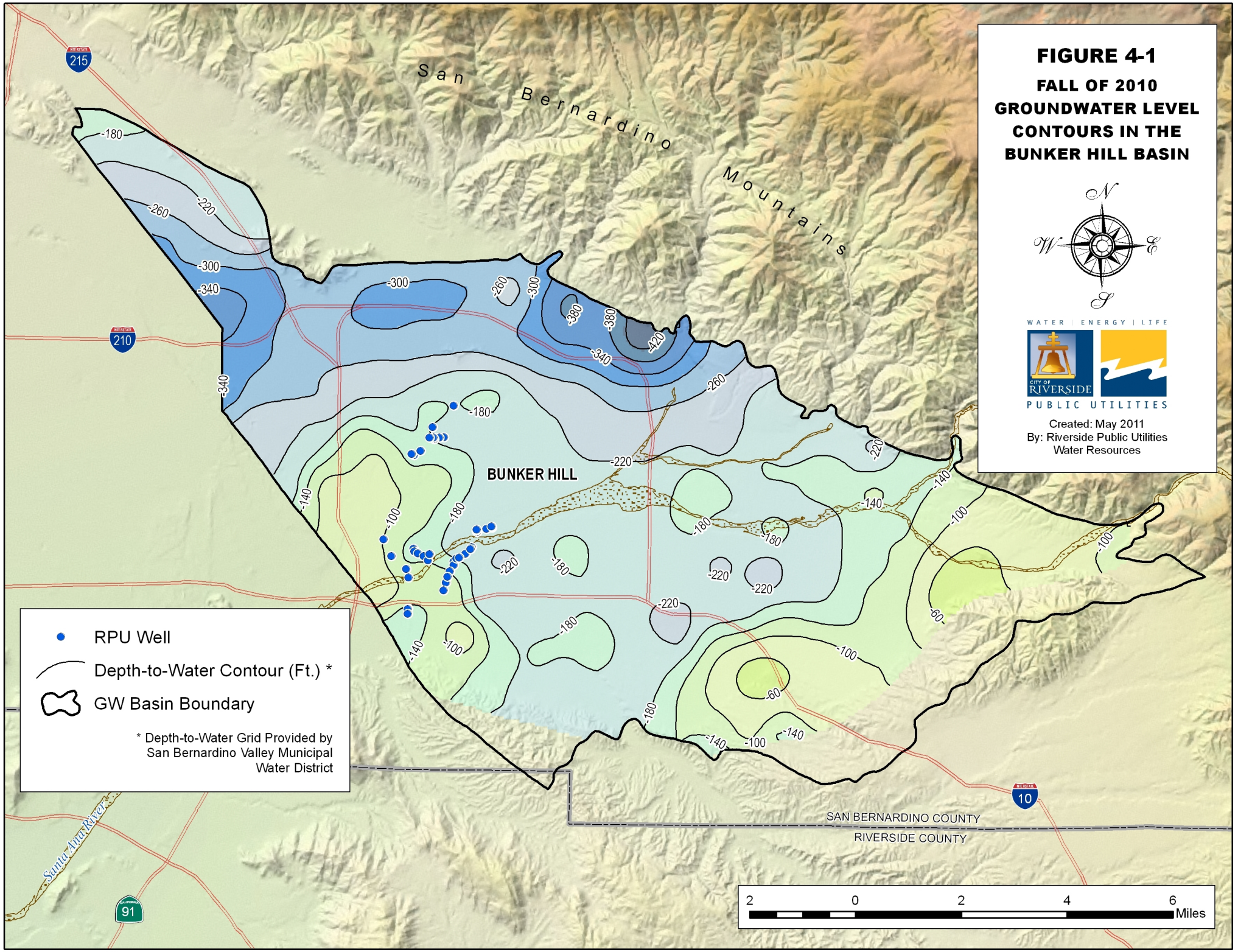


FIGURE 4-1
FALL OF 2010 GROUNDWATER LEVEL CONTOURS IN THE BUNKER HILL BASIN
N
W
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S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
San Bernardino Mountains
BUNKER HILL
RPU Well
Depth-to-Water Contour (Ft.) *
GW Basin Boundary
* Depth-to-Water Grid Provided by San Bernardino Valley Municipal Water District
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
Santa Ana River
215
210
10
91
2 0 2 4 6 Miles

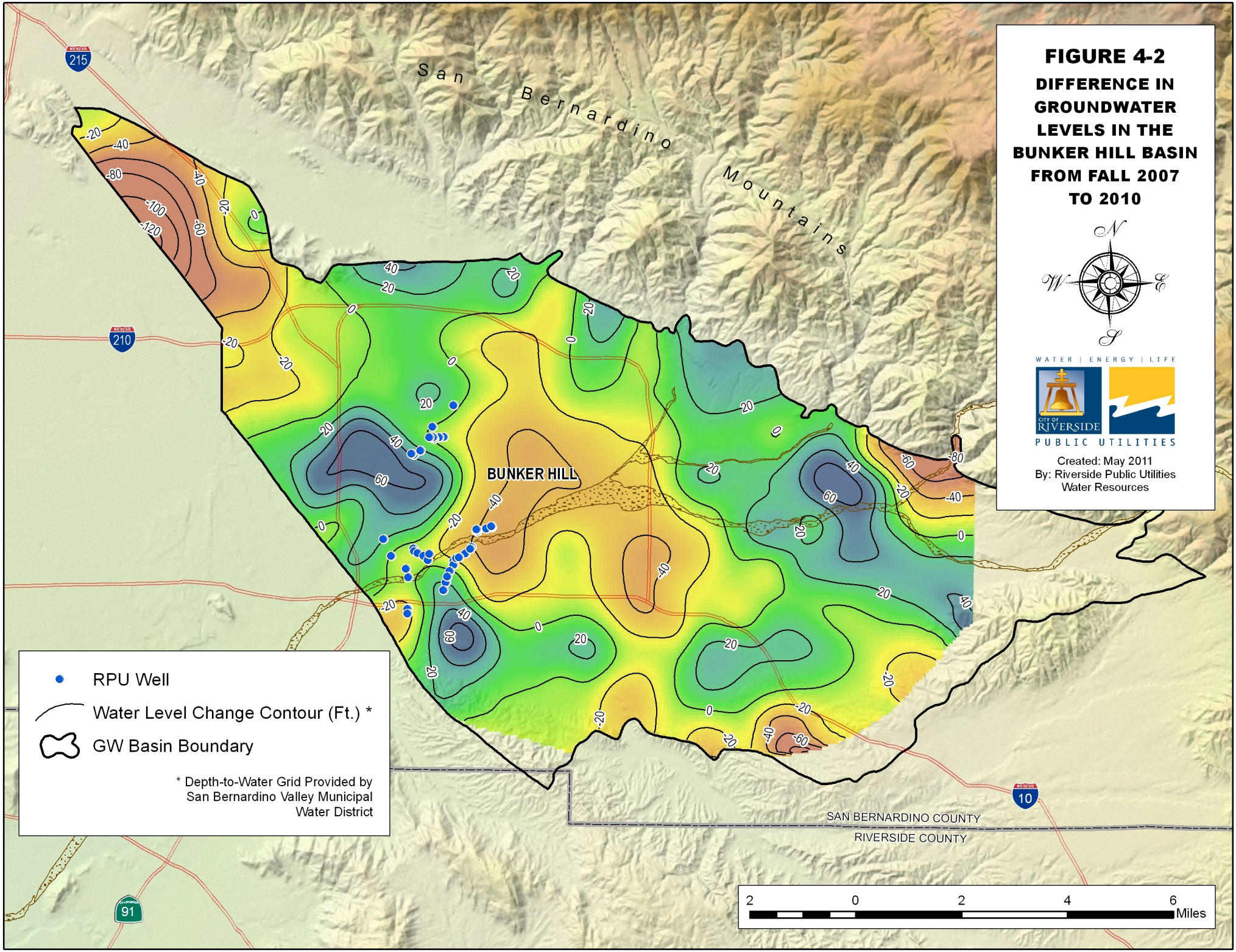
FIGURE 4-2
DIFFERENCE IN GROUNDWATER LEVELS IN THE BUNKER HILL BASIN FROM FALL 2007 TO 2010
N
W
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S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
San Bernardino Mountains
BUNKER HILL
215
210
10
91
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
RPU Well
Water Level Change Contour (Ft.) *
GW Basin Boundary
* Depth-to-Water Grid Provided by San Bernardino Valley Municipal Water District
2 0 2 4 6
Miles

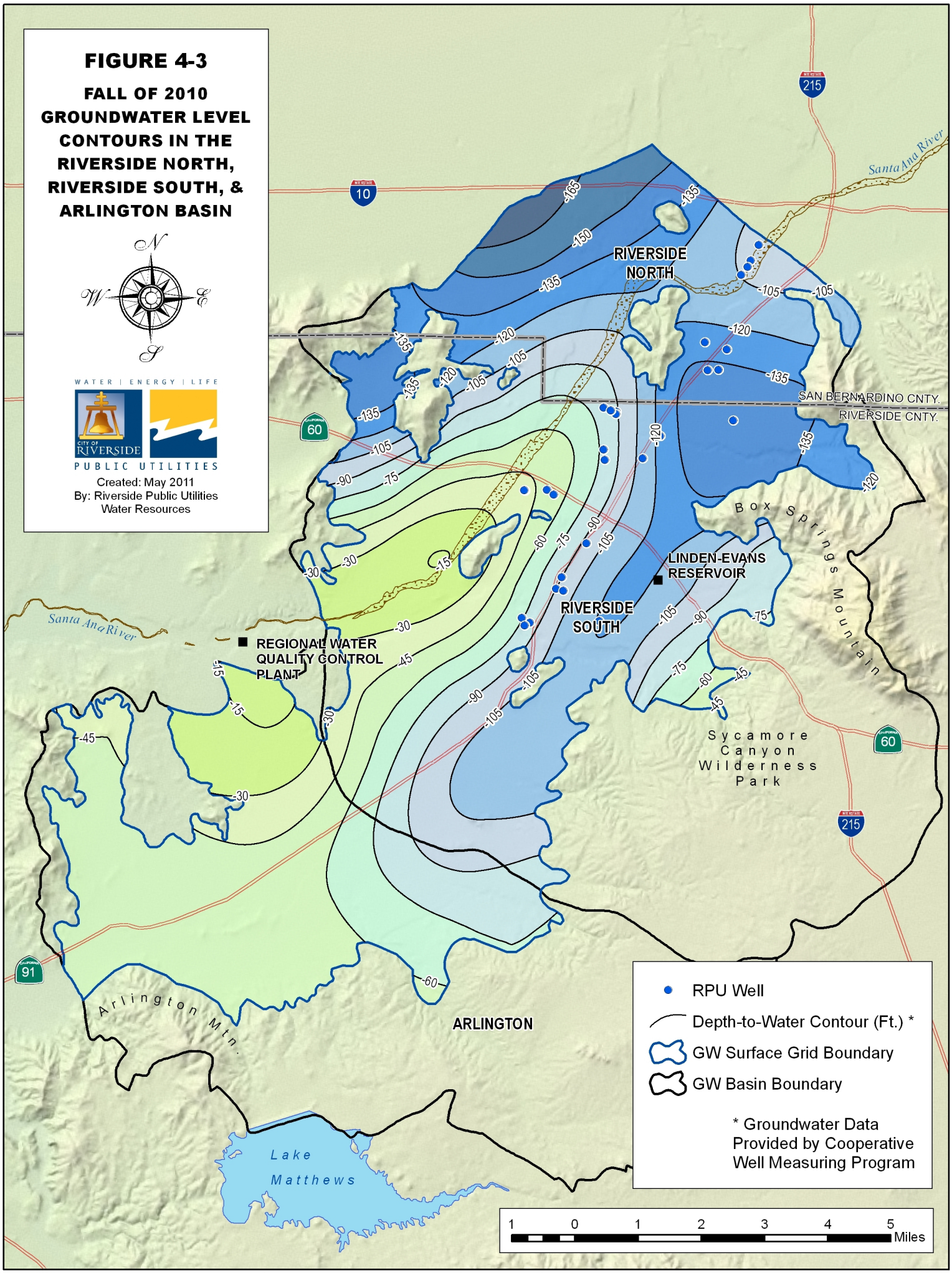
FIGURE 4-3
FALL OF 2010 GROUNDWATER LEVEL CONTOURS IN THE RIVERSIDE NORTH, RIVERSIDE SOUTH, & ARLINGTON BASIN
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
RIVERSIDE NORTH
RIVERSIDE SOUTH
ARLINGTON
LINDEN-EVANS RESERVOIR
REGIONAL WATER QUALITY CONTROL PLANT
SAN BERNARDINO CNTY.
RIVERSIDE CNTY.
Santa Ana River
Box Springs Mountain
Sycamore Canyon Wilderness Park
Arlington Mtn.
Lake Matthews
215
10
60
91
-165
-150
-135
-120
-105
-90
-75
-60
-45
-30
-15
RPU Well
Depth-to-Water Contour (Ft.) *
GW Surface Grid Boundary
GW Basin Boundary
* Groundwater Data Provided by Cooperative Well Measuring Program
1 0 1 2 3 4 5 Miles

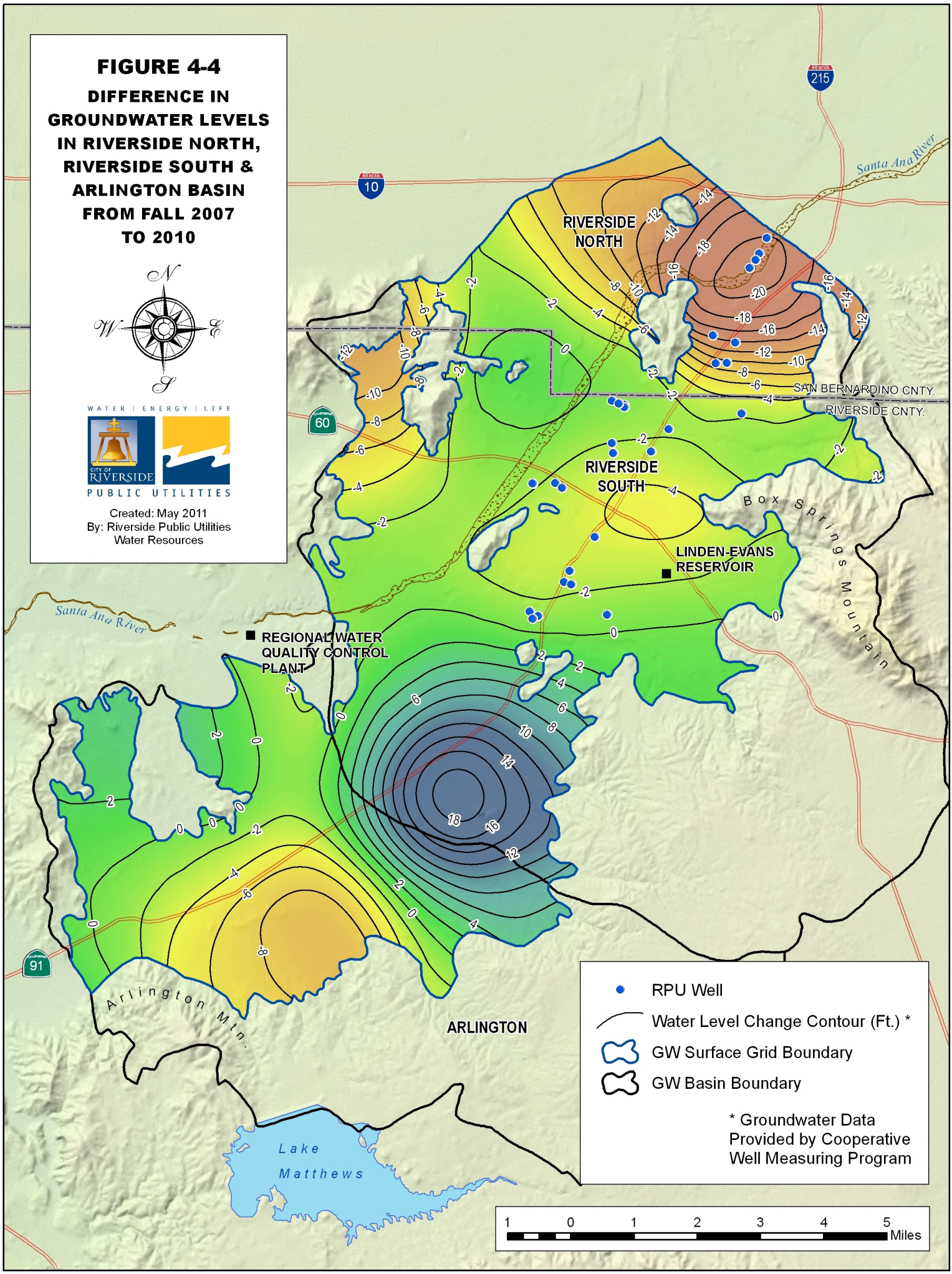
FIGURE 4-4
DIFFERENCE IN GROUNDWATER LEVELS IN RIVERSIDE NORTH, RIVERSIDE SOUTH & ARLINGTON BASIN FROM FALL 2007 TO 2010
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
RIVERSIDE NORTH
RIVERSIDE SOUTH
ARLINGTON
SAN BERNARDINO CNTY.
RIVERSIDE CNTY.
LINDEN-EVANS RESERVOIR
REGIONAL WATER QUALITY CONTROL PLANT
Santa Ana River
Box Springs Mountain
Arlington Mtn.
Lake Matthews
215
10
60
91
RPU Well
Water Level Change Contour (Ft.) *
GW Surface Grid Boundary
GW Basin Boundary
* Groundwater Data Provided by Cooperative Well Measuring Program
1 0 1 2 3 4 5 Miles

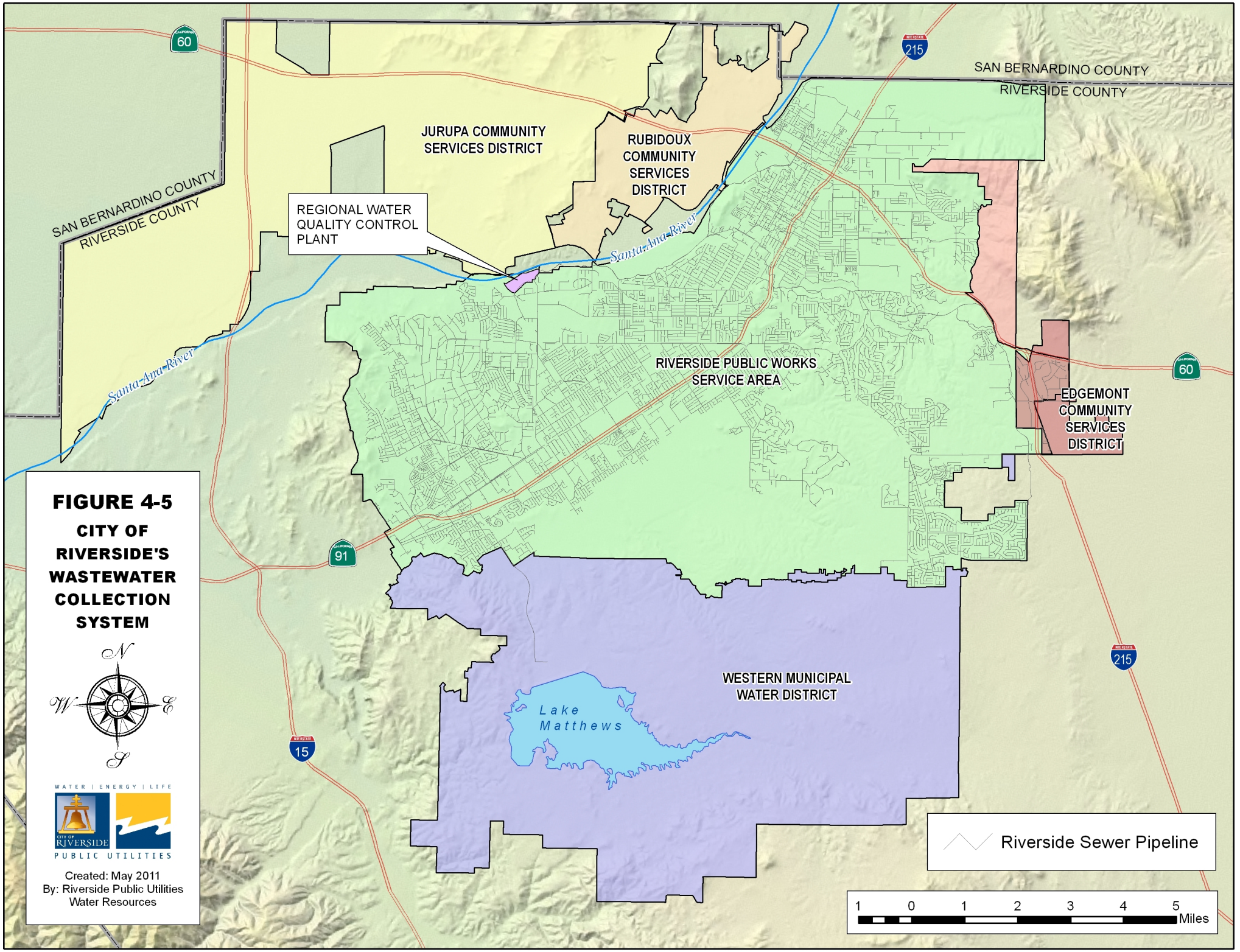
FIGURE 4-5
CITY OF RIVERSIDE'S WASTEWATER COLLECTION SYSTEM
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
JURUPA COMMUNITY SERVICES DISTRICT
RUBIDOUX COMMUNITY SERVICES DISTRICT
REGIONAL WATER QUALITY CONTROL PLANT
Santa Ana River
RIVERSIDE PUBLIC WORKS SERVICE AREA
EDGEMONT COMMUNITY SERVICES DISTRICT
WESTERN MUNICIPAL WATER DISTRICT
Lake Matthews
60
215
91
15
Riverside Sewer Pipeline
1 0 1 2 3 4 5
Miles

SECTION 5 – WATER SUPPLY RELIABILITY and WATER SHORTAGE CONTINGENCY PLANNING

5.1 Reliability of Supply

5.1.1 Consistency of Supplies

Historically, RPU's source waters have proven reliable, even during the multi-year droughts from 1984 to 1990, 1999 to 2002, and 2006 to 2009. To date, RPU has not experienced any major deficiencies in water supply. RPU, water management agencies, and other local water retailers are cooperating to further increase the reliability of groundwater from the Bunker Hill Basin, Rialto-Colton Basin, Riverside North, and Riverside South as discussed earlier in Section 4.1.5.

Current RPU source waters are consistently available as described in Table 5.1. In order to increase groundwater production beyond historical levels and improve water supply reliability of the local groundwater basins, RPU has collaborated with other local water retailers through SAWPA, the USAWRA, and BTAC to address the various groundwater management issues. Typical collaborative efforts include developing groundwater models, sharing groundwater quantity/quality data, partnering on regional projects, and conducting source water assessments (SWA).

Table 5-1: Factors Resulting in Inconsistency of Supply

Water Supply Sources	Source Name	Limitation Quantification (acre-ft)	Legal	Environmental	Water Quality	Climate	Additional Information
Groundwater	Extractions from the Bunker Hill Basin, Riverside North, and Riverside South	0	None	None	None	None	None
Surface Water	Rainfall Runoff and Dry-Weather Flow from the Santa Ana River Watershed as a Source of Recharge for RPU's Conjunctive Use Projects	3,300	None	None	None	Drought Conditions	None
Recycled Water	Tertiary Treated Recycled Water from the RWQCP	0	None	None	None	None	None
Imported Water from WMWD	State Water Project Water from MWD Via WMWD	N/A	Competition for New Supplies	Endangered Species	Contamination of Supply and/or More Stringent Water Quality Standards	Drought Conditions	RPU Does Not Plan To Use Imported Water

5.1.2 Reliability of Groundwater Supplies

Local groundwater supplies account for most of RPU's water supplies, with approximately 60-percent originating from the Bunker Hill Basin, which is adjudicated. RPU's water rights are based on the long-term safe yield from the Bunker Hill Basin, which includes wet, dry, and normal periods. RPU's wells are generally located in the section of the basin with the greatest thickness of water bearing layers. Thus, RPU's water supply from the Bunker Hill Basin is considered reliable during single and multi-year dry periods. The Western-San Bernardino Judgment also permits producers to increase groundwater production by up to 20-percent in any single year for peaking purposes.

As part of the *2011 Riverside Basin Groundwater Management Plan* the safe yield for the Riverside and Arlington basins were established based on 43 years of historical production and hydrologic conditions (1965 to 2007). This period includes wet, dry, and normal periods and is considered to be

representative of long-term mean climatological conditions. The calibrated numerical groundwater model of the Riverside and Arlington basins determined the safe yield to be 27,200 acre-ft in Riverside North and 35,100 acre-ft in Riverside South. Recharge associated with RPU's planned conjunctive use projects will allow RPU to increase groundwater production from the Riverside Basin without adversely impacting the sustainability of this water resource.

5.1.3 Reliability of Surface Water Supplies

RPU intends to augment natural recharge in the Bunker Hill and Riverside basins through conjunctive use projects. Specifically, RPU plans to recharge about 4,000 acre-ft/yr of surface water to the Bunker Hill Basin through the Seven Oaks Dam Conservation Program, recharge about 3,500 acre-ft/yr of surface water to Riverside North through the Riverside North Storage and Recovery Project, and recharge about 6,000 acre-ft/yr of surplus groundwater from the Bunker Hill Basin (i.e. RPU's unused water rights and/or excess production made available from the Western-San Bernardino Watermaster), surface water diversions from the proposed Riverside North Aquifer Storage and Recovery Project into the Riverside Canal, and surface water from the Pellissier Storm Channel to Riverside South through the Pellissier Ranch Aquifer Storage and Recovery Project.

The quantity of surface water recharge from these projects is dependent on the hydrologic conditions in the Santa Ana River Watershed. However, in wet years above average recharge will occur and in dry years below average recharge will occur. These projects each have inherent storage capacity, whether it is storage capacity behind the Seven Oaks Dam or storage capacity within a groundwater basin. Therefore, over a single or multi-year dry period the quantity of supply from these projects will only be slightly reduced, because in those dry years, supplemental water will be pulled from storage.

5.1.4 Reliability of Recycled Water Supplies

The primary source of the recycled water is local groundwater that has gone through the potable distribution system and the sewage treatment plant. RPU plans to reuse the available volume of recycled water from the RWQCP and considers this supply to be 100-percent reliable during single or multi-year dry periods.

5.1.5 Reliability of Imported Supplies

RPU is contracted to receive State Water Project water from MWD through WMWD. MWD is the largest State Water Contractor, with an annual maximum entitlement of 1,911,500 acre-ft through 2035. However, actually deliveries of State Water Project water from the State to MWD vary each year based on amount of precipitation and projected water use within MWD's service area.

The *2009 State Water Project Reliability Report* estimates a decrease in water delivery reliability from the State Water Project over the next 20 years. The 2009 report indicates that on a long-term average basis, State Water Contractors can expect about 60-percent of their annual maximum entitlement.

MWD has worked on many programs to augment potential diminished supplies due to dry periods or regulation restrictions. Thus the imported water supply reliability from MWD to its customers is greater than 60-percent.

As described earlier, RPU has implemented several measures to maximize the use of local water resources and eliminate reliance on imported water. No significant purchases of imported water are anticipated through 2035. Imported Water supply is anticipated to be limited to emergencies and drought conditions.

5.2 Drought Planning

5.2.1 Seasonal and Climatic Shortages

In general, groundwater and recycled water supplies are less vulnerable to seasonal and climatic changes than surface water (i.e. local and imported) supplies. RPU has been able to increase production from local groundwater basins during previous droughts pursuant to the Western-San Bernardino Judgment. The Western-San Bernardino Watermaster also independently reviews groundwater conditions annually to assess the change in groundwater levels. Historically, the Watermaster permitted additional extraction beyond the specified water rights from the Bunker Hill Basin to decrease higher than optimal groundwater levels in the basin.

DWR defines a multiple-dry year period as "three or more consecutive years with the lowest average annual runoff". In recent years, RPU obtained more than 60-percent of its water supply from the Bunker Hill Basin. In the Bunker Hill Basin, 2003, 2002, and 1999 through 2002 were selected to represent average, single-dry, and multiple-dry years, respectively. Table 5-2 and Table 5-3 show the base years and quantity of water supply for the average, single-dry, and multiple-dry years, respectively. Table 5-3 also shows that during single and multi-year dry periods, RPU experiences an increase in demands of about 9-percent above average/normal year demands.

Table 5-2: Basis of Water Year Data

Water Year Type	Base Year(s)
Average Water Year	2003
Single-Dry Water Year	2002
Multi-Dry Water Years	1999 through 2002

Table 5-3: Supply Reliability for Historical Conditions

Average / Normal Water Year [2003]	Single Dry Water Year [2002] (acre-ft/yr)	Multiple Dry Water Years			
		Year 1 [1999] (acre-ft/yr)	Year 2 [2000] (acre-ft/yr)	Year 3 [2001] (acre-ft/yr)	Year 4 [2002] (acre-ft/yr)
81,731	88,940	89,114	89,783	88,193	88,940
Percentage of Average / Normal Year:	109%	109%	110%	108%	109%

5.2.2 Estimate of Minimum Supply for Next Three Years

For RPU, the most appropriate driest three-year historical sequence is from 2000-2002 mainly because:

- Precipitation and runoff were below normal during the period;
- And, the period best reflects the most recent hydrogeological situation within local groundwater basins and higher water demand due to population growth.

Table 5-4 shows the projected minimum water supply for the next three years.

Table 5-4: Estimated Three Year Minimum Water Supplies

Water Supply Sources	Average / Normal Water Year Supply [1] (acre-ft/yr)	Multiple Dry Water Year Supply [2]		
		Year 2011 (acre-ft/yr)	Year 2012 (acre-ft/yr)	Year 2013 (acre-ft/yr)
Groundwater	87,700	94,000	95,600	97,200
Recycled Water	260	260	260	260
Imported Water from WMWD	0	0	0	0
Total	87,960	94,260	95,860	97,460
Percent of Average/Normal Year		107%	109%	111%

1. Based on the average/normal water year supply projection for 2012.
2. Demands are assumed to increase 9-percent above average/normal year demands during dry periods.

5.2.3 Projected Supply and Demand

5.2.3.1 Comparison of Projected Normal Supply and Demand

Table 5-5 compares the projected normal water supply and demand over the next 25 years in 5-year increments. The available projected supplies exceed the projected demand through 2035. The projected annual "surplus" will decrease from about 35,200 acre-feet in 2015 to about 27,600 acre-feet in 2035. The demands totals shown in Table 5-5 account for the planned conservation programs described in Section 3.

Table 5-5: Normal Year Supply and Demand Comparison

	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)	2035 (acre-ft/yr)
Existing Supplies					
Groundwater (Bunker Hill Basin)	53,426	53,426	53,426	53,426	53,426
Groundwater (Rialto-Colton Basin)	2,700	2,700	2,700	2,700	2,700
Groundwater (Riverside North)	13,500	13,500	13,500	13,500	13,500
Groundwater (Riverside South)	28,600	28,600	28,600	28,600	28,600
Total Existing Supplies	98,226	98,226	98,226	98,226	98,226
Planned Supplies					
Seven Oaks Dam Conservation (Phase 1)	2,000	4,000	4,000	4,000	4,000
Riverside North Aquifer Storage and Recovery	3,500	3,500	3,500	3,500	3,500
Pellissier Ranch Aquifer Storage and Recovery	0	10,000	10,000	10,000	10,000
Recycled Water (RWQCP)	3,650	5,800	5,800	5,800	5,800
Total Planned Supplies	9,150	23,300	23,300	23,300	23,300
Available Supplies					
Imported Water (MWD via WMWD)	21,700	21,700	21,700	21,700	21,700
Total Available Water Supply	129,076	143,226	143,226	143,226	143,226
Demand Totals (from Table 3-13) [1]	93,850	103,200	107,600	112,400	115,600
Difference	35,226	40,026	35,626	30,826	27,626
Difference as Percentage of Supply	27%	28%	25%	22%	19%
Difference as Percentage of Demand	38%	39%	33%	27%	24%

1. The demand totals from Table 3-13 have been adjusted to remove the water wheeled to WMWD, as this demand is met with WMWD's water supplies.

5.2.3.2 Comparison of Projected Single-Dry Year Supply and Demand

RPU's source waters will not be affected by a single-dry year. RPU does not anticipate purchasing imported water through 2035, but it is available from WMWD through an existing agreement. Table 5-6 summarizes the projected supply and demand for a single-dry year assuming a 9-percent increase in demands.

Table 5-6: Single-Dry Year Supply and Demand Comparison

	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)	2035 (acre-ft/yr)
Existing Supplies					
Groundwater (Bunker Hill Basin)	53,426	53,426	53,426	53,426	53,426
Groundwater (Rialto-Colton Basin)	2,700	2,700	2,700	2,700	2,700
Groundwater (Riverside North)	13,500	13,500	13,500	13,500	13,500
Groundwater (Riverside South)	28,600	28,600	28,600	28,600	28,600
Total Existing Supplies	98,226	98,226	98,226	98,226	98,226
Planned Supplies					
Seven Oaks Dam Conservation (Phase 1)	2,000	4,000	4,000	4,000	4,000
Riverside North Aquifer Storage and Recovery	3,500	3,500	3,500	3,500	3,500
Pellissier Ranch Aquifer Storage and Recovery	0	10,000	10,000	10,000	10,000
Recycled Water (RWQCP)	3,650	5,800	5,800	5,800	5,800
Total Planned Supplies	9,150	23,300	23,300	23,300	23,300
Available Supplies					
Imported Water (MWD via WMWD)	21,700	21,700	21,700	21,700	21,700
Total Available Water Supply	129,076	143,226	143,226	143,226	143,226
Demand Totals [1]	102,297	112,488	117,284	122,516	126,004
Difference	26,780	30,738	25,942	20,710	17,222
Difference as Percentage of Supply	21%	21%	18%	14%	12%
Difference as Percentage of Demand	26%	27%	22%	17%	14%

1. Demand totals are assumed to increase 9-percent above average/normal year demands during dry periods.

5.2.3.3 Comparison of Projected Multiple-Dry Year Supply and Demand

RPU relies mainly on groundwater sources that have proven very reliable even during multi-year droughts. This reliability is expected to continue in the current planning timeframe. However, RPU's planned conjunctive use projects include some recharge of surface water. Thus the yield from the planned conjunctive use projects is reduced by about 3,300 acre-ft in the third year of a

multi-year dry period as shown in Table 4-6. Table 5-7 summarizes the projected supply and demand for a multi-dry year assuming a 9-percent increase in demands.

Table 5-7: Multiple-Dry Year Supply and Demand Comparison

		2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)	2035 (acre-ft/yr)
Multiple Dry Year First Year Supply	Supply Totals	129,076	143,226	143,226	143,226	143,226
	Demand Totals [1]	102,297	112,488	117,284	122,516	126,004
	Difference	26,780	30,738	25,942	20,710	17,222
	Difference as Percentage of Supply	21%	21%	18%	14%	12%
	Difference as Percentage of Demand	26%	27%	22%	17%	14%
Multiple Dry Year Second Year Supply	Supply Totals	129,076	143,226	143,226	143,226	143,226
	Demand Totals [1]	102,297	112,488	117,284	122,516	126,004
	Difference	26,780	30,738	25,942	20,710	17,222
	Difference as Percentage of Supply	21%	21%	18%	14%	12%
	Difference as Percentage of Demand	26%	27%	22%	17%	14%
Multiple Dry Year Third Year Supply	Supply Totals [2]	125,776	139,926	139,926	139,926	139,926
	Demand Totals [1]	102,297	112,488	117,284	122,516	126,004
	Difference	23,480	27,438	22,642	17,410	13,922
	Difference as Percentage of Supply	19%	20%	16%	12%	10%
	Difference as Percentage of Demand	23%	24%	19%	14%	11%

1. Demand totals are assumed to increase 9-percent above average/normal year demands during dry periods.

2. Supply totals for the third consecutive year of a dry period where reduced to account for the reduced production from RPU's conjunctive use projects.

5.3 Water Shortage Contingency Planning

5.3.1 Catastrophic Supply Interruption Plan

Major hazards that can degrade the quality and/or impact the quantity of water available to the RPU water system include: regional power outages, earthquakes, liquefaction (i.e. high groundwater levels), floods, chemical spills, groundwater contamination, and terrorist acts. Some of these hazards could also adversely impact the distribution systems, such as the major transmission mains or reservoirs. Interruptions to water supplies from any of the above mentioned hazards may be limited to days or even months, except for groundwater contamination, which could last several years.

RPU has implemented several measures to improve the reliability of its water system since the last update of the Urban Water Management Plan. Actions taken to prepare for a catastrophe include:

- Establishing criteria for a proclamation of water shortage

- Developing alternate sources of water supplies
- Establishing contacts and mutual aid agreement with other agencies
- Establishing an Emergency Response Team/Coordinator
- Preparing an Emergency Response Plan (ERP)
- Developing public awareness programs

In 2008, The City updated its ERP, which incorporates the RPU Water System Emergency Response Plan. The plan may be activated whenever any of the following conditions exist:

- Natural disasters such as earthquake, flood, etc.
- Major loss of power
- Loss of water transmission lines, main breaks, or other major facilities
- Water quality issues involving a "boil water" order or other major public relations /communication issues
- Emergency curtailment
- Disturbance affecting nearby utilities
- Hazardous spills
- Terrorist activities

In addition to updating the Water System Emergency Response Plan, RPU performed the following actions to prepare for possible catastrophic events:

Regional Power Outages. Added additional local power sources including renewable energy. RPU also improved the reliability of its transmission and distribution systems.

Earthquakes. Increased the total amount of emergency storage capacity in reservoirs and installed new transmission mains to connect local wells to centrally located reservoirs in the City.

Liquefaction. Assisted in the mitigation of high groundwater levels in the Bunker Hill Basin and regularly monitor local groundwater levels.

Floods. Relocated wells from flood plains. And, with the construction of the Seven Oaks Dam RPU's flood risk has been reduced.

Groundwater Contamination. Developed a Water Supply Contingency Plan, Groundwater Management Plan, Source Water Protection Plan, prepared Source Water Assessments for wells, installed wellhead treatment, and negotiated agreements with responsible parties to pay for future clean-up.

Terrorism/Sabotage. Conducted a Vulnerability Assessment and implemented its recommendations.

The ERP will guide damage assessment, record keeping, prioritization of repairs, and coordination with other City Departments. The goal is returning to normal operations as soon as practicable.

Typical, RPU's actions during voluntary rationing include a public information campaign and media outreach to encourage conservation. Typical emergency response actions to the above listed possible catastrophes may include the following:

- Assemble crisis management teams at pre-designated locations and Emergency Operations Center (EOC)
- Assess and document damaged facilities and repair or reactivate as appropriate
- Assess for signs of contamination, i.e., increase the frequency of monitoring
- Deactivate contaminated sources
- Install additional treatment facilities
- Community outreaches e.g., public education, media outreach, boil water advisories
- Coordination with other City Departments, and other government agencies
- Seek mutual aid assistance
- Drain contaminated reservoirs as quickly as possible

An assessment of each listed catastrophe and summarized description of previous responses and/or actions undertaken to prepare for such catastrophic events is described below.

5.3.1.1 Regional Power Outages

RPU is a municipal owned utility that provides both water and electricity within the City of Riverside. RPU maintains a diverse power supply portfolio that includes long term base load and local generating facilities (LGF). The long-term base load of 235 megawatts (MW) includes Intermountain Coal Plant (137 MW), San Onofre (40 MW) and Palo Verde (12 MW) nuclear plants, and the Salton Sea Geothermal Plant (46 MW). LGFs include rooftop solar power (a total of 3 MW), Springs 'peaker' Power Plant (40 MW), and the Riverside Energy Resource Center (RERC) Power Plant (192 MW). RPU's total available capacity to meet summer peak demand is currently 629 MW, while its all-time record peak demand was 607 MW in August 2007. More important, with 232 MW of internal generation (Springs and RERC) on RPU's distribution system, RPU can maintain a high level of reliability in emergency situations. The City of Riverside was not severely impacted by the electrical power crisis in 2001, and today, with the additions of the Springs Plant, which came on-line in 2002, and four RERC units, two of which came on-line in 2006 and the other two in 2011, the City is even less vulnerable to regional power outages.

Some wells in the Bunker Hill Basin are powered by electricity provided by Southern California Edison. During electrical power outages, RPU will still be able to produce some potable water from the Gage wells and the Garner B well because they are or can be powered by gas engines. The water distribution system is entirely within the RPU electric service territory. Most of the pressure zones within the distribution system are fed by gravity from reservoirs. The *2009 Water Master Plan* sized distribution system reservoirs using several criteria including emergency storage capacity of at least 150-percent of average day demand or 88-percent of the maximum day demand. RPU is likely to have water in storage to meet an average day demand should a power outage occur.

5.3.1.2 Earthquakes

The City of Riverside is located close to two major earthquake faults: the San Andreas and San Joaquin. Earthquakes pose potential significant risks to the RPU water system and could potentially result in water supply shortages and disruptions to the transmission/distribution systems. Groundwater produced from wells in the Bunker Hill Basin is conveyed using two major transmission mains that cross several earthquake faults before reaching the Linden Evans Reservoir in Riverside.

The City of Riverside has experienced some earthquakes in the past without significant water supply shortages or disruptions. Table 5-8 lists the major earthquakes near the RPU service area during the

last twenty years. Stronger earthquakes can result in major water service disruptions either due to facility damage or to power outages. In some cases, harmful microorganisms could migrate into the distribution system because of pipe breaks and/or damage to water disinfection facilities. It could take several days (or more) to restore the water distribution system depending on the severity of damage.

Table 5-8: Major Earthquakes near the RPU Service Area since 1990

Date	Name	Magnitude
March - 1990	Upland	5.5
June - 1991	Sierra Madre	5.8
April - 1992	Joshua Tree	6.1
June - 1992	Landers	7.6
June - 1992	Big Bear	6.7
January - 1994	Northridge	6.8
February - 2003	Big Bear	5.4
June - 2005	Yucaipa	4.9
July - 2008	Chino Hills	5.4

5.3.1.3 Liquefaction

Another potential hazard related to earthquakes is soil liquefaction. Liquefaction is a phenomenon that occurs in loose, saturated, granular soils when subjected to strong ground movement. High groundwater levels shallower than the threshold (between 30 and 50 feet below ground surface) may at some locations increase the potential for liquefaction during very strong earthquakes. Some of the wells in the North Orange area of the Riverside Basin are located in areas prone to liquefaction. RPU also has wells located in the lower part of the Bunker Hill Basin (i.e. the pressure zone), which can be vulnerable to liquefaction. Some segments of RPU's major water transmission mains from the Bunker Hill Basin to the Linden Evans Reservoir are located within potential liquefaction zones.

RPU cooperated with BTAC to develop and implement a "high groundwater" mitigation plan to reduce the potential for liquefaction in the Bunker Hill Basin. During the past five years, the Western San-Bernardino Watermaster has not declared a "high groundwater" risk. Groundwater levels are lower in the Bunker Hill Basin due to climactic conditions and increased pumping. Should high groundwater pose a threat in the future, RPU will assist by pumping additional groundwater from the pressure zone, in accordance with the rules and regulations of the Western-San Bernardino Watermaster.

5.3.1.4 Floods

Some RPU wells are located within the flood plains of the Santa Ana River and vulnerable to flooding. In 1995, floods washed away the superstructure of the Gage 21 well and the sub-surface portion of the well was subsequently abandoned. The Gage 98-1 well replaced the Gage 21 well with funding assistance from the Federal Emergency Management Agency (FEMA). The other wells most vulnerable to flooding include some Warren Tract wells. Some of the Warren Tract wells were

replaced upstream with the Cooley J well. In 1999, the Seven Oaks Dam, which is located near the headwaters of the Santa Ana River, became operational and will reduce the magnitude, frequency and vulnerability of flooding while increasing available water rights.

Potential hazards from floods are not limited to physical damage and/or loss of water infrastructure. Curriero, Frank C. et al. (2001), found that more than half of the waterborne disease outbreaks in the United States in the past 50 years were preceded by heavy rainfall. Outbreaks due to surface water contamination, which accounted for approximately 24-percent of all outbreaks, were associated with extreme precipitation occurring during the month of the outbreak and one month prior. Outbreaks due to groundwater contamination, which accounted for approximately 36-percent of all outbreaks, were associated with extreme precipitation occurring within a three month lag preceding the outbreaks.

RPU has implemented many measures in order to minimize adverse impacts of flooding on groundwater contamination. For example, RPU increased the length of well seals for newer wells to greater depths than required by the State of California water well standards. RPU also screens newer wells generally deeper than 400 feet below ground surface. Additional chlorination stations were added further upstream of the major transmission mains thereby increasing the disinfection contact time. Prior to 2003, wells in the North Orange area use to pump directly into the distribution system. The North Orange wells have now been connected by a major transmission main to the Linden Evans Reservoir for increased disinfection contact time.

5.3.1.5 Groundwater Contamination

Potential hazards that could result in groundwater contamination include migrating contaminant plumes, chemical spills, agricultural return flows, leaky underground storage tanks, and septic systems. Chemical spills and leaking underground storage tanks initially tend to affect a small number of wells, whereas contaminant plumes, agricultural return flows, and septic systems may impact regional aquifers.

Previous improper waste disposal practices have created several groundwater contamination plumes that impact a number of RPU wells. Groundwater contamination has the ability to interrupt water supplies for an extended period. However, some groundwater contamination/chemical spills have Potentially Responsible Parties (PRP) who can be made to pay mitigation costs. PRPs are mitigating groundwater contamination due to organic solvents thus assuring continued availability and reliability of water supplies affected by those plumes.

In 2001, RPU reached an agreement with manufacturers of the pesticide dibromochloropropane (DBCP) that has contaminated wells in the Riverside Basin. Under the agreement, DBCP manufacturers agreed to pay the capital costs and 40 years of operating and maintenance costs of facilities to remove DBCP from production wells. RPU has been reimbursed for Granular Activated Carbon (GAC) treatment plants that enable RPU to produce additional water from wells previously abandoned due to contamination.

In the late 1980s and early 1990s, water produced from wells connected to the Waterman Transmission main were used to blend impaired water produced from the Gage wells to meet potable drinking water standards. However, water quality within the Gage wells has improved since the Air Force and Lockheed constructed wellhead treatment facilities and replaced shallow wells with deeper ones. The treatment facilities are capable of removing a range of contaminants.

In 1999, RPU prepared a Water Supply Contingency Plan (WSCP) that addressed the potential water quality issues facing the City, especially from the Crafton-Redlands plume(s). The WSCP also included Contingency Plans for addressing issues related to more stringent water quality regulations. The California Department of Public Health approved the WSCP.

5.3.1.6 Terrorist Acts

In 2003, RPU completed the mandated Vulnerability Assessment (VA); and, in 2008 updated its ERP.

5.3.1.7 Mutual Aid Agreement and Emergency Water Connections to other Agencies

The USAWRA, which RPU is a member, assists in developing mutual aid agreements for use during emergencies. Table 5-9 shows the inter-ties between water systems that can be used to deliver water from other water retailers to assist RPU during short-term emergencies. RPU is also a member of the Water Agency Response Network (WARN).

Table 5-9: RPU Distribution System Inter-Ties

Water Agency	Connection	Location	Capacity (gpm)	Emergency / Imported	Direction	RPU Pressure Zone
Western Municipal Water District	Mills Connection	Cannon Road	13,400	Imported	To RPU	1600 Zone
Western Municipal Water District	Van Buren Highline	Mockingbird Canyon Road	13,400	Imported/ Wholesale	To/From RPU	1200 Zone
Western Municipal Water District	Warmington	Warmington Street	1,000	Emergency	From RPU	1100 Zone
Home Garden County Water District	Distribution System	Harlow Avenue	1,500	Wholesale	From RPU	925 Zone
City of Corona	Distribution System	Sampson Avenue	1,500	Emergency	To/From RPU	925 Zone
City of San Bernardino	Distribution System	North of Sixth Street	2,000	Emergency	To/From RPU	Gravity
East Valley Water District	Distribution System	Sixth Street near Pedley	4,000	Emergency	From RPU	Gravity
Western Municipal Water District	Lusk Highland (Box Springs)	Sycamore Canyon Boulevard	1,500	Emergency	To RPU	1600 Zone
Western Municipal Water District	Praed / Lake Knolls	Lake Knoll Park	1,500	Emergency	To RPU	1400 Zone
California Filter Plant	Distribution System	Shelby Drive	4,000	Emergency	To RPU	Gravity
Western Municipal Water District	Whitegates	Near Whitegates No. 2 Reservoir	1,100	Emergency	To RPU	1750 Zone

5.3.2 Water Shortage Ordinance

Appendix K contains the City's Water Shortage Ordinance. Appendix L contains the City's draft Water Conservation Ordinance, which will go before Council in 2011 for adoption. The Water Conservation Ordinance expands on the Water Shortage Ordinance and will amend the Riverside Municipal Code Title 14. The Water Conservation Ordinance includes a detailed description of unreasonable uses of water, RPU's Water Conservation Program, responses to water shortage emergencies, and enforcement and severability.

5.3.2.1 Unreasonable uses of water

The Water Conservation Ordinance states: No person shall use or permit the use of water for residential, commercial, industrial, agricultural, or any other purpose, contrary to any provision of the this ordinance. Nor shall any person waste water or use it unreasonably. Unreasonable use of water includes, but is not limited to, the following:

- allowing water to leave the Person's property by drainage onto adjacent properties or public or private roadways or streets due to excessive irrigation and/or uncorrected leaks;
- failing to timely repair a water leak;
- using water to wash down sidewalks, driveways, parking areas, tennis courts, patios or other paved areas, except to alleviate immediate safety or sanitation hazards;
- watering outdoor landscaped areas on rainy days and two days thereafter;
- failure to adjust sprinklers and irrigation systems to eliminate overspray and avoid run-off into streets, sidewalks, parking lots, alleys or other paved surfaces;
- operating a water fountain or other decorative water feature that does not use re-circulated water;
- installing single pass cooling systems in buildings requesting new water service;
- installing non-re-circulating water systems in new commercial conveyor car wash and new commercial laundry systems; and
- failure to install operational re-circulating water systems for commercial conveyor car wash systems and commercial laundry systems.

5.3.2.2 Water Conservation Program

The Water Conservation Ordinance establishes a Water Conservation Program which uses four stages to address conditions and needs. The Water Conservation Stage shall be set by City Council action. Table 5-10 describes the four water conservation stages.

Table 5-10: Water Conservation Stages

Stage No.	Water Supply Conditions	Supply Shortage %	Rationing Type
1	Normal Water Supply	0	Voluntary
2	Minimum Water Shortage	10 to 15	Voluntary
3	Moderate Water Shortage	15 to 20	Mandatory
4	Severe Water Shortage	20 to 50	Mandatory

Stage One represents normal conditions; Stages Two, Three and Four represent potential and actual shortages. Stages Two, Three and Four may be triggered by a local or regional water supply shortage; production, treatment, transmission, or delivery infrastructure problems; limited or unavailable alternative water supplies; or other circumstances.

Stages One and Two conservation measures are voluntary, and will be enforced through public outreach, education, and awareness measures by the City.

Stages Three and Four conservation measures are mandatory, and violations are subject to criminal, civil, and administrative action.

Stage One - Normal Water Supply. Stage One applies when the City can meet all of its water demands, and is in effect at all times unless the City Council declares otherwise. Any other normal water efficiency programs and water conservation regulations remain in force during Stage One.

During Stage One:

- Watering lawns and/or ground cover and irrigating landscaping is prohibited from 8:00 a.m. to 8:00 p.m. Pop-up spray-type sprinklers are limited to 15 minute total run-time. Impact and rotor sprinklers are limited to 30 minutes total run-time. Irrigation water cannot leave the landscaped area.
- All open hoses shall be equipped with automatic, positive shut-off nozzles.
- Washing of automobiles, trucks, trailers, boats, airplanes and other types of mobile equipment, is permitted at any time with a hand-held bucket or a hand-held hose equipped with an automatic, positive shut-off nozzle for quick rinses. Washing may be done at any time at a commercial car wash or commercial service station, or by a mobile car wash or on-site car wash using high pressure washing equipment. Washings necessary for the health, safety, and welfare of the public, such as garbage trucks or vehicles used for food and perishables, are exempt from this section.
- Construction operations shall not use water unnecessarily. Newly-installed landscaping at construction sites requiring watering must comply with the above requirments.

Stage Two – Minimum Water Shortage. Stage Two applies when a reasonable probability exists that the City will not be able to meet all of its water demands.

Upon declaration of Stage Two by the City Council, and the following measures shall apply:

- Except as otherwise provided in this Section, all Stage One measures remain in effect.
- Customers will be asked to reduce their monthly water consumption by 10 to 15-percent.
- Non-agricultural irrigation, including construction meter irrigation, is limited as follows:
    - Properties with odd number street addresses, parks, and the public right of ways may be irrigated only on Saturdays, Mondays, and Wednesdays between the hours of 8:00 p.m. to 8:00 a.m.
    - Properties with even number street addresses may be irrigated only on Sundays, Tuesdays, and Thursdays between the hours of 8:00 p.m. to 8:00 a.m.
    - All automatic irrigation timers shall be adjusted according to changing weather patterns and shall completely eliminate run-off.
    - Irrigation landscaping is prohibited on Fridays and on any day of the week from 8:00 a.m. to 8:00 p.m.

  - All irrigation timers shall be adjusted to comply with the above.
  - Recycled water may be used to irrigate fruit trees, lawns and ground covers, and ornamental trees and shrubs at any time and on any day of the week.
- All plumbing leaks, improperly adjusted sprinklers, or other water appurtenances requiring repair or adjustment shall be corrected to the satisfaction of the City within 72 hours of notification by the City. The City will attempt to contact customers by phone, mail or printed "door-hanger" notice. All customers shall ensure that the City has current telephone contact information.
- Use of water from fire hydrants shall be limited to fire-fighting-related activities, utility operation and repair, or other uses necessary to maintain the health, safety, and welfare of the public.
- Eating or drinking establishments, or other public place where food or drinks are sold, served, or offered for sale, may only provide drinking water upon specific request.
- Hotels, motels and other commercial lodging establishments shall provide customers the option of not having towels and linen laundered daily. Commercial lodging establishments shall prominently display notice of this option in each bathroom using clear and easily understood language.
- Construction operations receiving water from a construction meter or water truck shall not use water unnecessarily for any purpose, other than those required by regulatory agencies. Construction projects requiring watering for new landscaping materials shall adhere to the designated non-agricultural irrigation requirements listed above.

Stage Three - Moderate Water Shortage. Stage Three applies when the City will not be able to meet all of the water demands of its Customers.

Upon declaration of Stage Three by the City Council, the following measures shall apply:

- Except as otherwise provided in this Section, all Stage One and Two measures remain in effect.
- Water customers will reduce their monthly water consumption by 15 to 20-percent for the duration of Stage Three.
- Non-agricultural irrigation is limited to the following designated hours and designated days:
  - Properties with odd number street addresses, parks, and the public right of ways may be irrigated only on Saturdays and Wednesdays between the hours of 8:00 p.m. to 8:00 a.m.
  - Properties with even number street addresses may be irrigated only on Sundays and Thursdays between the hours of 8:00 p.m. to 8:00 a.m.
  - Pop-up spray-type sprinklers shall be limited to a maximum of 15 minute total run-time on the allowed days of irrigation. Impact and rotor sprinklers shall be limited to a maximum 30 minute total run-time on the allowed days of irrigation. All automatic irrigation timers shall be adjusted according to changing weather patterns and to completely eliminate run-off.
  - Irrigation is prohibited on Mondays and Fridays and on any day of the week from 8:00 a.m. to 8:00 p.m.
- Use of recycled water for irrigation is permitted on any day and at any time.
- Washing of automobiles, trucks, trailers, boats, airplanes and other types of mobile equipment is permitted only during the hours of 6:00 a.m. to 6:00 p.m. on Fridays,

Saturdays, Sundays, and Mondays with a hand-held bucket or a hand-held hose equipped with an automatic, positive shut-off nozzle for quick rinses. Washing is permitted at any time on the immediate premises of a commercial car wash. Commercial car washes not using partially reclaimed or recycled water shall reduce their water use as determined by the City Council. Washings necessary for the health, safety, and welfare of the public, such as garbage trucks or vehicles used for food and perishables, are exempt from this section.

- The overfilling of swimming pools and spas is prohibited.
- The filling or refilling of ponds, streams, and artificial lakes is prohibited.
- The operation of any ornamental fountain or similar structure is prohibited.
- Construction projects requiring water from a construction meter or a water truck shall not use water unnecessarily for any purposes, other than those required by regulatory agencies. Construction projects requiring water for new landscapes shall adhere to the designated days and times as set forth above.

Stage Four – Severe Water Shortage. Stage Four applies when the City's ability to meet its water demands is seriously impaired.

Upon declaration of Stage Four by the City Council, the following water conservation measures shall apply:

- Except as otherwise provided in this Section, all Stage One, Two, and Three conservation measures shall be in full force and remain in effect during Stage Four.
- Water customers will reduce their monthly water consumption by 20 to 50-percent for the duration of Water Conservation Stage Four.
- Non-agricultural irrigation shall be limited to supporting minimal survival of trees and shrubs. Trees and shrubs may be irrigated, only during the following designated hours and designated days:
    - Properties with odd number street addresses, parks, and public right of ways may irrigate only on Saturdays between the hours of 8:00 p.m. and 8:00 a.m.
    - Properties with even number street addresses may irrigate only on Sundays between the hours of 8:00 p.m. and 8:00 a.m.
    - Irrigation is prohibited on Mondays, Tuesdays, Wednesdays, Thursdays, and Fridays and on any day of the week from 8:00 a.m. to 8:00 p.m.
- Use of recycled water for irrigation is permitted on any day and at any time.
- All outdoor watering and irrigation of lawns and similar ground covers is prohibited with the exception of plant materials determined by the General Manager to be rare, exceptionally valuable, or essential to the well being of the public or threatened or endangered animals.
- Washing of automobiles, trucks, trailers, boats, airplanes and other types of mobile equipment is prohibited except at a commercial car wash. Commercial car washes shall only use wholly- or partially-recycled water for washing automobiles, trucks, trailers, boats, airplanes and other types of mobile equipment. Washings necessary for the health, safety, and welfare of the public, such as garbage trucks or vehicles used for food and perishables, are exempt from this section.
- Filling, refilling, or replenishing swimming pools, spas, ponds, streams, and artificial lakes is prohibited.
- Operation of any ornamental fountain, pond, or similar structure is prohibited.
- Use of water for cooling mists is prohibited.

- Water used for commercial, manufacturing, or processing purposes shall be reduced as determined by the City Council.

5.3.2.3 Water Shortage Emergency

If the City Council has declared either Stage Three or Stage Four conservation, it may also declare a Water Shortage Emergency. A Water Shortage Emergency may be an immediate emergency, or a threatened future water shortage, or both.

The Water Conservation Ordinance states:

> Upon finding that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the City's water supply to the extent that there would be insufficient water for human consumption, sanitation, and fire protection, the City Council may declare a Water Shortage Emergency to prevail within its jurisdiction.

Upon declaration of a Water Shortage Emergency:

- No new construction meters will be issued.
- No construction water may be used for earth work such as road construction purposes, dust control, compaction, or trench jetting.
- No new building permit(s) shall be issued, except:
    - Projects found by the City Council to be necessary for public health, safety.
    - Projects using recycled water for construction.
    - Projects which will not result in a net increase in non-recycled water use.
    - Projects with adequate Conservation Offsets, if available. The City, in its sole discretion, may choose to make Conservation Offsets available. Conservation Offset costs shall be based on the cost of conserving the water elsewhere to provide the water needed for a project, the cost of providing an alternative water supply deemed acceptable by the City, or other measures as may be found in the City's Water Use Efficiency Master Plan. Conservation Offset fees will be set forth in the Water Rules and Rate Schedules.

5.3.2.4 Enforcement and Severability

Any violation of this article shall be subject to enforcement by issuance of an administrative citation pursuant to Chapter 1.17 of the Riverside Municipal Code. Prior to issuance of an administrative citation, the City shall give one courtesy notice requesting voluntary correction of the violation. The City Manager, or his or her designee, may enter into a written agreement with a customer to resolve any violation provided that such agreement is consistent with the purpose and intent of the Water Conservation Ordinance.

RPU has mechanisms in-place for monitoring compliance with actual mandated reductions. Water sales to customers are metered and billed monthly. RPU implements a meter maintenance program to assure accuracy. Collected revenues from water sales are incorporated into the monthly financial reports produced by the RPU Finance Section. The RPU customer billing system simultaneously reports water usage for current and previous years in bills sent to customers. The billing software can be used to evaluate compliance with mandated reductions.

RPU has the capability to determine reductions in water production and consumption. In 2004, RPU completed a major upgrade of the SCADA system of the water distribution system. All

production wells are metered and monitored. The upgrade to the SCADA system is capable of recording potable water production and water levels within potable water reservoirs. Over the past five years, RPU has replaced nearly all of the meters connected to production wells. Water levels of selected wells are regularly monitored and charted. Flow meters installed at pump stations and booster stations can be read automatically through the SCADA system to determine usage.

5.3.3 Prohibitions

During a mandated reduction, RPU will intensify its water conservation programs, especially public education. RPU promotes efficient water use including non-potable uses such as landscaping and irrigation (Chapter 19.67 of the Riverside Municipal Code). Recycled water from the RWQCP may be used for street cleaning.

The adopted Water Shortage (i.e. Water Rule No. 9) and Water Waste (i.e. Water Rule No. 15) ordinances, and the draft Water Conservation Ordinance for the City of Riverside include prohibitions against wasteful water use practices. The Water Rule No. 15 is included in Appendix M.

Water Rule No. 9 states:

> In the event of any actual or threatened shortage of water supply, and during the period of such shortage, the Water Utility shall apportion the available supply of water among its Customers in the most equitable manner possible to continue service fairly and without discrimination, except that preference shall be given to such service as is essential to the public interest and to the preservation of life and health.

Table 5-11 lists RPU's mandatory prohibitions during moderate and severe water shortages.

5.3.4 Consumption Reduction Methods

Table 5-12 is the summary of RPU's consumption reduction methods. RPU also offers rebates to encourage conservation (i.e. ultra-low flush toilet replacements, high efficiency washing machines, etc.). RPU has a water rate structure that promotes water efficiency as discussed below. The reduction goal is to balance supply and demand.

Table 5-11: Mandatory Prohibitions

Prohibitions	Stage When Prohibitions become Mandatory
Water Lawns and /or Ground Cover and Irrigating Landscaping between 8:00am and 8:00pm	All
Open Hoses Without Automatic, Positive Shut-Off Nozzles	All
Allowing Water to Run on Streets	All
Non-Agricultural Irrigation on Unspecified Days	2
Non-Agricultural Irrigation between 8:00am and 8:00pm	2
Serving Unsolicited Drinking Water at Restaurants	2
Non-Agricultural Irrigation on Mondays and Fridays	3
Washing of Automobiles, Trucks, Trailers, Boats, Airplanes, and Other Types of Mobile Equipment on Tuesday through Thursday	3
Washing of Automobiles, Trucks, Trailers, Boats, Airplanes, and Other Types of Mobile Equipment between 6:00pm and 6:00am	3
Overfilling Swimming Pools and Spas	3
Filling or Refilling Ponds, Streams, or Artificial Lakes	3
Operating of Any Ornamental Fountain or Similar Structure	3
Non-Agricultural Irrigation on Mondays through Friday	4
All Outdoor Watering of Lawns and Similar Ground Cover	4
Washing of Automobiles, Trucks, Trailers, Boats, Airplanes, and Other Types of Mobile Equipment Except at a Commercial Car Wash	4
Filling, Refilling, or Replenishing Swimming Pools, Spas, Ponds, Streams, or Artificial Lakes	4
Use of Water for Cooling Mist	4

Table 5-12: Consumption Reduction Methods

Consumption Reduction Methods	Stage When Method Takes Effect	Projected (%)
Public Education	All	7
Water Efficiency Pricing	All	7
Voluntary Rationing	1 and 2	7
Mandatory Rationing	3 and 4	Up to 50-percent

5.3.5 Penalties

RPU maintains a tiered commodity water rate and seasonal water rates to encourage efficient water use in addition to a fixed monthly charge based on meter size [http://www.riversideca.gov/utilities/water-rulesandrates.asp]. Table 5-13 shows the "quantity rate" for a residential RPU customer (SCHEDULE WA-1) within the City of Riverside.

Table 5-13: Tiered and Seasonal Water Rates

Potable Water Quantity	June - October	November - May
From 0 to 1,500 cubic feet per month	$1.14	$1.13
From 1,600 to 3,500 cubic feet per month	$1.83	$1.64
From 3,600 to 6,000 cubic feet per month	$2.85	$2.26
Over 6,000 cubic feet per month	$4.10	$2.75

Water Rule No. 15 includes penalties for excessive water usage. According to Water Rule No. 15, "Whenever it appears to the Director that water delivered by the Water Utility is being used in violation of the terms of this Rule, he [/she] shall give written notice to the person so wasting water of his [/her] intention, after a reasonable time to be therein stated, to shut-off the water supply to the Person's Premises". Table 5-14 lists RPU's penalties and charges for excess water use.

Table 5-14: Penalties and Charges

Penalties or Charges	Stage When Penalty Takes Effect
Tiered Water Rates	All
Higher Seasonal Water Rates	All
Water Waste Ordinance (Water Rule No. 15)	All

5.3.6 Financial Impacts during Shortages

For the 2009-2010 fiscal year, gross revenues totaled $62.0 million including $52.9 million from water sales. Total expenses exceeded $48.5 million including operations/maintenance costs of about $25.2 million. Water wholesale and retail sales account for about 85-percent of total revenues. Reduction in water sales due to shortages will affect both revenue and expenses.

5.3.6.1 Revenue Impacts

RPU's typical water rate includes the following components: a fixed monthly charge, a prorated commodity charge based on consumption with increasing marginal rates and adjustments for seasonality, an energy factor adjustment, a surcharge for customers not within City Limits, and a Water Conservation and Reclamation surcharge. Revenue from fees such as fixed monthly charges,

development related fees, and the backflow protection program will not be impacted by reduction in water usage due to droughts.

RPU has many options to cushion reduction in revenues due to reduced demand by its retail customers. RPU maintains reserves that can offset minor revenue impacts. The Riverside Water Financial Plan reserve levels reached $51 million in 2010. In addition to these liquid assets, RPU has an additional 12 to 18 months of operating revenue in the form of non-liquid assets such as land and buildings.

Other potential measures that RPU can implement to mitigate some revenue impacts due to shortages include adjusting the water rates, using water that has been stored in reservoirs, and refinancing existing bonds or issuing new bonds.

5.3.6.2 Expenditure Impacts

Some expense categories such as purchased energy, treatment costs, and operations and maintenance will be reduced as revenue from water sales decrease. RPU estimated a reduction in energy costs of $350,000 per year assuming a 10-percent reduction in water demand. RPU can reduce or avoid some water treatment costs by choosing to operate wells that require the least amount of treatment. RPU can also pump the most efficient wells to further reduce energy costs. RPU can investigate additional energy savings from switching to cheaper rate schedules based on time of use by taking advantage of distribution system reservoir storage. Lastly, RPU can delay capital expenditures.

5.4 Water Quality

In 2001, the Board of Public Utilities formally adopted "non-detect at the tap" as the primary treatment goal for man-made contaminants such as trichloroethylene (TCE) and dibromochloropropane (DBCP). In October 2002, the Board of Public Utilities adopted the goal of safeguarding the supply and quality of RPU water resources for the next 100 years. One of the key programs involves developing a source water protection plan for the North Orange well field. Over the years, RPU has developed the technical (including legal), managerial, and financial capacity and experience to implement management strategies to address water quality concerns including treatment without impairing long-term reliability.

5.4.1 Quality of Water Sources

As discussed earlier in Section 4, RPU's source waters include groundwater, recycled water, and potentially imported water. RPU produces groundwater from wells spatially distributed across the Bunker Hill Basin, Riverside North, and Riverside South. Some treatment occurs at wellhead or regional facilities prior to delivery to the major transmission mains. Production from wells and/or treatment facilities is blended and chlorinated within the major transmission mains prior to distribution from the Linden Evans Reservoir. The blending and treatment make the system water less vulnerable to contamination at individual wells.

RPU regularly monitors the quality of its water supply. More than 17,700 samples were analyzed in 2009. Annually, RPU distributes summary reports on water quality to its customers. Appendix N shows the typical concentration of blended water. The quality of the blended water meets all applicable drinking water standards.

5.4.1.1 Groundwater Quality

In general, the natural quality of water in local groundwater basins is acceptable and reliable. However, there are several contaminant plumes migrating within the local basins. Figures 5-1 and 5-2 show the contaminant plumes in the surrounding groundwater basins.

Hamlin et al (2002) found "most samples of ground water in the Inland Basins (i.e. the Bunker Hill Basin, Riverside North, and Riverside South) were a calcium-bicarbonate type, which may reflect the quality of recharge originating in pristine, high-altitude areas of the adjacent San Gabriel and San Bernardino Mountains." Hamlin et al (2002) identified some of the other factors that influence local groundwater quality as recharge from the Santa Ana River, discharge of treated wastewater to the river, and use of imported water in the basin.

Levels of total dissolved solids (TDS) and nitrates can help distinguish the general quality of the groundwater basins. Figure 5-3 and 5-4 show the distribution of TDS and nitrate-nitrogen in some selected wells in the Bunker Hill and Rialto-Colton basins, respectively. The concentration of TDS in the selected wells ranges from 120 mg/L to 2,080 mg/L (i.e. the next highest data point was 660 mg/L) while the concentration of nitrates ranges from 0 mg/L to 16 mg/L. Figure 5-5 and 5-6 show the distribution of TDS and nitrate-nitrogen in some selected wells in the Riverside and Arlington basins, respectively. The concentration of TDS in the selected wells ranges from 210 mg/L to 1,200 mg/L while the concentration of nitrates ranges from 0 mg/L to 21 mg/L.

5.4.1.2 Imported Water Quality

Imported water is surface water from the State Water Project (SWP) that is treated at the Mills WTP in Riverside prior to delivery to RPU by WMWD. SWP water quality is maintained and governed by the standards established by DWR. The salinity (TDS) of SWP delivered to WMWD is usually less than 300 mg/L, but was as high as 430 mg/L during the 1977 drought (MWD, 2010). DWR and/or MWD regularly conduct sanitary surveys and monitor the quality of the water according to the applicable standards and regulations. MWD completed a source water assessment of the SWP in 2006.

5.4.1.3 Recycled Water Quality

Regarding the quality of recycled water, the RWQCP treats effluent to tertiary standards and monitors the quality to ensure compliance with the discharge permit from the SARWQCB. Recycled water supplies for the Arlington-Central Avenue Recycled Water Project and the Pellissier Ranch Aquifer Storage and Recovery Project will be in compliance with the revised discharge permit from the SARWQCB and the regulations set by CDPH.

5.4.2 Water Quality Management Measures

Potential hazards that could impact the quality of groundwater from local basins include migrating contaminant plumes as shown in figures 5-1 and 5-2, chemical spills, agricultural return flows, leaky underground storage tanks, and septic systems. Chemical spills, and leaking underground storage tanks initially tend to affect a small number of wells, whereas contaminant plumes, agricultural return drainage, and septic systems may impact regional aquifers extensively.

Previous improper waste disposal practices created several groundwater plumes that impact a number of RPU wells. RPU implemented several measures to address groundwater contamination that affecting its source waters. Some of the implemented measures included the following:

- Well replacement

- The development of a water quality blending optimization model
- The development of a Water Supply Contingency Plan
- Wellhead treatment pilot studies
- Preparation of a water treatment feasibility study (wellhead treatment)
- The construction of a water transmission main from the North Orange well field to the Linden Evans Reservoir to further improve blending capacity

RPU was able to improve the quality of its domestic water by successfully implementing a comprehensive strategy that emphasized pollution prevention and source water protection. Increased implementation of demand side management measures such as water recycling and conservation would further reduce the need to rely on poorer quality sources of water.

RPU developed a blending optimization model to ensure compliance with all mandatory health-based drinking water regulations. In 1993, RPU completed a *Water Treatment Feasibility Study* (Boyle Engineering Corporation, 1993). In 1999, the California Department of Public Health approved the Water Supply Contingency Plan developed by RPU. The Water Supply Contingency Plan addressed the best strategy for addressing the various water quality parameters of immediate and future concern and pending drinking water regulations including arsenic, radon, and perchlorate.

RPU collaborated with federal, state, and local regulators overseeing cleanup of groundwater plumes and provided assistance, where necessary. Potentially responsible parties (PRPs) have or are mitigating groundwater contamination plumes such as the Norton Air Force Base, Rialto (perchlorate), Santa Fe, and Crafton-Redlands as shown in Figure 5-1. The PRP for Crafton-Redlands plume constructed wellhead treatment facilities to treat TCE and perchlorate in that plume. Some treatment facilities can also remove additional organic compounds. USEPA installed some barrier wells and treatment facilities designed to intercept the Newmark and Muscoy plumes upstream of RPU wells.

RPU monitored cleanup measures, and where necessary, initiated and funded cooperative monitoring of water quality parameters near/within suspected plumes. RPU assisted the Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Department of Health and Human Services (DHHS) in conducting Public Health Assessments (PHAs). ATSDR concluded that "radiological contaminants detected in Norton AFB drinking water wells and Riverside drinking water wells down gradient of Norton do not pose a health hazard."

In 2001, RPU reached agreement with the manufacturers of the pesticide dibromochloropropane (DBCP) that have contaminated wells in the Riverside Basin. Under the agreement, DBCP manufacturers have agreed to pay the capital costs and 40 years of operating and maintenance costs of facilities to remove DBCP from impacted production wells.

RPU has steadily increased the capacities of water treatment in its system to mitigate contamination. RPU has trained and certified water operators to levels commensurate with the level of planned and installed water treatment facilities and as required by the amendments to the Safe Drinking Water Act (SDWA) in 1996.

5.4.3 Regulatory Requirements

5.4.3.1 Source Water Assessment (SWA)

In 1996, Congress amended the SDWA to include source water protection as part of the multiple-barrier approach to protecting the quality of drinking water delivered to consumers. The

amendments required public water systems (PWS) to conduct Source Water Assessment (SWA) and develop an optional protection plan. Source water protection is the first barrier of the multiple-barrier approach to protecting the quality of drinking water. Other elements of the multi-barrier protection framework include source water treatment (including disinfection); distribution system integrity (including cross-connection control programs); and public information (CCR).

RPU completed the SWA for wells located in Riverside North and Riverside South. RPU collaborated with other agencies through the USAWRA and the SBVWCD to conduct SWA for wells in Bunker Hill Basin. In 2007, RPU completed the SWA for the Tippecanoe Well, which is located the Bunker Hill Basin. In 2008, RPU completed SWAs for the Garner 4 and Scheuer 2 wells, which are located in the Bunker Hill Basin, and for Flume 2, 3, 4, and 6 wells, which are located in Riverside North. In 2009, RPU completed the SWA for the Raub 7 Well, which is located in the Bunker Hill Basin.

5.4.3.2 Other Regulations

There are a number of current and pending federal (USEPA) and state (CDPH) drinking water regulations that may impact the types and levels of treatment required for existing and future water supply sources. Table 5-15 summarizes the most pertinent regulations, both current and pending.

5.4.3.3 National Primary and Secondary Drinking Water Standards

Primary standards are legally enforceable standards that apply to public water systems to limit the levels of contaminants. Primary standards are set by the USEPA. States may adopt standards to lower the level of contaminants below the federal limit. For RPU, gross alpha, uranium, TCE, PCE, DBCP, nitrate, arsenic, and perchlorate are contaminants of concern in some of its water sources and are carefully tracked with a water quality blending model, which allows the City to verify that the system is operated to maintain water quality goals.

5.4.3.4 Stage 2 Disinfectant and Disinfection Byproducts Rule (D/DBPR)

The USEPA began regulating disinfection byproducts (DBPs) in 1979. DBPs form when disinfectants, such as chlorine, react with organic carbon in the water. DBPs such as trihalomethanes and haloacetic acids are believed to be carcinogenic. The latest update to the DBP regulations is the Stage 2 Disinfectant and Disinfection Byproduct Rule, which was promulgated in 2005. The previous rule (Stage 1 DBP Rule) set the MCLs for total trihalomethanes (TTHM) at 80 ppb and five haloacetic acids (HAA5) at 60 ppb. The Stage 2 DBP Rule maintains the same MCLs but includes the following additional requirements:

Systems must complete an Initial Distribution System Evaluation (IDSE) to better characterize the distribution system and to identify monitoring sites where customers may be exposed to high levels of DBPs. The best locations for monitoring will be selected and used for Stage 2 D/DBPR compliance monitoring.

Compliance will be calculated for each monitoring location in the distribution system, instead of using an average from all samples across the system.

Each system must determine if they have exceeded an operational evaluation level, which is identified based on their compliance monitoring results. Systems that exceed operational levels must review their operational practices and submit a report to their state identifying actions that they may take to reduce high DBP levels.

RPU's water supply is primarily groundwater, which typically has a low potential for formation of DBPs. Thus, the Stage 2 D/DBPR is not anticipated to have any major impact on the level of treatment required for existing or future water supply sources.

5.4.3.5 Ground Water Rule

In October 2006, the USEPA finalized the Ground Water Rule (GWR). The Final GWR was published in the Federal Register on November 8, 2006. Ground water occurrence studies and recent outbreak data has shown that pathogenic viruses and bacteria occur in public water systems that serve groundwater. The purpose of the GWR is to establish a multiple-barrier approach to protect against waterborne pathogens in drinking water from groundwater sources.

The targeted, risk-based strategy addresses risks through a multiple-barrier approach that relies on four major components:

Periodic sanitary surveys of ground water systems requiring the evaluation of eight elements and the identification of significant deficiencies. States must complete the initial survey by December 31, 2012 for most community water systems and by December 31, 2014 for systems with outstanding performance.

Source water monitoring to test for the presence of E. coli, enterococci, or coliphage in the sample.

There are two monitoring provisions:

Triggered monitoring for systems that do not provide 4-log treatment and have a total-coliform positive sample under Total Coliform Rule sampling in the distribution system.

Assessment monitoring – States can require systems, at any time, to conduct source water assessment monitoring to help identify high risk systems.

Requires correction of significant deficiencies and fecal contamination (by eliminating the source of contamination, providing alternative source water or providing treatment that achieves 4-log inactivation/removal of viruses).

Compliance monitoring to ensure treatment technology reliably achieves 4-log inactivation or removal of viruses.

RPU complies with this rule through the 4-log virus removal method.

Table 5-15: Selected Drinking Water Regulations

Regulation	Purpose
USEPA	
National Primary and Secondary Drinking Water Standards	Sets maximum contaminant levels (MCLs) for various primary contaminants (contaminants with public health effects) and secondary contaminants (contaminants with cosmetic and aesthetic effects). **Select Primary Contaminants:** Arsenic – MCL of 10 ppb Nitrate – MCL of 45 ppm (10 ppm as nitrogen) 1,2-Dibromo-3-chloropropane (DBCP) – MCL of 0.2 ppb Tetrachloroethylene (PCE) – MCL of 5 ppb Trichloroethylene (TCE) – MCL of 5 ppb Gross Alpha – MCL of 15 pCi/L Uranium – MCL of 30 ppb **Select Secondary Contaminant:** Total Dissolved Solids – Recommended MCL of 500 ppm (1000 ppm upper limit)
Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 D/DBPR)	Establishes locational running annual average (LRAA) MCLs for disinfection byproducts and new criteria for selecting sampling sites. Effective date April 2012 LRAA MCL (0.080/0.060 TTHM/HAA5)
Ground Water Rule	Establishes multiple barriers to protect against bacteria and viruses in drinking water from groundwater sources and establishes a targeted strategy to identify ground water systems at high risk for fecal contamination. Rule signed October 11, 2006; Final Rule published in the Federal Register November 8, 2006.
Proposed Radon Rule	Requires States to either develop a multimedia mitigation (MMM) program and reduce radon to less than 4,000 pCi/L in drinking water systems or reduce radon to less than 300 pCi/L in drinking water systems without development of an MMM program. Anticipated promulgation: Unknown
Contaminant Candidate List	Provides a primary list of priority contaminants undergoing research to determine if regulation is necessary to protect public health.
CDPH	
Primary MCL for Perchlorate	Establishes the MCL for perchlorate at 6 ppb. Effective: October 18, 2007.

5.4.3.6 Proposed Radon Rule

The Radon Rule was proposed by the USEPA in 1999. No promulgation date has been set for this rule. Average levels of radon in RPU's system are twice the proposed MCL of 300 pCi/L. RPU may elect to participate in a multimedia mitigation program in lieu of compliance with the MCL.

5.4.3.7 Perchlorate

The USEPA placed perchlorate on the first Contaminant Candidate List and has established an official reference dose, but has not yet proposed an MCL. CDPH established a perchlorate MCL of 6 ppb in 2007. Perchlorate is also a contaminant of concern in some of RPU's water sources and is tracked with the water quality blending model. Through a combination of treatment and blending, RPU maintains perchlorate at levels in the system below 4 ppb.

5.4.4 Projected Water Quality Impacts

Table 5-16 summarizes the assessment of likely impacts of water quality issues on water management strategies and supply reliability. There are no water quality issues projected to quantitatively impact RPU sources of water between now and 2035 (i.e. 100-percent of each of the source waters will be available). Potential supply reductions will be avoided through a combination of monitoring, treatment, blending, and development of alternative source waters.

Table 5-16: Current and Projected Water Supply Impacts from Water Quality Issues

Water Source	Description of Condition	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)	2035 (acre-ft/yr)
Groundwater	N/A	0	0	0	0	0	0
Recycled Water	N/A	0	0	0	0	0	0
Imported Water from WMWD	N/A	0	0	0	0	0	0

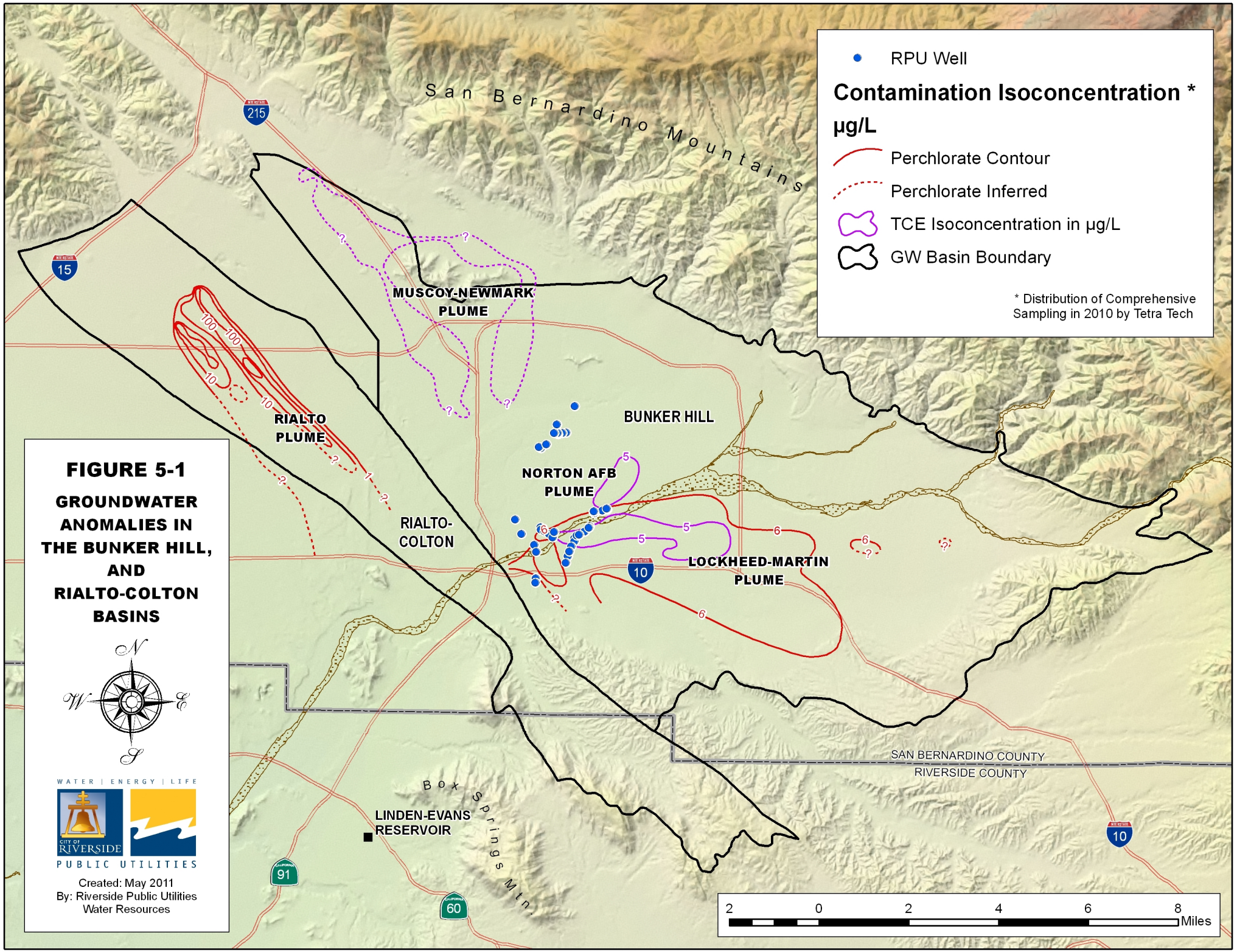

FIGURE 5-1

GROUNDWATER ANOMALIES IN THE BUNKER HILL, AND RIALTO-COLTON BASINS

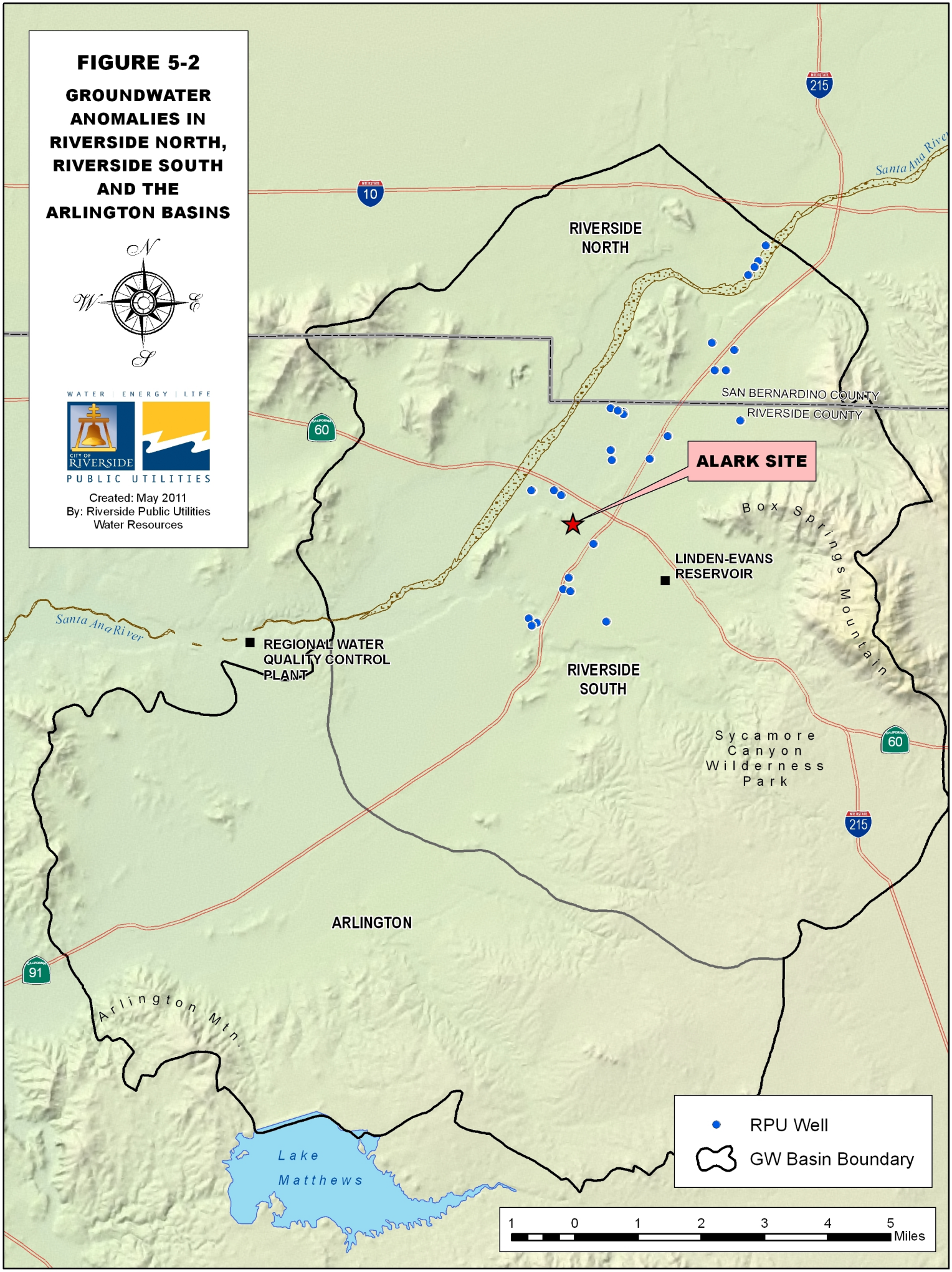
FIGURE 5-2
GROUNDWATER ANOMALIES IN RIVERSIDE NORTH, RIVERSIDE SOUTH AND THE ARLINGTON BASINS
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
RIVERSIDE NORTH
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
ALARK SITE
LINDEN-EVANS RESERVOIR
Box Springs Mountain
Santa Ana River
REGIONAL WATER QUALITY CONTROL PLANT
RIVERSIDE SOUTH
Sycamore Canyon Wilderness Park
ARLINGTON
Arlington Mtn.
Lake Matthews
10
215
60
91
RPU Well
GW Basin Boundary
1 0 1 2 3 4 5 Miles

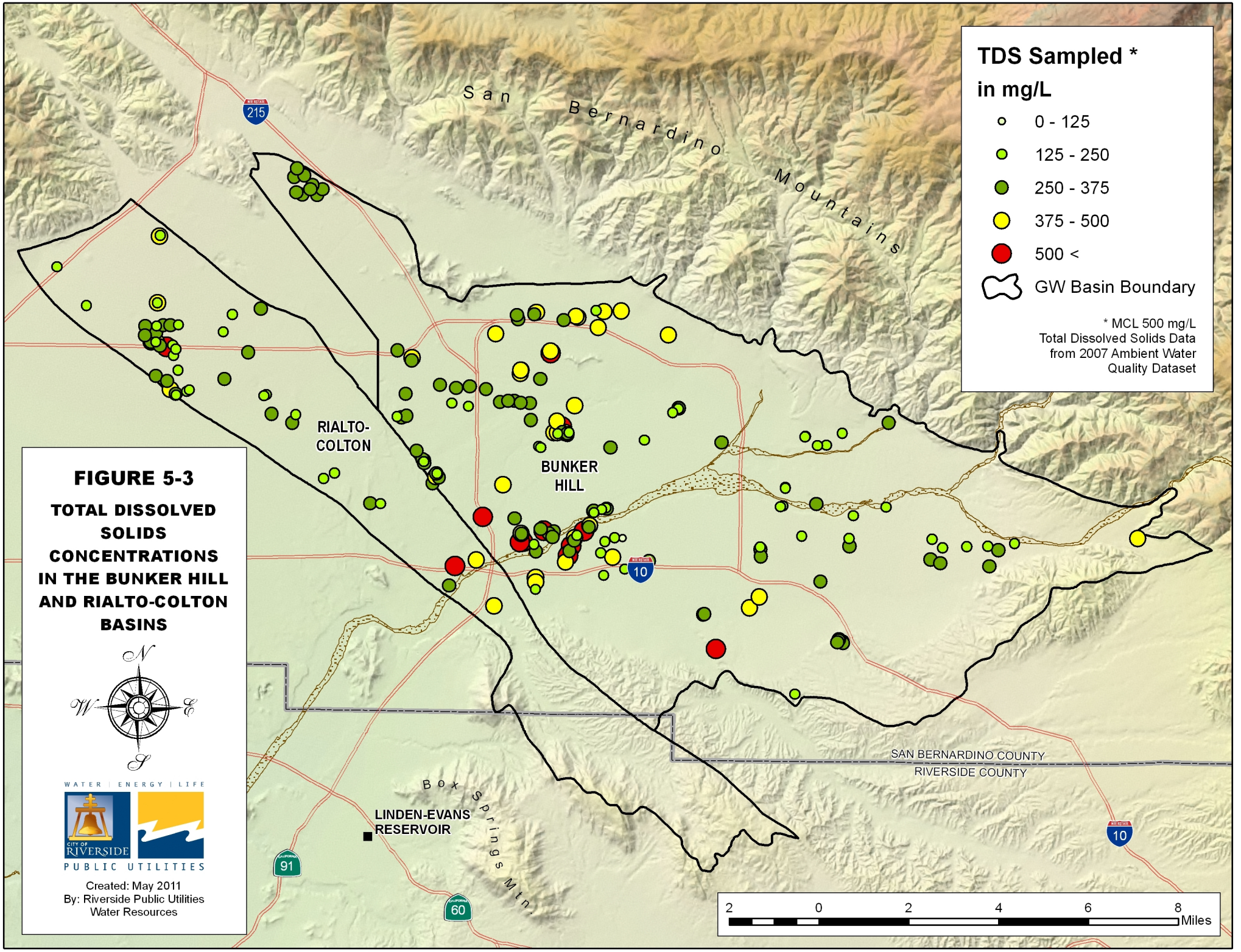

FIGURE 5-3

TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN THE BUNKER HILL AND RIALTO-COLTON BASINS

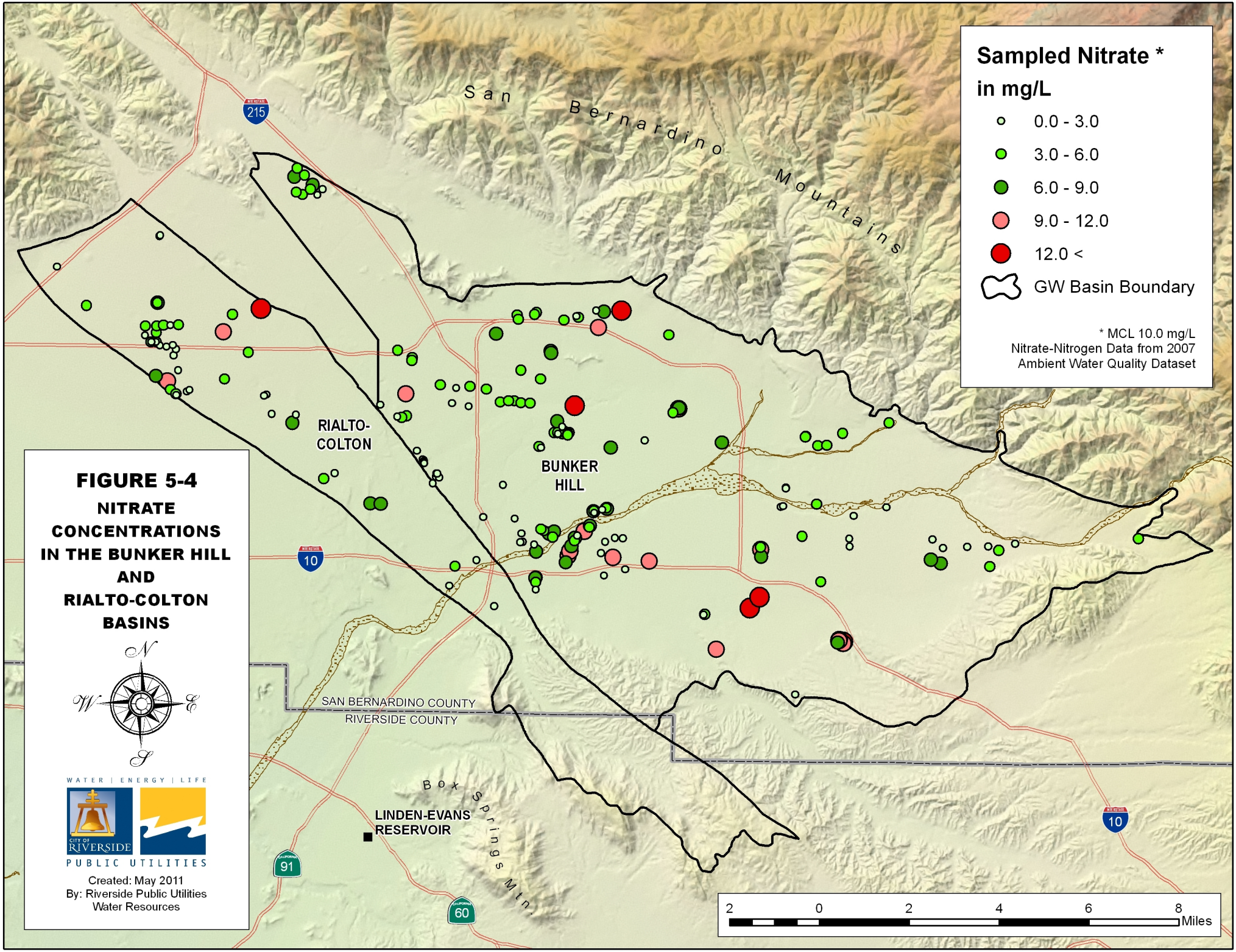

FIGURE 5-4

NITRATE CONCENTRATIONS IN THE BUNKER HILL AND RIALTO-COLTON BASINS

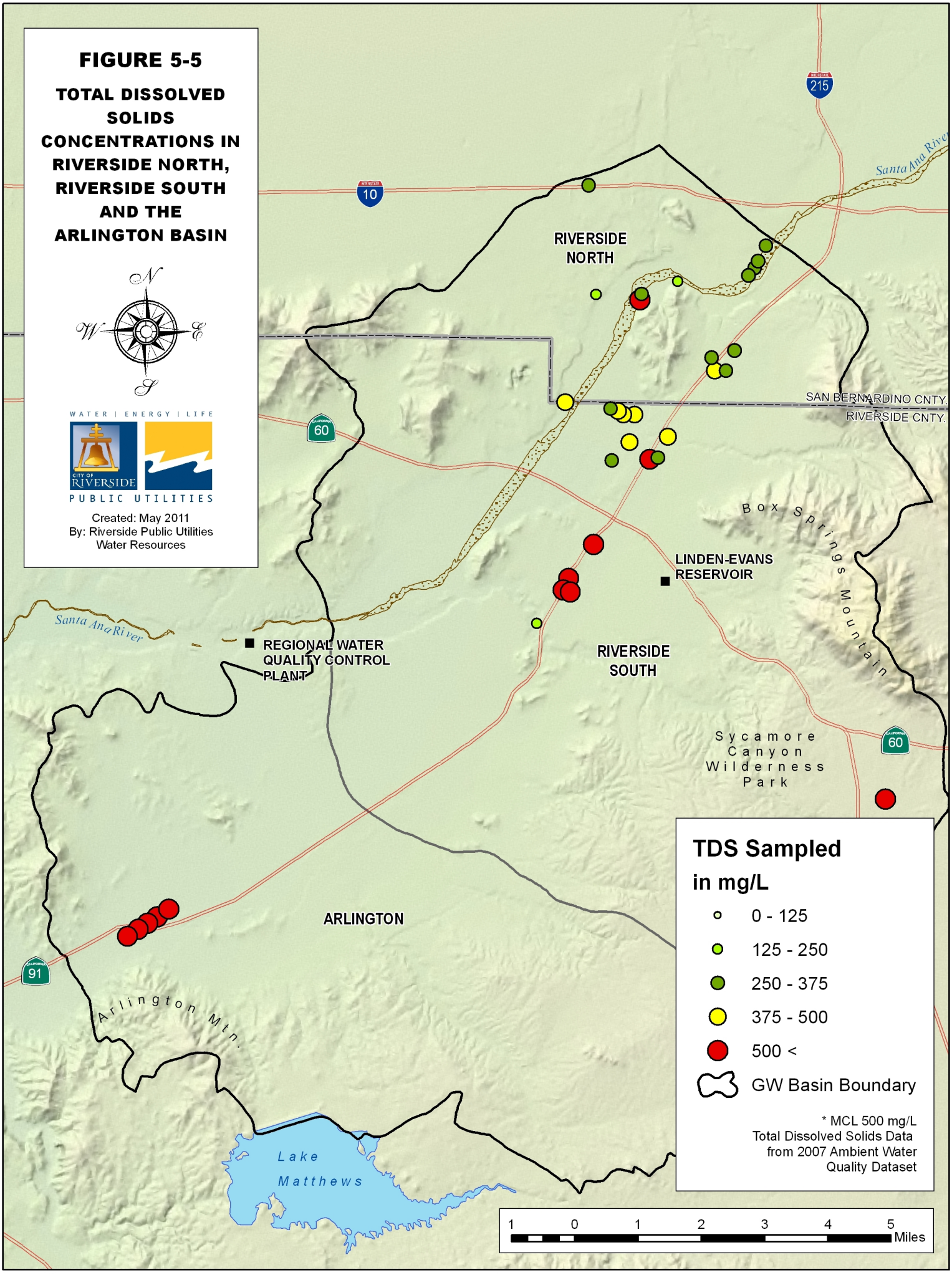
FIGURE 5-5
TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN RIVERSIDE NORTH, RIVERSIDE SOUTH AND THE ARLINGTON BASIN
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
215
10
60
91
Santa Ana River
RIVERSIDE NORTH
SAN BERNARDINO CNTY.
RIVERSIDE CNTY.
Box Springs Mountain
LINDEN-EVANS RESERVOIR
REGIONAL WATER QUALITY CONTROL PLANT
RIVERSIDE SOUTH
Sycamore Canyon Wilderness Park
ARLINGTON
Arlington Mtn.
Lake Matthews
TDS Sampled in mg/L
0 - 125
125 - 250
250 - 375
375 - 500
500 <
GW Basin Boundary
* MCL 500 mg/L
Total Dissolved Solids Data from 2007 Ambient Water Quality Dataset
1 0 1 2 3 4 5
Miles

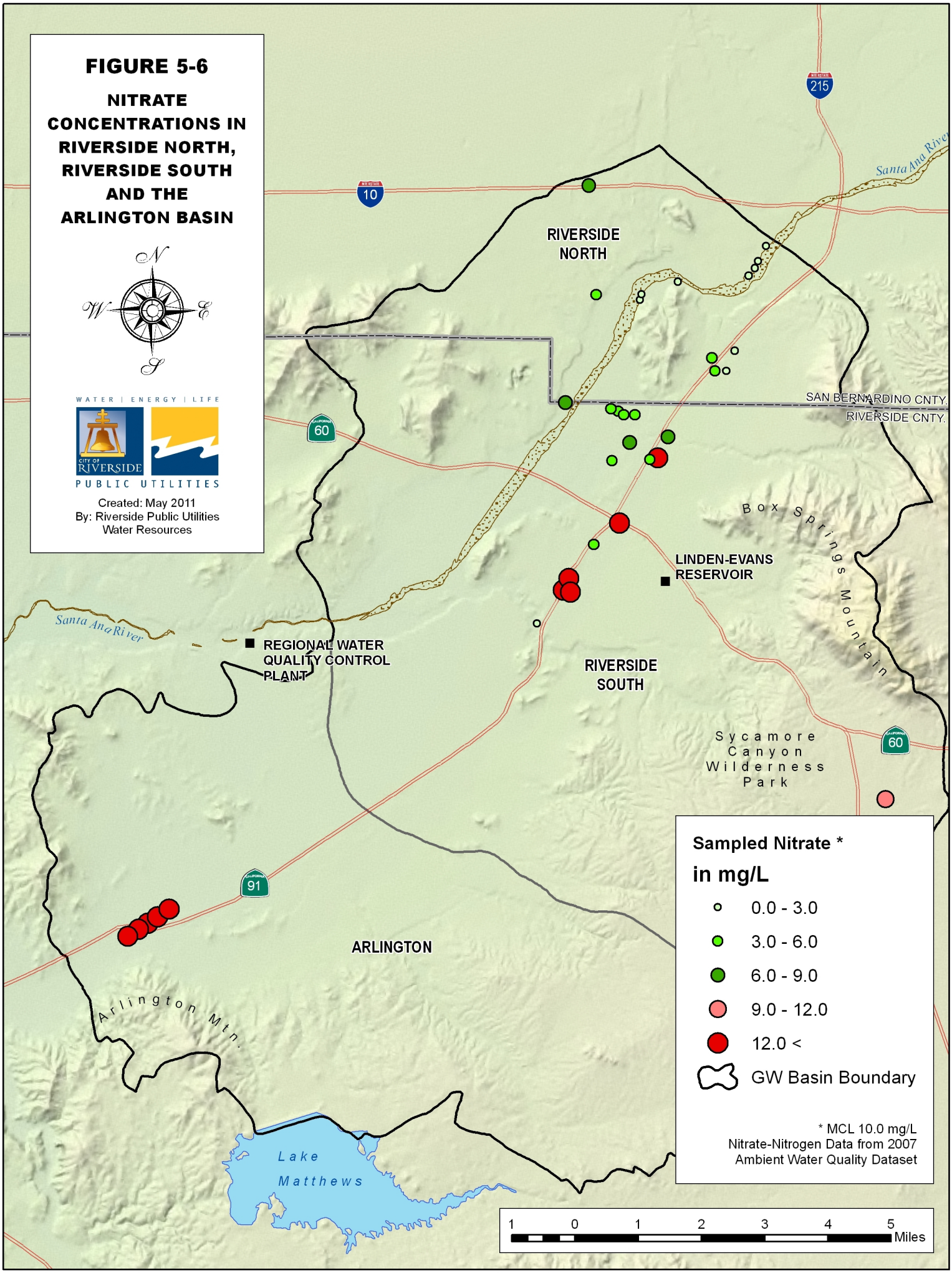
FIGURE 5-6
NITRATE CONCENTRATIONS IN RIVERSIDE NORTH, RIVERSIDE SOUTH AND THE ARLINGTON BASIN
N
W
E
S
WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES
Created: May 2011
By: Riverside Public Utilities
Water Resources
215
10
60
91
Santa Ana River
RIVERSIDE NORTH
SAN BERNARDINO CNTY.
RIVERSIDE CNTY.
Box Springs Mountain
LINDEN-EVANS RESERVOIR
REGIONAL WATER QUALITY CONTROL PLANT
RIVERSIDE SOUTH
Sycamore Canyon Wilderness Park
ARLINGTON
Arlington Mtn.
Lake Matthews
Sampled Nitrate *
in mg/L
0.0 - 3.0
3.0 - 6.0
6.0 - 9.0
9.0 - 12.0
12.0 <
GW Basin Boundary
* MCL 10.0 mg/L
Nitrate-Nitrogen Data from 2007
Ambient Water Quality Dataset
1 0 1 2 3 4 5
Miles

6.1 Summary of RPU's Conservation Programs

RPU is a signatory to the Memorandum of Understanding Regarding Urban Water Conservation in California (Urban MOU), which requires the implementation of 14 Best Management Practices (BMPs), or demand management measures (DMM), for water conservation. The Urban MOU was first adopted in December 1991 by the California Urban Water Conservation Council (CUWCC) and last amended in 2008. Agencies that are signatories to the Urban MOU are required to report regularly on their implementation efforts with regard to each of the 14 BMPs. These reports are archived in an online BMP Reporting Database at the CUWCC website and are publicly available.

The MOU and BMPs were revised by the CUWCC in 2008. The revised BMPs now contain a category of "Foundational BMPs" that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs). The remaining "Programmatic" BMPs have been placed into three categories: Residential, Large Landscape, and Commercial, Industrial, and Institutional Programs. The intent of the revision was to provide water utilities with flexibility on achieving reduction targets through alternative programs and now provide options including a flex track and per-capita use approach to compliance. These revisions will be reflected in the reporting database starting with reporting year 2009. A copy of RPU's 2009-2010 annual report is provided in Appendix P.

Table 6-1 provides a summary of RPU's current status in implementing the 14 BMP's of its conservation program. RPU is not a wholesale agency and does not implement BMP 10 "Wholesale Agency Assistance Programs".

6.2 Description of RPU's Conservation Programs

Brief descriptions are provided for the BMPs that RPU has met the compliance criteria. Detailed descriptions are provided for the BMPs that are currently being implemented.

6.2.1 Foundational Best Management Practices

6.2.1.1 BMP 3: Unaccounted Water

RPU is not currently in compliance with the revision to BMP 3 which requires implementation of AWWA's water audit standard per the M36 manual. RPU has recently identified inaccuracies in its operations data which have resulted in overestimations of system water loss. Effort has been underway in the last several years to reduce inaccuracies in system production data.

In July 2010, RPU initiated an audit of RPU's water supply based on the American Water Works Association's M-36 Water Audit method. The objectives for the water audit were:

1) To comply with the DWR and CUWCC mandate to account for water losses and implement measures for improvement to qualify for future State grant funding.
2) To better account for system water, realizing non-revenue water sources to identify areas for system improvement and optimization of revenue recovery.

The water audit resulted in a 10.1-percent unaccounted for water as a percent by volume of water supplied in 2010. This figure captures any production losses that occur in the normal course of water production.

Table 6-1 Summary of Current Conservation Programs

BMP	BMP Name	Status
Foundational Best Management Practices		
BMP 3	Unaccounted Water	Currently Implementing
BMP 4	Metering	In Compliance
BMP 7	Public Information	In Compliance
BMP 8	School Education	In Compliance
BMP 10	Wholesale Agency Programs	N/A
BMP 11	Rate Structure	In Compliance
BMP 12	Conservation Coordinator	In Compliance
BMP 13	Water Waste Prohibition	Currently Implementing
Programmatic Best Management Practices: Residential		
BMP 1	Residential Water Surveys	Currently Implementing
BMP 2	Residential Plumbing Retrofits	In Compliance
BMP 6	HECW	In Compliance
BMP 14	Residential ULFT	Currently Implementing
Programmatic Best Management Practices: Large Landscape		
BMP 5	Large Landscape Surveys	Currently Implementing
Programmatic Best Management Practices: Commercial, Industrial, Institutional		
BMP 9	Commercial, Industrial, Institutional	In Compliance

RPU has used the water audit results to:

1) Refine date collection practices and establish as routine business practices
2) Refine, enhance, and expand ongoing programs based on economic justification
3) Conduct detailed planning, budgeting, and launch of comprehensive improvements for metering, billing, and infrastructure management
4) Establish mid-range (5 year horizon) apparent and real loss reduction goals
5) Performance Benchmarking

RPU has developed an unaccounted water team to analyze all system aspects from billing to system modeling. The team will conduct a study of the system to identify any areas of the system where leaks or water loss appears evident. The results of the system analysis will further aid RPU in its infrastructure and CIP planning to best control losses.

Annual M-36 audits and quarterly benchmarking of water loss results will be used to evaluate the effectiveness of system improvements. RPU is working towards being in compliance with this BMP by the end of 2011.

6.2.1.2 BMP 7: Public Information

RPU has been in compliance with BMP 7 since BMP reporting began in 1999. The public information program is implemented in coordination with RPU's wholesale agency, WMWD. Regional ad and media programs are implemented with WMWD and also EMWD. RPU conducts its own program as well, through public events, demonstration gardens, school programs, media advertising, and bill stuffers.

6.2.1.3 BMP 8: School Education

RPU has been in compliance with BMP 8 since BMP reporting began in 1999 and has been implementing a school education program since 1989. The school education program is implemented in coordination with RPU's wholesale agency, WMWD. Educational handout materials and class presentations are provided to students in grades K through 6.

6.2.1.4 BMP 10: Wholesale Agency Programs

BMP 10 is not applicable to RPU.

6.2.1.5 BMP 11: Rate Structure

RPU is in compliance with BMP 11. 100-percent of service connections are metered and billed on an increasing block rate structure with seasonal rates to promote conservation as shown in Table 5-13.

6.2.1.6 BMP 12: Conservation Coordinator

RPU has been in compliance with BMP 12 since BMP reporting began in 1999. Clay Monroe is currently the conservation coordinator for RPU.

6.2.1.7 BMP 13: Water Waste Prohibition

RPU is not in compliance with BMP 13. BMP 13 requires that agencies enact and enforce measures that prohibit specific landscape and irrigation inefficiencies, commercial or industrial inefficiencies, and other misuses of water. While RPU has had a water waste prohibition ordinance since BMP reporting began, the ordinance does not cover commercial car wash, laundry, and landscape activities which are required by the BMP.

In 2010, RPU staff began work on a draft Water Conservation Ordinance to be taken forward to the Riverside City Council. The draft is currently in its final stage and adoption of this ordinance is anticipated in 2011.

The upcoming Water Conservation Ordinance for the City of Riverside will prohibit all mandated inefficient water uses as well as provide enforcement measures for RPU. Upon adoption RPU will be in compliance with all mandated water restrictions and prohibited uses. The ordinance will be entered into the Riverside municipal code and will be enforced by code enforcement officers. A description of the ordinance is included in Section 5.3.

6.2.2 Residential Programmatic Best Management Practices

6.2.2.1 BMP 1: Residential Water Surveys

RPU is currently not in compliance with BMP 1. RPU has been providing indoor and outdoor water surveys to single-family residential and multi-family residential accounts since 1989. The CUWCC Coverage Report for BMP 1 indicates that RPU is currently in compliance with this BMP. However, review of past BMP reports show inconsistencies between data reported prior to and after fiscal year 2003-04. The reported number of surveys completed prior to 2004 appears to be overstated, and inconsistent with RPU's current understanding of its residential water survey program. RPU is currently not in compliance with BMP 1, but is currently implementing a residential water survey program working toward a level sufficient to be on track towards compliance.

In 2011, RPU will launch a 3 year Smart Irrigation Program targeting the top 20-percent of water users in RPU's service territory. This program will require a certified water audit before any installation water efficient landscaping equipment occurs. By targeting the top 20-percent of water users in Riverside, RPU projects to save hundreds of acre feet per year through the water audit process. In addition to these audits, RPU will offer qualified customers free installation of smart irrigation controllers and high efficiency sprinkler nozzles to achieve additional water savings. RPU has budgeted $200,000 a year over the next three years toward this effort.

The Smart Irrigation Program will be administered in addition to RPU's current water auditing program that offers free services to all Riverside residents and businesses upon request.

6.2.2.2 BMP 2: Residential Plumbing Retrofits

RPU is in compliance with BMP 2. RPU has been installing low-flow showerheads since 1981 as part of a "Weatherization" program targeted to low income residents, senior citizens and the disabled. The *2010 Water Use Efficiency Master Plan* estimates that at least 90-percent of pre-1992 residences are outfitted with low-flow showerheads, based on an estimated device life of 3 to 7 years. This meets the saturation requirement of 75-percent for outfitting pre-1992 with low-flow showerheads.

6.2.2.3 BMP 6: High-Efficiency Clothes Washing Machines (HECW)

RPU is in compliance with BMP 6 by offering high-efficiency clothes washing machine rebates.

6.2.2.4 BMP 14: Residential Ultra-Low Flush Toilets (ULFT)

RPU is currently not in compliance with BMP 14. While RPU has been offering rebates and a direct install program for ULFT's and HET's, the level of replacements has not been at least equal to that which would be achieved through a retrofit-on-resale (ROR) ordinance as required for compliance.

In an effort to become compliant, RPU has budgeted $200,000 for an HET direct-install program that will target multi-family residential dwellings in the City of Riverside. RPU plans to install over 2,500 HETs and projects over 100 acre-ft of water savings in the first year through the initial running of this program. Future programs are planned but pending budgetary consideration.

The high efficiency toilet multi-family direct installation program is being run in addition to the standard rebate program RPU currently offers. RPU provides a $100 rebate for qualified HETs through its year-round HET Rebate Program.

6.2.3 Large Landscape Programmatic Best Management Practices

6.2.3.1 BMP 5: Large Landscape Surveys

RPU is currently not in compliance with BMP 5. BMP 5 has three conditions for compliance. Condition 1 requires that the agency develop ETo-based water budgets for 90-percent of its dedicated landscape meter accounts at an average rate of 9-percent per year for 10 years. RPU has not begun implementing this criterion. Condition 2 requires that the agency offer landscape surveys to at least 20-percent of its commercial, industrial, and institutional accounts with mixed use meters each report cycle and be on track to survey at least 15-percent of its commercial, industrial, and institutional accounts with mixed use meters within 10 years of the date implementation is to start. RPU was required to begin implementing this BMP in 1991-1992 and be complete by 2002. Currently, RPU has provided surveys for a total of 5-percent of its current commercial, industrial, and institutional accounts and is not surveying at least 1.5-percent of commercial, industrial, and institutional accounts annually. Condition 3 requires that the agency provide financial incentives to customers to support Conditions 1 and 2. Currently, RPU provides incentives in the form of rebates for turf replacement, weather-based irrigation controllers, and will be implementing a program to provide efficient sprinkler nozzles.

In an effort to comply with Conditions 2 and 3 of BMP 5, in 2011 RPU will launch a 3 year Smart Irrigation Program targeting the top 20-percent of water users in the RPU service area. This program will require a certified water audit before any installation water efficient landscaping equipment occurs. By targeting the top 20-percent of water users in Riverside RPU projects to save hundreds of acre feet per year through the water audit process. Through the offering of these audits to large landscape customers RPU will begin working at an accelerated rate toward compliance with Condition 2 of BMP 5.

In addition to these audits, RPU will offer qualified customers free installation of smart irrigation controllers and high efficiency sprinkler nozzles to achieve additional water savings and achieve compliance with Condition 3 of BMP 5.

RPU has budgeted $200,000 a year over the next three years toward this effort. The Smart Irrigation Program will be administered in addition to RPU's current water auditing program that offers free services to all Riverside large landscape customers upon request.

6.2.4 Commercial, Industrial, and Institutional Programmatic Best Management Practices

6.2.4.1 BMP 9: Commercial, Industrial, and Institutional Programs

RPU is currently in compliance with BMP 9. Through toilet, urinal, and washing machine rebates, and surveys, RPU is on track to reduce commercial, industrial, and institutional water use by an amount equal to 10-percent of baseline use by end of 2009, 10 years after implementation started.

As recommended in the *2010 Water Use Efficiency Master Plan* RPU will launch an additional CII performance based program to further incentive water savings. This program will offer financial incentives to CII customers to save water through fixture or process changes. Anticipated program creation and launch in early 2013.

The performance based program combined with the fixture based rebate program provided via the MWD Save-A-Buck Program should provide RPU with water savings above the needed compliance levels for BMP 9.

6.3 Wholesaler Implemented Conservation Programs

Many of the conservation activities that have been implemented in RPU's service area were conducted through both WMWD and Metropolitan Water District of Southern California (MWD). These wholesale agencies provide financial, technical, and program management support of conservation programs within their service areas through the requirements of BMP 10, Wholesale Agency Assistance Programs. The conservation activities being implemented through wholesaler programs is described below.

6.3.1 Metropolitan Water District

RPU's commercial, industrial, and institutional sector incentives are provided nearly entirely through MWD's rebates and the Save a Buck program for commercial, industrial, and institutional customers. MWD provides rebates for commercial and industrial customers within its member agencies' service areas for devices such as cooling towers, pH controllers, irrigation controllers, and toilets. Additionally, MWD has worked with WMWD and RPU to install high efficiency toilets in hotels, motels, and multi-family complexes in RPU's service area.

6.3.2 Western Municipal Water District

WMWD implements public outreach programs within its service area. RPU's public information (BMP 7) and school education (BMP 8) programs are conducted in coordination with WMWD's program. RPU has also utilized WMWD's Smart Landscape Retrofit Program to provide its customers with free direct installations of weather-based irrigation controllers.

6.4 BMP Saturation

This section evaluates RPU's implementation levels for the 14 BMPs.

6.4.1 Decay Factors

Water savings will decay over time due to equipment breakdown or degradation, lack of maintenance, or for reasons related to customer behavior (these tend to be the most dramatic decays). The analysis refers to decay factors developed by the CUWCC and documented in the Research and Evaluation Report (8/13/2009) and 2005 Cost & Savings Study.

6.4.2 Natural Replacement Rates

Natural replacement of older model fixtures with more efficient versions is largely driven by standards and/or improvements in fixture efficiency. The most important legislative action to date has been the 1994 Federal National Energy Policy Act which specified toilet, showerhead and aerator standards. As homeowners remodel older homes or replace aging plumbing fixtures, older homes and fixtures are forced into compliance with new plumbing code requirements. Many inefficient fixtures are replaced this way in addition to agency-sponsored installations and rebates. It is therefore not uncommon for utilities to allocate their resources to those fixtures or processes not mandated in order to capture savings that would not otherwise happen.

6.4.3 Unit water savings

Unit water savings estimates were taken from accepted industry standards and CUWCC protocols whenever possible.

6.4.4 Cost Effectiveness

Typically, a cost-effectiveness analysis is performed using the CUWCC Avoided Cost Model along with the CUWCC Cost-Effectiveness Model. RPU developed its own model using the same principles as the CUWCC models in order to best address RPU needs. The RPU model develops the analysis to 2020. Additionally, the CUWCC model is limited to the 14 BMPs and has strict input requirements, limiting the number of variables that can be considered.

6.4.5 Landscape Savings

Landscape savings assumption for audit estimates can vary significantly given the size of the site and/or whether they are higher users versus average users.

6.4.6 BMP Estimated Saturation Levels

Table 6-2 summarizes the estimated saturation levels of the 14 BMPs. The results show that while a few BMPs have reached high levels of saturations, there is still significant savings potential. BMPs 2 (low-flow showerheads) and 14 (ULFT) have the highest saturation levels but even these programs still offer potential given improvements in fixture efficiencies. For example, while the market may be saturated with 2.5 gpm model showerheads, the newer models flowing at 1.5 gpm can still offer significant and relatively low-cost savings. Similarly, while ULFT saturation ranges between 50 and 63 percent, HET saturation is still relatively low. The other BMPs, particularly indoor surveys and landscape BMPs, also demonstrate significant potential for additional conservation savings for RPU.

Table 6-2 Summary of Best Management Practices Saturation

BMP	Program	Saturation Percentage
BMP 1	Residential Water Surveys (SFR)	0.30%
BMP 1	Residential Water Surveys (MR)	0%
BMP 2	Low Flow Showerheads - 2.5 gpm models (SFR)	93%
BMP 2	Low Flow Showerheads - 2.5 gpm models (MFR)	95%
BMP 3	Unaccounted Water	Saturation estimates are not appropriate for BMP 3.
BMP 4	Dedicated Irrigation Meters for CII Accounts	Saturation estimates are not appropriate for BMP 4.
BMP 5	Large Landscape Water Budgets	0%
BMP5	Large Landscape Water Surveys Completed	0%
BMP 6	High-Efficiency Clothes Washers (HECWs)	17%
BMP 7	Public Information	Saturation estimates are not appropriate for BMP 7.
BMP 8	School Education	Saturation estimates are not appropriate for BMP 8.
BMP 9	CII Water Use Surveys Completed	1%
BMP 10	Wholesale Agency Programs	Not applicable to retailers.
BMP 11	Water and Sewer Rate Structures	Saturation estimates are not appropriate for BMP 11.
BMP 12	Conservation Coordinator	Saturation estimates are not appropriate for BMP 12.
BMP 13	Conservation Pricing	Saturation estimates are not appropriate for BMP 13.
BMP 14	Residential ULFTs (SFR)	50%
BMP 14	Residential ULFTs (MFR)	63%
BMP 14	Residential HETs (SFR)	8%
BMP 14	Residential HETs (MFR)	3%

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