City of Chino Hills

City of Chino Hills
Urban Water Management Plan 2020

June 2021

City of
Chino Hills

Hazen

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List of Acronyms

Abbreviation	Description
AF	Acre-Feet
AF/yr	Acre-Feet per Year
AWWA	American Water Works Association
CA	California
CBWCD	Chino Basin Water Conservation District
CCR	California Code of Regulations
CCWRF	Carbon Canyon Wastewater Reclamation Facility
CDA	Chino Basin Desalter Authority
CDPH	California Department of Public Health
CII	Commercial Industrial Institutional
CIMIS	California Irrigation Management Information System
CIP	Capital Improvement Project
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
CY	Calendar Year
DCP	Delta Conveyance Project
DMM	Demand Management Measures
DRA	Drought Risk Assessment
DWR	Department of Water Resources (California)
DYY	Dry Year Yield
ECO	excess carryover
EOP	Emergency Operations Plan
ETo	Evapotranspiration

Abbreviation	Description
FY	Fiscal Year
GAC	Granular Activated Carbon
GPCD	Gallons per Capita per Day
GSP	Groundwater Sustainability Plan
IEUA	Inland Empire Utilities Agency
IPR	Injection Pressure Regulator
IRP	Integrated water Resource Plan
IWRP	Integrated Water Resources Plan
JCSD	Jurupa Community Service District
MCL	Maximum Contaminant Level
MF	Multi-Family Residential
MGD	Million Gallons per Day
MVWD	Monte Vista Water District
MWD	Metropolitan Water District
OBMP	Optimum Basin Management Program
OCWD	Orange County Water District
RHNA	Regional Housing Needs Allocation
RP	Regional Plant
RWQCB	Regional Water Quality Control Board
SARWQCB	Santa Ana Regional Water Quality Control Board
SAWPA	Santa Anna Watershed Project Authority
SB	Senate Bill
SB-X7-7	Water Conservation Act
SCAG	Southern California Association of Governments
SFR	Single Family Residential
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project
SWRCB	State Water Resources Control Board
TCP	Trichloropropane
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
US	United States
UWMP	Urban Water Management Plan
WBIC	Weather Based Irrigation Controllers
WEWAC	Water Education/Water Awareness Committee
WFA	Water Facilities Authority
WQEOP	Water Quality Operational Plan
WSAP	Water Supply Allocation Plan
WSCP	Water Shortage Contingency Plan
WUE	Water Use Efficiency

Executive Summary and Lay Description

The City of Chino Hills' (City or Chino Hills) 2020 Urban Water Management Plan (UWMP) has been prepared pursuant to the California Water Code (CWC). This Executive Summary fulfills the requirements detailed in CWC Section 10630.5 and provides a high-level overview of the City's water supplies, water demands, water service reliability, and drought risk assessment. In addition to these key components, Chino Hills' UWMP has also developed a stand-alone Water Shortage Contingency Plan (WSCP) which provides guidance for the City's intended actions during a water supply shortage. This Executive Summary and Lay Description is intended to summarize the fundamental determinations (i.e., key findings) of the UWMP, particularly water service reliability, challenges ahead, and strategies for managing reliability risks.

System Description and Water Supplies

Chino Hills is located in the southwest corner of San Bernardino County, immediately adjacent to Riverside County, Orange County and Los Angeles County. Chino Hills' water system service area is largely consistent with City boundaries. The City has access to a diverse portfolio of supply sources including imported water originating in the Sacramento-San Joaquin River Delta (Bay Delta), groundwater from the Chino Basin that is produced locally by the City and purchased from local wholesalers, and recycled water provided by the Inland Empire Utilities Agency (IEUA). Chino Hills' imported Bay Delta supply is conveyed to Southern California via the State Water Project (SWP) where it is purchased by Metropolitan Water District of Southern California (MWD) and wholesaled to IEUA. IEUA in turn sells and conveys the water to the Water Facilities Authority (WFA) who treats the water and sells it to its five member agencies, including Chino Hills and Monte Vista Water District (MVWD). MVWD provides wholesale water to Chino Hills, which may consist of a portion of its allocation of water from WFA and/or groundwater pumping from the Chino Basin. Aside from purchases from MVWD, Chino Hills utilizes groundwater from the Chino Basin via a wholesale agreement with Chino Desalter Authority (CDA) and production from City-owned wells. Lastly, recycled water is available to Chino Hills through a contract with IEUA and is currently used for non-potable consumption.

Chino Hills' water supply sources are considered to be highly reliable over the next 25 years. The overall availability of imported Bay Delta supplies to Southern California have been decreasing over time due to ecosystem decline and regulatory decisions limiting exports. Availability is expected to continue to decrease due to drought, climate change, and additional regulation. Despite this, Chino Hills expects that its full contract value of water to be available in the future. This reliability is due to the long-term investments that MWD has made as the primary regional wholesale supplier, which include storage, water transfers, water banking, flexible operations, conservation, and alternate supplies.

Chino Hills' groundwater supplies from the local Chino Basin are also expected to be highly reliable into the future. Long-term management of the Basin by the Chino Basin Watermaster and the Optimum Basin Management Program has resulted in sustainable groundwater yields through active monitoring, management, accounting, and recharge. Currently, the Chino Basin has a "Very Low" prioritization under the Sustainable Groundwater Management Act (SGMA). Although the safe yield of the Basin may be recalculated from time to time, indications are that the source will continue to be reliable. The Watermaster expects to meet its recharge and replenishment goals through 2050. Given these conditions, Chino Hills expects its allocated safe yield to the basin in addition to its contracted supplies through MVWD and CDA to be available over the UWMP planning period. In the short term (i.e., between 2020-2025), Chino Hills' local groundwater production is expected to be limited due to monitored exceedances of California's maximum contaminate level (MCL) of 1,2,3-Trichloropropane (TCP). which was revised in 2018. The City is currently designing a treatment system to restore the availability of its local wells which is expected to be on-line in 2025.

Similar to its groundwater and imported supplies, Chino Hills expects that its recycled supply provided by IEUA will be nearly 100% reliable into the future, provided that water use (particularly indoor consumption) continues to grow with projected development in the region.

Water Demands

Chino Hills' water demands are expected to grow over the next 25 years consistent with projected demographic trends in the City, which include increases in population, housing units (single family and multi-family), and jobs. Growth projections for the City were based on information from the California Department of Finance, forecasts from the Southern California Association of Governments (SCAG), and local projections from the City's Community Development Department. Demand projections for the City are lower than those identified in the 2015 UWMP, owning to lower "per-unit demands" (e.g., demand per capita, demand per housing unit, or demand per employee) following the 2012-2016 drought and long-term trends in water efficiency.

Consistent with aforementioned trends in water efficiency, Chino Hills complied with its SB X7-7 (i.e., Water Conservation Act of 2009) goals demonstrating 2020 consumption at 148 GPCD relative to its 173 GPCD target.

Water Service Reliability

Chino Hills evaluated its water service reliability under three sets of hydrologic conditions; normal year, single dry year, and five consecutive dry years. Normal year conditions reflected best projections of future supply availability. Dry year conditions reflected normal projections of supply availability reduced by percent availabilities consistent with the lowest-availability year on record (FY 2015/16 per discussion with IEUA). Consistent with assumptions from IEUA, five consecutive dry year conditions were estimated by repeating FY 2015/16 conditions for five straight years. Given these hydrologic scenarios, the City compared its total projected supplies against total forecasted demand between 2025-2045 in five year increments. For each five-year period and within each hydrologic condition, Chino Hills is expected to have surplus water available.

The City also conducted a Drought Risk Assessment (DRA) for the 2021-2025 planning period. The City's DRA was conducted by estimating current supply availabilities (e.g., no availability of City-owned wells due to water quality condition) adjusted for five consecutive dry year conditions and comparing them to short-term projections of total system demand. Although short-term supply availability is expected to be lower due to water quality constraints, Chino Hills is still expected to have a surplus of available supply relative to demand.

Water Shortage Contingency Plan

Consistent with CWC Section 10632 Chino Hills developed an updated WSCP as part of its 2020 UWMP. The City's updated WSCP is considered a stand-alone document that may be updated on an as-needed basis outside of the five-year UWMP process. Chino Hills' WSCP formalizes the City's procedures for conducting the Annual Water Supply and Demand Assessments consistent with CWC Section 10632(a)(2), provides a "crosswalk" between the City's water shortage stages and DWR's six standard water shortage levels, and provides a detailed review of the City's drought response actions within each water shortage stage. The WSCP also reviews several critical aspects in responding to and planning for water shortages including communication protocols, compliance mechanisms, and financial consequences. Lastly, the WSCP details the City's processes for updating the Plan, including monitoring, legal authorities, and steps for refinement.

Major Findings of the 2020 UWMP

Chino Hills' 2020 UWMP provides an assessment of the City's water supplies, demand, and overall water service reliability through 2045 given the major assumptions identified above. The City's 2020 UWMP complies with the content and requirements outlined by the UWMP Act, including updated requirements passed by the State Legislature. The City's UWMP will be updated every five years to reflect changes in water demand, supply projections, and comply with subsequent updates to the CWC. Several key findings of the 2020 UWMP are summarized below:

- Chino Hills has access to a diverse portfolio of water supplies and is expected to be able to reliably meet demands through 2045 under the hydrologic conditions examined in the 2020 UWMP.
- Existing water quality conditions affecting Chino Hills' local wells are expected to limit the City's ability to produce its own groundwater until treatment systems are designed and built (expected in 2025). Despite this limitation, Chino Hills is still expected to have surplus supply relative to projected demands given the reliability of its imported and purchased water sources.
- Availability of the City's imported supply is an important component of the City's overall supply reliability. Though existing and planned programs from MWD are expected to protect this source, the City should continue to monitor availability of supplies originating in the Bay Delta and the planned actions from MWD and other wholesalers in mitigating future risks.
- Overall safe yield in the Chino Basin is an important component of the City's overall supply reliability. Existing management strategies have so far been successful in maintaining the reliability of the Basin. The City should continue to support plans and programs that protect the safe yield of the Basin.

1. Introduction and Overview

The 2020 update of the City of Chino Hills' UWMP is prepared in accordance with the California Urban Water Management Planning Act of 1983 and its amendments. The Act requires that a UWMP be prepared by all water purveyors having more than 3,000 accounts or supplying more than 3,000 acre-feet (AF) of water annually. Plans are required to be submitted every five years. The City adopted previous Plans for 1995, 2000, 2005, 2010 and 2015.

The City's 2020 UWMP provides a framework for long term water supply planning and informs the public of its plans. The City has planned for adequate water supplies for existing and future demands. This document was prepared in accordance with most recent State requirements[1], and includes the following information:

- Review of UWMP preparation;
- Description of the City's water supply system;
- Overview of system water use;
- Summary of conservation target compliance with 2009 Senate Bill 7 (SBx7-7);
- Description of the City's water supplies;
- An updated water supply reliability assessment;
- An updated WSCP;
- Review of the City's demand management measures; and
- An overview of the UWMP adoption, submittal and implementation.

This section provides a brief description of relevant updates to the CWC addressed by this document and a description of UWMP development in relation to other planning efforts.

1.1 Updates to the California Water Code and UWMP Development

Since its passage in 1983, several amendments have been added to the CWC and Urban Water Management Planning Act. The State Department of Water Resources (DWR) published a final guidebook in March 2021 to assist urban water suppliers understand the most recent revisions and prepare the 2020 UWMPs. The City has followed the guidance issued in DWR's guidebook in preparation of this document. A summary of new requirements addressed in this UWMP are presented in the following sections.

In addition to defining new requirements for the 2020 UWMPs, DWR's guidebook also provided an updated checklist to assist DWR staff in reviewing UWMPs. The City has completed this checklist and included it in Appendix A to this document.

[1] The State Department of Water Resources (DWR) published a final guidebook in March 2021 to assist urban water suppliers prepare the 2020 UWMPs (https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans/Final-2020-UWMP-Guidebook/UWMP-Guidebook-2020---Final-032921.pdf).

1.1.1 Five Consecutive Dry Year Assessment

Previous UWMPs required an assessment of a three consecutive dry year scenario. An update to CWC Section 10635 changed the three consecutive dry year scenario to a five consecutive dry year scenario. The consecutive dry year reliability assessment was increased from three to five years to account for increased periods of drought caused by climate change. The five consecutive dry years will be considered in the Sections 4.1.5 and 7.

1.1.2 Drought Risk Assessment

The California legislature created a new requirement to include a DRA in the 2020 UWMP. The requirement was added in part because of the extended duration of recent California droughts and concerns over hydrologic variability to climate change. The DRA examines water supply reliability over a five-year period from 2021 to 2025 and is presented in Section 7.

1.1.3 Seismic Risk

New to the UWMP requirements is an updated seismic risk assessment of water system facilities and a proposed mitigation plan. The prevision was added to consider regional hazards when evaluating water supply reliability. Seismic Risk is discussed in Section 8.4.6

1.1.4 Energy Use Information

Energy use calculations were a voluntary part of the 2015 UWMP. They are now required as part of the 2020 UWMP. Energy Use Information is provided in Section 6.9.

1.1.5 Water Loss Reporting for Five Years

Previous UWMPs required one year of water loss reporting. The 2020 UWMP is required to provide the last 5 years of water loss. Water loss reporting is in Section 4.1.2.

1.1.6 Water Shortage Contingency Plan

Many elements of the WSCP have been included in past UWMPs, however in 2018 a new requirement was added to the CWC for a specific, stand-alone WSCP. WSCPs provide the retail supplier with specific actions to take in the event of a drought or catastrophic water supply shortage. WSCPs will also be used by DWR, the State Water Board and the State Legislature in the event of a widespread disasters and/or drought. The City’s WSCP is considered a stand-alone document and is included in Section 1 of this UWMP.

1.1.7 Groundwater Supplies Coordination

New revisions to the CWC require consistency between the UWMP and existing Groundwater Sustainability Plans (GSP) where applicable. The Chino Basin is considered a “low priority” basin so, a GSP is not required and no coordination with the plan is needed. However, information provided in this

UWMP is consistent with the Chino Basin Optimum Management Program 2018 State of the Basin Report[2].

1.1.8 Lay Description

The Lay Description is intended for use by new staff, new governing members, customers, and the media. The goal of the Lay Description is to provide a high-level synopsis of the UWMP. The Lay Description for this UWMP is provided as the Executive Summary at the beginning of the document.

1.2 UWMP in Relation to Other City Planning Efforts

The City's 2020 UWMP was prepared by integrating information from the 2021 Citywide Water and Recycled Water Master Plan, Groundwater Management Plan, General Plan, the 2015 Urban Water Management Plan and among other city planning documents. The UWMP was also prepared given information from MWD's and IEUA's draft UWMPs.

[2] Wildermuth Environmental, Inc. Chino Basin Optimum Management Program 2018 State of the Basin Report. June 2019.

2. Plan Preparation

Development of the City's UWMP required significant coordination and outreach. This section provides an overview of the basis of planning for the 2020 UWMP, coordination activities, and descriptions of several key assumptions (e.g., baseline units of measure) used for describing information in the document.

2.1 Basis of Planning

The City operates a public water system that is regulated by the State Water Resources Control Board (SWRCB). According to CWC Section 10617, an "urban water supplier" is defined as a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 AF of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. Based on this characterization, the City is required to prepare an UWMP every five years. Table 2-1 provides the public water system number, the number of municipal connections, and the volume of water supplied in 2020.

Table 2-1: Public Water System (DWR Table 2-1)

Retail Public Water Systems			
Public Water System Number	Public Water System Name	Number of Active Municipal Connections 2020	Volume of Water Supplied 2020 (AF)
CA 3610036	Chino Hills, City of	21,743	13,949
	TOTAL	21,743	13,949

2.2 Regional Planning

DWR guidance allows for water retailers to develop individual or regional UWMPs. Regional reporting can consist of a group of retailers or another regional entity. Although a member of the Inland Empire Utilities Agency Alliance, the City elected to develop an individual UWMP. The City, IEUA, and its member agencies coordinated with each other to complete their UWMPs. Table 2-2 provides information on the City's UWMP identification.

Table 2-2: Plan Identification (DWR Table 2-2)

Plan Identification			
Select Only One	**Type of Plan**		**Name of RUWMP or Regional Alliance** *if applicable* *drop down list*
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☑	Water Supplier is also a member of a Regional Alliance	Inland Empire Utilities Agency Alliance
☐	**Regional Urban Water Management Plan (RUWMP)**		

2.3 Fiscal or Calendar Year and Units of Measure

Table 2-3 summarizes the City's supplier type, reporting years and units of measurement. The following tables in the UWMP are reported in Fiscal Years (FY). Quantities of water are reported in AF unless noted otherwise.

Table 2-3: Agency Identification (DWR Table 2-3)

Supplier Identification	
Type of Supplier (select one or both)	
☐	Supplier is a wholesaler
☑	Supplier is a retailer
Fiscal or Calendar Year (select one)	
☐	UWMP Tables are in calendar years
☑	UWMP Tables are in fiscal years
If using fiscal years provide month and date that the fiscal year begins (mm/dd)	
07/01	
Units of measure used in UWMP * (select from drop down)	
Unit	AF

2.4 Coordination and Outreach

The City's 2020 UWMP was prepared in coordination with each of its wholesale suppliers including IEUA, WFA, MVWD, and CDA. Chino Hills provided demand projections to each of these water agencies and received assumptions of planned water supply availability. Table 2-4 lists the agencies that were involved in the preparation of the City of Chino Hills' 2020 UWMP.

Table 2-4: Coordination with Local Agencies (DWR Table 2-4)

Retail Water Supplier Information Exchange
The retail Supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 10631.
Wholesale Water Supplier Name
Inland Empire Utilities Agency
Water Facilities Authority
Monte Vista Water District
Chino Basin Desalter Authority

2.5 Coordination with Other Agencies and the Community

In accordance with the UWMP Act and the CWC, the City provided a public review period for the 2020 UWMP draft and sent electronic mail notices for the intent to adopt the 2020 UWMP to the following interested parties:

- Inland Empire Utilities Agency
- Water Facilities Authority
- City of Chino
- City of Ontario
- City of Upland
- City of Pomona
- Cucamonga Valley Water District
- Monte Vista Water District
- Chino Basin Desalter Authority
- Fontana Water Company
- San Bernardino County

Pursuant to the CWC, the City provided the general public notice via the local Champion newspaper with the first notification occurring at least 60 days prior to the public hearing. The City held its public hearing on Tuesday June 22, 2021 and adopted the 2020 UWMP at that time.

3. System Description

An important part of UWMP development is understanding characteristics of the urban supplier's service area and distribution system. Section 3 describes the City's service area, land use, and demographic / socioeconomic characteristics as they relate to the 2020 UWMP. The section also includes a description of the current and future climate conditions.

3.1 General System and City Description

The City is located in the southwest corner of San Bernardino County, immediately adjacent to Riverside County, Orange County and Los Angeles County. A small portion of the southern and eastern city boundaries coincide with the Riverside County boundary. The southwestern city boundary is the Orange County border, and the western and northern city boundaries are defined by the Los Angeles County border. The northeastern City boundary is generally defined as State Route 71 with the exception of developed and agricultural land east of State Route 71 between Chino Hills Parkway and Pine Avenue. The surrounding cities include Pomona to the north, Chino to the east, Brea and Yorba Linda to the southwest, and Diamond Bar to the northwest. Figure 3-1 shows the vicinity and location of the City.

The City was incorporated in 1991 and currently encompass approximately 28,800 acres (45 square miles). The 7,360 acres (11.5 square miles) of Chino Hills State Park Reserve covers the southern portion of the City. The City's natural terrain consists of rolling hills and valleys, with elevations ranging from approximately 410 feet to 1,780 feet above sea level.

Most developable land within the City is zoned residential. Residential development is predominantly located along the City's significant transportation corridors, such as Chino Hills Parkway, Carbon Canyon Road, Butterfield Ranch Road, Peyton Drive and Grand Avenue. According to the 2010 Census, approximately 85% of the residential units are owner-occupied. Commercial development within the City is predominantly situated along the State Route 71 corridor. Other land uses include ranch, agriculture, parks, commercial, institutional, and landscaping.

3.2 Service Area Boundary

Chino Hills' service area boundary is largely consistent with City boundaries (see Figure 3-1). A small area towards the north of the City boundary is outside the water service area and served by the City of Pomona. Another small area to the east of Pipeline Avenue and south of Eucalyptus Avenue is part of the Chino Hills water service area although it is located within the City of Chino. The recycled water system is concentrated in the southeastern portions of the City (south of Soquel Canyon Parkway). The service area is the same for both the potable and the recycled water system.

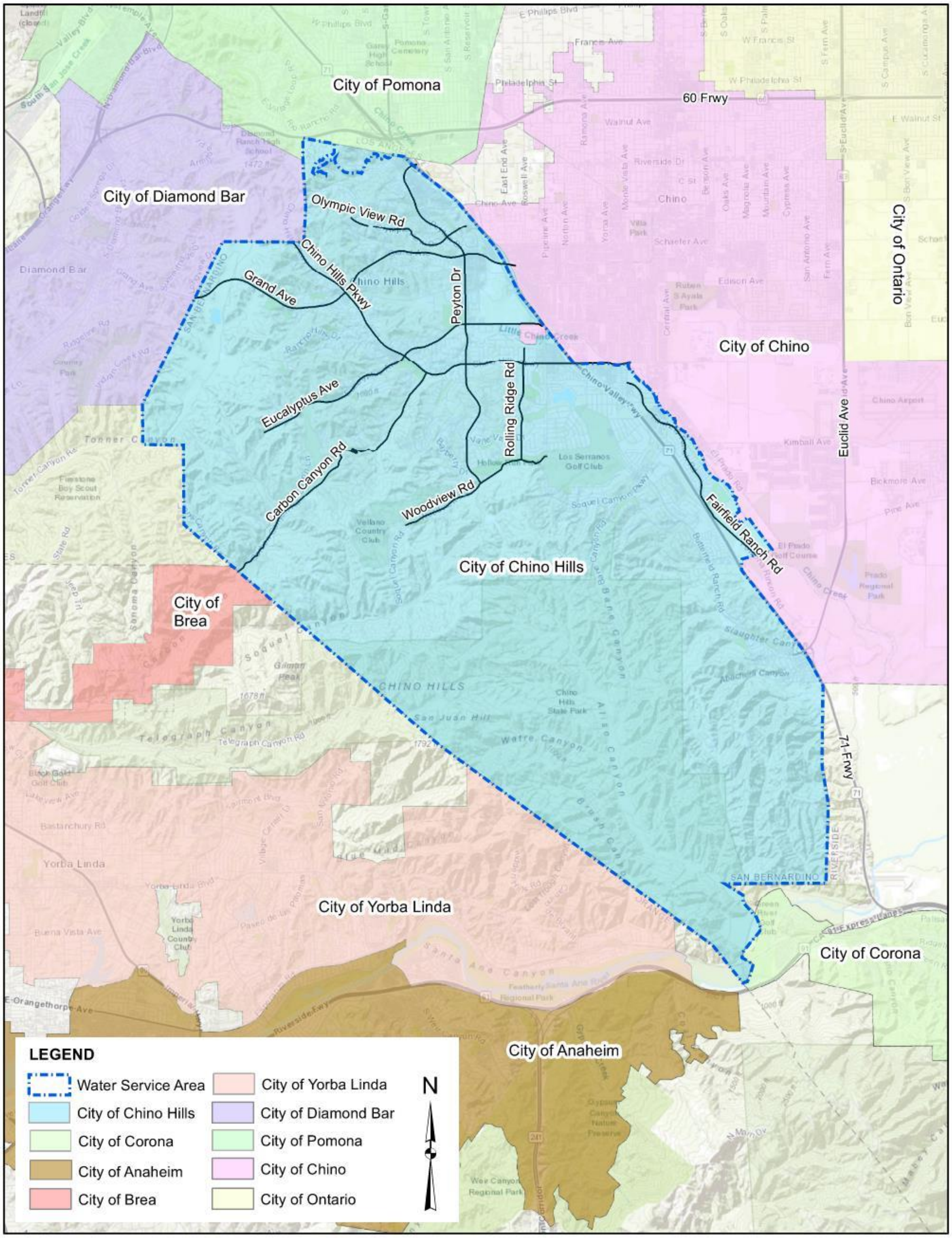

Figure 3-1: City of Chino Hills Service Area

3.3 Climate

The City is located within the South Coast hydrologic region of Southern California. From 2001 to 2020, the City received an average rainfall of approximately 13.9 inches. The average maximum air temperature was approximately 62.7 degrees Fahrenheit. Table 3-1 provides yearly average evapotranspiration (ET_o), precipitation, and average maximum air temperature (°F) for the City in calendar years.

Table 3-1: City of Chino Hills Climate

Year	Average ET_o (in)	Total Precipitation (in)	Average Max Air Temperature (°F)
2001	46.6	15.9	60.9
2002	48.8	7.4	60.8
2003	46.9	14.8	62.3
2004	51.2	19.9	61.8
2005	48.8	23.4	62.0
2006	49.1	12.2	62.3
2007	51.4	4.6	61.7
2008	50.1	14.8	62.6
2009	48.7	10.4	62.2
2010	47.2	28.8	60.9
2011	47.2	10.5	60.8
2012	49.5	9.9	62.5
2013	51.2	4.2	63.8
2014	52.9	5.9	65.4
2015	50.3	8.2	65.1
2016	49.2	12.9	64.5
2017	51.2	27.0	65.2
2018	56.2	11.3	64.1
2019	51.7	24.8	62.2
2020	55.1	12.2	63.2
Average	**50.2**	**13.9**	**62.7**

Note: Data retrieved from CIMIS website, Pomona Station (#78). Data was collected from 1/1/2001 through 12/30/2020.

3.4 Climate Change

Changing climate patters across the state are expected to stress water supply, and climate change-related temperature increases, will change regional hydrology in both quantity and seasonality. Southern California is expected to see longer periods of drought and increases in the frequency and quantity of extreme wet events (such as atmospheric rivers). According to California's Fourth Climate Change Assessment, the yearly average precipitation is not expected to change significantly. However, wet years are expected to be wetter and dry years are expected to be drier[3]. These changes in hydrology will stress the existing storage systems that are already challenged in drought conditions.

The City's primary supply sources that may be impacted by climate change consist of groundwater and imported water. The following sections provide additional detail on the specific climate change impacts to each of these sources.

3.4.1 Groundwater

The Chino Basin is a significant part of the City's water supply. Groundwater quality and quantity rely on natural rainfall recharge and supplemental recharge by water supply agencies. With the length of drought expected to increase and limit other water supply sources, there will be less water be available for groundwater recharge. Increased reliance on groundwater and limited recharge could cause low groundwater levels making the basin more susceptible to contamination. Prioritizing groundwater recharge during wet periods will be an important part of developing a resilient groundwater basin that can adapt to changing water supply needs. Despite these challenges, the Chino Basin Water Master's 2018 State of the Basin Report expects that all recharge and replenishment obligations will be met through 2050.[4]

3.4.2 Imported Water

As a member agency of WFA and IEUA, part of the City's imported water supply originates from the Bay Delta (conveyed to Southern California by the SWP).[5] The reservoir storage and conveyance systems that encompass the SWP have been designed to meet supply needs for existing hydrologic and climate patterns. More frequent and more severe drought events expected under climate change conditions will likely affect the reliability of SWP supplies. In addition, it is expected that higher temperatures will contribute to less snowpack, more rain, and an increase in early spring snowmelt. These conditions could stress the ability of SWP reservoirs to capture runoff as effectively as in the past, which may further affect overall reliability. Despite uncertainties in the future reliability of the SWP, IEUA and MWD currently project available allocations of imported water that are sufficient to meet the City's demand.[6] In addition, the City and IEUA continue to invest in a diverse array of water supply sources outside of imports, such as recycled water.

3.5 Service Area Population, Demographics and Socioeconomics

This section reviews current trends in service area population, demographics, and socioeconomics.

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[3] Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

[4] Refer to Chino Basin Watermaster 2018 State of the Basin Report (http://www.cbwm.org/docs/engdocs/State_of_the_Basin_Reports/SOB%202018/2018%20State%20of%20the%20Basin%20Report.pdf).

[5] Refer to Section 6.1.1 for additional information on imported supplies.

[6] Refer to Section 7 for additional information on water supply reliability.

3.5.1 Population

Although per-capita water demand has declined in recent years, the City's population has grown steadily. City population increased by approximately 3.6% from 2010 to 2015 and 6.2% from 2015 to 2020. For the purposes of the 2020 UWMP, 2045 is assumed to be projected buildout and associated population saturation. The City Planning Department projects a 7% population increase in the next 5 years and 30% increase by 2045. The population increase will primarily come from densification and development of multi-family homes. An increase in multi-family housing will increase demand slightly, however much less than a comparable increase in single family housing.[7] Table 3-1 shows current and projected population in five-year increments.

Table 3-1: City of Chino Hill Current and Projected Population (DWR Table 3-1)

Population - Current and Projected						
Population Served	2020	2025	2030	2035	2040	2045*(opt)*
	82,409	88,239	94,068	98,529	102,989	107,450
NOTES: Population projections provided by the City Planning department. 2020 population is from SCAGs population estimate published May 1, 2020.						

3.5.2 Demographics and Socioeconomics

According to the 2019 SCAG Profile of the City of Chino Hills, the City is predominantly white (30%), Asian/Pacific Islander (33%) and Hispanic or Latino (29%)[8]. The average household size is 3.3 persons with the majority consisting of families and 13% occupied by singles. 32% of the population is between the ages of 35 and 55 and 21% between 5 and 19 which is consistent with the larger number of families in the area. The median household income is $102,746. Per the 2010 US Census, 86% of the city has income classified by US Department of Housing and Urban development as “Above Moderate”.

The predominantly “above moderate” income level of the city indicates the potential to support programs for at home conservation such as water efficient fixtures and appliances. In addition, the significant number of school aged children provides an opportunity for sustainable water use education programs.

3.6 Land Uses within Service Area

The City of Chino Hills is primarily single family residential with commercial areas and business park corridors along Highway 71. The city has been mostly built out, with the remaining undeveloped land consisting of steep hillsides or other natural resources and hazards. The city anticipates that to accommodate requirements of the Regional House Needs Assessment (RHNA), high density multi-family

[7] Refer to Section 4.1.4 for addition discussion on projected water demands.

[8] Southern California Association of Governments. Profile of the City of Chino Hills Local Profile Report 2019. May 2019.

units will be developed along major arterials. Existing land use data, shown in Table 3-2 and Figure 3-2, was obtained from the City's Land Use geodatabase.

Table 3-2: Land Use Characterization

Land Use Designation	Area (ac)	%
Chino Hills State Park	7,325	25.53%
Agriculture/Ranches	7,221	25.17%
Low Density Residential	3,612	12.59%
Public Open Space	3,211	11.19%
Private Open Space	1,468	5.12%
Rural Residential	875	3.05%
Commercial Recreation	857	2.99%
Institutional/Public Facility	646	2.25%
Commercial	434	1.51%
Medium Density Residential	374	1.30%
High Density Residential	309	1.08%
Other	290	1.00%
Public Park	273	0.95%
Business Park	63	0.22%
Mixed Use	61	0.21%
Very High Density Residential	34	0.12%
Public Streets/Highway	1,642	**5.72%**
Total	28,694	**100%**

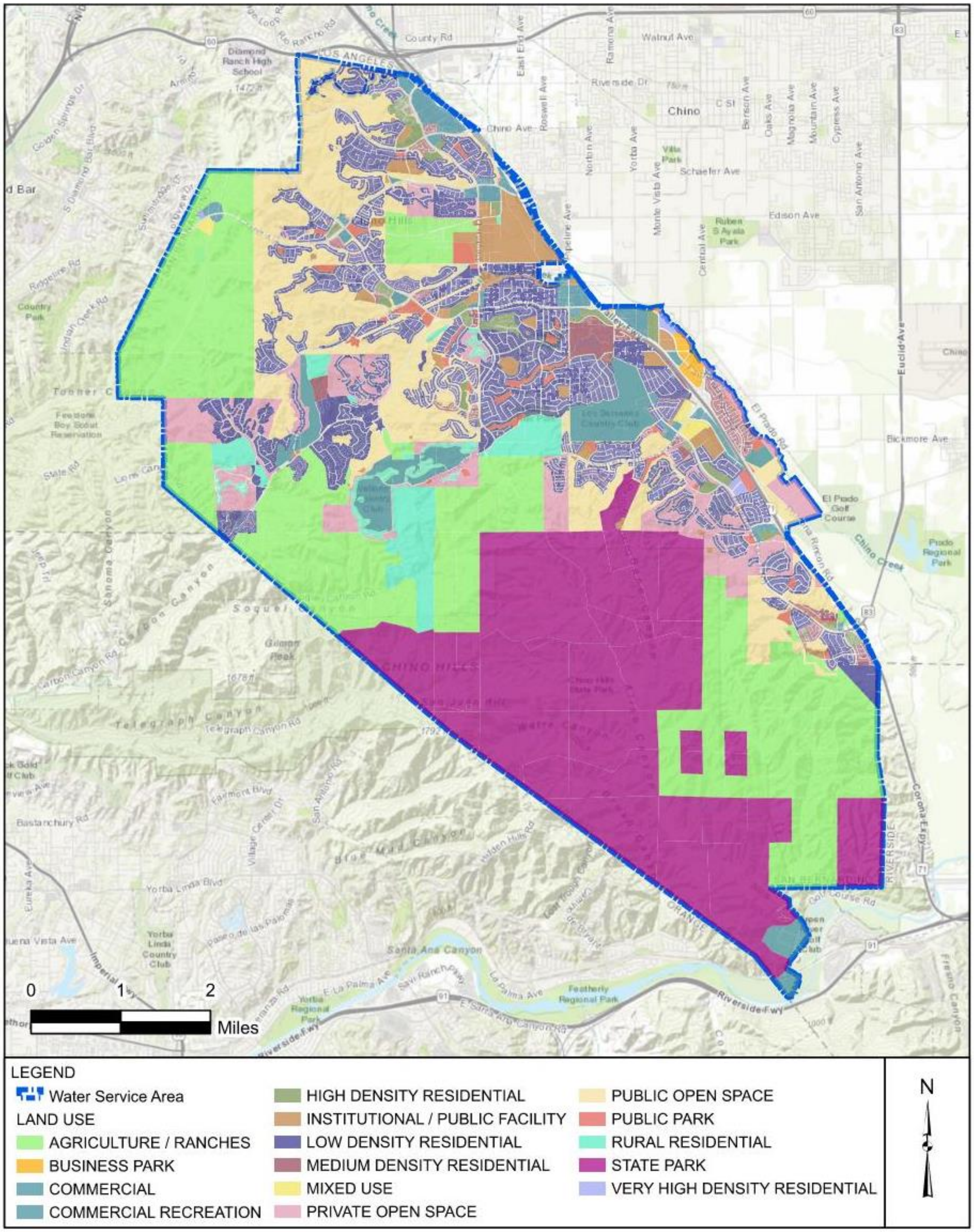

Figure 3-2: Land Use Zoning Adopted 2020

4. System Water Use

This section describes and quantifies past, current, and projected water use through 2045. Potable water use is quantified in three major sectors; single family residential; multi-family residential; and commercial, industrial, and institutional (CII). Recycled water was projected and quantified separately.

4.1 Past, Current and Projected Water Use by Sector

Since the City's incorporation in 1991, total water use has grown along with the City's population and developed land area. From FY 2014/15 to 2019/20, the City's annual water requirements have ranged from 16,070 to 13,620 AF. Governor Brown's executive order B-19-15 mandating a 25% reduction in water use for cities and towns across California drastically decreased the City's demand in FY 2015. In addition, the City plans to keep Stage 2 drought restrictions[9] in place for the foreseeable future. Stage 2 drought restrictions have contributed to a decrease in the City's water use by about 20% since FY 2015 despite the state removing its mandated water conservation.

A portion of current water needs have been supplied by recycled water. The most recent FY (2019/20) 1,414 AF of recycled water was used in-lieu of potable water supplies. The City is contracted with IEUA to receive up to 2,661 AF per year. The contract quantity is reliant on the wastewater IEUA receives from the City.

The City meters its customers using distinct classifications. The classifications allow the City to bill its customers within a tiered-rate structure and monitor the total use within each customer class. Customer classifications for billing are: Residential, which includes single family and multi-family homes; Non-Residential, which includes commercial, institutional, industrial (CII) and landscape; and recycled, which encompasses all recycled water users. A summary of the City's billing classifications is presented in Table 4-1 below.

Table 4-1: Summary of Water Billing Customer Classifications

Classification	Description
Residential	The residential units in the City of Chino Hills are about 75% single family homes and 25% multi-family housing units. However, to comply with RHNA goals most new development will be multi-family housing.
Non-Residential (i.e., CII)	Commercial and Institutional water usage account for 13.7% of the City's potable water consumption. The City's General Plan also includes land use zoning for future Commercial and Institutional land usage.
Landscape (Recycled)	Since 2005, potable water demand for landscaping has declined significantly due to the City's increased use of recycled water. Recycled water conversion for irrigation water users remains a high priority for the City.
Other	Other metered uses within the City involve street and sewer cleaning, fire hydrant flushing, construction, and other temporary uses.

[9] A summary of the City's existing drought restrictions is presented in Appendix B. See the City's updated WSCP (Section 8) for compliance with the six standard water shortage stages and more detail on water shortage actions.

4.1.1 Past Water Use

A summary of the City's past water use is shown in Table 4-2. Prior water use in the residential classification was subcategorized into single family and multi-family sectors to better understand changes in water consumption by housing type. Other water use primarily reflects fire flows and construction demand. Water losses are not accounted for in Table 4-2.

Table 4-2: Past Potable, Recycled and Total Water Use in Acre-Feet

Fiscal Year	Single Family	Multi-Family	CII	Other	Total Potable	Recycled	Total (All)
2009/10	10,029	801	4,045	80	**14,956**	1,499	**16,456**
2010/11	9,680	755	3,060	18	**13,513**	1,560	**15,073**
2011/12	9,865	751	3,530	54	**14,200**	1,567	**15,767**
2012/13	10,460	774	3,644	109	**14,986**	1,946	**16,932**
2013/14	10,494	847	3,930	117	**15,389**	1,923	**17,312**
2014/15	9,312	732	3,510	144	**13,698**	1,827	**15,525**
2015/16	7,775	684	2,537	111	**11,107**	1,391	**12,497**
2016/17	8,282	731	2,946	98	**12,056**	1,828	**13,884**
2017/18	9,130	820	3,170	68	**13,187**	1,857	**15,044**
2018/19	8,192	955	2,951	39	**12,138**	1,547	**13,685**
2019/20	8,190	1,033	2,967	12	**12,203**	1,416	**13,617**

4.1.2 Distribution System Water Loss

The City estimated its distribution system losses for FY 2019/2020 using the American Water Works Association (AWWA) water audit software.

Table 4-3: Five-Year Water Loss Audit Reporting (DWR Table 4-4)

Last Five Years of Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss [1,2]
07/2015	--
07/2016	--
07/2017	86.5 AF/yr
07/2018	59.7 AF/yr
07/2019	30.48 AF/yr
[1] *Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.* [2] ***Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*	
NOTES: FY 2015 and 2016 water audits were not available to report	

4.1.3 Current Water Use

Table 4-4 shows 2020 water demands by customer classification and the level of water treatment. Recycled water is not included in Table 4-4.

Table 4-4: Potable and Non-Potable Water Demands – Actual (DWR Table 4-1)

Demands for Potable and Non-Potable[1] Water - Actual			
Use Type	2020 Actual		
Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool	Additional Description (as needed)	Level of Treatment When Delivered Drop down list	Volume[2]
Single Family	Residential	Drinking Water	8,191
Multi-Family	Residential	Drinking Water	1,033
Commercial	CII[3]	Drinking Water	2,967
Other Potable	Water Use that does not fall into residential or CII	Drinking Water	12
Losses	AWWA Water Audit	Drinking Water	59.7
		TOTAL	12,263

[1] Recycled water demands are NOT reported in this table. Recycled water demands are reported in Table 6-5
[2] Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-3
[3] Commercial, industrial, and institutional are combined into a single CII sector.

4.1.4 Projected Water Use

The projected demands, seen in Table 4-5 and Table 4-6, were calculated using projected unit demand methodology similar to methodology K.2.2 provided by DWR. The unit demand factors were developed using a linear regression model. The predictors in the regression include climate variables, a macro-economic index, and seasonal variability. Details can be found in the 2021 Citywide Water and Recycled Water Master Plan and applicable sections outlining the demand forecasting approach are presented in Appendix D.

Table 4-5 shows forecasted potable water demands broken down by water use sector. Table 4-6 presents total demand, inclusive of potable and recycled water. Table 4-6 summarizes projections for total gross water use (potable and non-potable) from 2020-2045.

Table 4-5: Demands for Potable and Raw Water – Projected (DWR Table 4-2)

Use for Potable and Non-Potable[1] Water - Projected						
Use Type	Additional Description (as needed)	Projected Water Use[2] *Report To the Extent that Records are Available*				
Drop down list May select each use multiple times. These are the only Use Types that will be recognized by the WUEdata online submittal tool		2025	2030	2035	2040	2045 (opt)
Add additional rows as needed						
Single Family	Residential	10,061	10,061	10,224	10,224	10,224
Multi-Family	Residential	1,356	1,527	1,664	1,669	1,669
Commercial	CII[3]	4,003	4,046	4,089	4,132	4,175
Other	Water Use that does not fall into residential or CII	30.8	31.3	32.0	32.0	32.1
Losses	AWWA Water Audit	59.7	59.7	59.7	59.7	59.7
	TOTAL	15,511	15,725	16,069	16,116	16,160

[1] Recycled water demands are NOT reported in this table. Recycled water demands are reported in Table 6-5
[2] Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-2
[3] Commercial, industrial, and institutional are combined into a single CII sector.

Table 4-6: Total Gross Water Use (DWR Table 4-3)

Total Water Use (Potable and Non-Potable)						
	2020	2025	2030	2035	2040	2045 (opt)
Potable Water, Raw, Other Non-potable *From Tables 4-1R and 4-2 R*	12,263	15,511	15,725	16,069	16,116	16,160
Recycled Water Demand *From Table 6-4*	1,414	1,609	1,609	1,609	1,609	1,609
Optional Deduction of Recycled Water Put Into Long-Term Storage	-	-	-	-	-	-
TOTAL WATER USE	13,677	17,120	17,334	17,678	17,725	17,769

Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-2

4.1.5 Characteristic Five-Year Water Use

Consistent with 2020 UWMP requirements, the City has developed short-term demand projections reflecting gross water use from 2021-2025. These projections are used to support the DRA conducted in Section 7 and are presented in Table 4-7 below.

Table 4-7: Projected Water Use 2021-2025

Use Type	2020	2021	2022	2023	2024	2025
Single Family	8,191	9,477	9,623	9,769	9,915	10,061
Multi-Family	1,033	1,081	1,150	1,219	1,287	1,356
Commercial, Industrial, Institutional	2,967	3,969	3,977	3,986	3,994	4,003
Other	12	29	30	30	30	31
Recycled	1,414	1,609	1,609	1,609	1,609	1,609
Unaccounted*	60	60	60	60	60	60
Total	**13,677**	**16,226**	**16,449**	**16,673**	**16,896**	**17,120**

4.2 Water Use for Lower Income Households

Most future development is aimed to provide a range of housing types while maintaining the City's overall character, which protects its hillsides and directs high density development to the flatter portions of the City. Currently, the City has one Habitat for Humanity house that was constructed in 2008 and is affordable to a low income household. The City contributed no cost land and City Housing In-Lieu fee funds toward its planning and permitting. The City is currently assisting Habitat for Humanity with two new veteran houses that will be affordable to very low income households, contributing no cost land and Housing In-Lieu fee funds toward the houses planning and permitting. The City also is initiating the planning process for a low income senior apartment project, and plans to contribute no cost land and Housing in Lieu Fee and grant financing. The City's 2015 General Plan includes high density residential land uses which provides an opportunity for the City to develop low-income housing programs. In the current Housing Element cycle, to achieve compliance with RHNA goals, the City is required to zone for projects with 2,203 high-density housing units that could be built between 2021 and 2029. These units are expected to be multi-family in nature and are accounted for within the water use projections identified in the previous tables. Table 4-8 provides additional detail on specific inclusions and assumptions in the water demand projections.

Table 4-8: Inclusion in Water Use Projections (DWR Table 4-5)

Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	NA
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes
NOTES: Demand projections include 2,203 multi-family housing units projected to be built between 2021and 2029 corresponding with low income and very low income RHNA designations.	

4.3 Climate Change Considerations

Increased days of extreme heat and the overall increase in temperature that is expected in the City of Chino Hills will likely increase water demand. As a largely residential city, the demand will likely come from residential irrigation. Precipitation and temperature are both inputs for the demand model allowing sensitivity testing associated with increased temperatures and changes in precipitation. See the Drought Risk Assessment in Section 7.2 for details.

4.4 Recycled vs Potable & Raw Water Demand

The use of recycled water is addressed in Section 6.4.

5. Conservation Target and Compliance with SBX7-7

In 2009, the State adopted the Water Conservation Act (SB-X7-7). The Water Conservation Act requires a 20% reduction of urban per capita water use by 2020. The 2010 UWMP determined historical water use Baselines as well as targets for 2015 and 2020. This section will demonstrate compliance with the water use target for year 2020.

5.1 General Requirements for Baseline and Targets

The City elected to use Method One from UWMP Guidebook Appendix P in the 2010 UWMP. Method One determines the 2020 target to be 80% of the Baseline gallons per capita per day. Baselines are calculated for 10-year and 5-year periods. Calculation details are explained in Section 5.2.2. Refer to the 2015 UWMP for a full explanation.

5.2 Baseline and Targets Development

5.2.1 Service Area Population

In compliance with CWC Section 10644, service area populations were determined using federal, state, and local population reports and projections. The 2020 population estimate for Chino Hills from the California Department of Finance is 82,409 persons, which is a 6% increase from the 2015 population estimate of 77,596.

5.2.2 Baseline and Targets Summary

In accordance with guidance from DWR's, the 2010 UWMP reported the gallons per capita per day for years 1994 through 2010 by dividing the total gross potable water supply entering its potable water distribution system by its population for each year. Service area population was based on population data obtained from California Department of Finance and the U.S. Census. Gross potable water supply was calculated using total water into the distribution system less water for agricultural use. Note that as of 2018, the City removed the agricultural use billing class and combined it with other existing billing classes such as CII. The amount of net change in distribution storage was negligible; therefore, it was excluded from gross potable supply.

As shown in Table 5-1, the Baseline gallons per capita per day, using the 10-year GPCD average of the years 1995 through 2004, is 217 GPCD. The minimum threshold using the 5-year average gallons per capitata per day from 2003 to 2007 is 202 GPCD. Baseline quantities identified in Table 5-1 originate from City's 2010 UWMP.

Table 5-1: Baselines and Targets (DWR Table 5-1_

Baselines and Targets Summary				
Baseline Period	Start Year	End Year	Average Baseline GPCD	Confirmed 2020 Target GPCD
10-15 year[1]	1995	2004	217	173
5 Year	2003	2007	202	
NOTE: [1] The 10-year baseline period was used				

5.2.3 2020 Compliance Daily Per-Capita Water Use

Table 5-2 demonstrates compliance with the 2020 target. As discussed in Section 5.2.2, the City's calculated 2020 Target is 173 GPCD. The City's total purchases and supply for 2020 was 14,417 AF, which converts to 157 GPCD given the population identified in Section 5.2.1. The City's 2020 water use of 157 GPCD is less than the City's calculated 2020 Target of 173 GPCD, therefore the City is in compliance with the 2020 Target established by SB X7-7.

Table 5-2: Demonstration of 2020 Target Compliance (DWR Table 5-2)

2020 Target Compliance				
2020 GPCD			2020 Confirmed Target GPCD	Did Supplier Achieve Targeted Reduction for 2020? Y/N
Actual 2020 GPCD	2020 TOTAL Adjustments	Adjusted 2020 GPCD *(Adjusted if applicable)*		
157	0	157	173	Yes

6. System Supplies

Chino Hills relies on a variety of water sources to meet demands. The City works cooperatively with other agencies to achieve water supply reliability for its customers. Figure 6-1 diagrams the City's water sources and relationship with its wholesale suppliers.

Table 6-1 on the following page summarizes the City's water supply sources, suppliers, and projections of supply availability from 2025-2045 in five-year increments. In accordance with the UWMP Act, the City coordinated its water supply projections with each of its wholesale suppliers. Table 6-2 presents the water quantity consumed from each supply source in 2020.

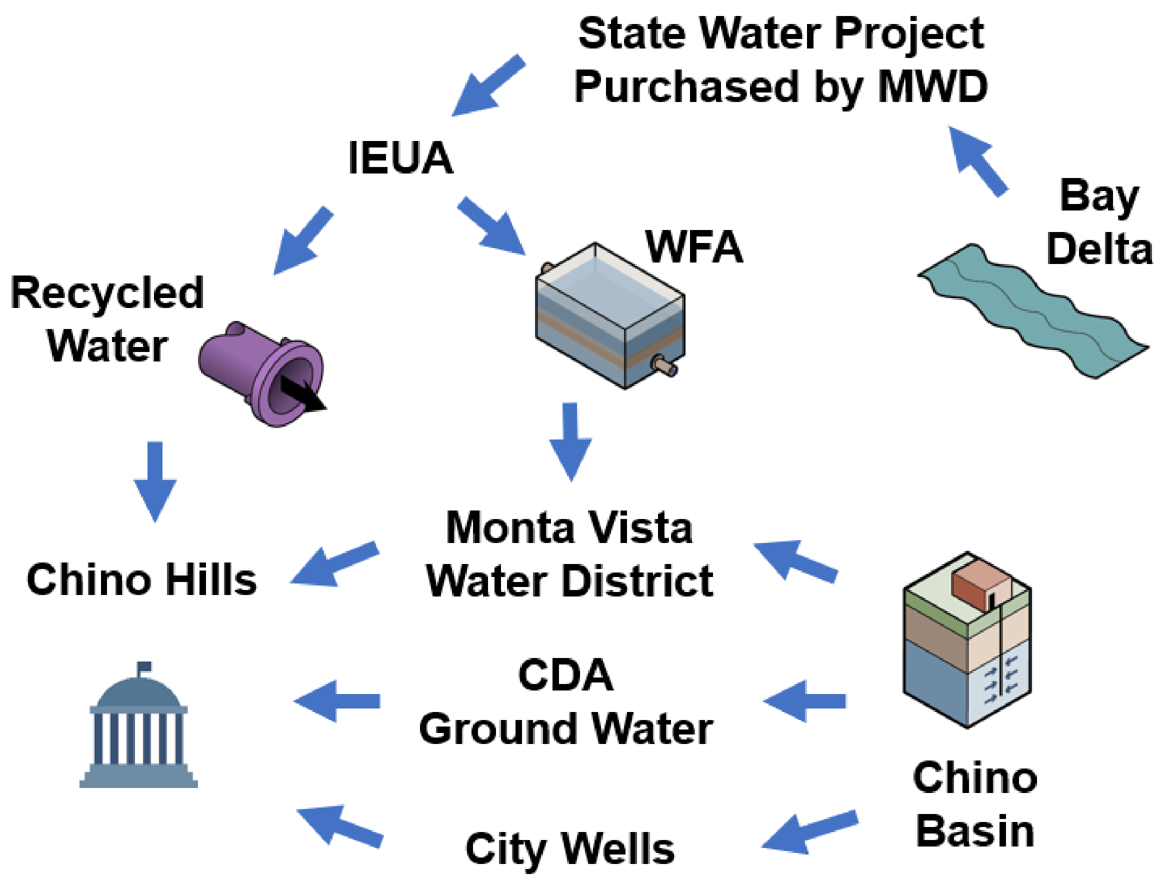

Figure 6-1: City of Chino Hills Water Source Diagram

Table 6-1: Projected Water Supplies (DWR Table 6-9)

Submittal Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply Report To the Extent Practicable									
		2025		2030		2035		2040		2045 (opt)	
Drop down list May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)
Purchased or Imported Water	WFA	14,258		14,258		14,258		14,258		14,258	
Purchased or Imported Water	MVWD[1]	8,407		8,407		8,407		8,407		8,407	
Groundwater (not desalinated)	Chino Hills Wells	4,158		4,158		4,158		4,158		4,158	
Desalinated Water - Groundwater	CDA	4,200		4,200		4,200		4,200		4,200	
Recycled Water	IEUA	2,661		2,661		2,661		2,661		2,661	
	Total	33,684		33,684		33,684		33,684		33,684	

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Values for Reasonably Available Volume are contract amounts. See Section 7 for details on drought supplies.
[1] MVWD availability is calculated as the total MVWD contractual amount (20.22 MGD) less the City of Chino Hill's 12.72 MGD ownership of WFA plant capacity.

Table 6-2: 2020 Purchased Supply Volume (DWR Table 6-8)

Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2020		
Drop down list May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Actual Volume	Water Quality Drop Down List	Total Right or Safe Yield (optional)
Add additional rows as needed				
Purchased or Imported Water	WFA	1,700	Drinking Water	14,258
Purchased or Imported Water	MVWD	7,707	Drinking Water	8,407
Groundwater (not desalinated)	Chino Hills Wells	0	Drinking Water	4,158
Desalinated Water - Groundwater	CDA	3,669	Drinking Water	4,200
Recycled Water	IEUA	1,417	Recycled Water	2,661
	Total	14,436		33,684
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*				

6.1 Purchased or Imported Water

The City typically relies on imported or purchased water to meet about 60% of its annual average demand. The following sections provide a narrative of the City's imported water supplies (Section 6.1.1) and purchased water supplies (6.1.2). A summary of 2020 actual water use from these sources is presented in Table 6-2. Contracts between the City and its wholesalers are presented in Appendix E.

6.1.1 Imported Water

The City's supply of imported water is provided by IEUA, which is a member agency of MWD. MWD imports water to Southern California from Northern California (via the SWP) and the Colorado River by way of the Colorado River Aqueduct. In general, only water from the SWP is delivered to the City. Imported water from MWD and IEUA is treated and delivered to the City via WFA. MVWD also purchases water from WFA, a portion of which is sold to Chino Hills

The WFA is a joint powers agency formed for the specific purpose of funding the construction and operation of the Agua De Lejos Regional Water Treatment Facility, more commonly known as the WFA Treatment Plant. The facility is located in the City of Upland and treats the raw water received through IEUA Turnout #12 on MWD Foothill Feeder Rialto Pipeline. The WFA member agencies, who jointly own the treatment plant, are the Cities of Upland, Ontario, Chino, Chino Hills, and MVWD. Chino Hills owns 12.72 MGD (14,258 AF/yr) of capacity (a 15.7 % share) in the WFA treatment plant. The City also purchases WFA water though MVWD's allocation. Purchases of water from MVWD are described in the Section 6.1.2 below. All the City's WFA water is transported though MVWD's distribution system. MVWD distributes the water to the City though a turnout at Ramona Avenue south of Philadelphia Street.

6.1.2 Purchased Water

Purchases from MVWD

MVWD is a member agency of IEUA and WFA and provides retail and wholesale water supply services to Chino Hills and several other local agencies.[10] Water delivered under the acquisition agreement is comprised of a combination of imported water through the WFA treatment plant and groundwater produced by the MVWD wells. MVWD overlies a portion of the Chino Basin and has developed extensive well capacity to facilitate conjunctive use of the basin. The City of Chino Hills purchased capacity rights from MVWD for a total of 20.22 MGD (22,2649 AF/year).

As part of this arrangement, the 42-inch transmission main in Ramona Avenue was constructed to facilitate the delivery of the increased water supply to the City of Chino Hills' system. The agreement provides a needed water supply source for the City and allows MVWD to expand its demand base by using its groundwater capacity beyond its own service area. Appendix E includes a copy of the 1998 water supply agreement between the City and MVWD.

Purchases from Chino Basin Desalter Authority

CDA is a joint powers agency formed to achieve sustainable management of water quality in the lower portions of the Chino Basin through the construction of desalter facilities. The Santa Anna Watershed Project Authority (SAWPA) in cooperation with IEUA, MVWD, and the OCWD (Orange County Water District) formed SAWPA Project Committee #14 to initiate the Chino I Desalter. CDA was subsequently formed by agencies subscribing to capacity in the new desalters. The City is a capacity shareholder in the CDA along with the cities of Ontario, Chino, Norco, IEUA, JCSD, Santa Ana River Water Company, and Western Municipal Water District. The contract operator is IEUA and the administrative entity is the JCSD. With the completion of the Chino II Desalter, the City of Chino Hills is subscribed to 3.75 MGD (4,200 AF/yr) in the Chino Desalter Facilities which could provide more than 20% of the City's total water demand.

Desalinated groundwater is a local and reliable source of water for the City. It can reduce the cities demand of imported water and make contaminated groundwater available for municipal use. Groundwater basin management relies on achieving hydraulic control which CDA facilities are an integral part of achieving. The current capacity of the desalter facilities is 24,600 AF/yr.

[10] MVWD serves a population of over 100,000 within a 30 square mile area, including the communities of Montclair, Chino Hills (by contract), portions of the City of Chino, and the unincorporated area which extends between the cities of Pomona, Chino Hills, Chino, and Ontario.

6.2 Groundwater

Chino Hills uses groundwater from City-owned wells in addition to purchased groundwater from MVWD and CDA. Details associated with purchased water from MVWD and CDA are presented in section 6.1.2. The following section is associated with City-produced Chino Basin groundwater.

6.2.1 Chino Basin

The Chino Basin is a major aquifer system in the Santa Ana River watershed that provides both local yield and seasonal carry over storage for water purveyors in the region. Chino Hills typically extracts groundwater from the Chino Basin using its own wells that are located within City limits. The water is conveyed to Chino Hills' lower pressure zone through a system of transmission mains.

The Chino Basin has been divided into five management zones (based upon similar hydrologic conditions) and into three sub-basins. Management zones and sub-basins were defined in the Chino Basin Watermaster Optimum Basin Management Program (OBMP). and the 1995 Water Quality Control Plan for the Santa Ana Watershed (Region 8). The OBMP in included in Appendix F

The Chino Basin is one of the largest groundwater basins in Southern California, containing about 5,000,000 AF of water in storage, with an additional unused storage capacity of about 1,000,000 AF. Cities and other water supply entities extract groundwater from the basin for all or part of their municipal and industrial supplies. In addition, agricultural users also pump water from the Chino Basin.

The court-approved safe yield of the Basin is 135,000 AF/yr. This water is allocated among three "pools" of users: the Overlying Agriculture Pool (82,800 AF/yr), the Overlying Non-Agricultural Pool (7,366 AF/yr), and the urban use Appropriative Pool (44,834 AF/yr). Additional groundwater production (in excess of the safe yield) is permitted under the Judgment provided that pumped water is replaced with replenishment water. In addition, groundwater is re-allocated from the Overlying Agricultural Pool to the Appropriative Pool for urban use when it is not pumped by the agricultural users. Over time, as agricultural production declines, the re-allocation of groundwater to the Appropriative Pool is expected to increase. The management of the Chino Basin is now guided by the "Peace" [11] and "Peace II" [12] Agreements of the Optimum Basin Management Program.

The operation of the Chino Basin is governed by the 1978 court judgment and agreement among producers, whereby each is allotted a "Base Water Right" to a certain percentage of the natural or "safe" yield of the basin. Prior to 1978, the Basin was in an overdraft condition. Under the Judgment, entities can pump in excess of their allotted Base Water Right but must pay a pump tax per acre-foot to cover the cost to replenish any overdraft. The provisions of the Judgment and monitoring, replenishment and other obligations are presided over by the court appointed Chino Basin Watermaster. Over the years these actions have successfully managed the Chino Basin, which is now considered to be "Very Low" priority by DWR. A copy of the Judgment is included in Appendix E.

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[11] Chino Basin Water Master. Peace Agreement Chino Basin. June 2000. https://18x37n2ovtbb3434n48jhbs1-wpengine.netdna-ssl.com/wp-content/uploads/2016/03/2000-Peace-Agreement.pdf

[12] Chino Basin Water Master. Peace II agreement: Party Support for Watermaster's OBMP Implementation Plan. October 2007 http://www.cbwm.org/docs/legaldocs/Final_Peace_II_Documents.pdf

As of FY 2020/21, Chino Hills' right to the Chino Basin is 4,158 AF/yr excluding carryover storage which may vary year to year. Additional information on this volume is presented in Section 7.1.1.

6.2.2 Groundwater Quality

In 2018 the State lowered MCL for 1,2,3- TCP. Since then, the City's groundwater wells have been offline for exceeding the new MCL. Table 6-3 shows water suppled from the City's groundwater wells from FY 2016 to 2020 with no groundwater use from January 2018 to the present.

The City has been working on a solution that will restore reliable operation of its wells and is in the process of designing a granular activated carbon (GAC) water treatment facility. The treatment system is expected to go online by 2025, at which time the City will be able to use the wells as a supply source again.

6.2.3 Past Five Years

Due to 1,2,3-TCP contamination described above in section 6.2.2, in the last 5 years, local groundwater was not used as a supply source from January 2018 to the present. Table 6-3 shows water supply quantities for 2016 and 2017. Note that FY 2018 includes July through December of 2017.

Table 6-3: Historical Local Production from Chino Basin (DWR Table 6-1)

Groundwater Volume Pumped						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
☑	All or part of the groundwater described below is desalinated.					
Groundwater Type ***Drop Down List*** *May use each category multiple times*	Location or Basin Name	2016	2017	2018	2019	2020
Alluvial Basin	Chino Basin - City of Chino Hills	1,633	1,560	1,290	0	0
	TOTAL	1,633	1,560	1,290	0	0
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*						

6.3 Surface Water

The City does not use any local surface water as a supply source. See Section 6.1 for the description of imported and purchased surface water.

6.4 Recycled Water

The City uses recycled water provided by IEUA primarily from the Carbon Canyon Wastewater Reclamation Facility (CCWRF) and Regional Plant 5 (RP-5). IEUA provides wholesale recycled water to local water purveyors throughout the Chino Basin including Chino, Fontana, Montclair, Ontario, Upland, MVWD, JCSD, and Cucamonga Valley Water District. IEUA has developed recycled water supply as part of a comprehensive plan to manage water resources in the Chino Basin. Both the Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board govern recycled water use. The recycled water from IEUA reclamation facilities meets Title 22 requirements for non-restricted recreational use (e.g., full body contact).

Water recycling is a critical component of IEUA's water resource management strategy for the region and has proven to be essential for meeting the service area of the growing water demand. Recycled water provides a more dependable local supply of water, and it will reduce the likelihood of water rationing during droughts.

According to IEUA’s 2015 UWMP, future recycled water supplies are projected to reach 67,000 AF/yr in 2040. Conforming with the 1969 Santa Ana River Judgment, a minimum of approximately 16,000 AF/yr of water will be discharged to the Santa Ana River, leaving approximately 51,000 AF/yr of recycled water for beneficial reuse for IEUA members by 2040.

6.4.1 Recycled Water Facilities

IEUA operates four regional wastewater treatment plants, including Regional Plant Number 1, Carbon Canyon Water Recycling Facility (CCWRF), Regional Plant Number 4, and Regional Plant Number 5. IEUA's recycled water treatment plants produce water that meets the requirements of the State Water Resources Control Board’s Title 22 standards for recycled water.

The IEUA’s regional distribution system is comprised of transmission pipelines for conveyance of recycled water from IEUA’s regional treatment plants. The existing treatment facilities provide the ability to deliver recycled water to major industrial and municipal users. These facilities can also deliver recycled water, storm water, and imported water to groundwater recharge basins throughout IEUA’s service area.

Pursuant to the DWR Guidelines, the UWMP must discuss wastewater flow contribution to the regional agency providing treatment and recycled water services. Wastewater that flows from the City is only a portion of the wastewater flow to IEUA’s reclamation facilities. The City’s wastewater flow contribution from 2020 are shown in Table 6-4 below.

Table 6-4: Wastewater Collected Within Service Area (DWR Table 6-2)

Wastewater Collected Within Service Area in 2020						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
	Percentage of 2020 service area covered by wastewater collection system *(optional)*					
	Percentage of 2020 service area population covered by wastewater collection system *(optional)*					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected from UWMP Service Area 2020 *	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
City of Chino Hills	Estimated	6,838	IEUA	Carbon Canyon Water Recycling Facility	No	No
Total Wastewater Collected from Service Area in 2020:		6,838				
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3* **.**						
NOTES: Volume of wastewater collected estimated as 50% of demand.						

The most direct recycled water sources for the City are from CCWRF and Regional Reclamation Plant No. 5. CCWRF is located on Telephone Avenue in the City of Chino. CCWRF product water delivery system includes over four miles of pipeline to the cities of Chino and Chino Hills. CCWRF has been operational since 1992 with a current capacity of 11.4 MGD (12,770 AF/yr) for irrigation and agricultural use. Recycled water produced at the CCWRF enters the City's recycled water system from Chino Hills Parkway. Plant No. 5 is located on Kimball Avenue, which is east of El Prado Avenue in the City of Chino and has a current plant capacity of 16.3 MGD 18,258 (AF/yr) of recycled water. Plant No. 5 has been operational since 2004, and it provides recycled water to the City. As identified above, wastewater is not treated or disposed of within the City boundaries.

The City's existing recycled water system lies in the southeastern portion of the City. The system layout is typical of most recycled water systems which consist of a relatively simple transmission system layout aimed for the new development and the high water use customers such as golf courses and regional parks; A system of pump stations, pipelines and reservoirs deliver recycled water from its source through a series of pressure zones.

6.4.2 Existing and Potential Recycled Water Demand

In 1998, the City enacted Ordinance 101 as an addition to the CWC Title 15 which established recycled water use in the City. Shortly thereafter, the City established recycled water usage rates and adopted design and construction standards for the development of its internal transmission and distribution system. Recycled water deliveries to the City customers began in September 1999, and approximately 42

AF were supplied that year. The demands have increased since the system inception and currently average around 1,400 AF/yr. Based on the City's water production records, the City's current recycled water supply accounts for approximately 13% of the total water used. The City's projected and actual water use for 2020 are show in Table 6-5

The recycled water usage is primarily for landscape irrigation such as golf courses, parks, landscaped medians, and groundwater recharge. Major recycled water users within the City include the Big League Dreams recreational sports park and the Los Serranos Golf Course.

The City's recycled water wholesaler, IEUA, recognizes that the development of local recycled water facilities of various retail agencies is key in the expansion of recycled water direct use. Direct use includes irrigation, industrial processes and cooling, and recreational use. IEUA expanded its recycled water infrastructure within the City, constructing a five million gallon reservoir on Galloping Hills Road. This reservoir is served by a 30" pipeline from the Carbon Canyon Wastewater Treatment Plant located at Chino Hills Parkway and Telephone Avenue in the City of Chino. The reservoir provides recycled water opportunities for the north end of the City that were previously unavailable. Since the reservoir came on-line, the Community Center, McCoy's Equestrian Center, Government Center, the Shoppes, Boys Republic and several churches on Peyton Dr have had their landscape irrigation converted to recycled water, saving hundreds of AF of potable water annually. Projections of future recycled water use are presented in Table 6-6.

Table 6-5: Projected and Actual 2020 Recycled Water Use (DWR Table 6-5)

2015 UWMP Recycled Water Use Projection Compared to 2020 Actual		
☐	Recycled water was not used in 2015 nor projected for use in 2020. The supplier will not complete the table below. If recycled water was not used in 2020, and was not predicted to be in 2015, then check the box and do not complete the table.	
Beneficial Use Type	**2015 Projection for 2020**	**2020 Actual Use**
Groundwater recharge (IPR)	N/A	N/A
Other (Description Required) [1]	2,661	1,417
Total	2,661 [2]	1,417
Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-3.		
NOTE: [1] "Other" category is combined irrigation (golf course and non-golf course). [2] The 2020 projection from the 2015 UWMP was based on the total available supply, not expected use.		

Table 6-6: Current and Projected Recycled Water Use (DWR Table 6-4)

Recycled Water Direct Beneficial Uses Within Service Area											
☐	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.										
Name of Supplier Producing (Treating) the Recycled Water:		IEUA									
Name of Supplier Operating the Recycled Water Distribution System:		IEUA									
Supplemental Water Added in 2020 (volume) *Include units*											
Source of 2020 Supplemental Water											
Beneficial Use Type *Insert additional rows if needed.*	**Potential** Beneficial Uses of Recycled Water (Describe)	Amount of **Potential** Uses of Recycled Water (Quantity) *Include volume units*[1]	General Description of 2020 Uses	Level of Treatment *Drop down list*	2020 [1]	2025 [1]	2030[1]	2035[1]	2040[1]	2045[1] (opt)	
Other (Description Required)			Irrigation	Tertiary	1,414	1,609	1,609	1,609	1,609	1,609	
				Total:	1,414	1,609	1,609	1,609	1,609	1,609	
2020 Internal Reuse					0						
[1] ***Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*											

6.4.3 Optimizing the Use of Recycled Water

In February 1998 the City enacted Ordinance No. 101, which was an addition to Chapter 15.08 Regulations for the Availability and Use of Reclaimed Water of the Chino Hills Municipal Code. On May 3, 2000 IEUA adopted Ordinance No. 69 which redefined the agency's recycled water program and established new wholesale rates.

The City's current retail recycled water rate is 85% of the cost of the City's potable water rate. IEUA is working closely with its local retail agencies, including the City, to develop a regional recycled water distribution program to maximize water reuse. At this time, the City does not have any plans for capital projects to expand recycled water use.

6.5 Exchanges and Transfer Opportunities

The City has an agreement with MVWD to receive up to 20.22 MGD (22650 AF/yr). Interconnections with the City of Chino and Pomona may also be considered to improve reliability during a temporary disruption in imported water supply. The Chino Basin may could be a future resource for water transfers because of its storage capacity of up to 1,000,000 AF. Currently, the City does not have any plans for capital projects to expand transfers and exchanges.

6.6 Development of Desalinated Water

Currently the city does not rely on desalinated sea water. However, a desalination facility in Huntington Beach is scheduled to be operational by 2023. This could provide future opportunities for the City of Chino Hills to purchase desalinated water.

6.7 Potential Projects to Increase Water Supply

The City's abundant supply sources provide the City with operational redundancy and reliability under emergency supply outages and drought conditions. The City’s cornerstone to this strategy has been to maximize its use of local groundwater production and maximize its use of recycled water. Existing local groundwater requires new treatment to meet State MCLs; treatment facilities are in design and are the only water supply specific project the City has planned (see Table 6-7).

The City continually monitors its ability to meet maximum month demands, under all foreseeable conditions, primarily by local sources. The following recommendations should serve to maintain the City's supply reliability:

- Seek opportunities to further expand recycled water system and usage;
- Market surplus imported water capacity;
- Increase groundwater capacity and transmission system reliability;
- Periodically evaluate maximum monthly water requirements, and the ability to meet these requirements in the event of an extended imported water system outage; and
- Pursue regional solutions, including inter-ties with adjacent entities.

Table 6-7: Future Water Supply Project or Programs (DWR Table 6-7 R)

Expected Future Water Supply Projects or Programs						
☑	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other suppliers?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List*	Expected Increase in Water Supply to Supplier *This may be a range*
	Drop Down List (y/n)	*If Yes, Supplier Name*				
Add additional rows as needed						
1,2,3-TCP Removal Treatment Plant	No			2023	All Year Types	4,158
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES: The 1,2,3-TCP Removal Treatment Plant project restores the use of the existing local ground water supply. Chino Hills already has rights to this source, but it is offline until treatment is implemented.						

6.8 Special Conditions

Several special conditions may affect the City's water supplies, including climate change and regulatory conditions. These are further detailed below.

6.8.1 Climate Change Impacts

It is anticipated that climate change will cause increased temperatures in the region both as an increase in average temperature and the number of days of extreme heat. Climate impacts will likely increase demand and can conceptually limit available source water quantities. A more detailed description on climate change impacts on supply sources is described in Section 3.4

6.8.2 Regulatory Conditions and Other Locally Applicable Criteria

The City is not currently using water from local groundwater wells due to updates to the MCL for 1,2,3- TCP. Additional discussion of groundwater quality is provided in Section 6.2.2.

6.9 Energy Intensity

Energy intensity calculations were performed in accordance with DWR Guidance Appendix O. For the last several years, the City has relied primarily on imported and purchased water due to local groundwater quality conditions. Imports/purchases and recycled water are not treated or sourced within the service area, so energy used for transport and treatment is excluded from the energy intensity calculations. Table 6-8 shows energy use and energy intensity for potable and recycled water. This data is based on energy usage at all potable water and recycled water distribution facilities (wells, pump stations, reservoirs, etc.) for FY 19/20.

Table 6-8: Energy Intensity

	Potable Water	Recycled Water
Volume of Water Entering Process (AF)	13,076	1,416
Energy Consumed (kWh)	3,680,970	453,218
Energy Intensity (kWh/AF)	281.5	320

7. Water Service Reliability and Drought Risk Assessment

Historically, California has experienced wet years followed by years of drought. Seasonal rain and snow drench California in winter and spring leaving the State dry and parched in summer months. These seasonal fluctuations combined with cycles of drought and unusual large precipitation events present challenges for Southern California to have a dependable, consistent water supply.

Chino Hills' leadership had the foresight to expand its water portfolio to manage these variables. Stored groundwater, investments in the WFA and CDA, and agreements with neighboring agencies help the City maximize its water supply reliability. The City is committed to the efficient management of its water resource portfolio to ensure adequate supply for future demands.

This section will assess the City's water supply reliability and provides the results of the DRA required under CWC Section 10635(b). The results of the DRA will inform the City's plans for water supply projects, conservation measures and the WSCP (see Section 8).

7.1 Water Service Reliability Assessment

Chino Hills has prepared a summary of its water service reliability consistent with CWC Section 10631 (b)(1). This section provides an overview of the following topics:

- Narrative of the constraints on the City's water supply sources;
- Year type characterization detailing expected supply availability under normal and dry year (single year though five-year drought) conditions;
- A supply and demand comparison over the next 25 years; and
- A brief description of management tools and options available to the City.

7.1.1 Constraints on Water Sources

This section provides a narrative overview of the constraints on the City's water supply sources.

Imported Water Supplies (WFA)

As identified in Section 6.1, the City of Chino Hills' imported supplies originate from the Bay Delta which are conveyed to Southern California via the SWP. In this setting, MWD is the primary contractor of SWP water and delivers wholesale water to IEUA. IEUA in turn provides wholesale SWP water to WFA, who treats the water and distributes it to Chino Hills and other WFA member agencies (including MVWD).

The Bay Delta is a critical supply source for the City and Southern California in general.[13] The Bay Delta's ecosystem has been in steady decline owing to several factors including urban and agricultural runoff, loss of native fish species, and overall operation of state and federal water supply

[13] The Bay Delta is the source of about 30% of Southern California's water supply.

systems. In response to these challenges, state and federal regulatory bodies have implemented several programs and decisions (e.g., various Biological Opinions, Incidental Take Permits, and the Bay Delta Water Quality Control Plan) that have restricted overall water exports from the Bay Delta. In addition to these regulatory impacts, drought and climate change[14] have further exacerbated short and long-term reliability of the Bay Delta water supply.

Imported water from the SWP makes up a significant portion of MWD's water supplies (frequently over 25% of production between 2000-2020).[15] In recognition of the vulnerability of SWP reliability, MWD has made substantial investments in storage, water transfers / banking, flexible operations, conservation, and alternate supplies to improve its overall water supply reliability. MWD has provided updated documentation of these efforts in its 2020 UWMP (MWD, 2020) which detail several new and/or updated programs including:

- Continued investment in water conservation, including support of financial incentives, turf replacement, education, appliance/plumbing standards, and outreach programs.
- Investment in local resources, such as stormwater capture.
- Entrance into short and mid-term agreements and exchanges of imported water (including SWP supplies) with other water districts.
- Improvements to storage programs allowing storage of excess SWP supplies during wet conditions and return of stored supplies during dry conditions (e.g., banking/pumpback with Semitropic Water Storage District, take/puts in the High Desert Water Bank).
- Modifications to MWD's distribution system to increase operational flexibility and reliability.
- Improvements to its Water Shortage Contingency Plan.
- Support of the Delta Conveyance Project (DCP) which will restore ability of the SWP to export water and simultaneously protect the Bay Delta's biological resources.

These new programs supplement prior investments in storage, groundwater, recycled water, desalination, and other local supply sources position MWD as a highly reliable wholesaler. MWD is continuing its dedication to meeting regional water supply needs though its upcoming 2020 Integrated water Resource Plan (IRP). The 2020 IRP update will directly consider future uncertainties and that affect variability in supply and demand (e.g., climate change) and will employ a scenario-based approach for evaluating future actions and investments.

Water Quantity Constraints

In the past, the delivery of water to MWD's member agencies has been nearly 100% reliable. MWD's 2020 UWMP provides an updated water reliability assessment under normal conditions, a single dry year, and a five consecutive dry year sequence. Based on this analysis, MWD is expected to meet 100% of its member agencies' demand under each condition from 2025-2045. This analysis reflects

[14] Expected impacts of climate change include rising temperatures, changing hydrology, and sea level rise. Rising temperatures and changing hydrology are expected to reduce snowpack in Northern California, affecting the ability of SWP reservoirs to capture and release water to the Bay Delta. Sea level rise has the effect of increasing salinity in the Bay Delta and threatening overall water quality.
[15] Metropolitan Water District (MWD), 2021. Draft 2020 Urban water management plan. Accessed from http://www.mwdh2o.com/AboutYourWater/Planning/Planning-Documents.

the decreased availability of SWP supplies in addition to MWD's water resource investments described above. During catastrophic shortages, MWD will redirect as necessary the limited imported water to member agencies which are largely dependent on imported water (i.e., those without major groundwater resources). MWD provides a thorough analysis of climate change impacts in their 2020 UWMP.

In preparation of its 2020 UWMP, Chino Hills coordinated with IEUA staff to confirm the findings of regional imported supply reliability identified by MWD. IEUA confirmed that it expects the ability to receive its full 93,283 AF/yr Tier 1 allocation from MWD out to 2045. Under dry year conditions, IEUA assumes FY 2015/16 as a single dry year and repeats that for five years for multi-year drought conditions. Under these dry year conditions, IEUA expects to maintain the ability to deliver 100% of its normal year supply.

Water Quality Constraints

Imported SWP water is relatively low in salinity, but typically contains high levels of Bromide and Total Organic Carbon (TOC). This is due to seawater intrusion and agricultural drainage from peat soil islands in the Bay Delta. Bromide and TOC combine with chemicals used in the water treatment process and form disinfection by-products that are strictly regulated under the federal Safe Drinking Water Act. The Imported water is treated at the WFA treatment plant; Water quality monitoring at the plant and upgrades to the plant ensure water meets MCLs. The City of Chino Hills does not expect that the imported water quality affects the supply reliability.

Local Groundwater Supply (Chino Hills' Wells)

As identified in Section 6.2, Chino Hills has access to local groundwater from the Chino Basin produced by wells that are owned and operated by the City. Section 6.2.1 describes the overall safe yield of the Chino Basin as well as the regulatory framework (1978 Judgment and Peace and Peace II agreements of the OBMP) associated with water rights allocations of the Basin. City-owned wells are considered a highly reliable long-term supply, but currently have water quality constraints that affect short-term availability. These constraints are further detailed below.

Water Quantity Constraints

The quantity of available groundwater supply from the Chino Basin is influenced by several factors, including Chino Basin Watermaster policies and MWD's Dry Year Yield (DYY) Program. City pumping can be affected by Chino Basin Watermaster policies, including (but not necessarily limited to) optimization of the basin's safe yield, allocation of replenishment supplies to offset overproduction, and levying/collecting administrative and replenishment assessments. However, consistent with the 1978 Judgment, subsequent management agreements, and recalculation of safe yield, Chino Hills is expected to have sufficient rights and capacity to meet its supply needs.

Per the FY 2020/21 Chino Basin Watermaster Assessment Package (Chino Basin Watermaster, 2020)[16], Chino Hills currently has a total production right from the Chino Basin of 5,885 AF/yr. The distribution of this right across varying "accounts" is identified in Table 7-1 below.

Table 7-1: Summary of 2020 Chino Basin Production Right

Account	Chino Hills 2020 Right (AF/yr)
Carryover balance	1,726.6
Prior year adjustments	0
Assigned share of safe yield	1,726.6
Agricultural pool reallocation	2,431.8
Water transaction activity	0
Total	**5,885.0**

For the purpose of UWMP development, future availability in the City's Chino Basin supply is estimated to be the assigned share of the Chino Basin safe yield plus an assumed agricultural pool reallocation equal to the 2020 reported value (see Table 7-2 below). The total projected right is assumed to be a conservative estimate given that current carryover balances[17] as well as operation of the DYY are not included.

Table 7-2: Projected Chino Basin Production Right

Account	Chino Hills Projected Right (AF/yr)
Assigned share of safe yield	1,727
Agricultural pool reallocation	2,432
Total	**4,158**

MWD's DYY Program (executed in 2002 by IEUA, the Chino Basin Watermaster, and MWD) also conceptually increases the overall availability of Chino Basin supplies, particularly during dry years. The DYY is an implementation element of the OBMP Program (Elements Number 8 and Number 9) and is designed to reduce demands on imported water while increasing the reliability of groundwater supply during dry years through conjunctive use. Within the DYY, MWD utilizes the Chino Basin for dry year storage of up to 100,000 AF of surplus imported water. Imported water deliveries to participants increase during wet or normal (or "put") years, and deliveries of imported water decrease during dry (or "take") years. During take years, participants pump additional groundwater in-lieu of taking delivery of imported supplies. As of June 30, 2020, the DYY storage account contained 45,961 AF.[18]

The City's long-term projected available water from the Chino Basin (4,158 AF/yr) is anticipated to be conservative and 100% reliable into the future given current/projected basin conditions[19], ability for excess carryover storage, and basin conjunctive use programs such as the DYY. Consistent with

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[16] See 2020-21 Assessment Package.pdf (cbwm.org)

[17] Current year balance and excess carryover account. Current value of Chino Hills' excess carryover account is 11,924.2 AF.

[18] See Status Report 2020-1c.pub (cbwm.org)

[19] The most recent Chino Basin Optimum Management Program 2018 State of the Basin Report (Chino Basin Watermaster, 2019) indicates that the Watermaster will have sufficient capacity to meet all recharge and replenishment obligations through 2050.

other retail agencies utilizing the Chino Basin, this reliability is assumed for normal and dry-year hydrologic conditions. In the short-term, projected availabilities of Chino Basin supplies are expected to be limited by water quality constraints which are further described below.

Water Quality Constraints

The Chino Basin management efforts emphasize the importance of water quality to ensure long term groundwater use in the region. In 1989, the Chino Basin Watermaster initiated an extensive monitoring program for the Chino Basin to maintain groundwater quality for permanent potable use. Parts of the basin have high TDS and Nitrate concentrations as a result of past and continuous agricultural and other activities overlying the southern half of the basin. In addition, the Santa Ana Regional Water Quality Control Board (SARWQCB) and the Chino Basin Watermaster have developed water quality standards and management programs to mitigate water quality issues of the Chino Groundwater Basin. Treatment processes like the construction of desalters and the removal of agricultural and industrial waste and brine are costly, but such processes are an essential part of the overall strategy to ensure the maximum use of the groundwater supply.

In 2018, the State Water Resources Control Board adopted Resolution No. 2017-0042 which decreased MCLs of a variety of contaminants. Chino Hills local groundwater supply has been offline since the resolution was enacted due to 1,2,3-TCP contamination. A new groundwater treatment facility is expected to be completed and online by 2025 which will provide treatment for five inactive wells and restore total pumping capacity to 4 MGD. In response to this constraint, the Drought Risk Assessment detailed in Section 7.1.4 does not factor any local groundwater availability. The long-term supply and demand comparison detailed in Section 7.1.3 assumes full restoration of Chino Hill's local groundwater capacity given the expected project completion by 2025.

Purchased CDA Groundwater Supply

As identified in Section 6.1.2, Chino Hills purchases treated groundwater from CDA. Supplies from CDA are generally accepted to be highly reliable long-term sources. Potential water quantity and quality constraints for CDA are discussed below.

Water Quantity Constraints

Discussions and documentation from CDA indicate that its wholesale supply is highly reliable. Projections from the CDA 2015 UWMP (CDA, 2015) indicate that CDA's full production capacity is anticipated to be available over the next 25 years, on a constant flow basis throughout the year, unaffected by climactic changes. However, it is possible that the supply wells or Reverse Osmosis Membrane Treatment Facilities could be subject to short-term outages. CDA allows for 96% run-time and 4 % down-time for filter and maintenance issues.

City booster pump stations and well pumps incorporate a backup power generator or an alternative power source to ensure water delivery to customers. In addition, almost all customers are served from open reservoirs through the various pressure zones of the City. This system is pressurized by gravity; thus, brief power outages are not a concern.

For UWMP planning purposes, Chino Hills assumes 100% reliability of its 3.75 MGD (4,200 AF/yr) supply from CDA under all future conditions (normal and dry-year).

Water Quality Constraints

The CDA treatment process includes pretreatment, filtration, air stripping to remove volatile organic compounds, ion exchange for removal of nitrates, and reverse osmosis for removal of salts. The treated water is considered to be high quality, thus there are no current or expected water quality constraints associated with the supply.

Purchased Water from MVWD

As identified in Section 6.1.2, Chino Hills purchases treated water from MVWD. Supply sources conveyed by MVWD consist of imported Bay Delta supplies from WFA in addition to local Chino Basin groundwater pumped by MVWD's wells. MVWD provides Chino Hills with blended water from these sources up to a total capacity of 20.22 MGD. The supply sources conveyed by MVWD as subject to the same constraints identified for the WFA and Chino Basin supplies identified above. This section provides additional detail on constraints and mitigating factors specific to MVWD.

Water Quantity

With over half of the City's potable water requirements slated to be provided through the MVWD capacity acquisition, it is important that the City has confidence that the MVWD can deliver the contracted supply under normal and adverse circumstances. The City has a substantial investment in the MVWD capacity. The 42-inch Ramona Feeder, which provides the primary conveyance from MVWD's system to the City's system is deemed as a secure source in recent California Department of Public Health (CDPH) documentation and SB 610/221 Water Supply Assessments and Verifications. As the City's principal water sources, MVWD supply, WFA imported water, and Chino Basin groundwater are subject to the same or similar disruptions. In particular, the imported source for these entities has the same origin and relies on common conveyance and treatment facilities.

Total projected supply availability to Chino Hills is the total MVWD obligation (20.22 MGD) less the Chino Hills full right to the WFA supply (12.72 MGD).[20] This 7.5 MGD (8,407 AF/yr) supply is expected to be highly reliable over the next 25 years in both normal and dry-year conditions, consistent with the supply constraints identified for the WFA and Chino Basin supplies identified above. As a conservative measure, the City's UWMP assumes the same 100% dry-year availability applied to the WFA source.

Water Quality Constraints

The MVWD supply is subject to the same water quality constraints as the WFA and Chino Basin supplies identified above. Certain portions of MVWD Groundwater are contaminated. The City is heavily investing in the construction of a treatment plant with MVWD. Recycled Water

[20] Chino Hills' WFA supply is conveyed through infrastructure common to MVWD and Chino Hills, therefore MVWD's obligation of water in addition to Chino Hills' WFA supply is 7.5 MGD.

Both IEUA and the City are committed to providing safe and reliable recycled water to customers. Water recycling is a critical component of IEUA's water resource management strategy for the region because it is recognized as a reliable water source during the times of drought or other water supply shortage conditions. Recycled water receives extensive treatment and testing based on stringent state and federal regulations. This section outlines the quantity and quality constraints associated with the recycled water supply.

Water Quantity

The City's wastewater collection system serves the high-density land uses throughout the City. This collection system represents most of the wastewater generated within the City of Chino Hills. The collection system conveys the entire City collected wastewater to the IEUA for treatment and reuse, or disposal. Projected wastewater flows can be related to water usage. Historically, wastewater production has been approximately 50% of the City's water usage.

For the purposes of the UWMP supply reliability assessments, projected normal year availability of recycled water is assumed to be 2,661 AF/yr. Communication with IEUA indicates that its recycled water supply will be reliability to 100% of normal year availability during dry years.

Water Quality

Both IEUA and the City are committed to provide safe and reliable recycled water to their customers. Recycled water receives extensive treatment and testing based on stringent State and Federal regulations. However, recycled water treatment standards can vary depending on the Application. For most applications in the State of California, recycled water is treated to meet Title 22 standards. Title 22 standards allow for a human full body contact with recycled water, but not potable consumption. In general, there is a considerable interest in the areas of emerging contaminates, water quality testing, health issues, and safety and risk regarding all water supplies. However, all recycled water usage is restricted to non-potable uses, such as those allowed under Title 22.

Total Dissolved Solids (TDS) are commonly used as a water quality parameter for recycled water. Based on the IEUA 2010 Urban Water Management Plan, TDS of IEUA recycled water supply to Chino Hills from Regional Plant 5 (RP-5) and CCWRF can be expected to remain at approximately 500 milligrams per liter (mg/L). However, the Chino Basin objective is 550 mg/L; therefore, it is reasonable to assume that future supplies will remain at/or below that level. Water quality concerns are not expected to affect supply availability of recycled water.

7.1.2 Year Type Characterization

Following DWR guidance, three year types are examined for water service reliability including, average year, single dry year, and five consecutive dry year drought. Chino Hills' year type characterization follows the supply reliability assumptions and constraints identified in Section 7.1.1 and are summarized in Table 7-3 below. Year types selected for Chino Hills' UWMP and supply constraints identified in Section 7.1.1 are consistent with the year types selected by IEUA for their 2020 UWMP. The average year type is considered the average supply availability from FY 2015/16-FY 2019/20. The single dry year is the lowest water supply available, consistent with FY 2015/16. The five consecutive dry year scenario is the single dry year (FY 2015/16) repeated for five years in a row. A detailed summary of expected precent availabilities by source under these conditions is identified in Table 7-4.

Table 7-3: Basis of Water Year Data (DWR Table 7-1)

Submittal Table 7-1 Retail: Basis of Water Year Data (Reliability Assessment)			
Year Type	Base Year If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 2019-2020, use 2020	Available Supplies if Year Type Repeats	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP.
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available *	% of Average Supply
Average Year	2016-2020		100%
Single-Dry Year	2016		100%
Consecutive Dry Years 1st Year	2016		100%
Consecutive Dry Years 2nd Year	2016		100%
Consecutive Dry Years 3rd Year	2016		100%
Consecutive Dry Years 4th Year	2016		100%
Consecutive Dry Years 5th Year	2016		100%
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*			

Table 7-4: Summary of Hydrologic Year Types and Availability by Supply Source

Water Supply	Supply Source	Average Year	Single Dry Year	Consecutive Dry Year
Imported Water	WFA	100%	100%	100%
Purchased Water	MVWD	100%	100%	100%
Groundwater	Chino Hills Wells	100%	100%	100%
Groundwater	CDA	100%	100%	100%
Recycled Water	IEUA	100%	100%	100%

7.1.3 Supply and Demand Comparison

The following Table 7-5 though

Table 7-7 provide a supply and demand comparison over the next 25 years (2025-2045) under normal year, single dry year, and five consecutive dry year conditions. Demand projections are consistent with those presented in Section 4.1.4. Supply projections under normal year conditions reflect expected future supply availability consistent with Table 6-1. Supply projections under dry year conditions reflect normal year supply projections multiplied by the percent availabilities documented in Table 7-4 above. Based on this analysis, Chino Hills is expected to have an overall supply surplus out to 2045 under the analyzed hydrologic conditions.

Table 7-5: Normal Year Supply and Demand Comparison (DWR Table 7-2)

Normal Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 *(Opt)*
Supply totals	33,684	33,684	33,684	33,684	33,684
Demand totals	17,120	17,334	17,678	17,725	17,769
Difference	16,564	16,350	16,006	15,959	15,915
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*					

Table 7-6: Single Dry Year Supply and Demand Comparison (DWR Table 7-3)

Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045 (Opt)
Supply totals	33,684	33,684	33,684	33,684	33,684
Demand totals	13,677	17,120	17,334	17,678	17,725
Difference	20,007	16,564	16,350	16,006	15,959
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*					

Table 7-7: Multiple Dry Years Supply and Demand (DWR Table 7-4)

Multiple Dry Years Supply and Demand Comparison						
		2025	2030	2035	2040	2045 (Opt)
First year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,060	17,275	17,618	17,666	17,709
	Difference	16,624	16,409	16,066	16,018	15,975
Second year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,103	17,343	17,628	17,675	17,709
	Difference	16,581	16,341	16,056	16,009	15,975
Third year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,146	17,412	17,637	17,683	17,709
	Difference	16,538	16,272	16,047	16,001	15,975
Fourth year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,189	17,481	17,647	17,692	17,709
	Difference	16,495	16,203	16,037	15,992	15,975
Fifth year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,232	17,549	17,656	17,700	17,709
	Difference	16,452	16,135	16,028	15,984	15,975
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*						

7.1.4 Description of Management Tools and Actions

Chino Hills is taking action to maximize local resources and minimize the need for imported water. At the local level, the City is currently designing treatment facilities to restore access to its groundwater wells, which have recently been offline due to water quality concerns (refer to Section 7.1.1 for additional information). At the regional level, Chino Hills receives imported SWP water through WFA via IEUA and MWD. MWD and its member agencies (including IEUA) have made significant investments in local / regional supply sources (including demand management). As a recipient of water from IEUA and MWD, Chino Hills may indirectly receive water from these investments, including covered actions that reduce reliance on the Bay Delta. Several MWD-specific programs (though not an exhaustive list) are described in Section 7.1.1. In addition, the IEUA Reduced Delta Reliance Report in Appendix G provides a summary of regional activities that MWD and IEUA are taking to reduce Delta Reliance in compliance with California Code of Regulations (CCR), Title 23, § 5003.

7.2 Drought Risk Assessment

Per CWC Section 10635(b) Chino Hills has completed a DRA as part of information considered in developing the demand management measures and water supply projects and programs to be included in the UWMP. This section reviews the City's DRA and includes the following information:

- Description of the data, methodology, and basis for the DRA;
- Description of the reliability of each of the City's water supply sources under dry year conditions; and
- Comparison of total supply versus demand under dry year conditions.

7.2.1 Data, Methods, and Basis for Water Shortage Condition

Consistent with CWC Section 10635(b) Chino Hills' DRA considers a five-year dry sequence consistent with the driest years on record. Following guidance from IEUA, FY 2015/16 was selected and repeated for five consecutive years. Overall supply reductions by source associated with this year type are discussed in Section 7.1.1 and further detailed in Table 7-3 and Table 7-4.

In addition to supply reductions based on hydrologic year type, current conditions associated with each water source were considered in the DRA. Specifically, local groundwater from Chino Hills' Chino Basin wells was considered to be unavailable over the DRA planning period (2021-2025) given the existing water quality constraints (see Section 7.1.1) and the current lack of treatment. The City's other supply sources, including imported water from WFA, purchased water from MVWD, purchased water from CDA, and recycled water from IEUA are all in good condition and are expected to be available consistent with existing water supply agreements. A summary of current projected supply availabilities under dry year conditions are presented in Section 7.2.2.

Chino Hills' supply and demand comparison (Section 7.2.3) was conducted on an annual basis by subtracting the total projected demand from the total projected available supplies, which are adjusted based on the dry year percent availabilities detailed in Table 7-3 and Table 7-4. Annual comparisons of supply and demand are appropriate for Chino Hills' system because:

- The City's supply sources are not highly variable on an intra-annual basis;[21] and

[21] Chino Hills' supply sources are imported / purchased, groundwater based, and/or recycled. These sources, unlike local surface water supplies, do not have significant month-to-month variance.

- The City's water supply contracts and distribution system have sufficient capacity to meet monthly peak demands.

7.2.2 DRA Water Source Reliability

Availability of Chino Hills' water supply sources from 2021-2025 under dry year conditions are identified in Table 7-8 below. Assumptions for the documented availabilities are described in Sections 7.1.1 and 7.2.1.

Table 7-8: DRA Dry Year Availabilities for Chino Hills' Water Supply Sources

Water Supply	Supply Source	2021	2022	2023	2024	2025
Imported Water	WFA	14,258	14,258	14,258	14,258	14,258
Purchased Water	MVWD	8,407	8,407	8,407	8,407	8,407
Groundwater	Chino Hills Wells	0	0	0	0	0
Groundwater	CDA	4,200	4,200	4,200	4,200	4,200
Recycled Water	IEUA	2,661	2,661	2,661	2,661	2,661
Total		**29,526**	**29,526**	**29,526**	**29,526**	**29,526**

7.2.3 Total Water Supply and Use Comparison

Table 7-9 documents the outcome of Chino Hills' DRA water supply and demand comparison. The City does not expect to encounter any water supply shortages within the next five years.

Table 7-9: Five-Year Drought Risk Assessment (DWR Table 7-5)

Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b)	
2021	**Total**
Total Water Use	16,166
Total Supplies	29,526
Surplus/Shortfall w/o WSCP Action	13,360
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	13,360
Resulting % Use Reduction from WSCP action	0%

2022	Total
Total Water Use	16,389
Total Supplies	29,526
Surplus/Shortfall w/o WSCP Action	13,137
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	13,137
Resulting % Use Reduction from WSCP action	0%

2023	Total
Total Water Use	16,613
Total Supplies	29,526
Surplus/Shortfall w/o WSCP Action	12,913
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	12,913
Resulting % Use Reduction from WSCP action	0%

2024	Total
Total Water Use	16,837
Total Supplies	29,526
Surplus/Shortfall w/o WSCP Action	12,689
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	12,689
Resulting % Use Reduction from WSCP action	0%

2025	Total
Total Water Use	17,060
Total Supplies	29,526
Surplus/Shortfall w/o WSCP Action	12,466
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	12,466
Resulting % Use Reduction from WSCP action	0%

8. Water Shortage Contingency Plan

Consistent with CWC Section 10632 Chino Hills has developed an updated Water Shortage Contingency Plan (WSCP) as a part of its UWMP. The City's WSCP is a guide for its intended actions during water shortage conditions and is meant to improve preparedness for these events.

Chino Hill's WSCP is included as Section 8 to its 2020 UWMP which will be submitted to DWR by July 1, 2021. However, the WSCP is considered a separate document to the UWMP and may be amended on an as-needed basis outside of revisions to the City's UWMP.

The WSCP is organized into 12 elements identified by CWC Section 10632. A brief summary of these elements, including new requirements from the State Legislature created in response to the 2012-16 drought, is provided in Table 8-1 below.

Table 8-1: Summary of WSCP Elements and New Requirements in 2020

WSCP Section	WSCP Element	New Requirements in 2020
8.1	Water Supply Reliability Analysis	Key attributes of the Water Supply Reliability Analysis [Water Code Section 10632(a)(1)]
8.2	Annual Water Supply and Demand Assessment Procedures	Procedures for conducting an annual water supply and demand assessment with prescribed elements. [Water Code Section 10632 (a)(2)]
8.3	Six Standard Water Shortage Stages	Six standard water shortage levels corresponding to progressive ranges of up to 10-, 20-, 30-, 40-, and 50-percent shortages and greater than 50-percent shortage. [Water Code Section 10632 (a)(3)(A)]
8.4	Shortage Response Actions	Locally appropriate "shortage response actions" for each shortage level, with a corresponding estimate of the extent the action will address the gap between supplies and demands. [Water Code Section 10632 (a)(4)]
8.5	Communication Protocols	Communication protocols and procedures to inform customers, the public, and government entities of any current or predicted water shortages and associated response actions. [Water Code Section 10632 (a)(5)]
8.9	Monitoring and Reporting	Monitoring and reporting procedures to assure appropriate data is collected to monitor customer compliance and to respond to any state reporting requirements. [Water Code Section 10632(a)(9)]
8.10	WSCP Refinement Procedures	A reevaluation and improvement process to assess the functionality of the WSCP and to make appropriate adjustments. [Water Code Section 10632(a)(10)]

8.1 Water Supply Reliability Analysis

Pursuant to CWC Section 10635, the City has conducted an analysis of its long-term water supply reliability which compares future water demands to best projections of supply availability under a range of hydrologic conditions. This analysis was most recently completed as a part of the City's 2020 UWMP, within its Water Service Reliability Assessment and Drought Risk Assessment (DRA). This section of the WSCP provides a concise summary of these assessments. The City recognizes that the WSCP is a stand-alone document that may be updated independently from the UWMP. In the event of updates to the supply and demand projections outside of the UWMP planning cycle, this section of the WSCP may be updated to reflect revisions to the Water Service Reliability Assessment and the DRA.

8.1.1 2020 Water Service Reliability Assessment

Chino Hills' 2020 Water Service Reliability Assessment was conducted by performing a comparison of the City's forecasted water demand against its projections of supply availability. The comparison was performed from 2025-2045 in five year increments and considers supply conditions during normal year, single dry year, and five consecutive dry year hydrologic conditions. Table 8-2 summarizes the supply and demand totals for the normal year, single dry year and five consecutive dry year conditions.

Table 8-2: Summary of 2020 Water Supply Reliability Assessment (AF/yr)

Year Characterization		2025	2030	2035	2040	2045
Normal Year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	13,677	17,120	17,334	17,678	17,725
	Difference	20,007	16,564	16,350	16,006	15,959
First dry year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,060	17,275	17,618	17,666	17,709
	Difference	16,624	16,409	16,066	16,018	15,975
Second dry year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,103	17,343	17,628	17,675	17,709
	Difference	16,581	16,341	16,056	16,009	15,975
Third dry year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,146	17,412	17,637	17,683	17,709
	Difference	16,538	16,272	16,047	16,001	15,975
Fourth dry year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,189	17,481	17,647	17,692	17,709
	Difference	16,495	16,203	16,037	15,992	15,975
Fifth dry year	Supply totals	33,684	33,684	33,684	33,684	33,684
	Demand totals	17,232	17,549	17,656	17,700	17,709
	Difference	16,452	16,135	16,028	15,984	15,975

Demand projections were conducted using estimations of per-unit (e.g., housing units and jobs), sectoral (e.g., single family, multi-family, and CII) water demand[22] scaled by the City's current projections of housing, population, and job growth. Supply projections were obtained under normal and dry year hydrologic conditions from based on input from the City's water supply wholesalers in addition to reported information from the Chino Basin Watermaster. A summary of the City's supply sources, normal year availability, dry year availability, and key assumptions / constraints are presented in Table 8-3 below.

[22] Per unit demands are based on historical sectoral consumption normalized based on weather, macroeconomic conditions, and drought conditions. See Appendix D from the City's 2020 UWMP.

As demonstrated in Table 8-3, Chino Hills' has a diverse portfolio of water supply sources ranging from imported supply to local resources provided by several providers, including the City itself. As detailed in Table 8-3, the City and its wholesalers have made and continue to make significant investments to ensure long-term water supply reliability. As a result, as of 2020, the City's supply sources are expected to be nearly 100% reliable between 2025-2045 even under dry hydrologic conditions. These supply sources are expected to be in surplus of the City's projected demands between 2025-2045.

Table 8-3: 2020 Summary of Supply Sources, Projected Availability, and Key Assumptions / Constraints

Supply Type	Supply Source / Provider	2025-2040 Normal Year Projected Availability	2025-2040 Dry Year Projected Availability	Key Assumptions and Constraints
Imported Water	WFA	14,258	14,258	• Reliability of Bay Delta supplies • Heath of the delta ecosystem to allow continued exports • MWD's continued efforts to improve water supply reliability and conveyance
Purchased Water	MVWD	8,407	8,407	• Water purchased from MVWD is the MVWD obligation less the Chino Hills WFA right • MVWD imported supply is from WFA and has the same reliability constraints as above • MVWD groundwater supply has no known existing water contaminants that would limit supply • The city has invested heavily in conveyance from MVWD to ensure reliable delivery
Groundwater	Chino Hills Wells	4,158	4,158	• Considered a highly reliable long-term supply • The Chino Basin Watermaster expects to have sufficient supply to meet recharge obligations through 2050 • Existing groundwater contaminants prevent the use of this source until treatment is constructed in 2025 • MWD's use of the Chino Basin for excess storage increases the source reliability
	CDA	4,200	4,200	• Highly reliable long-term source that is not anticipated to be affected by climate change • Existing water treatment limits any water quality concerns
Recycled Water	IEUA	2,661	2,661	• All wastewater collected by the City is delivered to IEUA • Supply provided by IEUA is reliant on the City's production of wastewater

8.1.2 2020 DRA

Chino Hills completed a DRA in its 2020 UWMP examining its water supply risks over the next five years (2021-2025). The analysis was conducted in the same manner as the Water Service Reliability Assessment by conducting an annual comparison of expected demands and supply availabilities. The 2020 DRA also more explicitly considered current conditions of the City's water supply sources, including the current unavailability of Chino Hills-owned wells, which are not in operation due to water quality concerns associated with 1,2,3-TCP.[23]

Even with the City-owned groundwater supply offline, Chino Hills is expected to have greater aggregate supplies than demand. Table 8-4 provides a summary of the 2020 DRA.

Table 8-4: 2020 DRA Summary

Water Supply	Supply Source	2021	2022	2023	2024	2025
Imported Water	WFA	14,258	14,258	14,258	14,258	14,258
Purchased Water	MVWD	8,407	8,407	8,407	8,407	8,407
Groundwater	Chino Hills Wells	0	0	0	0	0
Groundwater	CDA	4,200	4,200	4,200	4,200	4,200
Recycled Water	IEUA	2,661	2,661	2,661	2,661	2,661
Total Supplies		29,526	29,526	29,526	29,526	29,526
Total Projected Demand Year		16,166	16,389	16,613	16,837	17,060
Total Supply Surplus Year		13,360	12,883	12,660	12,436	12,213

8.1.3 Other Potential Issues

Like much of California, the major threats to water supply are drought, infrastructure failure due to seismic or other events and water quality contaminants. Sections 8.1.1 and 8.1.2 address drought concerns. This section will focus on infrastructure failure and water quality.

Imported water from WFA relies on an extensive conveyance system maintained by MWD. MWD has built a resilient system and has plans in place that make the source unlikely to be interrupted by infrastructure failure. The supply also passes though WFA infrastructure, if WFA infrastructure were to fail the City would have challenges meeting demand.

The City receives both the WFA allocation and MVWD purchases though the 42-inch Ramona Feeder. The City has invested heavily in the feeder to ensure reliability. It is deemed as a secure source in recent CDPH documentation and SB 610/221 Water Supply Assessments and Verifications. Seismic conditions are still a threat to the delivery of WFA imports and MVWD purchases. If the deliveries form MVWD were to be interpreted, the City would likely not be able to meet demand with only access to CDA and local groundwater.

The supply most vulnerable to contaminants is groundwater from the Chino Basin, both local and from MVWD and CDA. The City's groundwater is currently offline and does not affect their ability to meet demand. By 2025 treatment will be implemented and local groundwater supply will be back

[23] The wells are expected to be returned to service by 2025.

online. CDA already has treatment implemented so is unlikely to face water quality concerns. MVWD groundwater is a small portion of the supply and could easily be supplemented with imported water if quality concerns became apparent.

8.2 Annual Water Supply and Demand Assessment Procedures

Consistent with CWC Section 10632(a)(2) as an urban water supplier, Chino Hills is required to submit an Annual Water Supply and Demand Assessment (i.e., Annual Assessment). The Annual Assessment is an analysis of the City's short-term outlook for supplies and demands and how an anticipated shortage may relate to WSCP actions. The Annual Assessment will be based on current conditions and known information (including wholesaler availability) at the time of analysis. Consistent with CWC Section 10632.1, the first Annual Assessment will be submitted to DWR by July 1, 2022 and then each subsequent year on or before July 1.

This section describes Chino Hills' planned approach to conducting the Annual Assessment, including:

- The decision-making process for analyzing water supply reliability; and
- A description of key data inputs and assessment methodologies.

8.2.1 Decision Making Process

The majority of Chino Hills' water supply sources are purchased from wholesale water providers (refer to Table 8-3). As a result of this, coordination with the City's wholesale water providers is an important consideration in the timing and decision making process for the Annual Assessment. Table 8-5 provides a summary of Chino Hills' supply providers, supply sources, and relevant annual planning processes that are anticipated to affect the City's Annual Assessment process.

Table 8-5: Summary of Chino Hills Water Supply Providers and Recurring Planning Processes to Consider for the Annual Assessment

Supply Provider	Supply Sources Provided to Chino Hills	Relevant Planning Processes to Consider
WFA	Bay Delta surface water via SWP, MWD, and IEUA	• DWR SWP allocations • MWD Water Supply Allocation Plan (WSAP) • MWD WSCP and Annual Assessment • IEUA WSCP and Annual Assessment
MVWD	WFA and Chino Basin groundwater	• See above WFA processes • Chino Basin Watermaster annual reports • MVWD WSCP and Annual Assessment
CDA	Chino Basin groundwater	• CDA WSCP and Annual Assessment • Chino Basin Watermaster annual reports
IEUA	Recycled water	• IEUA WSCP and Annual Assessment
Chino Hills	Chino Basin groundwater	• Chino Basin Watermaster annual reports • Internal operations, engineering, and planning

Each water supply provider identified in Table 8-5 face the same requirements to submit their own Annual Assessments to DWR by July 1 of each year. Several water supply providers including the

City, CDA, and MVWD are informed by the Chino Basin Watermaster's Annual Assessment Package to define annual safe yield shares and storage account summaries. This report is typically available between September and November of each year and provides clarity on basin accounting and annual supply availability. Annual availability of imported SWP supplies conveyed to the City by WFA and MVWD are dependent on annual planning processes from IEUA, MWD, and DWR. Of these agencies and plans, information from the MWD WSAP is perhaps the most relevant, as it integrates supply availability from the SWP in addition to MWD's storage and other supply investments and defines a supply allocation across its member agencies, including IEUA. According to MWD's draft 2020 UWMP and WSCP, it plans on having an initial WSAP allocation determination by April-May of each year and will present a completed Annual Assessment to its Board of Directors by June. Based on this timeline, Chino Hills expects to have sufficient information to complete its own Annual Assessment by May-June of each year. The City will closely coordinate with its direct wholesalers, IEUA, WFA, and MVWD, to confirm annual availability of its imported supply.

By June of each year, City staff will present a completed Annual Assessment for approval by City Council including enaction of any specific shortage response actions triggers by the assessment. Following approval by City Council, City staff will formally submit the Annual Assessment to DWR by July 1.

8.2.2 Data and Methodologies

This section describes how Chino Hills will analyze water supply reliability for the Annual Assessment process. Consistent with CWC Section 10632(a)(2), reliability will be assessed for the current year and a single dry year. The Annual Assessment will be based on conditions of the City's water supply availability, unconstrained water demand, and existing infrastructure conditions. The difference between the Chino Hills' supply availability and unconstrained demand will be used to determine the anticipated water supply shortage stage under the City's WSCP. The following topics defining the City's approach are further described in this section:

- Evaluation criteria
- Water supply
- Current year unconstrained demand
- Current year available supply
- Infrastructure considerations
- Other factors.

Evaluation Criteria

Chino Hills' locally applicable evaluation criteria will consist of a two-year risk assessment calculating the difference between unconstrained demand under (1) current year supply availability and (2) single dry year supply availability. A description of specific criteria includes the following:

- Characterization of current year supply availability based on best-available data from the Chino Hills' wholesale providers and an understanding of local conditions from City-owned sources (see below).

- Assumed single dry year supply availability consistent with the year type characterization defined in Chino Hills' Water Service Reliability Assessment from its 2020 UWMP (see below).
- Estimation of unconstrained customer demand (see below).

For each year, the difference between projected supply availability and unconstrained demand will be calculated and the percent shortage will be calculated by dividing the calculated difference by unconstrained demand. WSCP actions will be recommended based on this analysis. Note that the Annual Assessment and recommended actions represent an evaluation at a given point in time. During projected water shortage conditions, the City will continually monitor supply and demand conditions and will take appropriate actions on an as-needed basis.

Water Supply

Chino Hills will quantify current year supply availabilities based on coordination with the City's wholesale agencies in addition to data and reports available at the local and regional level. Table 8-6 provides a summary of Chino Hills' supply sources and the methods City staff will employ to quantify the current year supply availability.

Table 8-6: Summary of Supply Sources and Methods for Quantifying Annual Availability

Supply Provider	Supply Sources Provided to Chino Hills	Data Sources / Methods to Quantify Availability
WFA	Bay Delta surface water via SWP, MWD, and IEUA	• Discussion with WFA and IEUA to review allocations and impacts of MWD WSAP relative to contract value
MVWD	WFA and Chino Basin groundwater	• See above data sources for WFA • Discussion with MVWD staff to review availability of WFA and groundwater supplies and confirm infrastructure / conveyance capacity relative to contract value
CDA	Chino Basin groundwater	• Chino Basin Watermaster annual reports • Discussion with CDA staff to confirm supply availability relative to contract value
IEUA	Recycled water	• Discussion with IEUA staff to review availability of recycled supply relative to contract value
Chino Hills	Chino Basin groundwater	• Chino Basin Watermaster annual reports, including assigned safe yield, carryover storage, and availability of Dry Year Yield supply • Internal operations, engineering, and planning data detailing constraints on existing infrastructure

Unconstrained Customer Demand

CWC Section 10632(a)(2)(B)(i) requires urban suppliers to consider "unconstrained demand" within the Annual Assessments. Chino Hills has interpreted unconstrained demand to be expected water use before any shortage response actions (e.g., drought restrictions) are applied under WSCP. Regular or “routine” activities such as ongoing water conservation within the service area are not considered as constraints on demands. For the Chino Hills’ Annual Assessments, City staff will consider two approaches for estimating unconstrained demand, which are outlined below:

- **Under normal conditions** (e.g., prior year did not have irregular restrictions imposed from the WSCP), City staff will consider the prior fiscal year’s total demand calculated as the sum off all billed consumption plus an estimate of losses.
- **Under drought conditions** (e.g., prior year’s demand was constrained by WSCP actions), City staff will consider total forecasted demand consistent with the Chino Hills UWMP.[24]

Current Year Available Supply

CWC Section 10632(a)(2)(B)(ii) requires that Annual Assessments determine “current year available supply, considering hydrological and regulatory conditions in the current year and one dry year.” Chino Hills’ Annual Assessment will include separate estimates of the City’s annual water supply availability under current year conditions and assumed dry year conditions. Current year supply availability is responsive to the requirements outlined in CWC Section 10632(a)(2)(B)(ii) based on the methodologies outlined in Table 8-6 above.

Single dry year availability will be quantified using the same approach applied in Water Service Reliability Assessment of the 2020 UWMP. This involves multiplying the expected percent available in the single driest year (defined as FY 2016/17 in the 2020 UWMP) by the normal year projection of available supply for each source. Within this process, expected constraints on supplies that would limit normal year availability (e.g., limitations / availability of local groundwater treatment) will be factored into the analysis.

Infrastructure Considerations

The status of current and near-term planned infrastructure conditions will be considered within the supply quantification of the City’s Annual Assessment. City staff with confirm infrastructure capacities and constraints (including planned repairs and projects) in the discussions with Chino Hills’ wholesale providers detailed in Table 8-6 above. Similarly, City staff will explicitly account for any infrastructure repairs or outages that are expected to affect supply reliability.

Other Factors

Similar to prior discussions on infrastructure considerations, City staff will consider any existing water quality constraints that may limit the availability of any of Chino Hills’ supply sources. Existing water quality issues and constraints will be surfaced in discussions with the City’s wholesale providers as well as internal operations, engineering, and planning data.

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[24] Recall that Chino Hills’ UWMP demand forecast reflects unconstrained demand in that the forecast is normalized based on weather, macroeconomic conditions, and drought conditions.

8.3 Six Standard Water Shortage Stages

Per CWC Section 10632(a)(3)(A), urban water suppliers are required to define six standard water shortage levels that correspond to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortages. CWC Section 10632(a)(3)(B) provides flexibility for urban water suppliers to comply with CWC Section 10632(a)(3)(A) requirements using existing shortage categories cross-referenced to the six standard water shortage stages. Table 8-7 details a "crosswalk" between Chino Hills' existing water shortage stages as they relate to the six standard water shortage levels. The City updated Stages 1-4 in 2016 as Ordinance No. 300u to comply with existing State regulations. Stage 5 is derived from the City's existing Emergency Response Plan.

In compliance with DWR Submittal Table 8-1, Chino Hills has identified its shortage response actions that correspond with each shortage stage in Table 8-8. The Shortage response actions for each stage are described in the following section.

Table 8-7: Water Shortage Stages (DWR Table 8-1)

Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description*)
Add additional rows as needed		
1	Limit Water Use	Voluntary
2	Less than 10%	Moderate Water Conservation
3	10% to 25%	High Water Conservation
4	25% to 50	Severe Water Conservation
5	Greater than 50	Catastrophic Event
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES: Adopted by Water Use Restriction Ordinance No. 300u		

Water Shortage Contingency Plan Levels	
Shortage Level	Complete Both
	Percent Shortage Range[1] *Numerical value as a percent*
Add additional rows as needed	
1	Up to 10%
2	Up to 20%
3	Up to 30%
4	Up to 40%
5	Up to 50%
6	>50%
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*	
NOTES:	

8.4 Shortage Response Actions

In compliance with CWC Section 10632(a)(4), Chino Hills' WSCP specifies shortage response actions that align with the shortage levels defined in Table 8-7. Specific shortage response actions are identified in Table 8-8 below. Note that in all stages, the City will also seek to address perceived shortages in a supply source through supply augmentation, which is further described in Section 8.4.2.

Table 8-8: Summary of Shortage Response Actions

Stage	Description	Shortage Response Action
1	Voluntary Water Conservation Alert	• Voluntarily limit the amount of water used from March 1st through October 31st to what is necessary for health, safety, business, and irrigation.
2	Moderate Water Conservation Alert	• Sprinkling or irrigating between the hours of 9:00 a.m. and 6:00 p.m. for non-water dependent businesses. • Applying potable water to outdoor landscapes in a manner that causes runoff. • Applying potable water to any impermeable surface • Permitting water to leak on any premises that is not repaired in a timely manner. • Serving of drinking water other than upon request in eating or drinking establishments. • Using potable water in a non-residential fountain or other decorative water feature, except where the water is part of a recirculating system. • Using water from fire hydrants shall be limited to fire fighting and related activities necessary to maintain the public health, safety, and welfare. • Noncommercial washing of privately owned livestock, vehicles, trailers, buses or boats, except from a bucket and/or a hand-held hose equipped with a shut-off nozzle. • Using a handheld hose that dispenses potable water without a shut-off valve.
3	High Water Conservation Alert	• All prohibitions and restrictions in Stage 1 and 2 shall be in effect. • All residential customers shall be limited in the outdoor use of water for sprinkling, watering, or irrigating landscaped or vegetated areas to a two days per week. • All such shall not exceed fifteen (15) minutes per watering-station. No irrigation shall occur between the hours of 9:00 a.m. and 6:00 p.m. • Entities using recycled water are exempted from irrigation prohibitions for their recycled water use. • The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall is prohibited. Measurable rainfall is defined as rainfall of one tenth of an inch (1/10") or more falling within a forty eight (48) hour period. • Hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily. • Swimming pool refilling or new-construction swimming pool filling shall be limited to the same days for outdoor use of water. • Washing of vehicles or boats is prohibited except when using a hose that is equipped with a shut-off valve; or when washed in either an automatic or manual commercial car wash. • Notwithstanding the above, temporary car washes held for fundraising purposes are prohibited. • Use of misting systems are prohibited. • Use of potable water for dust control is prohibited where recycled water is available for connection.
4	Severe Water Conservation Alert	• All previous restrictions noted in Stage 1, 2, and 3 shall be in effect. • There shall be no outdoor use of water at any time, including the use of a hand-held hose with shut-off valve. • All decorative fountains, decorative (i.e., non-swimming) pools shall be drained and made dry. Fountains, ponds or pools that are filled with recycled water are exempt. Decorative ponds that contain fish shall be exempt.
5	Catastrophic Event	• All previous restrictions noted in Stage 1, 2, 3 and 4 shall be in effect.

In addition to the shortage response actions identified in Table 8-8, this section reviews the following response actions in additional detail:

- Demand reduction actions;
- Supply augmentation actions;
- Operational changes; and
- Additional, mandatory prohibitions against specific water use practices.

This section also provides a narrative description of the City's Emergency Response Plan, a summary of the City's Seismic Risk Assessment and Mitigation Plan, and a summary of the anticipated effectiveness of the shortage response action effectiveness.

8.4.1 Demand Reduction

Demand reduction measures are an important part of Chino Hills' shortage response. The City's most recent reduction measures were adopted in 2016 through Ordinance 300u. These measures have been incorporated into the City's 2020 WSCP and account for a majority of the shortage response actions identified in Table 8-8. A summary of the aggregate demand reduction actions, including an estimate for the water demand savings, is presented in Table 8-9 for each of Chino Hills water shortage stages.

Table 8-9: Demand Reduction Actions and Expected Performance Summary (DWR Table 8-2)

Demand Reduction Actions				
Shortage Level [(1)]	Demand Reduction Actions	How much is this going to reduce the shortage gap? *Include units used (volume type or percentage)*	Additional Explanation or Reference *(optional)* [(2)]	Penalty, Charge, or Other Enforcement? ***For Retail Suppliers Only***
1	Other	0-10%	See Table 8-8	No
2	Other	10-20% [(3)]	See Table 8-8	Yes
3	Other	Up to 28% [(4)]	See Table 8-8	Yes
4/5	Other	Up to 45% [(5)]	See Table 8-8	Yes

NOTES:
[(1)] Shortage Levels correspond with Chino Hills water shortage stages identified in Table 8-8.
[(2)] Refer to Table 8-8 for identification of specific demand reduction activities.
[(3)] Savings identified with Stage 2 actions are based on percent reductions in consumption observed between FY 2013-14 (assumed baseline pre-drought water use) and FY 2017-19 and FY 2018-19 which are both years where Stage 2 was enacted. Percent savings rounded to the nearest 5%.
[(4)] Savings identified with Stage 3 actions are based on percent reductions in consumption observed between FY 2013-14 (assumed baseline pre-drought water use) and FY 2015-16 in which Stage 3 was enacted for the entire year.
[(5)] Savings identified Stage 4/5 actions are consistent with assumptions of savings from eliminating outdoor use. Refer to Section 8.4.7 for additional information.

8.4.2 Supply Augmentation

The City does not regularly use the full contractual amount from any water wholesaler. Table 8-10 shows the amount of excess water available (based on FY 2019/20 use) to the City based on contracted amounts with each supplier.

In addition to flexibility in the City's wholesale contracts, Chino Hills has access to additional groundwater supply above its allocated safe yield in the Chino Basin. During dry conditions or shortages in other supplies, Chino Hills may "over-produce" from the Chino Basin and draw from its excess carryover account (ECO) and/or from available storage in the MWD DYY conjunctive use program. Storage in the ECO account varies on a year-to-year basis depending on annual under-production of groundwater relative to Chino Hills' safe yield share. Storage in the DYY varies from year-to-year dependent on total "puts" (i.e., storage via avoided pumping) and "takes" (i.e., pumping in-lieu of delivery of MWD water). In addition to the volume of available emergency storage, Chino Hills is limited by pumping and treatment capacity, which is expected to be 4 MGD following construction of new treatment facilities.

Table 8-10: Summary Supply Augmentation Actions (DWR Table 8-3)

Supply Augmentation and Other Actions			
Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	How much is this going to reduce the shortage gap? *Include units used (volume type or percentage)*	Additional Explanation or Reference *(optional)*
Add additional rows as needed			
All	Other purchases	12,000 AF	WFA supplies up to 14,258 AF
All	Other purchases	500 AF	MVWD supplies up to 8,407 AF
All	Other purchases	500 AF	CDA supplies up to 4,200 AF
All	Other purchases	1,000 AF	IEUA recycled water up to 2,661 AF
All	Stored emergency supply	Variable	Chino Hills has access to additional storage in the Chino Basin via carryover storage and the DYY program. These accounts vary on an annual basis.
NOTES: The amount of supplemental supply was estimated based on fiscal year 2019/2020 use from each source compared to the contracted supply availability.			

8.4.3 Operational Changes

During a water shortage, the City will attempt to augment supply via increased purchases from unaffected (or less affected) wholesale providers. The City also has the option of pumping water above its safe yield share of the Chino Basin depending on available storage in the ECO and DYY accounts. Purchasing or producing greater than normal amounts from a particular supply source constitutes an operational change.

8.4.4 Additional Mandatory Restrictions

Water use restrictions during water shortage Stages 2, 3, 4 and 5 are considered mandatory. No additional mandatory restrictions have been adopted.

8.4.5 Emergency Response Plan

Catastrophic water shortages are categorized under Chino Hills' water shortage Stage 5 and correspond with the most severe shortage response actions, including mandatory elimination of outdoor use (see Table 8-8). In addition to these shortage response actions, the City has developed procedures to respond to various water supply related emergencies as part of its Water Quality Emergency Operational Plan (WQEOP).

As required by the State Water Resources Control Board, the WQEOP identifies the City's Public Works Director and/or the designee responsible for implementing the Emergency Notification Plan. The Emergency Notification Plan provides instructions and contact information for city personnel to implement a communication chain and implement emergency procedures.

Specific activities from the Emergency Notification Plan that are relevant to the WSCP include the following:

- Essential personnel are on 24-hour emergency call. The communication chain is triggered immediately after the emergency is evaluated.
- The City's on-call list is updated every six months with rotating on-call personnel. On-call personnel are responsible for notifying designated employees to implement the emergency communication chain and plan.
- In a magnitude earthquake of 4.0 or greater, the WFA and its member agencies, will send an employee in a vehicle with a two-way radio to the Agua de Lejos Water Treatment Plant following the City Ramona Pipeline to the Monte Vista Water District system to make a quick damage assessment of the line. When arriving at the plant, the City employee will report findings to the Plant Manager or designated representative and establish radio communications with the City of Chino Hills. The City employee will also assist WFA Plant staff until released by the Plant Manager or designated representative.

Newspaper Publication - Only upon request by the Department of Public Health, Office of Drinking Water, will the City contact the newspaper, radio stations, and/or television stations in the affected areas. All verbal notifications will be issued in both English and Spanish. The WQEOP also includes guidelines for personnel implementing emergency notifications. Guidelines include examples of water quality issues that would require immediate attention. The WQEOP also includes instructions on how to respond to vandalism of a reservoir that exposes the interior.

8.4.6 Seismic Risk Assessment and Mitigation Plan

Per CWC Section 10632.5, urban suppliers are required to assess seismic risk to water supplies as part of their WSCP. Per CWC Section 10632.5(c) suppliers may comply with this section by submitting a copy of the most recent adopted local hazard mitigation plan provided it addresses seismic risk. The City of Chino Hills adopted an updated Hazard Mitigation Plan in July 2020. The mitigation plan addresses Seismic Risk and protocols in the event of an earthquake. Relevant sections of the Hazard Mitigation Plan are in Appendix H.

8.4.7 Shortage Response Action Effectiveness

The expected effectiveness (i.e., the estimate to the extent to which that action will reduce the gap between supplies and demands) of each water shortage response action identified in the WSCP are summarized in Table 8-9 (demand reduction actions) and Table 8-10 (supply augmentation actions).

As identified in Section 8.4.2. effectiveness of supply augmentation actions are based on (1) the difference between typical purchases and contract values for wholesale supplies and (2) the availability of emergency storage in the Chino Basin. The ability to purchase additional water from wholesale suppliers is reliant on the assumption that wholesalers have enough supply to meet Chino Hills' contract value. Though Chino Hills' wholesale suppliers have indicated a near 100% reliability of the City's contract value, it is possible that availabilities may vary, particularly under extreme or catastrophic situations. Emergency storage in the Chino Basin is further detailed in Section 8.4.2 of the WSCP and Section 7.1.1 of the 2020 UWMP. Though it is considered a reliable emergency storage supply, the exact volume is variable from year to year based on Chino Basin operations and is limited by the City's projected 4 MGD groundwater treatment capacity.

The effectiveness of demand reduction actions are difficult to predict and can vary significantly between water agencies and particular water shortage events. However, the demand reduction actions identified by the City's WSCP are expected to be effective in reducing demand. For instance, the American Water Works Association (AWWA) suggests that a well-executed public information campaign on its own can result in savings between 5 and 20%.[25] While Chino Hills' demand reduction actions include public communication (see Section 8.5), they are more effective for the City than AWWA suggests. From a historical perspective, during the 2012-2016 drought, the City implemented water shortage Stages 2-3 which resulted between 13-28% reduction in annual water use from a 2013 pre-drought baseline. The most restrictive water shortage Stages (4 and 5) have not been

[25] American Water Works Association. 2019. Manual of Water Supply Practices – M60, Second Edition: Drought Preparedness and Response. p. 35

enacted by the City but are expected to result in up to 45% reduction in demand solely from curtailing outdoor water use.[26]

8.5 Communication Protocols

Per CWC Section 10632 (a)(5), suppliers are required to inform customers, the public, interested parties, and local, regional, and state governments of current/projected shortages, shortage response actions triggered by Annual Assessment or the WSCP and any other relevant communications. For current and projected water shortages in Stages 1 though 4, the Chino Hills' Water Utility Department will work with the City's Public Information Officer and local media to spread water use restriction information efficiently and effectively.

For emergency and catastrophic water shortages, the city will flow the Emergency Operations Plan (EOP). Appendix 6 of the plan details water utility specific communication actions. All necessary personnel are on 24-hour emergency call. As soon as the emergency is evaluated, the door-to-door notification time will be immediate. Appendix 6 of the EOP is presented in appendix I.

8.6 Compliance and Enforcement

In compliance with CWC Section 10632 (a)(6), this section identifies Chino Hills' compliance and enforcement actions associated with its shortage response actions detailed in this WSCP. When shortage response actions are in effect, the City implements water-waste patrols, however it primarily relies on community members to report violations. Violations to shortage response actions are detailed in Ordinance No. 300u provided in Appendix B. The ordinance establishes a penalty structure (outlined below) where each day of the violation is considered a new and separate offense:

- First Offense (Infraction) – written notification.
- Second Offense (Infraction) – $100 fine.
- Third Offense (Infraction) – $200 fine.
- Fourth Offense (Misdemeanor) – $500 fine. The City will may also insert a flow restrictor and may discontinue the water service.

In addition, the City may file an action for civil abatement where at the discretion of the court can be entitled to reimbursements for all necessary costs incurred by the City pertaining to the violation.

City Ordinance No. 300u allows for exemptions of these penalties under specific circumstances. Exceptions will be determined by the City manager and are allowed for the following reasons.

- Water use is necessary for public health and safety; or
- Recycled water is being used; or
- Water use is necessary due to the medical needs of the water customer.

[26] Indoor water use was estimated based on the annual minimum monthly consumption. Outdoor water use was estimated by assuming all monthly water use above the annual monthly minimum. Percent savings from eliminating outdoor use was estimated by dividing the total annual assumed outdoor use from total annual water consumption.

Exemptions are also available through the Public Works Commission for customers who would otherwise experience extreme financial hardship that cannot be mitigated. Requests for exemptions must be submitted to Public Works in writing two weeks prior to the Commission meeting.

8.7 Legal Authorities

City Ordinance no. 300u governs the implementation of Chino Hills' water shortage stages. It states that the City Council may declare the stages based on any of the following circumstances:

- Issuance of a water emergency executive order by the Governor of California; or
- Adoption of certain regulations by the California State Water Resources Control Board; or
- Major interruptions in water supply from MWD, IEUA or any other water supplier to the City;
- Occurrence of a major water emergency emanating from a natural or man-caused disaster; and
- Declaration of a water shortage emergency condition whenever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply to the extent that there would be insufficient water for human consumption, sanitation, and fire protection.

The City has also adopted an Emergency Operations Plan (EOP). Appendix 6 of the EOP is specific to the Water Supply System. The EOP governs the City's respond to a catastrophic water shortage. Emergency protocols are initiated when City Council, Board of Supervisors or other authorized person proclaim a local emergency. Pursuant to CWC Section 10632 (a)(7)(C), Chino Hills' City Council shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency under California Government Code, California Emergency Services Act (Article 2, Section 8558).

8.8 Financial Consequences of WSCP

Consistent with CWC 10632(a)(8) this section provides a description of the financial consequences of, and responses for, drought conditions and actions in the WSCP. A temporary reduction in revenue may occur with a catastrophic interruption in water availability or a prolonged drought. When the City's water shortage Stages 2-3 are enacted, customers are expected to reduce use up to 28%. If water shortage Stages 4 or 5 are enacted, customers may reduce use up to 45% resulting from curtailing outdoor use. These reductions would be expected to result in commensurate reductions in revenue relative to normal conditions. In order to mitigate reduced revenues incurred during water shortage conditions, the City may take several actions including:

- Increased monitoring of revenue and expenditures.
- Delay planed non-critical capital improvements and equipment purchases.
- Examine and adjust water rates.

In 2017, following the 2013-2016 drought, the City conducted a new rate study, which was designed to recover the full cost of water service incurred from the drought through meter service fee and consumption charges. Future rates were also planned to account for decreasing future water usage from ongoing conservation.

Consistent with CWC 10632(a)(8)(C), Chino Hills prohibits and discourages excessive water use though an excessive water use ordinance, which is consistent with CWC Section 367. City Ordinance No. 300u (provided in Appendix B) complies with these requirements and is further described in prior sections of the WSCP.

8.9 Monitoring and Reporting

Consistent with CWC Section 10632(a)(9), this section reviews Chino Hills' monitoring and reporting protocols for monitoring customer compliance and to meet state reporting requirements during shortage conditions. Chino Hills regularly monitors water supply and consumption throughout the service area. During a water shortage, the City Manager will be responsible for confirming that the supply quantities being delivered to the City are consistent with wholesale agreements/requests and comply with restrictions/constraints on City-managed supplies.

During water supply shortages, City staff will monitor overall water consumption on a monthly basis based off of the City's metering and accounting system. Rates of consumption will be assessed in comparison with "normal" unrestricted water use rates based on historical consumption during non-shortage periods. In the event system-wide monitoring indicates water use reduction targets (per the percent reductions identified in Table 8-7) are not met, City staff may perform a more detailed review and comparison against normal water use rates for specific water use categories. Outcomes of the categorical review may include additional targeted outreach/communication to categories that have not achieved the appropriate reduction and/or identification of specific meters/users for additional records review. Users that are deemed out of compliance will be contacted and given incentive to comply with the enacted restrictions.

8.10 WSCP Refinement Procedures

Chino Hills' WSCP is a standalone document that can be updated outside of the five-year UWMP cycle. The City will evaluate the WSCP as needed, specifically when changes in water supply or events that influence reliability occur. Analysis of the monitoring and reporting described in Section 8.9 will help identify changes that will trigger updates to the WSCP. For example, specific demand reduction actions may be modified and/or quantified in additional detail as additional supporting data becomes available. The WSCP will be revised by City staff and brought to City Council for approval and adoption.

8.11 Special Water Feature Distinction

Restrictions on special water features are described in Section 8.3.

8.12 Plan Adoption, Submittal, and Availability

Adoption of the City's WSCP will occur at the same time as the approval and adoption of the 2020 UWMP. Details on 2020 UWMP adoption are provided in Section 10 of the Chino Hills 2020 UWMP. Per CWC Section 10632 (c) the City will make the WSCP available to its customers and any city or county within which it provides water supplies no later than 30 days after adoption.

9. Demand Management Measures

Since the City's inception, City leadership has understood the necessity for the conservation of its precious resource. Chino Hills was one of the first cities in the region to bring recycled water online for irrigation to supplement potable water demands. This section outlines policies and practices that are designed to promote reasonable and efficient use of water. It details past and present conservation efforts that have helped the City meet its reduction targets and future implementation tools that will insure conservation objectives are met.

9.1 Demand Management Measures (DMM)

California Water Code (CWC) dictates that the following DMM's are addressed in this chapter:

- Water Waste prevention Ordinances
- Metering
- Conservation pricing
- Public education and outreach
- Programs to access and manage distribution system real loss
- Water conservation program coordination and staffing support
- Other demand management measures

9.1.1 Water Waste Prevention Ordinances

The City maintains Ordinance 300u for Water Conservation. The ordinance describes water use restrictions that are effective during the declaration of the City Council supply reductions. The restrictions prohibit wasteful practices and water usage in progressively more restrictive water shortage stages. Penalties are listed and enforced for non-compliance. City Code Enforcement and Public Works staff continually monitor visible water waste within City limits by using conservation letters and door hangars at customers' homes and businesses where water waste is apparent. Follow up notifications are performed by the City's Public Works staff to ensure the water waste issue is resolved. The City currently maintains a Stage 2 Moderate Water Conservation Alert and adjusts to more restrictive stages, as necessary. Additionally, the City has adopted the Water Efficient Landscape Ordinance with the purpose of being at least as effective in conserving water as the Model Water Efficient Landscape Ordinance drafted by the California Department of Water Resources pursuant to Assembly Bill AB 1881.

9.1.2 Metering

All water connections for the city are metered. In 2014, the City completed the final phase in converting all meters to automatic meter reading technology. The City began this endeavor 12 years ago. Since the first phase, battery technology has significantly improved allowing the meter's electronic reading ability to double from ten years to twenty. A representative sample of phase one meters were recently tested and found to be within 1% accuracy, well-within the AWWA standards for meter accuracy for new meters. The meters are now on a 20-year replacement cycle. Master meters for the City are calibrated annually.

The City maintains some commercial account connections that provide indoor use and outdoor irrigation. Depending on the future GPCD trends and other conservation program results, the City may investigate efforts that would split the connection and add a dedicated landscape meter, separating irrigation and potable demands.

9.1.3 Conservation Pricing

The City maintains a rate structure consisting of a fixed connection fee and a volumetric rate. The rate structure provides a significant price signal of water use. The City continues to monitor its revenue needs and compare it to the water demand to provide a conservation-pricing signal and will also update the rate structure, as necessary. In 2017, the City commissioned a Water and Recycled Water Rate Study to set water rates through 2023. The rate study includes a commodity charge which covers conservation and efficiency program efforts.

9.1.4 Public Education and Outreach

The City's Water Use Efficiency program maintains an extensive public information and outreach program in coordination with available IEUA regional programs. The City's outreach efforts provide information on water conservation programs and best practices through multiple mediums such as web postings, printed material, TV, bill stuffers, fliers, and other media.

The information is also displayed and provided at community events and on several dedicated pages on the City website. Also, the City has created online applications for several programs and provided links to rebates to facilitate easier enrollment. Moreover, City staff have increased rebate levels for selected devices. Customers are encouraged to utilize the available programs, rebates, and educational resources to increase their overall water-use efficiency.

In addition to the City's outreach efforts, IEUA also assists with several educational programs; Garden in Every School, National Theater for Children and Shows that Teach. Each of the listed outreach programs are designed to educate faculty and students in becoming more water efficient at school and at home. Tables 9-1 to 9-5 present the number of activities, number of schools, and funding involved from FY 2015/16 to FY 2019/20.

Table 9-1: Community/Education Outreach Program 2015-2016

Program	# of Schools	# of Students	# of Teachers	Funding ($)
National Theater for Children	6	2,900	127	6,050.00
Garden In Every School	1	567	27	10,589.44
Shows That Teach	4	2,241	95	3,650.00

Table 9-2: Community/Education Outreach Program 2016-2017

Program	# of Schools	# of Students	# of Teachers	Funding ($)
National Theater for Children	5	2,087	88	5,200.00
Garden In Every School	2	1,587	29	9,000.00
Shows That Teach	4	2,634	96	2,335.00

Table 9-3: Community/Education Outreach Program 2017-2018

Program	# of Schools	# of Students	# of Teachers	Funding ($)
National Theater for Children	4	1,415	60	4,160.00
Garden In Every School	4	2,779	107	3,303.05
Shows That Teach	2	1,166	N/A	1,950.00

Table 9-4: Community/Education Outreach Program 2018-2019

Program	# of Schools	# of Students	# of Teachers	Funding ($)
National Theater for Children	5	2,198	766	70.00
Garden In Every School	N/A	N/A	N/A	N/A
Shows That Teach	2	1,068	N/A	1,655.00

Table 9-5: Community/Education Outreach Program 2019-2020

Program	# of Schools	# of Students	# of Teachers	Funding ($)
National Theater for Children	7	3,140	121	8,736.00
Garden In Every School	N/A	N/A	N/A	N/A
Shows That Teach	1	829	N/A	954.17

The City is also a member of the Water Education/Water Awareness Committee (WEWAC) which is a coalition of 15 agencies whose mission is to promote efficient water use and increasing public awareness of the importance of water in Southern California. WEWAC offers grants for teachers who complete water conservation related projects, a scholarship contest for high school students and a media contest open to multiple grade levels.

9.1.5 Distribution System Water Loss Control Programs

Water loss control efforts have always been a main component of the water system operations. Pipeline leaks and breaks are repaired as soon as possible to minimize water loss. The City also maintains a water loss component tracking tool developed by the American Water Works Association. The tool, which is also required for California Urban Water Conservation Council (CUWCC) compliance, identifies all quantifiable water usage and potential unquantifiable water uses. Recommendations are provided for further investigation to determine actual water loss, costs, and benefits to eliminate water loss.

9.1.6 Water Use Conservation Coordination & Staffing Support

The City maintains a Water Use Efficiency (WUE) Coordinator position that oversees the regional programs. The coordinator is responsible for the participation and the development of the regional conservation efforts with IEUA and others. Other responsibilities of the WUE Coordinator includes program budgeting, program data collection and analysis, annual reporting requirement of the regional efforts, coordinate UWMP submittal and grant efforts.

9.1.7 Other Demand Management Measures

The City Water Use Efficiency program maintains a school education information and outreach program in coordination with the IEUA regional conservation and education program. The program supports the National Theater for Children which presents water and water use efficiency programs to school children. Numerous age-appropriate water education games and links are provided on the IEUA website. The Garden in Every School program provides grants and information to schools and converts a portion of existing turf area to a water efficient garden.

Conservation staff gives presentations and performs public outreach on water conservation topics to the community, city committee's and city council. In addition, they provide age-appropriate materials on water and water use efficiency. The City also sponsors a water conservation Design-A-Sign contest for grades K-12 conducted through the Recreation section in the Community Services Department. Winning posters are made into street signs and displayed throughout the City. In addition to the Design-A-Sign contest, the City also sponsors a team in the annual MWD Solar Cup Competition.

9.2 Implementation Over The Past Five Years

9.2.1 Free High Efficiency Sprinkler Nozzles

The program offers vouchers for free high efficiency sprinkler nozzles for both residential and commercial irrigation customers. Tables 9-6 and 9-7 show the free sprinkler nozzles rebates and water saved for both residential and commercial customers. Although not available in FY 2018/19 and FY 2019/20, the program is being redesigned in order to be more customer friendly.

Table 9-6: Residential Free Sprinkler Nozzles Program

FY	District Devices Rebates	AF Saved/Year
15/16	295	1
16/17	124	<1
17/18	100	<1
18/19	N/A	N/A
19/20	N/A	N/A

NOTES: Program not available in FY 2018/19 & FY 2019/20

Table 9-7: Commercial Free Sprinkler Nozzles Program

FY	District Devices Rebates	AF Saved/Year
15/16	544	2
16/17	0	0
17/18	0	0
18/19	N/A	N/A
19/20	N/A	N/A

NOTES: Program not available in FY 2018/19 & FY 2019/20

9.2.2 SoCal Water$mart Website

Residential and commercial customers are eligible to participate in multiple rebates through the MWD SoCal Water$mart website. Examples of rebates offered to customers are high efficiency clothes washers, rotary nozzles and weather-based irrigation controllers. MWD funds the program on an annual basis and rebates are available until the fiscal year's budget is expended.

In addition to device rebates, MWD currently offers a rebate for customers to replace turf with a low water use garden. The city has previously taken advantage of this rebate to reduce usage at city properties. Table 9-8 presents the number of completed residential and commercial turf removal projects and water saved from FY 2010/11 through FY 2019/20. Additionally, Table 9-9 presents the district device rebates and water saved for the rotating nozzles program from FY 2010/11 through FY 2019/20.

Table 9-8: Turf Removal Program (Combined – Residential/Commercial)

FY	District Devices Rebates	AF Saved/Year
15/16	27	81
16/17	0	0
17/18	0	0
18/19	17	51
19/20	24	72

Table 9-9: Rotating Nozzles Rebate Program – (Combined – Residential/Commercial)

FY	District Devices Rebates	AF Saved/Year
15/16	0	0
16/17	0	0
17/18	7	<1
18/19	3	<1
19/20	2	<1

9.2.3 IEUA - Smart Controller Direct Installation Program

The IEUA Program installs weather-based irrigation controllers for City water customers who are high water users. The program targets residential lots less than one-quarter of one acre, but who have more than 500 square feet of landscape. Residential customers who qualify and elect to participate are required to attend a workshop on how to use the controller that would be installed. Table 9-10 presents the number of installations of weather-based irrigation controllers from program inception through FY 2019/20.

Table 9-10: IEUA Smart Controller Direct Installation Program

FY	District Devices Rebates	AF Saved/Year
[1]16/17	9	.4
17/18	34	1.6
18/19	24	1
19/20	204	8

NOTES:[1]Program Inception

Tables 9-11 and 9-12 represents the number of rebates provided to residential and commercial customers for Weather-Based Irrigation Controllers (WBIC) from FY 2015/16 through FY 2019/20 through SoCal Water$mart

Table 9-11: Residential WBIC Rebates

FY	District Devices Rebates	AF Saved/Year
15/16	0	0
16/17	34	11
17/18	71	23
18/19	68	22
19/20	91	30

Table 9-12: Commercial WBIC Rebates

FY	District Devices Rebates	AF Saved/Year
15/16	0	0
16/17	0	0
17/18	5	15
18/19	3	9
19/20	2	6

9.2.4 IEUA - Landscape Evaluation and Audit Program

The program offers a landscape and irrigation evaluation. Residential or commercial customers are provided a brief report and a list of recommendations to improve the overall water use efficiency through planting, landscape design, irrigation design, irrigation scheduling, and water use patterns. The program is implemented by IEUA through the Chino Basin Water Conservation District/Water Wise Community Center (CBWCD). Table 9-12 shows the landscape audit program performance through site audits, irrigated acreage audited, and total estimated water savings for FY 2015/2016 through FY 2019/20.

Table 9-12: IEUA/CBWCD - Landscape Audit Program - (Combined – Residential/Commercial)

FY	Total Sites Audits	Total Irrigated Acreage Audited	Total Potential Water Savings (AF/yr)
15/16	9	0.56	<1
16/17	4	0.72	<1
17/18	53	44.6	14
18/19	54	47.04	26
19/20	37	41	35

9.2.5 IEUA – Pressure Regulator Installation Program

The water pressure regulator program offers repair, replacement, or installation of a pressure regulator for City water customers to reduce the water pressure from the public water main to a pressure that is usable by the customer and compatible with normal plumbing and fixtures. It also helps prevent pressure surges from entering the plumbing from the public main. High water pressure can result in dripping faucets and water pipes and damaged appliances. The program typically only covers indoor water pressure and does not assist with landscape pressure issues unless already covered by the existing pressure regulator. Installing a water pressure regulator will save water, energy, maintenance costs, life of appliances, and longevity of pipes. This program began in summer of 2016 and is currently ongoing.

Table 9-13: IEUA – Pressure Regulator Program

FY	Total Sites Audits	Total Potential Water Savings (AF/yr)
[1]15/16	10	<1
16/17	73	1.2
17/18	90	1.5
18/19	92	1.5
19/20	58	1

Note: [1]Program Inception

9.2.6 IEUA – Residential Lots Less than ¼ Acre Landscape Retrofit Program

The Residential Landscape Retrofit program provides outdoor irrigation evaluations and limited retrofits of landscape devices for residential water customers who have been identified as having high water use and a total lot size greater than one-quarter of one acre. Devices include high-efficiency sprinkler nozzles (Section 9.2.1) and weather-based irrigation controllers . Table 9-14 shows the properties that have completed the residential landscape retrofit program and water saved from FY 2015/16 through FY 2019/20.

Table 9-14: IEUA - Residential Landscape Retrofit Program

FY	District Devices Rebates	AF Saved/Year
15/16	12	7
16/17	38	25
17/18	54	35
18/19	9	6
19/20	42	28

9.2.7 IEUA - Residential Irrigation Tune Up Program

The IEUA Residential Irrigation Tune Up Program provides a basic outdoor irrigation evaluation and minor repairs and retrofits for common issues found in residential irrigation systems. The number of services are based off of lot size, but all eligible customers receive assistance with sprinkler and valve repair, sprinkler timer assistance, irrigation scheduling and leak detection. Table 9-15 shows the number of properties that have completed the Tune Up program and water saved from FY 2018/19 to FY 2019/20. The water savings is still being determined and the program is currently ongoing.

Table 9-15: IEUA - Residential Tune Up Program

FY	District Devices Rebates	AF Saved/Year
18/19	9	N/A
19/20	54	N/A

9.2.8 IEUA Annual Regional Water Use Efficiency Report

IEUA's Annual *Regional Water Use Efficiency Report* summarizes water conservation for each member agency. The report for FY 2019/20 is in Appendix J.

9.3 Planned Implementation to Achieve Water Use Targets

The DWR 2020 UWMP Guidelines require a description of the efforts and plans to meet the 20x2020 target requirements. In addition to its own operational conservation programs, the City is also a participating member in the IEUA Regional Water Efficiency Business Plan. IEUA is currently updating the plan for FY 2020/21. The City intends to meet the GPCD target requirements through the combination of its own internal conservation programs and the regional conservation program efforts. The City will also convert some of the existing potable water irrigation customers to recycled water to reduce its GPCD. The City will track monthly production, GPCD, and customer demands to evaluate the program effectiveness and change or modify the program as necessary to maintain compliance.

The City also supports IEUA efforts to continually track and evaluate the regional conservation program for effectiveness and cost efficiency. The IEUA Water Use Efficiency Business Plan evaluates a large group of potential programs to assess water savings potential and impact on the regional alliance GPCD targets. The Business Plan selects programs that can provide the most cost-efficient mix of water savings. The IEUA regional conservation program is evaluated annually for implementation results. Specific programs are also evaluated periodically to confirm or modify water savings estimates. The program verification includes a review of water demands before and after the device installation or program implementation to compare saving assumptions to actual results.

Annual implementation and verification results are used to revise and improve the conservation program on a continuous basis. Currently, the City of Chino Hills has achieved both the 2015 interim target and the 2020 water use target (refer to Section 5).

10. Plan Adoption, Submittal, and Implementation

This section summarizes information regarding the notification, public hearing, adoption, and submittal of Chino Hills' 2020 UWMP and WSCP. The process for amending the UWMP is also discussed.

10.1 Inclusion of All 2020 Data

The UWMP must include all data for 2020. The data provided herein reflects fiscal years beginning July 1. Data submitted for the UWMP is complete through June 30, 2020.

10.2 Notice and Public Hearing

The preparation of the 2020 UWMP was announced in local newspapers, and notifications were sent to IEUA, WFA, City of Chino, MVWD, and CDA 60 days prior to the planned adoption date. Appendix K contains the hearing and adoption notices. The final draft was made available at the Public Works counter at City Hall. Table 10-1 lists the agencies notified.

Table 10-1: Notifications to Cities and Counties (DWR Table 10-1)

Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Inland Empire Utilities Agency	Yes	Yes
Water Facilities Agency	Yes	Yes
City of Chino	Yes	Yes
City of Ontario	Yes	Yes
City of Upland	Yes	Yes
City of Pomona	Yes	Yes
Cucamonga Valley Water District	Yes	Yes
Monte Vista Water District	Yes	Yes
Fontana Water Company	Yes	Yes
Chino Basin Desalter Authority	Yes	Yes
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
San Bernardino County	Yes	Yes

10.3 Public Hearing and Adoption

The City held a public hearing at a regularly scheduled City Council meeting on June 22nd 2021 at 7:00 pm. The adoption was held at the same meeting after the public hearing. Abiding by the Water Conservation Act of 2009, the City (during the public hearing) provided information on baseline values, water use targets, and plan implementation. The 2020 UWMP was made available to the public prior to the public hearing and adoption on the City's website. Notification of the public hearing was advertised in the local newspaper, which is included in Appendix K.

10.4 Plan Submittal and Public Availability

The adopted 2020 UWMP and WSCP was provided electronically to DWR within 30 days of adoption. The plan was also submitted to the State library, the agencies listed in Table 10-1, and made available on the City's website. Per CWC Section 10645, this UWMP and WSCP was made available to the public not later than 30 days after filing a copy of its plan with the City.

10.5 Amending an Adopted UWMP

Any amendments to, or changes in the UWMP will follow the same process of notification, public hearing, adoption, and submittal.

Appendix A
Urban Water Management Plan Check List

UWMP Checklist

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Chapter 1	10615	A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities.	Introduction and Overview	Executive Summary
x	x	Chapter 1	10630.5	Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter.	Summary	Executive summary
x	x	Section 2.2	10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	2.1

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 2.6	10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	2.2
x	x	Section 2.6.2	10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan and contingency plan.	Plan Preparation	2.5
x		Section 2.6, Section 6.1	10631(h)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source.	System Supplies	2.4

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
	x	Section 2.6	10631(h)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	NA
x	x	Section 3.1	10631(a)	Describe the water supplier service area.	System Description	3.1 /3.2
x	x	Section 3.3	10631(a)	Describe the climate of the service area of the supplier.	System Description	3.3
x	x	Section 3.4	10631(a)	Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045.	System Description	3.5.1
x	x	Section 3.4.2	10631(a)	Describe other social, economic, and demographic factors affecting the supplier's water management planning.	System Description	3.5.2
x	x	Sections 3.4 and 5.4	10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	3.5.1/5.2.1
x	x	Section 3.5	10631(a)	Describe the land uses within the service area.	System Description	3.6

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 4.2	10631(d)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	4.1
x	x	Section 4.2.4	10631(d)(3)(C)	Retail suppliers shall provide data to show the distribution loss standards were met.	System Water Use	4.1.2
x	x	Section 4.2.6	10631(d)(4)(A)	In projected water use, include estimates of water savings from adopted codes, plans, and other policies or laws.	System Water Use	4.1.4
x	x	Section 4.2.6	10631(d)(4)(B)	Provide citations of codes, standards, ordinances, or plans used to make water use projections.	System Water Use	Appendix D
x	optional	Section 4.3.2.4	10631(d)(3)(A)	Report the distribution system water loss for each of the 5 years preceding the plan update.	System Water Use	4.1.2
x	optional	Section 4.4	10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	N/A
x	x	Section 4.5	10635(b)	Demands under climate change considerations must be included as part of the drought risk assessment.	System Water Use	4.3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x		Chapter 5	10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	5.2
x		Chapter 5	10608.24(a)	Retail suppliers shall meet their water use target by December 31, 2020.	Baselines and Targets	5.2.2
	x	Section 5.1	10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	NA
x		Section 5.2	10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	NA

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x		Section 5.5	10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5-year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	5.2.2
x		Section 5.5 and Appendix E	10608.4	Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form.	Baselines and Targets	Section 5
x	x	Sections 6.1 and 6.2	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought.	System Supplies	7.1.2 and 7.1.3
x	x	Sections 6.1	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, *including changes in supply due to climate change.*	System Supplies	6.8.1 and 7.2.3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 6.1	10631(b)(2)	When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies.	System Supplies	6
x	x	Section 6.1.1	10631(b)(3)	Describe measures taken to acquire and develop planned sources of water.	System Supplies	Throughout section 6
x	x	Section 6.2.8	10631(b)	Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045.	System Supplies	6.1
x	x	Section 6.2	10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	6.2
x	x	Section 6.2.2	10631(b)(4)(A)	Indicate whether a groundwater sustainability plan or groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Appendix G
x	x	Section 6.2.2	10631(b)(4)(B)	Describe the groundwater basin.	System Supplies	6.2.1

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 6.2.2	10631(b)(4)(B)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Appendix E
x	x	Section 6.2.2.1	10631(b)(4)(B)	For unadjudicated basins, indicate whether or not the department has identified the basin as a high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions.	System Supplies	NA
x	x	Section 6.2.2.4	10631(b)(4)(C)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	6.2.3
x	x	Section 6.2.2	10631(b)(4)(D)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	6.2.1
x	x	Section 6.2.7	10631(c)	Describe the opportunities for exchanges or transfers of water on a short-term or long- term basis.	System Supplies	6.5

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 6.2.5	10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	6.4.1
x	x	Section 6.2.5	10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	6.4.1
x	x	Section 6.2.5	10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	6.4.3
x	x	Section 6.2.5	10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	6.4.2
x	x	Section 6.2.5	10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	6.4.3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 6.2.5	10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	6.4.3
x	x	Section 6.2.6	10631(g)	Describe desalinated water project opportunities for long-term supply.	System Supplies	6.6
x	x	Section 6.2.5	10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area with quantified amount of collection and treatment and the disposal methods.	System Supplies (Recycled Water)	NA
x	x	Section 6.2.8, Section 6.3.7	10631(f)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive water years.	System Supplies	6.7
x	x	Section 6.4 and Appendix O	10631.2(a)	The UWMP must include energy information, as stated in the code, that a supplier can readily obtain.	System Suppliers, Energy Intensity	6.9

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 7.2	10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	7.1.1
x	x	Section 7.2.4	10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	7.1.4
x	x	Section 7.3	10635(a)	Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five consecutive water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	7.1.3
x	x	Section 7.3	10635(b)	Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.	Water Supply Reliability Assessment	7.2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 7.3	10635(b)(1)	Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years.	Water Supply Reliability Assessment	7.2.1
x	x	Section 7.3	10635(b)(2)	Include a determination of the reliability of each source of supply under a variety of water shortage conditions.	Water Supply Reliability Assessment	7.2.2
x	x	Section 7.3	10635(b)(3)	Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.	Water Supply Reliability Assessment	7.2.3
x	x	Section 7.3	10635(b)(4)	Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.	Water Supply Reliability Assessment	7.2.1
x	x	Chapter 8	10632(a)	Provide a water shortage contingency plan (WSCP) with specified elements below.	Water Shortage Contingency Planning	8

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Chapter 8	10632(a)(1)	Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP	Water Shortage Contingency Planning	8.1
x	x	Section 8.10	10632(a)(10)	Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented.	Water Shortage Contingency Planning	8.2
x	x	Section 8.2	10632(a)(2)(A)	Provide the written decision-making process and other methods that the supplier will use each year to determine its water reliability.	Water Shortage Contingency Planning	8.2.1
x	x	Section 8.2	10632(a)(2)(B)	Provide data and methodology to evaluate the supplier’s water reliability for the current year and one dry year pursuant to factors in the code.	Water Shortage Contingency Planning	8.2.2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 8.3	10632(a)(3)(A)	Define six standard water shortage levels of 10, 20, 30, 40, 50 percent shortage and greater than 50 percent shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply.	Water Shortage Contingency Planning	8.3
x	x	Section 8.3	10632(a)(3)(B)	Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories.	Water Shortage Contingency Planning	8.3
x	x	Section 8.4	10632(a)(4)(A)	Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions.	Water Shortage Contingency Planning	8.4
x	x	Section 8.4	10632(a)(4)(B)	Specify locally appropriate demand reduction actions to adequately respond to shortages.	Water Shortage Contingency Planning	8.4

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 8.4	10632(a)(4)(C)	Specify locally appropriate operational changes.	Water Shortage Contingency Planning	8.4.3
x	x	Section 8.4	10632(a)(4)(D)	Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions are appropriate to local conditions.	Water Shortage Contingency Planning	8.4 table 8-8
x	x	Section 8.4	10632(a)(4)(E)	Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action.	Water Shortage Contingency Planning	8.4.1 table 8-9
x	x	Section 8.4.6	10632.5	The plan shall include a seismic risk assessment and mitigation plan.	Water Shortage Contingency Plan	8.4.6
x	x	Section 8.5	10632(a)(5)(A)	Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages.	Water Shortage Contingency Planning	8.5
x	x	Section 8.5 and 8.6	10632(a)(5)(B) 10632(a)(5)(C)	Suppliers must describe that they will inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications.	Water Shortage Contingency Planning	8.5

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x		Section 8.6	10632(a)(6)	Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP.	Water Shortage Contingency Planning	8.6
x	x	Section 8.7	10632(a)(7)(A)	Describe the legal authority that empowers the supplier to enforce shortage response actions.	Water Shortage Contingency Planning	8.7
x	x	Section 8.7	10632(a)(7)(B)	Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3.	Water Shortage Contingency Planning	8.7
x	x	Section 8.7	10632(a)(7)(C)	Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency.	Water Shortage Contingency Planning	NA
x	x	Section 8.8	10632(a)(8)(A)	Describe the potential revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	8.8
x	x	Section 8.8	10632(a)(8)(B)	Provide a description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	8.9

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x		Section 8.8	10632(a)(8)(C)	Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought	Water Shortage Contingency Planning	8.6
x		Section 8.9	10632(a)(9)	Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance.	Water Shortage Contingency Planning	8.9
x		Section 8.11	10632(b)	Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	Water Shortage Contingency Planning	8.11
x	x	Sections 8.12 and 10.4	10635(c)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 30 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	8.12/10.2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 8.14	10632(c)	Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan.	Water Shortage Contingency Planning	8.12
	x	Sections 9.1 and 9.3	10631(e)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	NA
x		Sections 9.2 and 9.3	10631(e)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	9.1
x		Chapter 10	10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance).	Plan Adoption, Submittal, and Implementation	10.2/10.3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 10.2.1	10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Reported in Table 10-1.	Plan Adoption, Submittal, and Implementation	10.3 / Appendix k
x	x	Section 10.4	10621(f)	Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.	Plan Adoption, Submittal, and Implementation	10.4
x	x	Sections 10.2.2, 10.3, and 10.5	10642	Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan.	Plan Adoption, Submittal, and Implementation	10.4
x	x	Section 10.2.2	10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	10.2
x	x	Section 10.3.2	10642	Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	10.3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 10.4	10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	10.4
x	x	Section 10.4	10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	10.4
x	x	Sections 10.4.1 and 10.4.2	10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	10.5
x	x	Section 10.5	10645(a)	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	10.4
x	x	Section 10.5	10645(b)	Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	10.4

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
x	x	Section 10.6	10621(c)	If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings.	Plan Adoption, Submittal, and Implementation	NA
x	x	Section 10.7.2	10644(b)	If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption.	Plan Adoption, Submittal, and Implementation	10.5

Appendix B
Water Conservation Ordinance

ORDINANCE NO. 300u

AN URGENCY ORDINANCE OF THE CITY COUNCIL OF THE CITY OF CHINO HILLS, CALIFORNIA, REPEALING CHAPTER 13.08 WATER CONSERVATION AND ORDINANCE NOS. 286u and 286 OF THE CHINO HILLS MUNICIPAL CODE IN ITS ENTIRETY, AND ESTABLISHING A NEW CHAPTER 13.08 WATER CONSERVATION OF THE CHINO HILLS MUNICIPAL CODE AND FINDING THAT THIS PROJECT IS EXEMPT FROM REVIEW UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF CHINO HILLS DOES HEREBY ORDAIN AS FOLLOWS:

SECTION 1. The City Council does hereby make the following findings of fact:

a. It is necessary to repeal the exisiting Chapter 13.08 Water Conservation and Ordinance Nos. 286u and 286 in order to continue to comply with State of California regulations and current water enacted requirements and to conserve water appropriately.

b. It is necessary to establish a new Chapter 13.08 Water Conservation in its stead in order to continue to comply with California State Water Resources Control Board (Board) Regulations and minimize the potential for water shortages while balancing the needs for the survival of landscape City assets, including trees and other vegetation during drought years.

c. It is necessary to minimize the potential for water shortage through the practice of water conservation pursuant to California Water Code § 375 et seq., based upon the need to conserve water supplies and to avoid or minimize the effects of any future shortage.

d. It is further necessary to reduce the potential effect of a water shortage on the residents, businesses and visitors of Chino Hills and to modify provisions that will continue to reduce the inefficient consumption of water, thereby extending the available water resources necessary for the domestic, sanitation, and fire protection of the community to the greatest extent possible.

e. On January 17, 2014, the Governor issued a proclamation of a state of emergency under the California Emergency Services Act based on drought conditions.

f. On April 25, 2014, the Governor issued a proclamation of a continued state of emergency under the California Emergency Services Act based on continued drought conditions.

g. On April 1, 2015, the Governor issued an Executive Order that, in part, directs the Board to impose restrictions on water suppliers (including the City of Chino Hills) to achieve a statewide 25 percent reduction to potable urban usage through February 28, 2016.

h. On May 5, 2015, the Board adopted California Code of Regulations, Title 23, Section 866 and re-adopted Sections 863, 864, and 865 that requires, among other things, that, beginning June 1, 2015, the City of Chino Hills reduce its total potable water production by 28 percent for each month as compared to the amount used in the same month in 2013.

i. On November 13, 2015, the Governor issued an Executive Order calling for an extension of urban water use restrictions until October 31, 2016 should drought conditions persist through January 2016.

j. On February 2, 2016, the Board adopted extended emergency regulations to be in effect through October 2016 in order to address specific provisions of the Governor's November 13, 2015 Executive Order.

k. On May 9, 2016, the Governor issued an Executive Order that, in part, directs the Board to adjust and extend its emergency water conservation regulations through the end of January 2017 in recognition of the differing water supply conditions for many communities.

l. On May 18, 2016, the Board adopted extended emergency regulations to be in effect through January 2017 in order to address specific provisions of the Governor's May 9, 2016 Executive Order. The Board-adopted regulations (May 18, 2016) to provide specific guidance for the City of Chino Hills, which resulted in the City not having a consumption reduction requirement. The City can demonstrate that over the following three years, assuming drought conditions persist, its water supply slightly exceeds its demand. Nevertheless, the City still must conserve water given the overall drought conditions in the State and the unpredicability of the future.

m. The present year is critically dry in the Southern California area and has been immediately preceded by four or more consecutive below normal precipitation, dry, or critically dry years. While Northern California received some rainfall, the Southern California area received very little and is still in a drought. According to the National Oceanic and Atmospheric Administration (NOAA), June of 2016 is the hottest June on record. This, along with water-use restrictions adopted by the City, including the two-days per week irrigation restrictions, has resulted in a tremendous number of dead, dying and distressed trees within the City. There are indications that the upcoming months will likely continue the trend of dry and very hot weather.

n. Given the lessening of the State water restrictions on the City of Chino Hills, the public good requires that trees and vegetation that have suffered in the drought years receive an additional watering day from the current two times per week restriction. Concurrent with this Ordinance, the City Council plans to take an action to reduce the water restrictions from Stage III to Stage II. However, given the strong public need for water conservation, prior to this reduction, the public good requires that Stage II restrictions be strengthened to incorporate some of the conservation measures previously included in Stage III.

o. California Water Code Section 375 et seq. empower any public entity which supplies water at retail or wholesale to adopt and enforce a water conservation program to reduce the quantity of water used by those within its service area after holding a public hearing and making appropriate findings of necessity for the adoption of a water conservation program.

p. Pursuant to California Water Code Section 375, on July 2, 2016 the City published notice in the Chino Champion, a regularly published newspaper, a notice of the time and place of the July 12, 2016 public hearing on the proposed urgency Ordinance. A duly noticed public hearing before the City Council will be conducted on July 12, 2016 at which time all interested persons will be given an opportunity to testify.

q. Based on the facts noted above, and all other facts presented to the City Council, this Ordinance is adopted for the immediate preservation of the public peace, health or safety and is passed by no less than a four-fifths vote of the City Council.

SECTION 2. The City Council finds that this Ordinance is exempt from review under the California Environmental Quality Act (California Public Resources Code §§ 21000, et seq., "CEQA") and CEQA regulations (Title 14 California Code of Regulations §§ 15000, et seq.) because it consists of the operation of existing facilities involving no expansion of use and consists of actions taken to assure the maintenance, protection and enhancement of natural resources and the environment. Consequently, it is categorically exempt from further CEQA review under California Code of Regulations Title 14, §§ 15301, 15307 and 15308.

SECTION 3. That Chapter 13.08 Water Conservation of the Chino Hills Municipal Code and Ordinance Nos. 286u and 286 are hereby repealed in their entirety.

SECTION 4. That Chapter 13.08 Water Conservation of the Chino Hills Municipal Code is hereby adopted and shall read as follows:

Chapter 13.08
WATER CONSERVATION

13.08.010 - Findings of Necessity.

It is necessary to minimize the potential for water shortage through the practice of water conservation pursuant to California Water Code § 375 et seq., based upon the need to conserve water supplies and to avoid or minimize the effects of any future shortage. It is further necessary to reduce the potential effect of a water shortage on the residents, businesses and visitors of Chino Hills and to adopt provisions that will significantly reduce the inefficient consumption of water, thereby extending the available water resources necessary for the domestic, sanitation, and fire protection of the community to the greatest extent possible. Nothing in this chapter shall prevent the City from also declaring a water emergency pursuant to Water Code Section 350.

13.08.020 - Water Customer.

Water customer, for the purposes of this chapter, shall mean any person, partnership, business, corporation, or association or legal entity to whom the City of Chino Hills (City) supplies water or user of water supplied by the City.

13.08.030 - Application.

This chapter shall be applicable to all water customers.

13.08.040 - Exceptions and Exemptions.

A. **Exceptions**. The City Manager or his/her designee shall grant an exception from the requirements of this chapter for any of the following reasons:
   1. Water use is necessary for public health and safety; or
   2. Recycled water is being used; or
   3. Water use is necessary due to the medical needs of the water customer.

B. **Exemptions**. The Public Works Commission may grant an exemption to the requirements of this chapter, with or without conditions, if it determines that a water customer would otherwise experience extreme financial hardship that cannot be mitigated. The Public Works Commission shall review any requests for an exemption from compliance with this chapter. A written request for an exemption must be submitted to the Public Works Department a minimum of two weeks prior to the Commission meeting at which the exemption is to be considered. If appropriate, the Public Works Commission may require the customer granted an exemption to reduce water use by other appropriate alternative methods. A decision of the Public Works Commission may be appealed to the City Council in accordance with Chino Hills Municipal Code Section 1.20.010. The City Council may establish by resolution an "exemption processing fee."

13.08.050 - Authorization.

The City Council may declare the conservation stage based on any of the following circumstances:

- Issuance of a water emergency executive order by the Governor of California; or
- Adoption of certain regulations by the California State Water Resources Control Board; or
- Major interruptions in water supply from Metropolitan Water District, the Inland Empire Utilities Agency or any other major water supplier to the City; or
- Occurrence of a major water emergency emanating from a natural or man-caused disaster.

As declared, the City Council shall see to the enforcement of all prohibitions and restrictions as outlined in the following four stages:

Stage 1 - Voluntary Water Conservation Alert;

Stage 2 - Moderate Water Conservation Alert;

Stage 3 - High Water Conservation Alert; and

Stage 4 - Severe Water Conservation Alert.

13.08.060 - Stage I Voluntary Water Conservation Alert.

Chino Hills water customers are requested to voluntarily limit the amount of water used from March 1st through October 31st of each year to the amount absolutely necessary for health, safety, business, and irrigation. During Stage 1, all elements of the prohibitions and restrictions for moderate, high and severe conservation alerts shall apply on a voluntary basis.

13.08.070 - Stage II Prohibitions and Restrictions - Moderate Water Conservation Alert.

The following restrictions and exceptions shall be applicable during a Moderate Water Conservation Alert as declared by the City Council, whenever the City's water supply is anticipated to be reduced by up to ten (10) percent, and voluntary conservation does not achieve the desired reduction, or whenever any of the conditions noted under Section 13.08.050 are met requiring conservation measures noted in this stage:

A. All residential customers shall be limited in the outdoor use of water for sprinkling, watering, or irrigating any shrubbery, trees, lawns, grass, groundcovers, plants, vines, gardens, vegetables, flowers, or any other landscaped or vegetated areas to a three days per week schedule based on street address. Designated days of irrigation: Residential addresses ending in an even number may use water on Mondays, Wednesdays and Saturdays and residential addresses ending in an odd number may use water on Tuesdays, Thursdays and Sundays. All such irrigation may only occur between 12:01 a.m. and 9:00 a.m. or between 6:00 p.m. and 12:00 a.m. and shall not exceed fifteen (15) minutes per watering-station, except for drip or micro-spray irrigation systems which shall not exceed 30 minutes per station. No irrigation shall occur between the hours of 9:00 a.m. and 6:00 p.m.;

B. Non-residential customers, including commercial nurseries, golf courses, institutions and other water dependent industries shall be prohibited from watering lawns, landscapes, or other turf areas more than three times per week. Such irrigation may only occur on Mondays, Wednesdays and Fridays between 12:01 a.m. and 9:00 a.m. or between 6:00 p.m. and 12:00 a.m. and shall not exceed fifteen (15) minutes per watering-station during assigned days, except for drip or micro-spray irrigation systems which shall not exceed 30 minutes per station. No irrigation shall occur between the hours of 9:00 a.m. and 6:00 p.m. Entities using recycled water are exempted from this prohibition for their recycled water use. However, such entities are not exempted for their potable water use;

C. The outside irrigation of landscapes with City-supplied potable water for new construction of homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission;

D. The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall is prohibited. Measureable rainfall is defined as rainfall of one tenth of an inch (1/10") or more falling within a forty-eight (48) hour period;

E. Applying potable water to outdoor landscapes in a manner that causes runoff such that water flows onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures;

F. Applying potable water to any hard surface, including but not limited to driveways, sidewalks, parking areas, asphalt, patios, porches, verandas;

G. Permitting water to leak on any premises. Such leak shall be repaired in a timely manner after notification by the City, but in no case in excess of forty-eight (48) hours after notification;

H. Serving of drinking water other than upon request in eating or drinking establishments, including but not limited to restaurants, hotels, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased;

I. Using potable water in a non-residential fountain or other decorative water feature, except where the water is part of a recirculating system;

J. Using water from fire hydrants shall be limited to fire fighting and related activities necessary to maintain the public health, safety, and welfare. An exception may be made for construction use through a proper City-designated meter where recycled water is not available;

K. Permitting non-commercial washing of privately owned livestock, trailers, buses or boats, except from a bucket and/or a hand-held hose equipped with a shut-off nozzle used for a quick rinse;
L. Using a hand-held hose that dispenses potable water without a shut-off valve. Such use shall not be in conflict with any provision within this code.
M. Swimming pool refilling or new-construction swimming pool filling shall be limited to the same days as set forth in subsection A for outdoor use of water; and
N. Washing of vehicles or boats is prohibited except:
    1. When using a hose that is equipped with a shut-off valve; or
    2. When washed in either an automatic or manual commercial car wash. Notwithstanding the above, temporary car washes held for fundraising purposes are prohibited.

13.08.080 - Stage III Prohibitions and Restrictions - High Water Conservation Alert.

The following restrictions and exceptions shall be applicable during a High Water Conservation Alert as declared by the City Council whenever the City's water supply is anticipated to be reduced by more than ten (10%) percent and up to twenty-five (25%) percent or whenever any of the conditions noted under Section 13.08.050 are met requiring conservation measures noted in this Stage:

A. All prohibitions and restrictions in Section 13.08.070 shall be in effect;
B. All residential customers shall be limited in the outdoor use of water for sprinkling, watering, or irrigating any shrubbery, trees, lawns, grass, groundcovers, plants, vines, gardens, vegetables, flowers, or any other landscaped or vegetated areas to a two days per week schedule based on street address. Designated days of irrigation: Residential addresses ending in an even number may use water on Wednesdays and Saturdays and residential addresses ending in an odd number may use water on Thursdays and Sundays. All such irrigation may only occur between 12:01 a.m. and 9:00 a.m. or between 6:00 p.m. and 12:00 a.m. and shall not exceed fifteen (15) minutes per watering-station, except for drip or micro-spray irrigation systems which shall not exceed 30 minutes per station. No irrigation shall occur between the hours of 9:00 a.m. and 6:00 p.m.;
C. Non-residential customers, including commercial nurseries, golf courses, institutions and other water dependent industries shall be prohibited from watering lawns, landscapes, or other turf areas more than twice per week. Such irrigation may only occur on Tuesdays and Fridays between 12:01 a.m. and 9:00 a.m. or between 6:00 p.m. and 12:00 a.m. and shall not exceed fifteen (15) minutes per watering-station during assigned days, except for drip or micro-spray irrigation systems which shall not exceed 30 minutes per station. No irrigation shall occur between the hours of 9:00 a.m. and 6:00 p.m. Entities using recycled water are exempted from this

prohibition for their recycled water use. However, such entities are not exempted for their potable water use. Alternatively, non-residential customers may be exempted from this prohibition by reducing their potable water usage by 28 percent from their usage in 2013;

D. To promote water conservation, operators of hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily. The hotel or motel shall prominently display notice of this option in each guestroom using clear and easily understood language;

E. Use of potable water for dust control is prohibited where recycled water is readily available for connection by the property owner.

13.08.090 - Stage IV prohibitions and restrictions - Severe Water Conservation Alert.

In the event of a major earthquake, large-scale fire, or other so called "Act of Nature" which could have serious impacts on the City's total available water storage capacity, whether storage capacities have been reduced or not, or in the case of a reduction in City water supply anticipated to be more than twenty-five (25%) percent or whenever any of the conditions noted under Section 13.08.050 are met requiring conservation measures noted in this Stage, a Severe Water Conservation Alert shall be declared by the City Council. The following conservation measures shall apply:

A. All previous restrictions noted in Sections 13.08.070 and 13.08.080 shall be in effect;

B. There shall be no outdoor use of water at any time, including the use of a hand-held hose with shut-off valve;

C. All decorative fountains, decorative (i.e., non-swimming) pools shall be drained and made dry. Such fountains and pools shall not be refilled until the City has returned to a Stage III water conservation stage. Fountains, ponds or pools that are filled with recycled water are not subject to this provision. Decorative ponds that contain fish as a feature shall be exempt from this restriction as long as the system is maintained in good working order with measures taken to reduce the volume of makeup water required for evaporative losses; and

D. No commitments shall be made to provide water service as part of any new land use entitlement (general plan, specific plan or amendments requesting new water allocations) until the City has returned to a Stage III drought restriction. Currently approved specific plans with accompanying development agreements and projects or properties that have received water allocations in advance of full entitlements may be issued building permits so long as they comply with the remainder of this chapter.

13.08.100 - Penalties.

A. No water customer of the City shall knowingly use, or permit the use of, water in a manner contrary to any provision of this chapter, or in an amount in excess of that use permitted by the provisions of this chapter;
B. Unless otherwise provided, any water customer violating any provision of this chapter shall be guilty of an infraction or misdemeanor as specified in this section, and each day or portion thereof such violation, which is in existence, shall be a new and separate offense;
C. Any violation of this chapter is deemed an infraction, punishable as provided in Section 1.36.020 of this code. Subsequent violations shall also be punished as provided in Section 1.36.020 of this code;
D. Notwithstanding the above, the City Attorney or Deputy District Attorney may charge and prosecute second and subsequent offenses as misdemeanors at the City's sole discretion pursuant to California Water Code § 377. In addition to the above penalties, the City may file an action for civil abatement and, at the discretion of the court, be entitled to reimbursement for all necessary costs and attorney's fees incurred through investigation, discovery, analysis, inspection, abatement and other actual costs incurred by the City or its agents pertaining to the violation;
E. The court shall fix the amount of any such reimbursements upon submission of proof of such costs by the City. Payment of any penalty provided in this section shall not relieve a person, firm or corporation, or other entity from the responsibility of correcting the condition resulting from the violation; and
F. In addition to the above remedies, the City Manager or his/her designee is empowered, to enforce any or all of the following penalties:
   1. Place a flow restricting device upon the water service;
   2. Lock-off a water meter;
   3. Remove a water meter; and
   4. Shut-off the service connection.

All costs or expenses incurred by the City for enforcement of this section shall be borne by the water customer. No water service shall be limited or discontinued until the City Manager or his/her designee provides a written notice of intent to so limit or discontinue such service and the reasons for such decision, and further, provides such water customer notice of the right to request an administrative review and hearing pursuant to the procedures set forth in Section 1.18.090 of this code, except that any reference to "citation" in that section shall instead be deemed a reference to a "notice of intent" as described in this section. A written notice of intent shall be provided either by first class mail, by personal service to the water customer, or by posting said notice in a conspicuous place on the property wherein the violation occurred. Notwithstanding any other provision of this code, there shall be no right to further administrative review or appeal.

13.08.110 - Compliance.

Any City Code Enforcement Officer, Water Use Efficiency Coordinator and any other employee designated by the City Manager shall enforce the provisions of this chapter.

13.08.120 - Implementing policies.

The City Manager is authorized to promulgate policies and procedures to implement this chapter.

SECTION 5. If any section, subsection, subdivision, sentence, clause, phrase, or portion of this Ordinance is, for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this Ordinance. The City Council hereby declares that it would have adopted this Ordinance, and each section, subsection, subdivision, sentence, clause, phrase, or portion thereof, irrespective of the fact that any one or more sections, subsections, subdivisions, sentences, clauses, phrases, or portion thereof be declared invalid or unconstitutional.

SECTION 6. This Ordinance must be broadly construed in order to achieve the purposes stated in this Ordinance. It is the City Council's intent that the provisions of this Ordinance be interpreted or implemented by the City and others in a manner that facilitates the purposes set forth in this Ordinance.

SECTION 7. Repeal of any provision of the Chino Hills Municipal Code does not affect any penalty, forefeiture, or liability incurred before, or preclude prosecution and imposition of penalties for any violation occurring before, this Ordinance's effective date. Any such repealed part will remain in full force and effect for sustaining action or prosecuting violations occurring before the effective date of this Ordinance.

SECTION 8. The City Clerk shall certify as to the adoption of this Ordinance in its entirety thereof to be published within ten (10) days of the adoption and shall post a certified copy of this Ordinance, including the vote for and against the same, in the Office of the City Clerk, in accordance with Government Code Section 36933 and Water Code Section 376.

SECTION 9. This Ordinance shall take effect immediately as an urgency Ordinance necessary for the preservation of the public peace, health or safety, pursuant to California Government Code Section 36937(b).

INTRODUCED, APPROVED AND ADOPTED at a regular meeting of the City Council of the City of Chino Hills, California this 12th day of July, 2016.

Art Bennett

ART BENNETT, MAYOR

ATTEST:

CHERYL BALZ, CITY CLERK

APPROVED AS TO FORM:

Elizabeth M. Calciano

MARK D. HENSLEY, CITY ATTORNEY Elizabeth M. Calciano, Asst. City Attorney

STATE OF CALIFORNIA)
COUNTY OF SAN BERNARDINO) ss
CITY OF CHINO HILLS)

I, CHERYL BALZ, City Clerk of the City of Chino Hills, DO HEREBY CERTIFY that Ordinance No. 300u was duly introduced at a regular meeting held July 12, 2016; and adopted at a regular meeting of the City Council held on the 12th day of July, 2016 by the following vote, to wit:

AYES:	COUNCIL MEMBERS:	BENNETT, MARQUEZ, MORAN, ROGERS
NOES:	COUNCIL MEMBERS:	NONE
ABSENT:	COUNCIL MEMBERS:	GRAHAM

CHERYL BALZ, CITY CLERK

I hereby certify that the foregoing is the original of Ordinance No. 300u duly passed and adopted by the Chino Hills City Council at their regular meeting held on July 12, 2016 and that the Ordinance in its entirety was published on July 16, 2016 the Chino Hills Champion newspaper.

CHERYL BALZ, CITY CLERK

Appendix C
AWWA Water Audits

Validator Provided

Certified Validation Report

Audit Information:

Water Supplier Name: City of Chino Hills PWS ID: 3610036

System Type: Potable Audit Period: Fiscal Year 2019-2020

Utility Representation: Cheryl Yeamans, Jacob Loukeh

Validation Date: 9/14/20 Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 69 Data Validity Band (Level): Level III (51-70)

ILI: 1.59 Real Loss: 28.39 (gal/conn/day) Apparent Loss: 2.09 (gal/conn/day)

Non-revenue water as percent of cost of operating system: 3.1%

Certification Statement by Validator:

This water loss audit report has been Level 1 validated per the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34.

All recommendations on volume derivation and Data Validity Grades were incorporated into the water audit. ☒

If not, rejected recommendations are included here.

Validator Information:

Water Audit Validator: Mark Wiley Qualifications: Certified AWWA Water Loss Validator

Certified Validation Report

Utility Provided

Water Supplier Name: City of Chino Hills **Water Supplier ID Number:** 3610036 **Water Audit Period:** Fiscal Year 2019-2020

Water Audit & Water Loss Improvement Steps:

Utility to provide steps taken in preceding year to increase data validity, reduce real loss and apparent loss as informed by the annual validated water audit:

The City created a GIS position and hired an employee to address inaccuracies and update mapping and technical pipeline data in 2017. City staff repaired two leaking storage reservoirs at the end of this audit period. Over-age meter replacement is continuing on a 15 year cycle for all size potable meters, with approximately 1,500 meters exchanged during the audit period. Water meters have been installed on all vehicles that use City system water (water trucks, vactors, street sweepers, etc.). The City hired a contractor to replace corroding saddles in this audit and in next year's audit. For the third audit in a row, City owned wells were taken off-line due to the new MCL for TCP. The City is now 100% reliant on purchased water from the State, and two neighboring water agencies. Two extensive leak audits were performed in the city with no major deficiencies found. There was an extreme delta between this year's real losses and last year's. This auditor is very suspect of the meter calibration from CDA and MVWD as no reports were provided and also the city's new billing system.

Certification Statement by Utility Executive:

This water loss audit report meets the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34 and has been prepared in accordance with the method adopted by the American Water Works Association, as contained in their manual, *Water Audit and Loss Control Programs, Manual M36, Fourth Edition* and in the Free Water Audit Software version 5.

Executive Name (Print)	Executive Position	Signature	Date
Daniel Bobadilla, P.E.________________	Director of Public Works and Engineering__	____________________________	____________________

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Validity Grade
1	Volume from Own Sources	VOS	N/A	Supply meter profile: Wells Inactivated VOS input derived from: Manual reads from production meters as archived. Comments: No meter test documentation, due to wells off-line. Recycled Water not included confirmed.	Percent of own supply metered: 100% Signal calibration frequency: N/A Volumetric testing frequency: Annual, N/A Volumetric testing method: N/A Percent of own supply tested and/or calibrated: N/A Comments: Wells off-line due to contamination, did not have tested during audit period.
2	VOS Master Meter & Supply Error Adjustment	VOS MMSEA	N/A	Input derivation: N/A Net Storage change included in MMSEA input: No Comments: No additional comments	Supply meter read frequency: N/A Supply meter read method: Manual and automatic logging. Frequency of data review for trends & anomalies: Monthly Storage levels monitored in real-time: Yes Comments: No additional comments
3	Water Imported	WI	7	Import meter profile: Water is imported from three agencies: WFA, CDA and MVWD. MVWD and WFA flows through two common meters maintained by MVWD. WI input derived from: Totalization of volumes per daily meter reads from importer and exporter. Comments: Volumetric and calibration data supplied by CDA Volumetric by MVWD.	Percent of import supply metered: 100% Signal calibration frequency: Annually for CDA Volumetric testing frequency: Annually for CDA Volumetric testing method: Pitot Percent of import supply testes and/or calibrated: 100% Comments: No additional comments.
4	WI Master Meter & Supply Error Adjustment	WI MMSEA	3	Input derivation: 3 Comments: No additional comments.	Imported meter read frequency: Daily Imported meter read method: Manual and automatic data logging. Frequency of data review for trends and anomalies: Monthly Comments: No additional comments
5	Water Exported	WE	N/A		
6	WE Master Meter & Supply Error Adjustment	WE MMSEA	N/A		

7	Billed Metered	BMAC	7	Customer meter profile: Master Meter Manufacturer Age profile: Meters range in age up to 15 years Reading System: AMR Read frequency: Monthly Comments: Lag- time correction is not determined in input derivation. Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.	Percent of customers metered: 100% Small meter testing policy: Reactive – complaint based or flagged consumption testing only. Number of small meters tested/year: Not quantified but known to be small. Large meter testing policy: Reactive – complaint based or flagged consumption testing only. Number of large meters tested/year: Not quantified but known to be small. Meter replacement policy: Customer meters are replaced every 15 years. Number of replacements/year: Entire meter stock was replaced in 2004-05, replacement is cycling back. Billing data auditing: Standard billing QC, plus review of volumes by use type each billing cycle. Comments: No additional comments
8	Billed Unmetered	BUAC	N/A		
9	Unbilled Metered	UMAC	9	Profile: Includes street sweepers, vactor and water trucks, flushing. Input derivation: Direct from monthly meter reads. Comments: Input derivation from supporting documents confirmed.	Policy for billing exemptions: Own facilities plus other exemptions including street sweepers, vactors and water trucks. Comments: No additional comments.
10	Unbilled Unmetered	UUAC	3	Profile: Includes Fire Department usage. Comments: Custom California default of .25% used.	Comments: Default grade applied.
11	Unauthorized Consumption	UC	5	Comments: Default input applied.	Comments: Default grade applied.
12	Customer Metering Inaccuracies	CMI	3	Input derivation: Rudimentary estimate Comments: See BMAC regarding meter testing & replacement activities.	Characterization of meter testing: Limited (upon request and consumption flag only). Characterization of meter replacement: Customer meters are replaced every 15 years. Comments: No additional comments.
13	Systematic Data Handling Errors	SDHA	5	Comments: Default input applied.	Comments: Default grade applied.
14	Length of Mains	LM	3	Input derivation: Total from GIS based Map. Hydrant leads included: Not Included. Comments: No additional Comments.	Mapping format: Digital Asset management database: In place but separate from GIS.

					Map updates & field validation: Field validation regularly takes place. Comments: The City hired a dedicated GIS staff person to address deficiencies this audit period.
15	Number of Service Connections	NS	9	Input derivation: Standard report run from billing system. Basis for database query: Account ID, Non- premise based. Comments: Inactive connections are included.	CIS updates & field validation: Accomplished through normal meter reading process. Approximately 100 re-reads occur monthly. Estimated error of total count within: Less than 1% Comments: No additional comments.
16	Average Length of Cust. Service Line	LP	5	Comments: Default input applied.	Comments: Default grade applied.
17	Average Operating Pressure	AOP	3	Number of zones, general profile: Operate four pressure zones with 53 PRV's Typical pressure range: 45 -160 PSI Input derivation: Rudimentary Estimate Comments: No additional comments.	Extent of static pressure data collection: Hydrant flow test and pressures are collected at the request of residents and Fire Department personnel. Characterization of real-time pressure data collection: Real-time monitoring limited to reservoir levels. Hydraulic model: None currently in place. Comments: No additional comments.
18	Total Annual Operating Cost	TAOC	9	Input derivation: From official financial reports Comments: Confirmed costs limited to water only, water service and CIP included.	Frequency of internal auditing: Annually Frequency of third-party CPA auditing: Annually Comments: No additional comments.
19	Customer Retail Unit Cost	CRUC	9	Input derivation: All rate classes included. Comments: Customers are billed on a modified water budget rate structure.	Characterization of calculation: This number was derived by dividing the total volume-based revenues by the total volume of potable water delivered in CCF Comments: No additional comments.
20	Variable Production Cost	VPC	7	Supply profile: Own sources and import supply. Primary costs included: Imported & treatment costs. Secondary costs included: Power Comments: No additional comments.	Characterization of calculation: Input calculations have not been reviewed by an M36 water loss expert. Comments: No additional comments.

Key Audit Metrics

(~) VALIDITY Data Validity Score: 69 Data Validity Band (Level): Level III (51-70)

(#) VOLUME ILI: 1.59 Real Loss: 28.39 (gal/conn/day) Apparent Loss: 2.09 (gal/conn/day)

($) VALUE Annual Cost of Real Losses: $866,845 Annual Cost of Apparent Losses: $63,861

Infrastructure & Water Loss Management Practices:

Infrastructure age profile: Average infrastructure age generally falls around 30 years, and a small amount of infrastructure is 50+ years in age.
Infrastructure replacement policy (current, historic): Due to corrosive soils, infrastructure is replaced with PVC, any buried metallic appurtenances are wrapped in plastic.
Estimated main failures/year: 12 Estimated service failures/year: 19
Extent of proactive leakage management: The City is proactively replacing mild steel saddles with bronze saddles in problematic areas. Approximately 1 mile of deficient water main and service lines are scheduled for replacement in the next year. Two leaking potable reservoirs were identified and repaired. The City is has a hired a consultant to execute a Master Plan and design a hydraulic model. MVWD's meters may be over-registering.
Other water loss management comments: Soils are highly corrosive and severely affect infrastructure.

Comments on Audit Metrics & Validity Improvements

The infrastructure Leakage Index (ILI) of 1.59 describes a system that experiences leakage at 1.59 times the modeled technical minimum for its system characteristics. This number is unrealistic and should be higher.

The Data Validity Score falling within Band III (51-70) suggests that next steps may be focused simultaneously on improving data reliability and evaluating interventions for water and revenue loss recovery. Opportunities to improve the reliability of audit inputs and outputs include:

- Install automatic data-logging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.
- Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.
- Conduct accountability checks to confirm that all imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.
- Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.

- Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.
- Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).
- Expand meter accuracy testing to a larger group of meters.
- Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.
- Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.
- Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.
- Formalize a procedure to use pressure gauging/data-logging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
+ Click to add a comment

Water Audit Report for: City of Chino Hills (CA3610036)
Reporting Year: 2018 | 7/2017 - 6/2018

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

	Grade	Value	Unit	Grade (adj.)	Pcnt	Value	Unit
Volume from own sources:	5	1,289.736	acre-ft/yr	3			acre-ft/yr
Water imported:	4	12,023.550	acre-ft/yr	2			acre-ft/yr
Water exported:	n/a	0.000	acre-ft/yr				acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: **13,313.286** acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons

	Grade	Value	Unit	Pcnt	Value	Unit
Billed metered:	5	13,189.510	acre-ft/yr			
Billed unmetered:	n/a	0.000	acre-ft/yr			
Unbilled metered:	9	3.973	acre-ft/yr			
Unbilled unmetered:	3	33.283	acre-ft/yr		33.283	acre-ft/yr

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: **13,226.766** acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption)

86.520 acre-ft/yr

Apparent Losses

	Grade	Value	Unit	Pcnt	Value	Unit
Unauthorized consumption:		33.283	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

	Grade	Value	Unit	Pcnt	Value	Unit
Customer metering inaccuracies:	3	33.066	acre-ft/yr	0.25%		acre-ft/yr
Systematic data handling errors:	5	13.280	acre-ft/yr		13.280	acre-ft/yr

Apparent Losses: **79.630** acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: **6.890** acre-ft/yr

WATER LOSSES: **86.520** acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: **123.776** acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grade	Value	Unit
Length of mains:	3	300.8	miles
Number of active AND inactive service connections:	9	22,038	
Service connection density:		73	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 3 | 80.0 psi

COST DATA

	Grade	Value	Unit
Total annual cost of operating water system:	10	$23,060,082	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$2.52	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	7	$1,087.54	$/acre-ft

☐ Use Customer Retail Unit Cost to value real

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 57 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Water imported

2: Customer metering inaccuracies

3: Billed metered

AWWA Free Water Audit Software: Reporting Worksheet

WAS
American Water Works Association.

? Click to access
+ Click to add a

Water Audit Report for: City of Chino Hills (CA3610036)
Reporting Year: 2019 | 7/2018 - 6/2019

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

Item	Grade	Value	Units	Master Meter Grade	Pcnt	Value	Units
Volume from own sources:	n/a	0.000	acre-ft/yr				acre-ft/yr
Water imported:	9	12,270.370	acre-ft/yr	9			acre-ft/yr
Water exported:	n/a	0.000	acre-ft/yr				acre-ft/yr
WATER SUPPLIED:		**12,270.370**	acre-ft/yr				

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

Item	Grade	Value	Units	Pcnt	Value	Units
Billed metered:	7	12,176.210	acre-ft/yr			
Billed unmetered:	n/a	0.000	acre-ft/yr			
Unbilled metered:	9	3.780	acre-ft/yr			
Unbilled unmetered:	3	30.676	acre-ft/yr		30.676	acre-ft/yr
AUTHORIZED CONSUMPTION:		**12,210.666**	acre-ft/yr			

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption)

59.704 acre-ft/yr

Apparent Losses

Item	Grade	Value	Units	Pcnt	Value	Units
Unauthorized consumption:		30.676	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Item	Grade	Value	Units	Pcnt	Value	Units
Customer metering inaccuracies:	3	12.176	acre-ft/yr		12.176	acre-ft/yr
Systematic data handling errors:	5	6.640	acre-ft/yr		6.640	acre-ft/yr
Apparent Losses:		**49.492**	acre-ft/yr			

Real Losses (Current Annual Real Losses or CARL)

Item	Value	Units
Real Losses = Water Losses - Apparent Losses:	**10.212**	acre-ft/yr
WATER LOSSES:	**59.704**	acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: **94.160** acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Item	Grade	Value	Units
Length of mains:	3	300.8	miles
Number of active AND inactive service connections:	9	22,038	
Service connection density:		73	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Item	Grade	Value	Units
Average operating pressure:	3	80.0	psi

COST DATA

Item	Grade	Value	Units
Total annual cost of operating water system:	9	$25,341,118	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$2.61	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	7	$846.03	$/acre-ft

☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 76 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Customer metering inaccuracies
2: Water imported
3: Billed metered

Appendix D
Demand Projection Methdology

3.2 Demand Projections

This section provides an overview of the demand projection methodology and demand forecast for the City of Chino Hills. Hazen selected a demand forecast approach that segments water consumption into standardized sectors based on billing classification (e.g., single family residential, multi-family residential) and characterizes consumption based on water using intensity (i.e., rate of use) and a measure of the number of services/customers (i.e., driver units). This "rate of use times driver unit" approach is characterized by Equation 1 below, where for any given model sector Q reflects volumetric consumption, N is the count of driver units, and q is the rate of water use.

$$Q \equiv N * \frac{Q}{N} \equiv N * q \quad (1)$$

In order to forecast demand using Equation 1, the future rate of water use, and the projected number of driver units must be defined. The rate of water use is known to vary with several factors, including weather, socioeconomic conditions, and drought. In order to estimate the future rate of use, linear regressions were developed to understand the relationship between historical water consumption and the variability in explanatory factors. The historical regressions were applied using assumptions of future conditions (refer to Section 3.2.2) to produce a forecasted rate of use. Future volumetric demand was developed by multiplying the forecasted rate of use by projections of driver units based on information from regional planning agencies (e.g., Southern California Agency of Governments (SCAG)).

The following sections define the historical data used to develop the historical regressions, future assumptions used in demand forecast development, and projections of water use for the City.

3.2.1 Historical Data and Development of Linear Regressions

Linear regressions relating historical water use to explanatory variables were developed to understand variability in water consumption and forecast future rate of water use. This section reviews the historical data used to develop the linear regressions and documents the performance of the linear regression output relative to historical water use.

3.2.1.1 Definition of Model Sectors

Historical records of billed water consumption were segmented into standardized water use sectors (i.e., model sectors) including single family residential; multi-family residential; Commercial, Industrial, and Institutional (CII); and other. Table 3-2 translates the City's billing classification categories to model sectors and defines the driver units for each sector. Regression equations were estimated for the single family, multi-family, and CII sectors which are further described in Section 3.2.1.2. Regression equations were not developed for the other sector; rather future use was estimated based on the historical proportion of total consumption.

Table 3-2: Model Sector Definitions by Billing Classification

Model Sector	Billing Classification	Driver Units
Single Family Residential	All single-family accounts	Housing units
Multi-Family Residential	All Multi-family accounts	Housing units
CII	Government, CII, Landscape, non-residential accounts	Number of jobs
Other[1]	Fire Lines, Temporary Service	N/A
[1] Projections are based on historical averages		

3.2.1.2 Historical Data and Model Fit

Several historical data sources were used to develop the regression models for single family, multi-family, and CII sectors. A summary of this historical data sources and their purpose in the regression model is presented in Table 3-3.

Table 3-3: Summary of Historical Data Sources Used for Regression Development

Purpose	Source	Data Element	Details and Period of Record
Historical consumption	City of Chino Hills	Billed consumption totaled to model sectors in Table 3-2	2006-2019
Historical driver units	CA Dept of Finance	Number of single family and multi-family housing units	2006-2019
	US Census	Number of jobs	2006-2019
Explanatory variables	City of Chino Hills	Drought restrictions	2007- May 2015: Stage 0 June 2015- July 2016: Stage 3 July 2016-present: Stage 2
	California Irrigation Management Information System (CIMIS)	Maximum daily Temperature (degrees Fahrenheit) Precipitation (inches per month)	Raw data obtained for 2006-2019 Deviation from 30-year average values used in regression equations
	Economic Cycles Research Institute (ECRI)	National coincident economic index	Raw index obtained for 2006-2019 Index processed to remove long term trend to better capture short-term economic fluctuations (e.g., the Great Recession)
	N/A	Calculated seasonal cycle	Sine/cosine functions to capture annual diurnal pattern

The regression models provided good fits for each model sectors. R^2 for Single Family, Multi-family and CII are 0.92, 0.75 and 0.77 respectively. Figure 3-4 to Figure 3-6 show plots of historical observed rate of water use compared to modeled per driver unit demand.

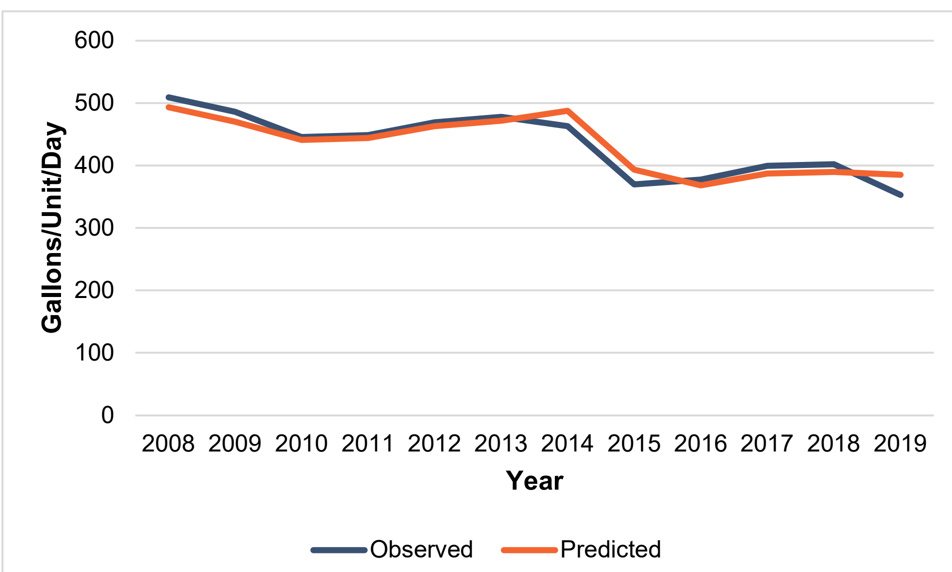

Figure 3-4: Historical and Predicted Single Family Rate of Water Use

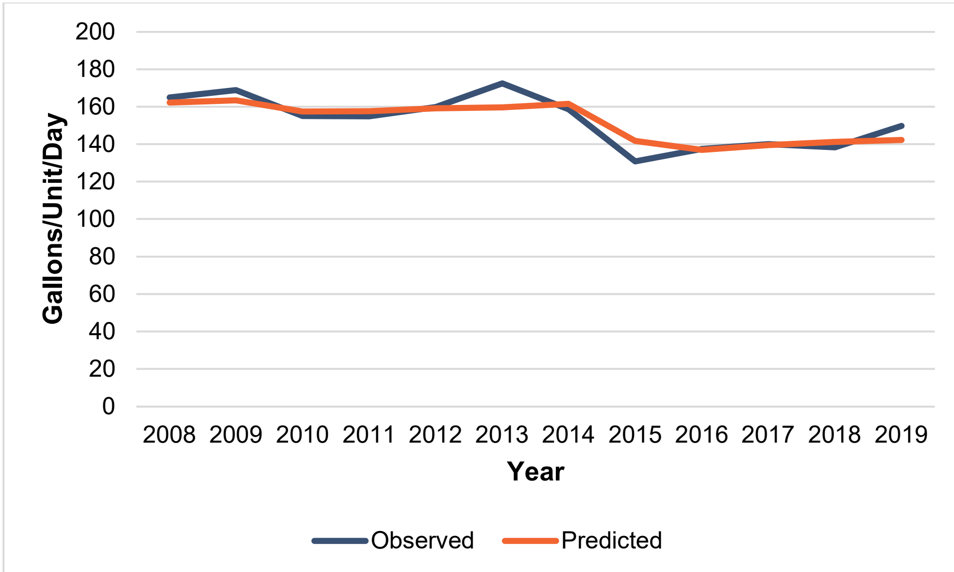

Figure 3-5: Historical and Predicted Multi-family Rate of Water Use

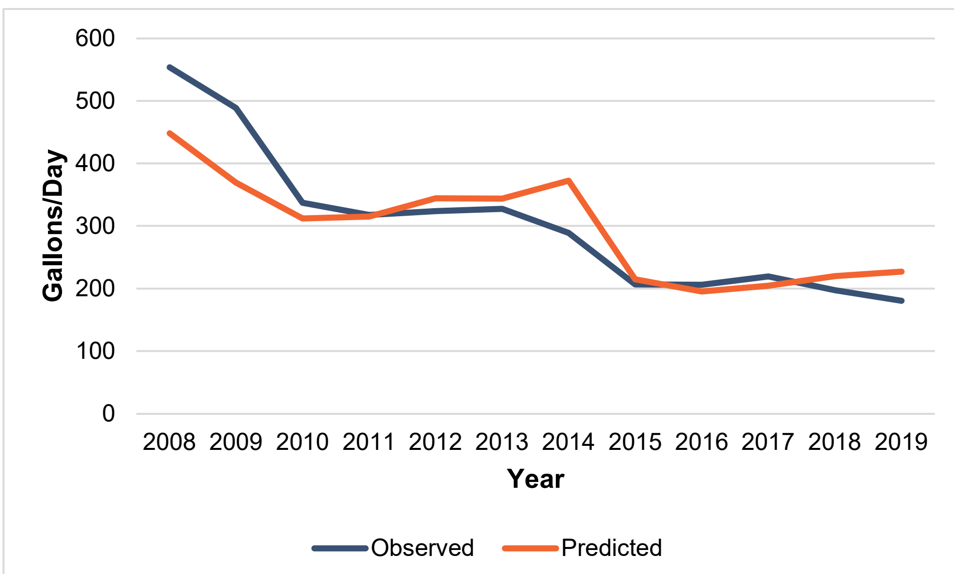

Figure 3-6: Historical and Predicted CII Rate of Water Use

3.2.2 Assumptions of Future Conditions Affecting Demand

This section reviews the assumptions associated with future conditions used in the regression models to develop demand projections for the City.

3.2.2.1 Driver Units

Projected diver units for single family and multi-family residential sectors were calculated based on both SCAG housing projections and Regional Housing Needs Allocation (RHNA) buildout requirements. SCAG housing projections provide a single number of total housing units, which needed to be disaggregated to the single family and multi-family sectors. RHNA provided housing type requirements for full buildout (assumed here to be 2045). RHNA total new housing and SCAG percent increase per year were combined to develop separate single and multi-family housing driver unit time series.

SCAG also provided total job projections which were used for future CII driver units.

3.2.2.2 Explanatory Variables

Future values of the explanatory variables identified in Table 3-3 were developed assuming continuance of "normal" (i.e., long-term average) conditions into the future. Precipitation and temperature were assumed to be consistent with the most recent historic 30-year average. The economic index was assumed to follow the historic long-term trend. The City anticipates remaining in Stage 2 drought restrictions for the foreseeable future. However, to provide a level of conservatism appropriate for master planning to the demand projections, the future drought stage was assumed to be Stage 1 through 2045.

3.2.2.3 Calibration

Calibration factors were calculated for each model sector and applied to the projected water use based on 2018 and 2019 values of observed vs modeled yearly per unit consumption. The calibration corrects for any systematic errors in the overall magnitude of the historical model predictions relative to observed consumption. The 2018 and 2019 demands were used for the calibration because the City was still under Stage 3 drought restriction in 2017 which alters water use patterns.

3.2.3 Projected Water Use

Table 3-4 shows the total projected demand and projected demand by water use sector in five-year increments from 2020 to 2045. Figure 3-7 details the total projected water demand relative to the historical billed consumption.

Table 3-4: Projected Water Demand by Sector

Year	Single Family (AF)	Multi-Family (AF)	CII (AF)	Other/ Non-Revenue (AF)	Total (AF)	Total (MGD)
2020	9,331	1,013	3,960	88.3	14,393	12.8
2025	9,479	1,092	4,003	88.8	14,663	13.1
2030	9,627	1,170	4,046	89.4	14,933	13.3
2035	9,769	1,246	4,089	89.9	15,194	13.6
2040	9,905	1,318	4,132	90.4	15,446	13.8
2045	10,041	1,390	4,175	90.9	15,698	14.0

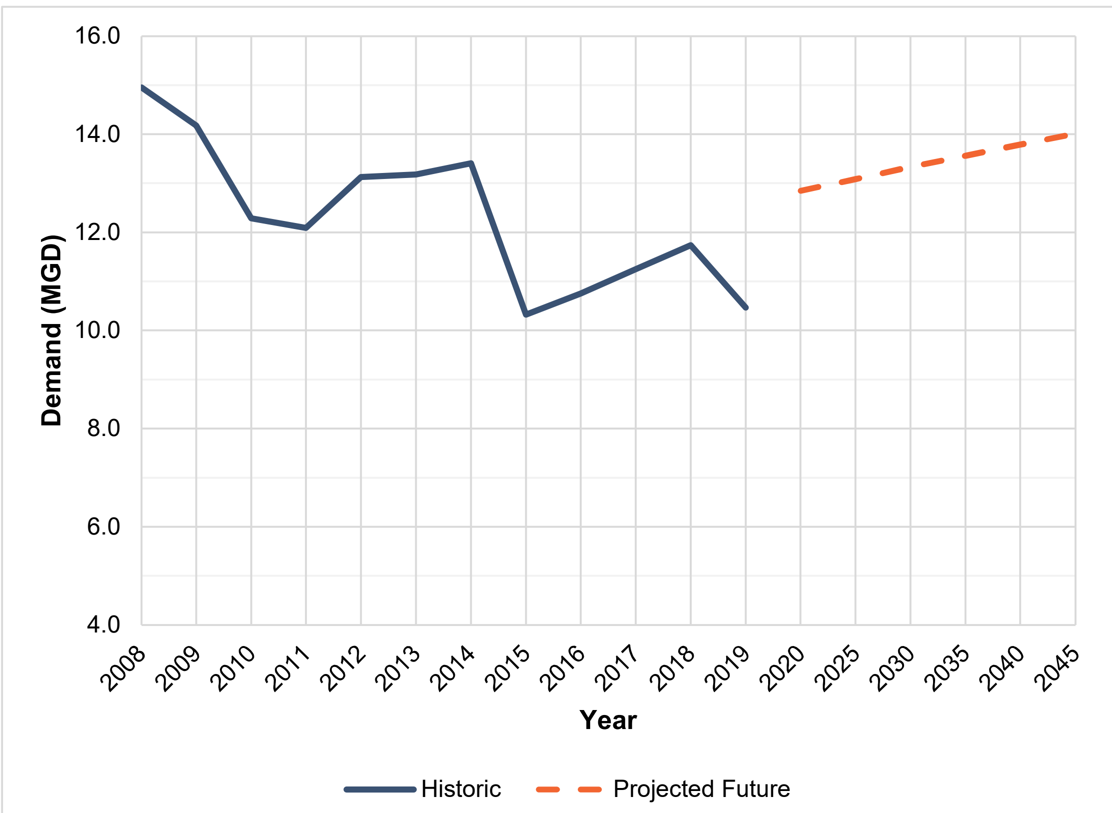

Figure 3-7: Total Projected Water Demand

Appendix E
Contractual Agreements with Water Wholesale Agencies

EXECUTION COPY

WATER PURCHASE AGREEMENT

Dated as of January 15, 2002

By and Between

CHINO BASIN DESALTER AUTHORITY

and

THE CITY OF CHINO HILLS

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EXHIBITS

Exhibit A.	Schedule of Project Allotments	A-1
Exhibit B.	Form of Opinion of District Counsel	B-1
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WATER PURCHASE AGREEMENT

This Agreement, dated as of January 15, 2002, by and between the Chino Basin Desalter Authority (the "Authority"), a joint exercise of powers agency duly organized and existing pursuant to Article 1, Chapter 5, Division 7, Title 1 of the Government Code (the "Joint Powers Act"), commencing with Section 6500, and the City of Chino Hills, California (the "Purchaser").

WITNESSETH:

WHEREAS, the Purchaser and certain other water purveyors in the Chino Basin have entered into the Integrated Chino-Arlington Desalters System Term Sheet (the "Term Sheet") pursuant to which such water purveyors have made a contractual commitment to purchase desalted water from certain desalting facilities (capitalized terms used herein and not otherwise defined shall have the meanings set forth below);

WHEREAS, in order for the Purchaser to receive desalter water, certain facilities described in the Term Sheet and comprising the Project must be acquired and constructed by the Authority;

WHEREAS, the Authority and the Purchaser now wish to enter into this Agreement to provide for the acquisition, construction, operation and financing of the Project, for the sale by the Authority to the Purchaser of the Purchaser's Project Allotment and certain other matters;

NOW THEREFORE, the parties hereto do agree as follows:

Section 1. Definitions.

The following terms shall, for all purposes of this Agreement have the following meanings:

"Authority" shall have the meaning assigned thereto in the preamble hereto.

"Authority Bonds" means bonds, notes or other evidences of indebtedness issued by or on behalf of the Authority to finance or refinance the Project.

"Authority Fiscal Year" means the twelve month period commencing on July 1 of each calendar year and ending on the following June 30 or such other twelve month period which may be designated by the Authority as its fiscal year.

"Bonds" mean all bonds, notes or similar obligations (but not including Contracts) of the Purchaser authorized and issued by the Purchaser under and pursuant to applicable laws of the State of California after the date of execution of this Agreement, the principal of and interest on which are an operation and maintenance expense of the Purchaser Water System determined in accordance with generally accepted accounting principles and which are secured by a pledge or a lien on Purchaser Net Water System Revenues and which are on a parity with the obligations of the Purchaser under this Agreement.

"Bond Resolution" means the resolution or resolutions providing for the issuance of Authority Bonds and the terms thereof, and any indenture or trust agreement related thereto.

"Contract Payments" means:

(1) the interest payable during such Purchaser Fiscal Year on all outstanding Bonds, assuming that all outstanding term Bonds are redeemed or paid from sinking fund payments as scheduled (except to the extent that such interest is to be paid from the proceeds of the sale of any Bonds);

(2) that portion of the principal amount of all outstanding serial Bonds maturing during such Purchaser Fiscal Year;

(3) that portion of the principal amount of all outstanding term Bonds required to be redeemed or paid during such Purchaser Fiscal Year; and

(4) that portion of payments under Contracts (other than under this Agreement) constituting principal and interest required to be made at the times provided in the Contracts.

"Contracts" means this Agreement and all contracts of the Purchaser authorized and executed by the Purchaser under and pursuant to the applicable laws of the State of California after the date of execution of this Agreement, the payments under which are an operation and maintenance expense of the Purchaser Water System determined in accordance with generally accepted accounting principles and which are secured by a pledge of or lien on the Purchaser Net Water System Revenues and which are on a parity with the obligations of the Purchaser under this Agreement.

"Debt Service" means, as of the date of calculation and with respect to Authority Bonds, an amount equal to the sum of (i) interest payable during such Authority Fiscal Year on Authority Bonds, except to the extent that such interest is to be paid from capitalized interest, (ii) that portion of principal of Authority Bonds payable during such Authority Fiscal Year, (iii) amounts necessary to replenish the Reserve Fund created pursuant to the Bond Resolution, and (iv) all letters of credit and other financing costs payable on a periodic basis. Such interest, principal installments and financing costs for such series shall be calculated on the assumption that no Authority Bonds outstanding at the date of calculation will cease to be outstanding except by reason of the payment of principal on the due date thereof;

provided further that, as to any such Authority Bonds bearing or comprising interest at other than a fixed rate, the rate of interest used to calculate Debt Service shall be one hundred ten percent (110%) of the greater of (a) the daily average interest rate on such Authority Bonds during the twelve (12) calendar months preceding the date of calculation (or the portion of the then current Authority Fiscal Year that such Authority Bonds have borne interest) or (b) the most recent effective interest rate on such Authority Bonds prior to the date of calculation; and

provided further that, as to any such Authority Bonds or portions thereof bearing no interest but which are sold at a discount and which discount accretes with respect to such Authority Bonds or portions thereof, such accreted discount shall be treated as interest in the calculation of Debt Service; and

provided further that the amount on deposit in a debt service reserve fund on any date of calculation of Debt Service shall be deducted from the amount of principal due at the final maturity of the Authority Bonds for which such debt service reserve fund was established and in each preceding Authority Fiscal Year until such amount is exhausted.

"Facilities Acquisition Agreement" means the Facilities Acquisition Agreement, dated as of January 15, 2002, by and between SAWPA and the Authority, as such Facilities Acquisition Agreement may be amended or supplemented from time-to-time.

"Fixed Project Costs" means capital costs, including Debt Service, and reserves for repair and replacement and improvement to the Project and for payment of Debt Service of the Project, and all other amounts paid by the Authority other than Variable O&M Costs and Fixed O&M Costs.

"Fixed O&M Costs" means operation, maintenance, power, replacement and other costs, including Project Operation and Maintenance Expenses and a reasonable reserve for contingencies, in each case incurred by the Authority with respect to the Project, irrespective of the amount of water delivered to the Project Participants, including but not limited to amounts required to be deposited in the Membrane Replacement Fund, and amounts payable to Jurupa Community Services District under the Agreement By And Between The Chino Basin Desalter Authority, Jurupa Community Services District, The City Of Ontario, The City Of Norco And Santa Ana River Water Company Providing For The Transportation Of Chino II Desalter Water.

"Independent Certified Public Accountant" means any firm of certified public accountants appointed by the Purchaser, or the Authority, as the case may be, and each of whom is independent pursuant to the Statement on Auditing Standards No. 1 of the American Institute of Certified Public Accountants.

"Joint Powers Agreement" means the Joint Exercise of Powers Agreement creating the Chino Basin Desalter Authority, as such agreement may be amended or supplemented from time to time.

"Project" means certain facilities necessary to deliver desalted water to the Project Participants, including the following: (i) the Chino I Desalter, (ii) the Chino I Expansion facilities, (iii) Chino II Desalter; and (iv) water pipelines, electric generators and associated facilities. The Authority and the Purchaser acknowledge that portions of the Project are currently being designed and that the definition of the Project may be revised from time-to-time prior to commencement of construction as provided in Section 4 hereof without amendment to this Agreement.

"Project Allotment" means 4,200 acre-feet of desalted water per year.

"Project Operation and Maintenance Expenses" means the actual costs spent or incurred by the Authority for maintaining and operating the Project, calculated in accordance with generally accepted accounting principles and Section 9 hereof, including (among other things) the expenses of management and repair and other expenses necessary to maintain and preserve the Project, in good repair and working order, and including administrative costs of the Authority, overhead, insurance, taxes (if any), fees of auditors, accountants, attorneys or engineers and insurance premiums, and including all other reasonable and necessary costs of the Authority, or charges required to be paid by it to comply with the terms of the Authority Bonds or of this Agreement, but excluding in all cases (i) depreciation, replacement and obsolescence charges or reserves therefor, (ii) amortization of intangibles or other bookkeeping entries of a similar nature, (iii) costs of capital additions, replacements, betterments, extensions or improvements to the Project, which under generally accepted accounting principles are chargeable to a capital account or to a reserve for depreciation and (iv) Debt Service.

"Project Participant" mean the Purchaser and each entity listed in Exhibit A hereto executing Water Purchase Agreements with the Authority.

"Purchaser" shall have the meaning assigned thereto in the preamble hereto.

"Purchaser Fiscal Year" means the twelve month period commencing on July 1 of each year and ending on the following June 30 or such other twelve month period which may be designated by the Purchaser as its fiscal year.

"Purchaser Net Water System Revenues" means, for any Purchaser Fiscal Year, the Purchaser Water System Revenues for such Purchaser Fiscal Year less the Purchaser Operation and Maintenance Expenses for such Purchaser Fiscal Year.

"Purchaser Operation and Maintenance Expenses" means the costs spent or incurred by the Purchaser for maintaining and operating the Purchaser Water System, calculated in accordance with generally accepted accounting principles, including (among other things) the expenses of management and repair and other expenses necessary to maintain and preserve the Purchaser Water System, in good repair and working order, and including administrative costs of the Purchaser, salaries and wages of employees, payments to the Public Employees Retirement System, overhead, insurance, taxes (if any), fees of auditors, accountants, attorneys or engineers and insurance premiums, and all other reasonable and necessary costs of the Purchaser, but excluding in all cases (i) depreciation, replacement and obsolescence charges or reserves therefor, (ii) amortization of intangibles or other bookkeeping entries of a similar nature, and (iii) charges for the payment of principal and interest on Bonds or Contracts.

"Purchaser Share" means the Purchaser's Project Allotment divided by the sum of all Project Participants' Project Allotments, all as set forth as Exhibit A hereto.

"Purchaser Water System" means properties and assets, real and personal, tangible and intangible, of the Purchaser now or hereafter existing, used or pertaining to the acquisition, treatment, reclamation, transmission, distribution and sale of water, including all additions, extensions, expansions, improvements and betterments thereto and equipment relating thereto; provided, however, that to the extent the Purchaser is not the sole owner of an asset or property or to the extent that an asset or property is used in part for the above described water purposes, only the Purchaser's ownership interest in such asset or property or only the part of the asset or property so used for water purposes shall be considered to be part of the Purchaser Water System.

"Purchaser Water System Revenues" means the income, rents, rates, fees, charges, and other moneys derived by the Purchaser from the ownership or operation of Purchaser Water System including, without limiting the generality of the foregoing, (i) all income, rents, rates, fees, charges or other moneys derived from the sale, furnishing, and supplying of water and other services, facilities, and commodities sold, furnished, or supplied through the facilities of Purchaser Water System, including standby and availability charges, capital water facilities fees for design, construction and reconstruction expenses, development fees and other fees allocable to the Purchaser Water System, (ii) taxes or assessments as may be imposed if the levy thereof and payment hereunder is permitted by law, and (iii) the earnings on and income derived from amounts set forth in clauses (i) and (ii) above, and shall not include (y) customers' deposits or any other deposits subject to refund until such deposits have become the property of the Purchaser and (z) proceeds of any taxes or assessments except taxes or assessments described in clause (ii) above.

"SAWPA" means the Santa Ana Watershed Project Authority, a joint exercise powers agency, including the successors and assigns thereof.

"Term Sheet" shall have the meaning assigned thereto in the preamble hereto.

"Trustee" means the entity or entities designated by the Authority pursuant to any Bond Resolution to administer any funds or accounts required by such Bond Resolution or otherwise.

"Variable O&M Costs" means the operation, maintenance, power, replacement and other costs, including Project Operation and Maintenance Expenses incurred by the Authority in connection with the Project in an amount which is dependent upon and varies with the amount of water delivered to the Project Participants.

"Water Purchase Agreement" means this Agreement and each Water Purchase Agreement by and between the Authority and a Project Participant, as the same may be amended or supplemented from time to time.

Section 2. Purpose.

The purpose of this Agreement is for the Authority to sell Project Allotment to the Purchaser, to deliver Project Allotment to the Purchaser available from the Project, to provide the terms and conditions of such delivery and sale and to provide for the acquisition, construction and financing of the Project. The parties hereto confirm that this Agreement constitutes a contractual right to purchase desalted water and that no water right is being transferred by the Authority to any Project Participant under this Agreement.

Section 3. Financing, Construction and Operation.

The Authority will use its best efforts to cause or accomplish the acquisition, construction, operation and financing of the Project, the obtaining of all necessary authority and rights, consents and approvals, and the performance of all things necessary and convenient therefor, subject to compliance with all necessary federal and state laws, including but not limited to the California Environmental Quality Act ("CEQA"), the terms and conditions of the Authority's permits and licenses and all other agreements relating thereto.

Section 4. Delivery of Water.

(a) Request by Purchaser. Pursuant to the terms of this Agreement, the Authority shall provide to the Purchaser, and the Purchaser shall take, or cause to be taken, in each Authority Fiscal Year an amount of water equal to the Purchaser's Project Allotment unless the Purchaser notifies the Authority, pursuant to procedures to be developed by the Authority, that the Purchaser requires an amount of water less than the Purchaser's Project Allotment. Subject to the Project Participant's payment obligations hereunder, the Authority agrees to use its best efforts to deliver desalted water pursuant to this Agreement meeting the water quality standards set forth in Section 5.3 of the Joint Powers Agreement and all applicable local, state and federal water quality standards as such standards may be in effect from time to time.

(b) Points of Delivery; Flow Rate. The Authority will deliver or cause to be delivered to or for the account of the Purchaser the amount of water specified in each request at a flow rate and through delivery structures at a point along the Project to be agreed upon by the Authority and the

Purchaser. The Authority will remain available to make or cause to be made all necessary and possible arrangements for transmission and delivery of such water in accordance with this Agreement.

(c) Delivery of Water Not Delivered in Accordance with Schedule. If in any Authority Fiscal Year the Authority, as a result of causes beyond its control, is unable to deliver any portion of the Purchaser's Project Allotment for such Authority Fiscal Year as provided for in the delivery schedule established for that Authority Fiscal Year, the Purchaser may elect to receive the amount of water which otherwise would have been delivered to it during such period at other times during the Authority Fiscal Year or subsequent to such Authority Fiscal Year, to the extent that such water is then available and such election is consistent with the Authority's overall delivery ability, considering the then current delivery schedules of all Project Participants and the Authority.

(d) SARWC Request. Pursuant to the Joint Powers Agreement, if Santa Ana River Water Company cannot receive the full 1,200 acre feet of water allocated thereto as provided in the Term Sheet, then Jurupa Community Services District and the City of Ontario will abate their deliveries of water from the Project on a pro-rata basis to ensure that Santa Ana River Water Company can receive the full 1,200 acre feet of water from the Authority for such year. Notwithstanding the foregoing, Jurupa Community Services District and the City of Ontario shall only have such obligation if Santa Ana River Water Company's demand for water is constant or at a "steady-rate" of 744 gpm.

Section 5. Curtailment of Delivery for Maintenance Purposes.

(a) Authority May Curtail Deliveries. The Authority may temporarily discontinue or reduce the delivery of water to the Purchaser hereunder for the purposes of necessary investigation, inspection, maintenance, repair, or replacement of any of the Project facilities necessary for the delivery of water to the Purchaser. The Authority shall notify the Purchaser as far in advance as possible of any such discontinuance or reduction, except in cases of emergency, in which case notice shall be given as soon thereafter as possible.

(b) Purchaser May Receive Later Delivery of Water Not Delivered. In the event of any discontinuance or reduction of delivery of water pursuant to subsection (a) of this Section, the Purchaser may elect to receive the amount of water which otherwise would have been delivered to it during such period under the water delivery schedule for that Authority Fiscal Year at other times during the Authority Fiscal Year or subsequent to such Authority Fiscal Year to the extent that such water is then available and such election is consistent with the Authority's overall delivery ability, considering the then current delivery schedules of all Project Participants and the Authority.

Section 6. Shortage in Water Supply.

In any Authority Fiscal Year in which there may occur a shortage or interruption in the supply of water available for delivery to the Project Participants, including but not limited to shortages or interruptions caused by changes in laws, regulations or rulings relating to or affecting the Authority's permits and licenses, with the result that such supply is less than the total of the annual Project Allotments of all Project Participants for that Authority Fiscal Year, the Authority shall reduce the delivery of water to the Purchaser in accordance with the Joint Powers Agreement.

Section 7. Measurement of Water Delivered.

The Authority shall measure, or cause to be measured, all water delivered to the Purchaser and shall keep and maintain accurate and complete records thereof. For this purpose and in accordance with Section 4 hereof, the Authority shall install, operate, and maintain, or cause to be installed, operated and maintained, at all delivery structures for delivery of water to the Purchaser at the point of delivery determined in accordance with Section 4(b) such measuring devices and equipment as are satisfactory and acceptable to both parties. Said devices and equipment shall be examined, tested, and serviced by the Authority regularly to insure their accuracy. At any time or times, the Purchaser may inspect such measuring devices and equipment, and the measurements and records taken therefrom.

Section 8. Responsibility for Delivery and Distribution of Water.

(a) Neither the Authority nor any of its officers or agents shall be liable for the control, carriage, handling, use, disposal, or distribution of water supplied to the Purchaser after such water has passed the points of delivery established in accordance with Section 4(b) hereof; nor for claim of damage of any nature whatsoever, including but not limited to property damage, personal injury or death, arising out of or connected with the control, carriage, handling, use, disposal or distribution of such water beyond said points of delivery and including attorneys fees and other costs of defense in connection therewith; the Purchaser shall indemnify and hold harmless the Authority and its officers, agents, and employees from any such damages or claims of damages.

(b) Neither the Purchaser nor any of its officers, agents, or employees shall be liable for the control, carriage, handling, use, disposal, or distribution of water supplied to the Purchaser until such water has passed the points of delivery established in accordance with Section 4(b) hereof; nor for claim of damage of any nature whatsoever, including but not limited to property damage, personal injury or death, arising out of or connected with the control, carriage, handling, use, disposal or distribution of such water prior to such water passing said points of delivery and including attorneys fees and other costs of defense in connection therewith; the Authority shall indemnify and hold harmless the Purchaser and its officers, agents, and employees from any such damages or claims of damages.

Section 9. Rates and Charges.

(a) Establishment of Rates and Charges. The Authority shall fix charges to the Purchaser under this Agreement to produce revenues to the Authority from the Project equal to the amounts anticipated to be needed by the Authority to pay the actual cost of producing the Purchaser's Project Allotment, which shall include the following costs of the Authority to deliver the Purchaser's Project Allotment through the Project: (i) Fixed Project Costs, (ii) Fixed O&M Costs and (iii) Variable O&M Costs.

(b) Insufficiency of Funds. If Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs collected by the Authority are insufficient to operate and maintain the Project as contemplated under the Joint Powers Agreement, the Authority shall notify the Purchaser of such insufficiency and the Purchaser shall pay to the Authority an amount of such insufficiency equal to such insufficiency multiplied by the Purchaser Share. The obligation of the Purchaser to pay Fixed Project Costs and Fixed O&M Costs shall commence and continue to exist and be honored by the Purchaser whether or not water is furnished to it from the Project at all times or at all (which provision may be characterized as an obligation to pay all costs on a take-or-pay basis whether or not water is delivered or provided and whether or not the Project is completed or is operable).

(c) Source of Payments. The obligation of the Purchaser to make payments under this Agreement is a limited obligation of the Purchaser and not a general obligation thereof. The Purchaser shall make payments under this Agreement solely from Purchaser Water System Revenues as a Purchaser Operation and Maintenance Expense. The Purchaser shall make such payments on a parity with other Purchaser Operation and Maintenance Expenses and prior to any other payments other than Bonds or Contracts. Nothing herein shall be construed as prohibiting (i) the Purchaser from using any other funds and revenues for purposes of satisfying any provisions of this Agreement or (ii) from incurring obligations payable on a parity with the obligations under this Agreement so long as the Purchaser complies with Section 13(a) hereof.

(d) Obligation Is Not Subject To Reduction. The Purchaser shall make payments of Fixed Project Costs and Fixed O&M Costs under this Agreement whether or not the Project is completed, operable, operated or retired and notwithstanding the suspension, interruption, interference, reduction or curtailment of operation of the Project or of water contracted for in whole or in part for any reason whatsoever. Such payments are not subject to any reduction, whether offset or otherwise, and are not conditioned upon performance by the Authority or any other Project Participant under this Agreement or any other agreement.

(e) Several Obligation. The Purchaser shall not be liable under this Agreement for the obligations of any other Project Participant. The Purchaser shall be solely responsible and liable for performance of its obligations under this Agreement. The obligation of the Purchaser to make payments under this Agreement is a several obligation and not a joint obligation with those of the other Project Participants.

(f) Allocation of Costs and Expenses.

The Authority shall not allocate costs and expenses in any way which discriminates among Project Participants.

(i) Method of Computation of Fixed Project Costs and Fixed O&M Costs. The Fixed Project Costs shall be sufficient to return to the Authority those capital costs of the Authority necessary to deliver water to the Purchaser. The Fixed O&M Costs shall be sufficient to return to the Authority Project Operation and Maintenance Expenses and a reasonable reserve for contingencies, in each case incurred by the Authority with respect to the Project, irrespective of the amount of water delivered to the Project Participants. The total amount of Fixed Project Costs shall be allocated to the Purchaser by multiplying the Purchaser Share times all Fixed Project Costs. The total amount of Fixed O&M Costs shall be allocated to the Purchaser by multiplying the Purchaser Share times all Fixed O&M Costs.

(ii) Method of Computation of Variable O&M Costs. The Variable O&M Costs shall return to the Authority those costs of the Project which constitute Variable O&M Costs. There shall be computed for the Project a charge per acre-foot of water which will return to the Authority the total projected Variable O&M Costs of the Project for each Authority Fiscal Year. The parties confirm that if the Purchaser complies with the notice requirement of Section 4(a), no Variable O&M Costs will be allocated to the Purchaser for the portion of Project Allotment not produced by the Authority for the Purchaser.

(iii) Adjustments. The Authority shall update the values and amounts of Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs on a quarterly basis, including year-to-date comparisons to the approved Project budget in order that the costs and expenses to the Purchaser may accurately reflect increases or decreases from Authority Fiscal Year to Authority Fiscal Year in Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs. In addition, each such determination shall include an adjustment to be paid or received by the Purchaser for succeeding Authority Fiscal Years which shall account for the differences, if any, between projections of Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs used by the Authority in determining the amounts of said Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs for all preceding Authority Fiscal Years and actual Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs incurred by the Authority for water delivered to the Purchaser during such Authority Fiscal Years.

(iv) Interest Earnings. Interest earnings on all amounts paid by the Purchaser to the Authority shall be credited to the Purchaser through the budgeting process.

(g) Time and Method of Payment.

(i) Fixed Project Costs and Fixed O&M Costs. The Purchaser shall pay to the Authority, on or before June 30 of each Authority Fiscal Year, 100% of the charge to the Purchaser for the next succeeding Authority Fiscal Year of the Fixed Project Costs and Fixed O&M Costs; provided that the Purchaser shall not be obligated to pay Fixed Project Costs or Fixed O&M Costs for any Authority Fiscal Year prior to Authority Fiscal Year [insert date].

(ii) Variable O&M Costs. The Purchaser shall pay to the Authority the charges to the Purchaser for the Variable O&M Costs on the date the Chino 1 Desalter is acquired by the Authority and thereafter for the three-month period commencing on the next succeeding January 1, April 1, July 1 or October 1 so that the Authority receives quarterly payments of Variable O&M Costs three months in advance of the time when such Variable O&M Costs will begin to be incurred by the Authority.

(iii) Statement of Charges. The Authority shall furnish the Purchaser with a written statement of the estimated Fixed Project Costs for the next succeeding Authority Fiscal Year, taking into account applicable credits received by the Authority and estimated investment earnings on moneys related to the Project held by the Authority. The Authority shall, on or before March 15, June 15, September 15 and December 15 of each Authority Fiscal Year, commencing on the date the Chino 1 Desalter is acquired by the Authority, furnish the Purchaser with a statement of the charges to the Purchaser for the Variable O&M Costs for the three-month period commencing on the July 1, October 1, January 1 or April 1, commencing three and one-half months subsequent to such date.

(iv) Contest of Accuracy of Charges. If the Purchaser questions or disputes the correctness of any billing statement by the Authority, it shall pay the Authority the amount claimed when due and shall, within thirty (30) days of the completion and delivery of the Authority's annual audit, request an explanation from the Authority. If the bill is determined to be incorrect, the Authority will adjust the bill to the Purchaser in the next Authority Fiscal Year, including an adjustment equal to the interest actually earned by the Authority on its general reserves during such period. If the Authority and the Purchaser fail to agree on the correctness of a bill within thirty (30) days after the Purchaser has requested an explanation, the parties shall promptly submit the dispute to arbitration under Section 1280 et seq. of the Code of Civil Procedure.

Section 10. Annual Budget and Billing Statement.

The Authority will prepare and approve a budget for the period from the date of acquisition of the Chino 1 Desalter through June 30, 2002 on or prior to acquisition of the Chino 1 Desalter. Such initial budget shall include all Variable O&M Costs, Fixed O&M Costs and Fixed Project Costs. Thereafter, the Authority will prepare a preliminary annual budget for each applicable Authority Fiscal Year for credits, costs and expenses relating to the Project, including Variable O&M Costs and Fixed Project Costs. The Authority shall submit a draft of such budget to the Purchaser on or prior to each April 1 for review and comment. Authority staff shall use its best efforts to resolve any questions or concerns caused by a Project Participant during such review. The Board of Directors of the Authority will adopt a final annual budget for the applicable Authority Fiscal Year on or before June 1 of each Authority Fiscal Year after at least one public hearing on the budget and shall allow any Project Participant which may object to any provision of the budget to present such objection during such hearing. The Authority shall supply a copy of said final annual budget to the Purchaser on or before June 15 of each Authority Fiscal Year. Any amendment to the budget shall be submitted to the Purchaser for review and comment at least 30 days prior to action thereon by the Authority Board of Directors. Any such amendment shall be subject to the same hearing requirements applicable to the budget set forth above.

Section 11. Obligation in the Event of Default.

(a) Written Demand. Upon failure of the Purchaser to (i) make any payment in full when due under this Agreement or (ii) to perform any other obligation hereunder, the Authority shall make written demand upon the Purchaser. If a failure described in clause (i) above is not remedied within thirty (30) days from the date of such demand or, if Authority Bonds are outstanding, for such additional time as is reasonably required, in the sole discretion of the Trustee, to correct the same, such failure shall constitute a default at the expiration of such period. If a failure described in clause (ii) cannot be remedied within thirty (30) days from the date of such demand but the Purchaser commences remedial action within such thirty (30) day period, such failure shall not constitute a default hereunder. Notice of any such demand shall be provided to each other Project Participant by the Authority. Upon failure of the Authority to perform any obligation of the Authority hereunder, the Purchaser shall make written demand upon the Authority, and if said failure is not remedied within thirty (30) days from the date of such demand or, if Authority Bonds are outstanding, for such additional time as is reasonably required, in the sole discretion of the Trustee, to correct the same, such failure shall constitute a default at the expiration of such period. Notice of such demand shall be provided to each Project Participant by the Purchaser making such written demand.

In addition to any default resulting from breach by the Authority or the Purchaser of any agreement, condition, covenant or term hereof, if the Authority or the Purchaser shall file any petition or institute any proceedings under any act or acts, state or federal, dealing with or relating to the subject of bankruptcy or insolvency or under any amendment of such act or acts, either as a bankrupt or as an insolvent or as a debtor or in any similar capacity, wherein or whereby the Authority or the Purchaser asks or seeks or prays to be adjudicated a bankrupt, or is to be discharged from any or all of its debts or obligations, or offers to its creditors to effect a composition or extension of time to pay its debts, or asks, seeks or prays for a reorganization or to effect a plan of reorganization or for a readjustment of its debts or for any other similar relief, or if the Authority or the Purchaser shall make a general or any assignment for the benefit of its creditors, then in each and every such case the Authority or the Purchaser, as the case may be, shall be deemed to be in default hereunder.

(b) Transfer for Defaulting Purchaser's Account. Upon the failure of the Purchaser to make any payment which failure constitutes a default under this Agreement, the Authority shall use its best efforts to transfer for the Purchaser's account all or a portion of the Purchaser's Project Allotment for all or a portion of the remainder of the term of this Agreement. Notwithstanding that all or any portion of the Purchaser's Project Allotment is so transferred, the Purchaser shall remain liable to the Authority to pay the full amount of its share of costs hereunder as if such sale or transfer has not been made, except that such liability shall be discharged to the extent that the Authority shall receive payment from the transferee thereof.

(c) Termination of Entitlement to Project Allotment; Continuing Obligations. Upon the failure of the Purchaser to make any payment which failure constitutes a default under this Agreement and causes the Authority to be in default under any Bond Resolution, the Authority may (in addition to the remedy provided by subsection (b) of this Section) give notice of termination of the provisions of this Agreement insofar as the same entitle the Purchaser to its Project Allotment which notice shall be effective within 30 days thereof unless such termination shall be enjoined, stayed or otherwise delayed by judicial action. Irrespective of such termination, the Purchaser shall remain liable to the Authority to pay the full amount of costs hereunder.

(d) Enforcement of Remedies. In addition to the remedies set forth in this Section, upon the occurrence of an Event of Default as defined herein, the Authority or the Purchaser, as the case may be, shall be entitled to proceed to protect and enforce the rights vested in such party by this Agreement by such appropriate judicial proceeding as such party shall deem most effectual, either by suit in equity or by action at law, whether for the specific performance of any covenant or agreement contained herein or to enforce any other legal or equitable right vested in such party by this Agreement or by law. The provisions of this Agreement and the duties of each party hereof, their respective boards, officers or employees shall be enforceable by the other party hereto by mandamus or other appropriate suit, action or proceeding in any court of competent jurisdiction, with the losing party paying all costs and attorney fees.

(e) Trustee is Third Party Beneficiary. Any Trustee for Authority Bonds shall have the right, as a third party beneficiary, to initiate and maintain suit to enforce this Agreement to the extent provided in any Bond Resolution.

Section 12. Transfers, Sales and Assignments of Project Allotment or Purchaser Water System.

(a) Transfer of Project Allotment. The Purchaser has rights to make transfers, sales, assignments and exchanges (collectively "transfers") of its Project Allotment or its rights or obligations with respect thereto only as expressly provided in this Section. In no event shall any sale or other disposition of all or any portion of the Purchaser's Project Allotment relieve the Purchaser of any of its obligations hereunder. The Purchaser shall give notice to the Authority in accordance with rules and regulations approved by the Authority from time to time.

(b) Sale or Other Disposition of Project Allotment. If in any Fiscal Year the Purchaser determines in accordance with 4(a) not to receive all of the Project Allotment, the Authority shall offer such portion of the Project Allotment to the State of California at a price to be determined by the Authority. If the State of California declines to purchase such Project Allotment, the Purchaser shall have the right to sell such portion of the Project Allotment to another Project Participant or an entity which is not a Project Participant. No such sale of the Project Allotment shall relieve the Purchaser of any of its obligations hereunder.

Section 13. Covenants of the Purchaser.

The Authority and the Purchaser agree that the covenants contained in this Section shall only be enforced by the Authority to the extent necessary to enforce the payment provisions contained herein.

(a) Amount of Rates and Charges. The Purchaser will fix, prescribe and collect rates and charges for the Purchaser Water System which will be at least sufficient to yield during each Purchaser Fiscal Year Purchaser Net Water System Revenues (excluding Contract Payments, Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs) equal to one hundred twenty-five percent (125%) of the Contract Payments, Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs for such Purchaser Fiscal Year. The Purchaser may make adjustments from time to time in such rates and charges and may make such classification thereof as it deems necessary, but shall not reduce the rates and charges then in effect unless the Purchaser Net Water System Revenues from such reduced rates and charges will at all times be sufficient to meet the requirements of this section.

(b) Against Sale or Other Disposition of Property. Subject to Section 13(j), the Purchaser will not sell, lease or otherwise dispose of the Purchaser Water System or any part thereof unless the governing board of the Purchaser determines in writing that such sale, lease or other disposition will not materially adversely affect the Purchaser's ability to comply with subsection (a) of this Section and, in the case of a sale or other disposition, the entity acquiring the Purchaser Water System or such part thereof shall assume all obligations of the Purchaser under this Agreement. The Purchaser will not enter into any agreement or lease which impairs the operation of the Purchaser Water System or any part thereof necessary to secure adequate Purchaser Net Water System Revenues for the payment of the obligations imposed under this Agreement or which would otherwise impair the rights of the Authority with respect to the Purchaser Water System Revenues or the operation of the Purchaser Water System.

(c) Against Competitive Facilities. To the extent permitted by existing law and within the scope of its powers but only to the extent necessary to protect the rights of the owners of Authority Bonds, the Purchaser will not acquire, construct, maintain or operate and will use its best efforts not to permit any other public or private agency, corporation, district or political subdivision or any person whomsoever to acquire, construct, maintain or operate within the boundaries of the Purchaser any water system competitive with the Purchaser Water System which might have the effect of materially adversely affecting the Purchaser's ability to pay Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs.

(d) Maintenance and Operation of the Purchaser Water System; Budgets. The Purchaser will maintain and preserve the Purchaser Water System in good repair and working order at all times and will operate the Purchaser Water System in an efficient and economical manner and will pay all Purchaser Operation and Maintenance Expenses as they become due and payable. On or before the first day of each Purchaser Fiscal Year thereafter, the Purchaser will adopt and file with the Authority a budget approved by the legislative body of the Purchaser, including therein in the estimated

Variable O&M Costs and Fixed Project Costs payable to the Authority. Any budget may be amended at any time during any Purchaser Fiscal Year and such amended budget shall be filed by the Purchaser with the Authority.

(e) Insurance. The Purchaser shall procure and maintain or cause to be procured and maintained insurance on the Purchaser Water System with responsible insurers so long as such insurance is available from reputable insurance companies, or, alternatively, shall establish a program of self-insurance, or participate in a joint powers agency providing insurance or other pooled insurance program, in such amounts and against such risks (including accident to or destruction of the Purchaser Water System) as are usually covered in connection with water systems similar to the Purchaser Water System.

(f) Accounting Records and Financial Statements.

(i) The Purchaser will keep appropriate accounting records in which complete and correct entries shall be made of all transactions relating to the Purchaser Water System, which records shall be available for inspection by the Authority and the Trustee at reasonable hours and under reasonable conditions.

(ii) The Purchaser will prepare and file with the Authority annually within two hundred ten (210) days after the close of each Purchaser Fiscal Year (commencing with the Purchaser Fiscal Year ending June 30, 2002) financial statements of the Purchaser for the preceding Purchaser Fiscal Year prepared in accordance with generally accepted accounting principles, together with a report of an Independent Certified Public Accountant thereon. The Purchaser will promptly furnish a copy of such report to the Authority and to the Trustee.

(g) Protection of Security and Rights of the Authority. The Purchaser will preserve and protect the rights of the Authority and the Trustee to the obligations of the Purchaser hereunder and will warrant and defend such rights against all claims and demands of all persons.

(h) Payment of Taxes and Compliance with Governmental Regulations. The Purchaser will pay and discharge all taxes, assessments and other governmental charges which may hereafter be lawfully imposed upon the Purchaser Water System or any part thereof or upon the Purchaser Water System Revenues when the same shall become due. The Purchaser will duly observe and conform with all valid regulations and requirements of any governmental authority relative to the operation of the Purchaser Water System or any part thereof, but the Purchaser shall not be required to comply with any regulations or requirements so long as the validity or application thereof shall be contested in good faith.

(i) Further Assurances. The Purchaser will adopt, deliver, execute and make any and all further assurances, instruments and resolutions as may be reasonably necessary or proper to effect the financing and refinancing of the Project and to allow the Authority to comply with reporting obligations, to assure the Authority of the Purchaser's intention to perform hereunder and for the better assuring and confirming unto the Authority and the Trustee of the rights and benefits provided to them herein.

(j) Maintenance of Tax-Exempt Status of Authority Bonds. Notwithstanding any other provision of this Agreement, the Purchaser shall not take any action or omit to take any action, directly or indirectly, in any manner, which would result in any of the Authority Bonds being treated as an obligation not described in Section 103(a) of the Internal Revenue Code of 1986, as amended, by reason of classification of such Authority Bond as a "private activity bond" within the meaning of Section 141 of said Code or for any other reason.

Section 14. Covenants of the Authority.

(a) Insurance. The Authority shall procure and maintain or cause to be procured and maintained insurance on the Project with responsible insurers so long as such insurance is available from reputable insurance companies, or, alternatively, shall establish a program of self-insurance, or participate in a joint powers agency providing insurance or other pooled insurance program, covering such risks, in such amounts and with such deductibles as shall be determined by the Authority and as may be required under the Authority Bonds. The Authority shall indemnify and hold harmless the Purchaser from any liability for personal injury or property damage resulting from any accident or occurrence arising out of or in any way related to the construction or operation of the Project.

(b) Accounting Records and Financial Statements.

(i) The Authority will keep appropriate accounting records in which complete and correct entries shall be made of all Authority transactions relating to the Project, which records shall be available for inspection, copying and audit by the Purchaser and its accountants, attorneys and agents at reasonable hours and under reasonable conditions.

(ii) The Authority will prepare annually within two hundred ten (210) days after the close of each Authority Fiscal Year (commencing with the Authority Fiscal Year ending June 30, 2002) financial statements of the Authority for the preceding Authority Fiscal Year prepared in accordance with generally accepted accounting principles, together with a report of an Independent Certified Public Accountant thereof. The Authority will promptly furnish a copy of such report to the Purchaser and to the Trustee.

(c) Compliance with Law. The Authority shall comply with all local, state and federal laws applicable to the Project.

(d) Against Sale or Other Disposition of Project. The Authority will not sell, lease or otherwise dispose of the Project or any part thereof unless the Board of Directors of the Authority determines that such sale, lease or other disposition will not materially adversely affect the Authority's ability to comply with its obligations hereunder and under the Authority Bonds.

(e) Maintenance and Operation of the Project. Subject to the payment obligations of the Project Participants hereunder, the Authority will maintain and preserve the Project in good repair and working order at all times and will operate the Project in an efficient and economical manner consistent with the Joint Powers Agreement. Notwithstanding the foregoing, no material portion of the Project shall be abandoned by the Authority without the consent of all Project Participants.

Section 15. Term.

(a) No provision of this Agreement shall take effect until (i) it and Water Purchase Agreements with all Project Participants have been duly executed and delivered to the Authority together with an opinion for each Project Participant of an attorney or firm of attorneys in substantially the form attached hereto as Exhibit B and an opinion for the Authority of Stradling Yocca Carlson & Rauth, a Professional Corporation, Special Counsel, in substantially the form attached hereto as Exhibit C, and (ii) the Authority delivers a written certificate to the Purchaser stating that the Authority has acquired the portion of the Project known as the Chino 1 Desalter.

(b) Notwithstanding the delay in effective date of this Agreement until all Project Participants have complied with subsection (a) of this Section, it is agreed by the Purchaser that in consideration for the Authority's signature hereto, and for its commitment to use its best efforts to obtain the commitment of all Project Participants, the Purchaser upon its execution and delivery of this Agreement to the Authority along with the required opinion and any required evidence of compliance as required by subsection (a) of this Section shall be immediately bound not to withdraw its respective offer herein made to enter into this Agreement as executed and/or supplemented or to decrease or terminate its Project Allotment before March 31, 2002.

(c) The term of this Agreement shall continue until the later of January 15, 2031 or the final maturity of Authority Bonds. The parties hereto agree to negotiate in good faith to amend this Agreement on or prior to such date to extend the term hereof and to include terms and conditions as are mutually agreeable to the parties, provided that the price to be paid with respect to the Project Allotment in such amendment shall reflect the payment of capital costs to such date.

Section 16. Assignment.

The Authority may pledge and assign to any Trustee for Authority Bonds, all or any portion of the payments received under this Agreement from the Purchaser and the Authority's other rights and interests under this Agreement. Such pledge and assignment by the Authority shall be made effective for such time as the Authority shall determine and provide that the Trustee shall have the power to enforce this Agreement in the event of a default by the Authority under a Bond Resolution. The Purchaser may assign its rights or obligations under this Agreement only in accordance with Section 15 hereof.

Section 17. Amendments.

Except as otherwise provided in this Agreement, on and after the date Authority Bonds are issued and so long as any Authority Bonds are outstanding in accordance with the applicable Bond Resolution, Section 9, 11, 12, 13, 14 and 16 and this Section of this Agreement shall not be amended, modified or otherwise changed or rescinded by agreement of the parties without the consent of each Trustee for Authority Bonds whose consent is required under the applicable Bond Resolution. This Agreement may only be otherwise amended, modified, changed or rescinded in writing by each of the parties hereto.

The Authority agrees not to grant to the owners of Authority Bonds as individuals any rights relating to the amendment, modification or change of this Agreement.

Notwithstanding the foregoing, the sections of this Agreement set forth in the prior paragraph of this Section may be amended without the consent of each Trustee for Authority Bonds for any of the following purposes:

(a) to add to the agreements, conditions, covenants and terms contained herein required to be observed or performed by the Authority or the Purchaser other agreements, conditions, covenants and terms hereafter to be observed or performed by the Authority or the Purchaser, or to surrender any right reserved herein to or conferred herein on the Authority or the Purchaser, and which in either case shall not adversely affect the interests of the owners of any Authority Bonds;

(b) to make such provisions for the purpose of curing any ambiguity or of correcting, curing or supplementing any defective provision contained herein or in regard to questions arising hereunder which the Authority or the Purchaser may deem desirable or necessary and not inconsistent herewith, and which shall not materially adversely affect the interests of the owners of any Authority Bonds;

(c) to make any modifications or changes necessary or appropriate in the opinion of a firm of nationally recognized standing in the field of law relating to municipal bonds to preserve or protect the exclusion from gross income of interest on the Authority Bonds for federal income tax purposes;

(d) to make any modifications or changes to this Agreement in order to enable the execution and delivery of Authority Bonds on a parity with any Authority Bonds previously issued and to make any modifications or changes necessary or appropriate in connection with the execution and delivery of Authority Bonds;

(e) to make any other modification or change to the provisions of this Agreement which does not materially adversely affect the interests of the owners of any Authority Bonds;

(f) to make changes to the definition of "Project."

Section 18. Miscellaneous.

(a) Headings. The headings of the sections hereof are inserted for convenience only and shall not be deemed a part of this Agreement.

(b) Partial Invalidity. If any one or more of the covenants or agreements provided in this Agreement to be performed should be determined to be invalid or contrary to law, such covenant or agreement shall be deemed and construed to be severable from the remaining covenants and agreements herein contained and shall in no way affect the validity of the remaining provisions of this Agreement.

(c) Counterparts. This Agreement may be executed in several counterparts, all or any of which shall be regarded for all purposes as one original and shall constitute and be but one and the same instrument.

(d) Governing Law. THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF CALIFORNIA.

(e) Notices. Any notices required or permitted to be given hereunder shall be given in writing and shall be delivered (a) in person, (b) by certified mail, postage prepaid, return receipt requested, (c) by Federal Express or another reputable commercial overnight courier that guarantees next day delivery and provides a receipt, or (d) by telefacsimile or telecopy, and such notices shall be addressed as follows:

If to Purchaser:	City of Chino Hills 2001 Grand Avenue Chino Hills, CA 91709-4869 Attn: Water and Sewer Manager
With a copy to:	Burke Williams & Sorenson 3403 Tenth Street, Suite 300 Riverside, CA 92501 Attn: Geralyn Skapik
If to Authority:	Chino Basin Desalter Authority c/o Jurupa Community Services District 8621 Jurupa Road Riverside, California 92509
With a copy to:	Stradling Yocca Carlson & Rauth 660 Newport Center Drive Newport Beach, CA 92660 Attention: Douglas Brown

or to such other address as either party may from time to time specify in writing to the other party. Any notice shall be deemed delivered when actually delivered, if such delivery is in person, upon deposit with the U.S. Postal Service, if such delivery is by certified mail, upon deposit with the overnight courier service, if such delivery is by an overnight courier service, and upon transmission, if such delivery is by telefacsimile or telecopy.

(f) Merger of Prior Agreements. This Agreement and the exhibits hereto constitute the entire agreement between the parties and supersede all prior agreements and understandings between the parties relating to the subject matter hereof. This Agreement is intended to implement, and should be interpreted consistent with, the Joint Powers Agreement.

(g) Time of the Essence. Time is of the essence in the performance of this Agreement.

(h) Transportation Agreement. This Agreement constitutes the transportation agreement required to be entered into by the Authority and the Purchaser pursuant to Section 12.1 of the Joint Powers Agreement.

(i) Termination. The Purchaser hereby acknowledges that Agreement Number AEB 96001 for Desalter Water Sale and Purchase by and between the City of Chino Hills and Chino Basin Municipal Water District dated March 12, 1996 (the "Existing Water Purchase Agreement") has been terminated.

(j) IN WITNESS WHEREOF the Purchaser has executed this Agreement with the approval of its governing body, and caused its official seal to be affixed and the Authority has executed this Agreement in accordance with the authorization of its Board of Directors, and caused its official seal to be affixed.

CHINO BASIN DESALTER AUTHORITY

By: ______________________________
Chairperson

[SEAL]

Attest:

By: ______________________________
Secretary

CITY OF CHINO HILLS

By: ______________________________
Mayor

[SEAL]

Attest:

By: ______________________________
Secretary

EXHIBIT A

Project Participant	**Project Allotment (acre-feet)**
City of Chino	5,000
City of Chino Hills	4,200
City of Norco	1,000
City of Ontario	5,000
Jurupa Community Services District	8,200
Santa Ana River Water Company	1,200
	24,600

* Eliminates 400 acre feet of other per Exhibit A to the Term Sheet.

EXHIBIT B

[This opinion shall be delivered upon execution of the Water Purchase Agreement]

January __, 2002

Chino Basin Desalter Authority

____

____

City of Chino Hills
2001 Grand Avenue
Chino Hills, CA 91709-4869

Ladies and Gentlemen:

We are acting as general counsel to the City of Chino Hills (the "Purchaser") under the Water Purchase Agreement, dated as of January 15, 2002 (the "Agreement"), between the Chino Basin Desalter Authority (the "Authority") and the Purchaser, and have acted as general counsel to the Purchaser in connection with the matters referred to herein. As such counsel we have examined and are familiar with (i) documents relating to the existence, organization and operation of the Purchaser provided to us by the Purchaser, (ii) certifications by officers of the Purchaser, (iii) all necessary documentation of the Purchaser relating to the authorization, execution and delivery of the Agreement, and (iv) an executed counterpart of the Agreement. Terms used herein and not otherwise defined have the respective meanings set forth in the Agreement.

Based upon the foregoing and such examination of law and such other information, papers and documents as we deem necessary or advisable to enable us to render this opinion, including the Constitution and laws of the State of California, together with the resolutions, ordinances and public proceedings of the Purchaser, we are of the opinion that:

1. The Purchaser is a general law city, duly created, organized and existing under the laws of the State of California and duly qualified to furnish water service within its boundaries.

2. The Purchaser has legal right, power and authority to enter into the Agreement and to carry out and consummate all transactions reasonably contemplated thereby, and the Purchaser has complied with the provisions of applicable law relating to such transactions.

3. The Agreement has been duly authorized, executed and delivered by the Purchaser, is in full force and effect as to the Purchaser in accordance with its terms and, subject to the qualifications set forth in the second to the last paragraph hereof, and assuming that the Authority has all requisite power and authority, and has taken all necessary action, to authorize, execute and deliver such Agreement, the Agreement constitutes the valid and binding obligation of the Purchaser .

4. The obligations of the Purchaser to make payments under the Agreement from the Revenues of its Purchaser Water System or other lawfully available funds as provided in Section 10 of the Agreement is a valid, legal and binding obligation of the Purchaser enforceable in accordance with its terms.

5. No approval, consent or authorization of any governmental or public agency, authority or person is required for the execution and delivery by the Purchaser of the Agreement.

6. The authorization, execution and delivery of the Agreement and compliance with the provisions thereof will not conflict with or constitute a breach of, or default under, any instrument relating to the organization, existence or operation of the Purchaser, any commitment, agreement or other instrument to which the Purchaser is a party or by which it or its property is bound or affected, or any ruling, regulation, ordinance, judgment, order or decree to which the Purchaser (or any of its officers in their respective capacities as such) is subject or any provision of the laws of the State of California relating to the Purchaser and its affairs.

7. There is no action, suit, proceeding, inquiry or investigation at law or in equity, or before any court, public board or body, pending or, to our knowledge, threatened against or affecting the Purchaser or any entity affiliated with the Purchaser or any of its officers in their respective capacities as such, which questions the powers of the Purchaser referred to in paragraph 2 above or the validity of the proceedings taken by the Purchaser in connection with the authorization, execution or delivery of the Agreement, or wherein any unfavorable decision, ruling or finding would materially adversely affect the transactions contemplated by the Agreement, or which would adversely affect the validity or enforceability of the Agreement.

The opinion expressed in paragraphs 3 and 4 above are qualified to the extent that the enforceability of the Agreement may be limited by any applicable bankruptcy, insolvency, reorganization, arrangement, moratorium, or other laws affecting creditors' rights, to the application of equitable principles and to the exercise of judicial discretion in appropriate cases and to the limitations on legal remedies against public agencies in the State of California and provided that no opinion is expressed with respect to any indemnification or contribution provisions contained therein.

This opinion is rendered only with respect to the laws of the State of California and the United States of America and is addressed only to the Chino Basin Desalter Authority and the Purchaser . No other person is entitled to rely on this opinion, nor may you rely on it in connection with any transactions other than those described herein.

Very truly yours,

EXHIBIT C

[This opinion shall be delivered upon execution of the Water Purchase Agreement]

January __, 2002

Chino Basin Desalter Authority

The Project Participants Listed on
Exhibit A attached hereto

Ladies and Gentlemen:

We are special counsel to the Chino Basin Desalter Authority (the "Authority") and are familiar with those certain Water Purchase Agreements, dated as of January 15, 2002 (each, an "Agreement"), between the Authority and each of the water contractors identified on Exhibit A attached hereto (each, a "City") in connection with the matters referred to herein. As special counsel we have examined and are familiar with (i) documents relating to the existence, organization and operation of the Authority provided to us by the Authority, (ii) certifications by officers of the Authority, (iii) all necessary documentation of the Authority relating to the authorization, execution and delivery of the Agreement, and (iv) an executed counterpart of the Agreement. Terms used herein and not otherwise defined have the respective meanings set forth in the Agreement.

Based upon the foregoing and such examination of law and such other information, papers and documents as we deem necessary or advisable to enable us to render this opinion, including the Constitution and laws of the State of California, together with the resolutions, ordinances and public proceedings of the Authority, we are of the opinion that:

1. The Authority is a joint exercise of powers agency duly created, organized and existing under the laws of the State of California.

2. The Authority has legal right, power and authority to enter into the Agreement and to carry out and consummate all transactions reasonably contemplated thereby, and the Authority has complied with the provisions of applicable law relating to such transactions.

3. The Agreement has been duly authorized, executed and delivered by the Authority, is in full force and effect as to the Authority in accordance with its terms and, subject to the qualifications set forth in the second to the last paragraph hereof, and assuming that each City has all requisite power and authority, and has taken all necessary action, to authorize, execute and deliver such Agreement, the Agreement constitutes the valid and binding obligation of the Authority.

4. No approval, consent or authorization of any governmental or public agency, authority or person is required for the execution and delivery by the Authority of the Agreement.

5. The authorization, execution and delivery of the Agreement and compliance with the provisions thereof will not conflict with or constitute a breach of, or default under, any instrument relating to the organization, existence or operation of the Authority, any commitment, agreement or

other instrument to which the Authority is a party or by which it or its property is bound or affected, or, to the best of our knowledge, any ruling, regulation, ordinance, judgment, order or decree to which the Authority (or any of its officers in their respective capacities as such) is subject or any provision of the laws of the State of California relating to the Authority and its affairs.

6. There is no action, suit, proceeding, inquiry or investigation at law or in equity, or before any court, public board or body, pending or, to our knowledge, threatened against or affecting the Authority or any of its officers in their respective capacities as such, which questions the powers of the Authority referred to in paragraph 2 above or the validity of the proceedings taken by the Authority in connection with the authorization, execution or delivery of the Agreement, or wherein any unfavorable decision, ruling or finding would materially adversely affect the transactions contemplated by the Agreement, or which, in any way, would adversely affect the validity or enforceability of the Agreement.

The opinion expressed in paragraph 3 above is qualified to the extent that the enforceability of the Agreement may be limited by any applicable bankruptcy, insolvency, reorganization, arrangement, moratorium, or other laws affecting creditors' rights, to the application of equitable principles and to the exercise of judicial discretion in appropriate cases and to the limitations on legal remedies against public agencies in the State of California and provided that no opinion is expressed with respect to any indemnification or contribution provisions contained therein.

This opinion is rendered only with respect to the laws of the State of California and the United States of America and is addressed only to the Authority and the Project Participants. No other person is entitled to rely on this opinion, nor may you rely on it in connection with any transactions other than those described herein.

Respectfully submitted,

APPENDIX B

INFORMATION CONCERNING CHINO HILLS

The information set forth below has been provided by the City of Chino Hills ("Chino Hills"). The Chino Basin Desalter Authority (the "Authority") makes no representations or warranties as to the accuracy or completeness of any of the information set forth below. Capitalized terms not otherwise defined herein shall have the respective meanings ascribed to them in the Water Purchase Agreement, dated as of January 15, 2002, between the Authority and Chino Hills (the "Water Purchase Agreement").

THE CHINO HILLS WATER SYSTEM

History and Service Area

The predecessor to Chino Hills' water system (as further described below, the "Chino Hills Water System") was the San Bernardino County Waterworks District No. 8, (the "District"). The District was originally formed in the early 1920s to service an area in western San Bernardino County (the "County") commonly known as Sleepy Hollow, with approximately 100 service connections. In August, 1983, the territory served by the District was expanded to a size including the present service area with the acquisition and consolidation of five separate water companies. On October 15, 1989 the District sold approximately 25% of the District's service area (including the related distribution pipelines) to the Monte Vista Water District and the City of Chino. The service area sold is located east of Highway 71, outside of what is now Chino Hills city limits.

Nearly all of the District's retained service area was incorporated as the City of Chino Hills on December 1, 1991. At the same time, the County Board of Supervisors dissolved the District and the District's water system was transferred to Chino Hills. The Chino Hills Water System is owned, operated and accounted for by Chino Hills as a department of Chino Hills on an enterprise basis.

Chino Hills Water System currently serves a population of approximately 67,000.

Water Supply

General. Chino Hills receives an allocation of 10.68 million gallons per day ("mgd") of water through Chino Hills' participation in the Water Facilities Authority (the "Water Facilities Authority") all as further described under the caption "Water Facilities Authority."

Chino Hills pumps approximately 8.7 mgd from the Chino Basin groundwater basin. Chino Hills groundwater facilities include eight active wells. See the caption "Chino Basin Adjudication" below.

In July 1998, Chino Hills entered into an agreement with Monte Vista Water District ("Monte Vista") (the "Monte Vista Agreement") to purchase water from Monte Vista, also a member of the Water Facilities Authority. The Monte Vista Agreement replaces the lease agreement between Chino Hills and Monte Vista (the "Monte Vista Lease"). Under the terms of the Monte Vista Agreement, Monte Vista will provide Chino Hills up to 20.22 mgd of water. Chino Hills is obligated to purchase 10 mgd for $10,160,000. The Monte Vista Agreement further obligates Chino Hills to purchase an additional 6.22 mgd for $675,000 plus interest until paid. Chino Hills has an option for five years from the effective date of the Monte Vista Agreement to purchase an additional 4 mgd of water supply for $561,000 per mgd, subject to annual adjustment. Upon payment of such option price, Chino Hills may draw upon the 4 mgd of water supply within one year. The Monte Vista Agreement renews automatically each year. Chino Hills also purchases 650 acre feet per year of recycled water from Inland Empire Utilities Agency ("IEUA").

The average Chino Hills Water System water demand between November 2000 and October 2001 was 14.78 mgd; maximum demand was 24.14 mgd. The Chino Hills Water System can deliver between .5 mgd to 30.47 mgd depending upon well production and amount of water available through IEUA. As of November 30, 2001 Chino Hills had 19,706 water service connections.

Water Facilities Authority. In 1983, to accommodate future water quality and volume needs, Chino Hills joined the Water Facilities Authority, a joint powers authority, to facilitate financing and construction of a regional water treatment facility for State Water Project water purchased from Metropolitan Water District of Southern California ("MWD") (the "Agua de Lejos Facility"). The Agua de Lejos Facility was completed and operational by October, 1989, and was designed to meet the requirements of the Federal Safe Drinking Water Act and State water quality standards. The Agua de Lejos Facility treats MWD water purchased from IEUA.

Chino Basin Adjudication. Chino Hills' water rights to pump from the Chino Basin have primarily been established by a court decision, being the Chino Basin Municipal Water District ("CBMWD") versus the City of Chino et al, San Bernardino Superior Court Number 164327 (the "Chino Basin Judgment"), dated January 27, 1978. This decision adjudicated all groundwater rights in Chino Basin and contains a physical solution to meet the requirements of water users having rights in or dependent upon the Chino Basin. The Chino Basin Judgment declared that the safe yield of the Chino Basin is 140,000 acre feet per year, which is allocated among three classes of water users (or "pools"): (i) overlying agricultural- 82,800 acre feet per year, (ii) overlying non-agricultural (industries)- 7,366 acre feet per year, and (iii) appropriative (municipal)- 49,834 acre feet per year. A fundamental premise of the physical solution is that all Chino Basin water users, including Chino Hills, will be allowed to pump sufficient water from the Chino Basin to meet such users requirements. To the extent that pumping by such users exceeds the share of the safe yield assigned to the overlying pools (or the operating safe yield in the case of the appropriative pool) each pool will provide funds to the Chino Basin Watermaster to replace the overproduction with supplemental water which is primarily water imported into the Chino Basin.

Pursuant to the Chino Basin Adjudication, Chino Hills has been allocated a safe yield of 2,111 acre feet per year. Chino Hills is able to augment its safe yield by transfers of the unused safe yield allocations from the agricultural pool to the appropriative pool when and if available. During the last five years, this transfer has averaged 1,263 acre feet. Since Chino Hills produces groundwater from the Chino Basin in excess of the operating safe yield assigned Chino Hills under the Chino Basin Judgment, Chino Hills pays a replenishment assessment to the Watermaster for purchase of imported water for replenishment.

The Water Purchase Agreement

Chino Hills and the Authority have entered into the Water Purchase Agreement. Pursuant to the Water Purchase Agreement, the Authority will provide Chino Hills, and Chino Hills has agreed to purchase, 4,200 acre feet of desalter water (the "Chino Hills Project Allotment") each fiscal year. The Authority will charge Chino Hills under the Water Purchase Agreement an amount sufficient to cover Chino Hills' share of the Project's (i) Fixed Project Costs, (ii) Fixed O&M Costs and (iii) Variable O&M Costs, each as defined in the Water Purchase Agreement. See the caption "SECURITY FOR THE BONDS — The Water Purchase Agreements" for additional information concerning the Water Purchase Agreement. Chino Hills expects to use the Chino Hills Project Allotment to reduce pumping from the Chino Basin and to serve new demand.

Existing Facilities

Chino Hills presently has two connections to a 30 inch pipeline, the "Ramona Feeder", from the Agua de Lejos Facility. Other major facilities contained in the Chino Hills Water System include eight active supply wells, each with a chlorination station, transmission mains, supply connections, distribution pipeline, 16 storage reservoirs, 9 active pumping facilities, two major pressure reducing facilities and 380 back flow devices. The 16 storage reservoirs range in capacity from two hundred fifty thousand gallons to five million gallons, with the total storage capacity of 34.83 million gallons. The Chino Hills Water System is operated over four major water pressure zones. The Chino Hills Water System includes water lines and mains varying in size from two inches to thirty inches.

Future Capital Improvements

At present, Chino Hills anticipates issuing approximately $9 to $10 million of Chino Hills Water System indebtedness in 2002 (the "2002 Installment Purchase Agreement"). Proceeds of the 2002 Installment Purchase Agreement are proposed to be used for certain capital improvements to the Chino Hills Water System, and may include the financing of a 42-inch pipeline connecting to Monte Vista, installation of a telemetry system, construction of a 3 million gallon reservoir for the Chino Hills' recycled water system and construction of a pump station for the recycled water system. The 2002 Installment Purchase Agreement is anticipated to be paid from net revenues of the Chino Hills Water System.

As residential and commercial development continue within Chino Hills, additions to the Chino Hills Water System will be made, which expected to be principally financed through fees paid by developers ("Developers Fees").

Chino Hills plans approximately $37,485,000 in upgrades to the existing Chino Hills Water System, including an additional well, to be funded on a pay-as-you-go basis from user rates and reserves. Chino Hills does not anticipate using any debt to finance such capital improvements.

Water Users

The ten largest water users accounted for 21.64% of the annual water consumption in the Fiscal Year ending June 30, 2001. The largest private user, Los Serranos Golf Course, accounted for 3.69% of the total usage in Fiscal Year 2001.

CHINO HILLS WATER SYSTEM
Ten Largest Water Users
Fiscal Year Ending June 30, 2001

Customers	*12 Month Consumption (100 cubic Feet)*	*Percentage of Total*
City of Chino Hills	559,327	8.52
Los Serranos Golf Course	218,156	3.32
Chino Valley Unified School District	123,540	1.88
Western Hills Golf Course Association	92,250	1.41
Don McCoy Corporation	53,923	0.82
Boys Republic	48,412	0.74
Rancho Monte Vista Mobile Home Park	41,903	0.64
Lake Los Serranos Mobile Home Park	36,837	0.56
CTF-8 Village Oaks LLC	35,771	0.54
Eagle Canyon	35,557	0.54
Total	1,210,118	10.43

Source: Chino Hills.

Water Rates and Charges

General. Water rates are determined by the City Council of Chino Hills. Water rates are not subject to regulation by the California Public Utilities Commission or by any other state agency. Monthly water rates within Chino Hills boundaries are two-tiered, composed of both an availability charge and a commodity rate. The former is a flat rate assessed according to a meter size; the commodity rate is assessed per hundred cubic feet ("hcf"). In addition, Chino Hills has set installation charges for water capital connection, meter installation, and inspection fees.

Meter Installation Charge. The schedule of regular service meter installation charges is as follows:

Meter & Service Size	*Service Line and Curb Cock Already Installed*	*No Service Line Installed*
$^{3}/_{4}$ inch	$300.00	$ 750.00
1 inch	330.00	875.00
$1^{1}/_{2}$ inch	400.00	1,000.00
2 inch	500.00	1,300.00

All meter installation charges for meter sizes 3 inches or larger are made at cost, plus, ten percent (10%). Only duly authorized employees or agents of Chino Hills are authorized to install service connections.

The following table compares the typical monthly residential water costs to customers of the Chino Hills Water System and of eleven neighboring water utilities.

CHINO HILLS WATER SYSTEM
COMPARISON OF TYPICAL MONTHLY RESIDENTIAL WATER BILL
Monthly Cost for 22 ccf (1)
December 31, 2000

Utility	*Cost*
City of Chino Hills	**$36.15**
City of Chino	32.65
City of Ontario	31.80
City of Norco	29.25
Jurupa Community Services District(2)	28.99
Santa Ana River Water Company(3)	20.75

(1) Average water usage for a family of four per month.
(2) Based on a ¾ inch meter.
(3) Based on a 1 inch meter.
Source: The cities of Chino, Chino Hills, Norco, Ontario, and Jurupa Community Services District and Santa Ana River Water Company are each the source of their respective typical monthly residential water bill.

Water Capital Connection Charge. The schedule of water capital connection charges are shown below. Water capital connection charges are Developers Fees.

Meter Size	*Capital Connection Fee*	*Meter Size*	*Capital Connection Fee*
¾ inch	$ 5,358.00	4 inch	$ 89,318.00
1 inch	5,538.00	6 inch	178,582.00
1½ inch	17,842.00	8 inch	285,742.00
2 inch	28,558.00	10 inch	430,408.00
3 inch	53,580.00	12 inch	582,254.00

Monthly Service Charge. Chino Hills has a monthly service charge based on meter size ranging from $10.06 per month for a ⅝" meter to $1,635.85 per month for an 12" meter.

Meter Size	*Rates*	*Meter Size*	*Rates*
⅝ inch	$ 10.06	4 inch	$ 250.90
¾ inch	15.06	6 inch	501.75
1 inch	25.10	8 inch	802.80
1½ inch	50.20	10 inch	1,209.23
2 inch	80.30	12 inch	1,635.85
3 inch	150.50		

Source: Chino Hills.

Commodity Charge. Effective January 1, 2002, domestic water rates are $.99 per hcf in the low zone, $1.19 per hcf in the intermediate zone, and $1.22 per hcf in the high zone. Agricultural water rates are $.68 per hcf. Water used for construction purposes is $1.34 per hcf.

Recycled Water. Commodity Charge. Effective January 1, 2002, recycled water rates are $.79 per hcf in the low zone, $.95 per hcf in the intermediate zone, and $.98 per hcf in the high zone.

Agricultural water rates for recycled water are $.55 per hcf. Recycled water used for construction purposes is $1.08 per hcf.

Collection Procedures. Chino Hills is on a monthly billing cycle. Payment is due by 21 days after the billing date. If payment is not received, a delinquency notice is sent on the 22nd day after the billing date. A 10% late payment penalty is charged after a bill is delinquent for 42 days. Currently 7% of the accounts, which accounts for approximately 0.8% of Chino Hills' monthly water system revenues are delinquent. All accounts not paid in full within 44 days of the delinquent billing date will be discontinued until full payment is made, including late payment penalties and a $50.00 reconnection fee.

Water Consumption, Services and Collections

The following table sets forth water consumption by acre feet during the past five Fiscal Years.

CHINO HILLS WATER SYSTEM
Water Consumption
Fiscal Years Ending June 30

	1997	*1998*	*1999*	*2000*	*2001*
Number of Water Connections[1]	17,017	17,709	18,541	18,769	19,452
Total Water Consumption[2]	14,868	12,955	14,627	15,860	15,058
Billings[3]	$9,834,713	$9,210,231	$10,109,095	$10,876,346	$10,639,353

(1) Includes Chino Hills owned landscaping water meters.
(2) In acre-feet.
(3) Billings amount is for water sales only; amount excludes other operating and non-operating revenue collections from revenues such as meter connection fee, interest income and lease payments.
Source: Chino Hills.

Employee Relations

Currently, there are 18 employees of Chino Hills assigned to the Chino Hills Water System. The employees are represented by the San Bernardino Public Employees Association ("SBPEA"). The current memorandum of understanding between SBPEA and Chino Hills covering wages and conditions of employment expires on February 28, 2002.

Insurance

Chino Hills is a member of the California Joint Powers Insurance Authority (the "Insurance Authority"). The Insurance Authority arranges and administers programs for the pooling of self-insured losses, to purchase excess insurance or reinsurance, and to arrange for group-purchased insurance for property and other coverage. As a member of the Insurance Authority, Chino Hills is covered for general liability in the amount of $50,000,000 for each occurrence, with a $50,000,000 annual aggregate. Chino Hills' deductible with respect to such coverage is $20,000. Chino Hills is also covered by the Insurance Authority for workers' compensation liability in the amount of $500,000 annual aggregate, with excess insurance providing coverage to statutory limits. Chino Hills' deductible with respect to workers' compensation liability insurance is $50,000 for each occurrence.

FINANCIAL RESULTS OF THE WATER SYSTEM

Audited Financial Statements

A copy of the most recent general purpose financial statements audited by Lance Soll and Lunghard LLP, Brea, California (the "Auditor") are included as Appendix A hereto (the "Financial Statements"). The Financial Statements include a statement that the Auditor conducted an audit of the Financial Statements in accordance with generally accepted auditing standards and Government Auditing Standards issued by the Comptroller General of the United States. The Auditor opines that the Financial Statements present fairly, in all material aspects, the financial position of Chino Hills at June 30, 2001 and the results of Chino Hills' operations and cash flows of Chino Hills' proprietary funds for the year then ended in conformity with generally accepted accounting principles. The reports include certain notes to the financial statements which may not be fully described below under the subheading "Significant Accounting Policies" or in the footnotes to the Tables. Such notes constitute an integral part of the audited financial statements.

Significant Accounting Policies

Governmental accounting systems are organized and operated on a fund basis. A fund is defined as an independent fiscal and accounting entity with a self-balancing set of accounts recording cash and other financial resources, together with all related liabilities and residual equities or balances, and changes therein. Funds are segregated for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations restrictions or limitations.

The Chino Hills Water System is accounted for as an Enterprise Fund. Enterprise Funds account for operations in a manner similar to private business enterprises where the intent is that the costs (expenses, including depreciation) of providing goods or services to the general public on a continuing basis is to be financed or recovered primarily through user charges.

Chino Hills uses the modified accrual method of accounting for government funds and the full accrual method for the Chino Hills Water System. Under the modified accrual basis, revenues are recognized when they become measurable and available as net current assets. Revenues considered susceptible to accrual in those funds wherein revenue is recognized on a modified accrual basis is as follows: property and sales taxes, revenue from the use of money and property, interfund transfers, unbilled service receivables and intergovernmental revenue are all considered measurable and are recognized as revenue on a modified accrual basis; licenses, permits, fines and forfeitures and similar items are, for the most part, not susceptible to accrual and consequently are not recorded until received.

Expenditures are generally recognized under the modified accrual basis of accounting when the related fund liability is incurred; principal and interest on general long-term debt is recognized when due.

Chino Hills uses a system for allocating certain chargeable costs provided by one Chino Hills department or fund for the benefit of another.

Description of Indebtedness

The 1996 Installment Sales Agreement. Chino Hills and Chino Hills Capital Improvement Corporation are parties to a certain Installment Sales Agreement dated as of May 1, 1996, with an original aggregate principal amount of $21,645,000 (the "1996 Installment Sales Agreement"). The Installment Sales Agreement currently has an outstanding principal amount of $18,790,000, matures in 2015, and has an average annual payment of $1,738,089. As set forth in the 1996 Installment Sales Agreement, the 1996 Installment Sales Agreement is repayable solely from Net Revenues after payment of maintenance and operation costs. Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs payable by Chino Hills under the Water Sales Agreement are operation and maintenance expenses of the Chino Hills Water System. As a result, the 1996 Installment Sales Agreement is payable from Chino Hills Water System revenues subordinate to amounts payable under the Water Sales Agreement.

Prior Water Facilities Authority Debt. In October, 1997, the Water Facilities Authority issued $24,455,000 Refunding Certificates of Participation Series A (the "1997 Certificates"), pursuant to which each of the WFA Participants, including Chino Hills, entered into installment purchase agreements. Pursuant to the installment purchase agreement between Chino Hills and the Water Facilities Authority dated as of October 1, 1997 (the "1997 Installment Purchase Agreement"), Chino Hills agreed to repay 24.29% of the Water Facilities Authority's debt under the 1997 Certificates. In 1996, Chino Hills prepaid in full Chino Hills' portion of the 1997 Certificates out of funds from the 1996 Installment Sales Agreement.

Historic Operating Results and Debt Service Coverage

The following table is a summary of historic operating results and debt service coverage of the Chino Hills Water System for the past five fiscal years. These results have been derived from Chino Hills' financial statements, but exclude certain non-cash items and include certain other adjustments. The table has not been audited by Chino Hills' auditor. The following table includes revenue and expenses of the Chino Hills Water System's development impact fee program.

CHINO HILLS WATER SYSTEM
Historic Operating Results and Debt Service Coverage
For Fiscal Years Ended June 30

	1997	*1998*	*1999*	*2000*	*2001*
Revenues:					
Charges for Service	$ 9,842,768	$ 9,212,022	$10,267,649	$10,997,882	$10,843,216
Permit and Inspection Fees	103,455	79,819	78,822	45,115	80,409
Meter And Installation Fees	291,697	328,383	190,492	182,641	196,690
Interest Earnings	743,234	876,318	726,057	768,290	895,646
Other	236,220	324,887	1,776,600	1,869,198	2,870,979
Total Revenues	$11,217,374	$10,821,429	$13,039,620	$13,863,126	$14,826,940
Expenses:					
Purchased Water	$ 5,008,313	$ 4,364,873	$ 4,867,731	$ 5,427,119	$ 5,083,345
Utilities	475,502	524,202	521,920	639,488	594,812
Salaries and Benefits	802,950	867,505	806,318	807,766	838,713
Contractual Services	675,806	697,651	474,057	374,894	412,783
Repairs and Maintenance	487,678	536,168	312,807	793,412	284,118
Services and Supplies	131,514	113,708	120,721	176,705	115,678
Other General and Administrative	1,056,986	2,259,307	2,352,258	1,458,064	1,485,713
Total Expenses	$ 8,638,749	$ 9,363,414	$ 9,455,812	$ 9,677,448	$ 8,815,162
Net Revenues	$ 2,578,625	$ 1,458,015	$ 3,583,808	$ 4,185,678	$ 6,011,778
1996 Installment Sales Agreement	$ 1,739,505	$ 1,735,605	$ 1,740,455	$ 1,739,155	$ 1,736,630
Debt Service Coverage	1.48	.84	2.06	2.41	3.46

Source: Chino Hills.

Projected Operating Results and Debt Service Coverage

Chino Hills' estimated projected operating results for the Chino Hills Water System for the current and next four fiscal years are set forth below, reflecting certain significant assumptions concerning future events and circumstances. The financial forecast represents Chino Hills' estimate of the projected financial results of the Chino Hills Water System based upon Chino Hills judgment of the most probable occurrence of certain important future events. While the preceding historic table includes revenue and expenses of the Chino Hills Water System's development impact fee program, the following projections table does not include revenue and expenses of the Chino Hills Water System's development impact fee program. The assumptions set forth in the footnotes to the chart below are material in the development of financial projections for the Chino Hills Water System, and variations in the assumptions may produce substantially different financial results. Actual operating results achieved during the projection period may vary from those presented in the forecast and such variations may be material.

CHINO HILLS WATER SYSTEM
Projected Operating Results and Debt Service Coverage
For Fiscal Years Ended June 30

	2002	*2003*	*2004*	*2005*	*2006*
Revenues:					
Water Sales[1]	$ 12,102,000	$ 13,558,900	$ 14,327,500	$ 14,995,300	$ 15,485,500
Other Revenues[2]	815,400	688,700	739,500	753,400	794,700
Total Revenues	$ 12,917,400	$ 14,247,600	$ 15,067,000	$ 15,748,700	$ 16,280,200
Expenses:					
Purchased Water[3]	$ 5,952,500	$ 6,232,633	$ 6,063,360	$ 6,286,348	$ 6,909,107
Utilities[4]	323,800	337,918	358,050	383,996	415,052
Salaries and Benefits[4]	1,057,100	1,103,193	1,168,926	1,253,644	1,355,047
Contractual Services[4]	512,800	535,160	567,047	608,143	657,334
Repairs and Maintenance[4]	303,100	316,316	335,164	359,455	388,530
Services and Supplies[4]	140,000	146,104	154,810	166,030	179,459
Other General and Administrative[4]	1,187,500	1,239,279	1,313,120	1,408,289	1,522,201
Water Purchase Agreement[5]	750,000	768,000	1,365,604	1,696,800	1,738,800
Total Expenses	$ 10,226,800	$ 10,678,603	$ 11,326,079	$ 12,162,704	$13,165,530
Net Revenues	$ 2,690,600	$ 3,568,997	$ 3,740,921	$ 3,585,996	$ 3,114,670
Water Purchase Agreement Coverage[6]	4.59	5.65	3.74	3.11	2.79
Debt Service					
1996 Installment Sales Agreement	$ 1,745,475	$ 1,751,395	$ 1,749,645	$ 1,755,395	$ 1,748,065
2002 Installment Purchase Agreement[7]	376,000	751,900	751,900	751,900	751,900
Total Debt Service	$ 2,121,475	$ 2,503,295	$ 2,501,545	$ 2,507,295	$ 2,499,965
Debt Service Coverage[8]	1.27	1.43	1.50	1.43	1.25

(1) Assumes completion of 617, 517, 550, 450 and 390 new single-family residential units in fiscal years 2002 through 2006, respectively, and Water Sales per new unit of $555 Also assumes water rate increases of 9.50%, 4.50%, 3.50%, 2.75% and 1.75% in fiscal years 2002 through 2006, respectively, as approved by the Chino Hills City Council in November 2001.
(2) Includes Permit and Inspection Fees, Meter Installation Fees, Interest Earnings and Other Operating and Non-Operating Revenues.
(3) Cost of purchased water per acre-foot projected to increase at 2.5% per annum from fiscal year budgeted amounts due to inflation.
(4) Projected to increase at 2.5% per annum from fiscal year 2001 budgeted amounts due to inflation plus additional costs related to projected completion of new single family units as described in (1) above.
(5) Desalter water purchases from the Authority are estimated to be 2,000 acre-feet in 2002 and 2003; 3,466 acre-feet in 2004; and 4,200 acre-feet thereafter at an estimated cost of $375 per acre-foot in 2002 increasing 2.5% each year thereafter.
(6) Net Revenues plus Water Purchase Agreement expense, divided by Water Purchase Agreement expense.
(7) Assumes an installment purchase agreement in the principal amount of $9,000,000 is entered into in fiscal year 2002 at an assumed interest rate of 6%.
(8) Net Revenues divided by Total Debt Service.

Source: Chino Hills.

A-46-34

LEASE AGREEMENT

This Lease Agreement and Option (Agreement) is entered into as of this 25TH day of March, 1996 by and between Monte Vista Water District, a California Water District (Lessor), and the City of Chino Hills, a municipal corporation (Lessee).

WHEREAS, Lessor and Lessee are both members of the Water Facilities Authority, a joint powers authority (WFA); and,

WHEREAS, Lessor has the right to draw a maximum of approximately 16,320,000 gallons of water per day from the WFA when such amount is available under rules and regulations of the WFA; and,

WHEREAS, Lessor has the right to sell and dispose of surplus water to municipalities and public agencies located outside the Lessor's district boundaries under the provisions of Section 31023 of the California Water Code; and

WHEREAS, Lessee desires to lease from Lessor the right to draw from Lessor's WFA capacity, 10 million gallons of water per day (10 mgd). Lessor desires to lease to Lessee 10 mgd of its capacity in the WFA Treatment Plant. Lessor has projected its water demand during the term of this Lease and has determined such Lease will not adversely affect the normal supply of water by Lessor to its customers for such periods; and

WHEREAS, pursuant to the terms of the Joint Powers Agreement creating the WFA, Lessor has the obligation to pay a certain portion of the debt service incurred by the WFA in connection with the Upland site project as set forth in WFA Resolutions No. 88-10-1 and 93-06-03 (Lessor's Debt Service); and, WHEREAS, Lessor and Lessee share the use of the water line known as the Ramona Feeder,

NOW THEREFORE, the parties agree as follows:

1. Lease. Lessor hereby leases for the water year commencing July 1, 1996 and ending June 30, 1997, the right to draw 10 mgd from Lessor's water capacity in the WFA treatment plant.

2. Consideration. As consideration for the lease of the 10 mgd of capacity, Lessee shall pay to the Lessor on a quarterly basis in advance the following total annual amounts:

Fiscal Year	Annual Amount
1996/97	$ 349,000
1997/98	349,700
1998/99	350,500
1999/00	350,800
2000/01	351,600
2001/02	352,500

Lessee shall also pay to Lessor the general and administrative costs that are allocated by WFA in the proportion the 10 mgd capacity to be leased is to the total mgd capacity that Lessor has in the Treatment Plant - currently estimated at $4,400 per mgd. However, in the event the WFA causes these costs to be included in the purchase price of water, Lessee shall have no obligation to pay Lessor for such costs. Lessor and Lessee understand and agree that the costs set forth herein are for capacity only and that Lessee shall pay the WFA directly for all water taken. Lessee shall pay for the capacity it leases from Lessor irrespective of the amount of water it actually takes from the WFA treatment plant.

3. Annual Renewals. The lease of the 10 mgd from Lessor to Lessee shall automatically renew each year on the same terms and conditions for the water years commencing July 1, 1997 through and including the year commencing July 1, 2001. Notwithstanding the above, Lessee shall have the right upon one year's written notice prior to July 1, of each option year to decline to lease any water capacity from Lessor for the upcoming year and no consideration shall be due or owing to Lessor for any such year. The exercise of any option of Lessee's decision to decline any option hereunder shall terminate Lessee's right to lease capacity for any subsequent year.

4. Ramona Feeder. For each year in which Lessee leases capacity to take water from Lessor's WFA capacity rights, Lessee shall retain all of its rights in the Ramona Feeder and Lessee shall have the exclusive use of the Lessor's rights in Ramona Feeder line for delivery of up to 10 additional mgd.

5. Sublease. Lessee shall have the right to sublease any and all water capacity rights acquired hereunder from Lessor.

6. Representations and Warranties. Lessor hereby represents and warrants to Lessee that Lessor has the right to draw a minimum of 10 mgd from the WFA, and has not otherwise assigned, subordinated or alienated its right to receive at least 10 mgd from the WFA, nor its rights in the Ramona Feeder.

7. It is understood and agreed to between Lessor and Lessee that the lease of Water Treatment Plant capacity to Lessee under the terms of this Agreement shall under no circumstances create a vested right in Lessee to further lease periods or to Lessor's water beyond the term of this Agreement. The parties further expressly agree that the lease of water hereunder shall not in any manner create a detrimental reliance by Lessee on Lessor for the supply of water beyond the term of this Agreement. Lessee agrees that it shall not at any time use this Agreement in any type of legal action as a basis to compel Lessor to renew this Lease, except as provided in this Agreement or to provide water to Lessee beyond the time period specified in this

Agreement unless Lessor so consents in writing.

8. This Agreement constitutes the entire Agreement between the parties with respect to the leasing of WFA water capacity and Lessor's rights in the Ramona Feeder and supersedes all prior discussions, negotiations, and agreements whether written or oral with respect thereto.

9. Notices. Any notices or filings required to be given or made under this Lease shall be served or made in the following manner: Upon Lessee by serving the City Clerk personally or by Registered Mail addressed to the City Clerk, City of Chino Hills, California, 2001 Grand Avenue, Chino Hills, California, 91709-4869, or such other place as may hereafter be designated in writing by Lessee; and, upon Lessor by serving the Secretary of the Board of Directors personally or at 10575 Central Avenue, Montclair, California, 91763, or at such place as Lessor shall hereafter designate in writing.

10. Section Headings, Severability: The paragraph headings contained herein are for convenience and reference and are not intended to define or limit the scope of any provision of this Lease. If any section, subsection, sentence, clause or phrase of this Lease, or the application thereof to either party or any other person or circumstance, is for any reason held invalid, it shall be deemed severable and the validity of the remainder of the Lease for the application of such provision to the other party or to any person or circumstance shall not be affected thereby.

11. Attorney's Fees. Should either party hereto commence an action to enforce the provisions of this Lease, then such party that prevails in that action shall be entitled to reasonable attorney's fees, costs, expert witness fees, consulting fees, and testing fees.

12. Upon full execution of this Agreement, Lessor agrees to promptly notify WFA of the water rights assignment and option contained in this Agreement.

13. This Agreement may be executed in counterparts.

14. This Lease shall terminate forever at the conclusion of the term of this Lease as provided herein. Any payment by Lessee to Lessor after the term hereof (which includes the option years) shall under no circumstances create any holdover rights to Lessor's capacity in the WFA treatment plant. Any lease of capacity from Lessor to Lessee after the expiration of the term of this Lease must be negotiated by the Lessor and Lessee as a new Lease.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first set forth herein.

LESSOR
Monte Vista Water District

By______________________
Robb D. Quincey,
President, Board of Directors

ATTEST

By______________________
P. Joseph Grindstaff
Secretary/General Manager

APPROVED AS TO FORM:
MONTE VISTA WATER DISTRICT

____
Bruce J. Lance, Jr., Attorney

LESSEE
City of Chino Hills

By______________________
Ed Graham, Mayor

ATTEST

By______________________
Linda D. Ruth
City Clerk

APPROVED AS TO FORM
CITY OF CHINO HILLS

____
Mark D. Hensley, City Attorney

A98-44
City

AGREEMENT TO SUPPLY WATER

1. IDENTIFICATION

THIS AGREEMENT is made, entered into and effective this 14th day of July, 1998, by and between MONTE VISTA WATER DISTRICT, a county water district (District), and THE CITY OF CHINO HILLS, a municipal corporation (City).

2. RECITALS

2.1 District is a county water district located in San Bernardino County, California, and provides water service to the City of Montclair, as well as parts of the unincorporated area of San Bernardino County and the City of Chino.

2.2 District obtains its water supply from its wells within the District, as well as from State Water Project water obtained through the Water Facilities Authority (WFA) Agua de Lejos Water Treatment Plant.

2.3 District has determined that its sources of water, including new wells to be placed in service in the future, are more than sufficient to meet the reasonable anticipated needs of the District's residential and commercial customers at the present time, as well as at such time as undeveloped areas of the District are completely developed and water demand maximized. District has determined it has surplus water and

Ref#: 422.2

capacity in its system to provide to City.

2.4 District overlies a portion of the Chino Groundwater Basin (Chino Basin) and has the ability to drill new wells for production of water as District, may, from time to time, deem necessary and prudent. New wells which produce water with a nitrate level in excess of applicable regulatory standards can be blended with water from the WFA Treatment Plant or provided with well head treatment for delivery of water that meets applicable drinking water standards. Blending Plan Approved DHS,

2.5 City is a California Municipal Corporation in San Bernardino County and is located to the south and west of District. City is generally dependent upon sources of water outside of City to meets its present and future needs.

2.6 District is geographically situated at an elevation which would make delivery of water to City economically feasible.

2.7 City has a large area of undeveloped land, the owners of which presently and in the future will desire to develop into residential, commercial and industrial uses. Additional sources and supplies of water will be required for such development.

2.8 City desires to enter into a long term agreement with District for District to provide water at wholesale rates to City. District desires to enter into a long term contract with City to become a wholesale water provider to the City. Such an agreement will be beneficial to District's customers in that it will provide additional revenue to District which will allow additional development of facilities and will assist in stabilizing the water rates District will be required to charge its customers.

2.9 District presently leases 10 million gallons per day (MGD) of water capacity to City. That lease is due to expire on June 30, 2002 ("Lease").

3. **AGREEMENTS**

In consideration of the mutual covenants, promises and conditions contained herein, the parties agree as follows:

3.1 **Water Capacity.** District shall provide City water capacity in its system for the following specified charges:

typo – should read: 10,016,000.

Ck pd 10,016,000

a. A capacity charge of $1,016,000 per MGD for the first 10 MGD. The City shall have 30 days from the effective date of this Agreement to pay the District $6,000,000 and an additional 60 days thereafter to pay the remaining balance of $4,160,000 for such capacity. Upon delivery by City of such capacity charge to District, the Lease shall be terminated and City shall have the right to such capacity immediately.

Ck pd 4,198,500 BMWD

b. A capacity charge of $675,000 per MGD for the next 6.22 MGD plus simple interest from the date of execution of this Agreement at the Local Agency Investment Fund investment return rate as it may fluctuate from time to time. Upon payment therefor, the City shall have one year from the effective date of this Agreement to pay District for such capacity. City shall have the right to such capacity within one year of execution of this Agreement.

c. A capacity charge of $561,000 adjusted annually for the ENR rate as hereinafter defined, per MGD for the next 4 MGD The City shall have five years from the effective date of this Agreement to exercise its option to pay the District to acquire such capacity. Upon delivery by City of such capacity charge to District, the City shall have the right to draw on the capacity within one year.

In addition, District and City may agree in the future that District will provide City with additional water capacity if the circumstances at such time warrant it. The terms and conditions for such additional capacity will depend on future negotiations between the parties hereto.

3.2 **Ownership of System and Facilities.** Payment of the above-described capacity charges will provide City with a corresponding demand on District's system and facilities for delivery of the indicated quantity of water per day subject to the restrictions and qualifications set forth herein. District will, except in emergency situations, maintain capacity to meet the City's demand for up to 20.22 MGD. The City shall not take more than 20.22 MGD at any time without the District's prior written approval. The charge for any amounts taken over 20.22 MGD will be decided by the parties at the time of the District's written approval. Payment of the capacity charge shall not entitle City to an ownership interest in District's system and facilities. At all times District shall remain the sole owner of its system and facilities.

3.3 **Water Delivery Limitations.** District cannot guarantee City that in the event of an "emergency" it will be able to deliver the quantity of water that is equivalent to the capacity charges paid by City. An emergency shall be deemed to exist when a natural or other disaster, drought or regulatory decision makes it impossible for the District to provide the quantity of water demanded by City within the amount provided by this agreement. If an emergency arises District will reduce the City's water supply by no more than the least proportionate reduction imposed by the District on any wholesale or retail customer of the District. In the event of an emergency District and City promise and agree to implement reasonable and appropriate restrictions, limitations and regulations on water use by their retail customers to accordingly reduce their demand for water from District. District shall use reasonable judgment in determining whether an emergency exists which necessitates water delivery to City be curtailed. District shall provide City with written notice of such curtailment and upon receipt of such notice City shall implement the above-referenced reasonable and appropriate procedures within City to limit the demand of District for water.

3.4 **Source and Quality of Water.** District, in its sole discretion, shall determine whether well water, treatment plant water or a combination of both shall be delivered to City pursuant to this Agreement. District represents and warrants that such water will be potable, that District will use its best management practices to deliver water containing an acceptable low level of nitrates by utilizing a blend of groundwater and WFA water. District will provide City with water of no lesser quality than it serves to any retail or wholesale customer of the District. Such water shall meet or exceed all applicable health and regulatory standards. Nothing herein shall be construed to create a responsibility and/or liability for District for water quality problems that are caused by the WFA Treatment Plant Facilities or City's facilities. District will use its best efforts to monitor the quality of water received from the WFA facilities and to immediately notify City of any deficiencies in quality. City shall take all necessary and reasonable steps to maintain an acceptable quality of water in its system that is delivered by District pursuant to this agreement. For example, City, at appropriate intervals, shall flush its storage tanks to avoid trihalomethanes in its system. District pledges its best efforts to assist City in maintaining the quality and integrity of the water delivered by District to City.

3.5 **Location of Water Delivery.** District shall deliver the first 10 MGD of water to City pursuant to this Agreement, at the present connection to the Ramona Feeder near the intersection of Philadelphia and Ramona Avenue in the City of Chino. For delivery of capacity in excess of 10 MGD from District City will be required to construct a pipeline of sufficient size to accommodate the anticipated additional delivery of water by District to City. Such pipeline shall parallel, and may replace, the Ramona Feeder or such other route as is determined by City to a point that allows for connection to District's facilities near the intersection of State Street and Ramona Avenue in the unincorporated area of San Bernardino County. The District will construct all necessary system improvements and metering facilities to convey production water to said intersection, including connection to proposed Ramona Feeder parallel pipeline.

3.6 **Capacity Maintenance Charge.** City shall pay a sum to District to maintain the facilities and system proportionate to the capacity City acquired from District. Said sum shall be equivalent to 1/50 of the initial capacity charge per year and the funds received by District shall be used for the maintenance of City's proportionate capacity interest in the District's facilities and system. Such sum shall be adjusted on an annual basis by the percent change reflected in the publication "Engineering News Record" (EN/20 City Construction Cost Index currently at 5895.11). District shall bill City on a quarterly basis for such additional capacity maintenance charges and shall maintain a separate interest bearing account for such funds and provide an accounting for such funds to City within 30 days of each anniversary of this Agreement. City shall pay District within 25 days of receipt of such bill. Funds in this account in excess of those needed for maintenance or replacement shall be returned annually (within 30 days following the anniversary date of this Agreement) to the City to the extent they exceed 25% of the initial capacity charge as adjusted for inflation per ENR as set forth above. In the event that insufficient funds are available for the City's proportionate share of the cost of replacing infrastructure, the City shall pay to District its proportionate shortfall amount within 30 days of District's billing therefor.

3.7 **Supplemental Pipeline.** City and District have had some preliminary discussion relative to construction of the new pipeline described in Section 3.5 to connect to District's facilities. District shall participate in a proportionate ownership interest in the pipeline to the extent of 10 MGD capacity in the pipeline. District shall pay a proportionate share of the expense for construction, installation and maintenance of the pipeline. In addition, City may determine that it is in its best interest to have District supervise the engineering, planning and construction of the pipeline. In the event that District undertakes the supervision of the construction of such pipeline City and District shall, by separate agreement, determine and provide for the fair compensation for District for its services. District will have an ownership interest in the pipeline commensurate to its capacity interest therein.

3.8 **Water Rate.** Through and including June 30, 2003, City shall pay to District a fee for water delivered by District pursuant to this agreement that is equivalent to 98% of the WFA rate per acre foot for water it delivers to its constituents as determined from time to time. Beginning July 1, 2003 the following formula will be used annually to determine the fee for the water delivered by District to City:

Cost of Production	Percentage of Source
WFA Treated (Imported Rate) x	49%
Average Groundwater Production And Treatment x	31%
Average Groundwater Production And Treatment x	20%
Total Combined Water Rate:	**100%**

Water costs explicitly include a prorata share of associated labor, management, and administrative costs such as insurance, PERS, etc. On an annual basis, the District will prepare and submit to the City an analysis of production costs, including treatment and associated costs as described above. The analysis will include an accounting of allocation of appropriate costs for delivery of water to the City pursuant to this Agreement in proportion to the costs for water sold to District customers. District shall bill City monthly for delivery of water and City shall pay such within 25 days.

3.9 **Term of Agreement.** The term of this Agreement shall be from year to year and shall automatically renew each succeeding year on the anniversary of this Agreement, without limitation, unless otherwise terminated upon 60 days prior written notice by City or as otherwise provided in this Agreement.

3.10 **New Demand Charges.** In the event that Metropolitan Water District (MWD) imposes a new demand charge, or other charge, based upon increased water usage by District resulting from the additional water provided to City over and above District's base years, such additional new demand charges shall be passed through by District to City for payment. The term "base years" shall have the same meaning as is used by the Metropolitan Water District in its rules and regulations for the assessment of such charges.

3.11 **Privatization, Right of First Refusal.** In the event that City subsequently determines that it desires to privatize its water facilities and system it shall give District the right of first refusal to operate and manage its water facilities at the cost and terms equal to or better than competitive privatization proposals received by City.

3.12 **Possible Merger/Consolidation.** After City and District have operated for a period of three years under the terms and provisions of this Agreement, they shall discuss and study the possible merger and consolidation of City's water system with District's facilities. This provision does not require that any such merger occur.

3.13 **CEQA Compliance.** In the event that it is determined that any activity contemplate herein is required to comply with the California Environment Quality Act, as amended, either party, as is determined between them, will undertake the roll of lead agency in connection with all actions, applications, and proceedings necessary to comply with such act as they may determine between them.

3.14 **Damage From Disaster.** District will maintain insurance on all of its facilities to the extent that such facilities are presently insured. In the event of damage to District's facilities from a natural disaster City can either (1) pay a proportionate share of the repair costs that exceed the applicable insurance coverage and the amount of reserves in the Capacity Maintenance Charge set forth in Section 3.6 or (2) terminate the Agreement and any liability or obligation for such repairs. The proportionate share shall be determined by the ratio of City's capacity interest over District's total system capacity. District shall promptly provide City with all appropriate documentation to support the City's proportionate share. City shall pay its proportionate share within 90 days of the date notice of the amount of repairs is presented to City.

3.15 **Section Headings, Severability.** The paragraph headings contained herein are for convenience and reference and are not intended to define or limit the scope of any provision of this Agreement.

3.16 **Default or Breach.** In the event of a default or breach by either party to this Agreement which is not cured within sixty (60) days following written notice thereof from the other party, the nondefaulting party may give written notice to the other party of the intention to terminate the Agreement. If the defaulting party is the City, the City may accept the notice of termination or elect to submit the alleged default to mandatory arbitration and, if applicable, pay under protest any amount demanded by District pursuant to this Agreement. If the City does not notify the District in writing of its election to submit to mandatory arbitration within 30 days, the Agreement shall be terminated upon the expiration of such 30 day period. The purpose of this arbitration election for the City is td allow the City to cure any default which the arbitrator deems to exist and allow the City to continue to draw upon its capacity granted herein.

3.17 **Termination.** This Agreement may also be terminated by City in the event of the insolvency of District. In the event of its dissolution, consolidation or merger, the surviving entity or successor shall be bound by all of the terms and conditions of this agreement. In the event of termination of this Agreement, except termination arising from a breach by District, City shall pay to District all fees for water previously delivered to City as of the date of termination of this agreement. In the event of termination of this Agreement, except arising from a breach by City or a termination by City of be in writing and signed by the party against whom the waiver is asserted. Any such waiver of a breach of or default under this Agreement shall not operate as or be construed to be a waiver of any other breach of or default under this Agreement. The failure of any party to insist on strict adherence to any term of this Agreement on one or more occasions shall not be construed as or deemed to be a waiver of any provision or of any breach of any provision of this Agreement, or deprive that party of the right thereafter to insist upon strict adherence to that term or provision of or any other term or provision of this Agreement. Any delay, failure or omission on the part of either party in exercising any right under this Agreement shall not constitute a waiver of any such right or of any other right under this Agreement.

3.20 **Governing Law.** This Agreement is governed by, and is construed and interpreted in accordance with, the laws of the State of California.

3.21 **Severability.** If any provision of this Agreement is invalid, illegal or unenforceable, such provision shall be deemed to be severed and deleted from this Agreement, and the balance of the Agreement shall remain in full force and effect notwithstanding such invalidity, illegality or unenforceability.

3.22 **Enforcement Rights.** Except for assignments permitted under this Agreement, or by law, and except as provided under the Agreement without cause, District shall return to City all unencumbered funds received by District pursuant to Section 3.6 and a pro-rata share of the funds paid pursuant to Section 3.1 based upon a fifty year period.

3.18 **Mandatory Arbitration.** In the event of any conflict or dispute between the parties in connection with the performance of either party of an obligation or duty imposed upon it by this Agreement, or if there is a conflict or dispute between the parties with respect to the interpretation or construction of any term or condition of this Agreement, it is agreed that the parties shall submit such conflicts or disputes to binding arbitration by the Judicial Arbitration and Mediation Service (JAMS) in accordance with its rules and procedures. Either party may give notice of submission of conflict or dispute to arbitration. If JAMS is no longer in existence or declines to arbitrate a dispute the parties shall select another similar arbitration service.

3.19 **Amendment, Modification & Waiver.**

a. No provision of this Agreement may be waived, modified or amended except by a writing signed by the party against whom enforcement of the waiver, modification or amendment is sought.

b. Any waiver of any provision or waiver of a default under or breach of any provision of this Agreement, must paragraph 3.17 above, this Agreement does not create rights enforceable by any person or organization or any kind that is not a party to this Agreement.

3.23 **Notices.** For purposes of all notices and payments applicable under the provisions of this Agreement, certified mail shall be sent to City of Chino Hills, 2001 Grand Avenue, Chino Hills, California, 91709, attention City Clerk, and to Monte Vista Water District, P.O. Box 71, Montclair, California, 91763-0071, attention General Manager.

Any notice or other communication required or permitted to be given in connection with this Agreement shall be in writing. The notice shall be personally served, or sent by facsimile or telegram, or sent prepaid by registered or certified mail with return receipt requested, or sent by a reputable courier or delivery service. Notice shall be deemed given and complete: (a) If personally served, upon delivery to the party to whom the notice is addressed; (b) If given by facsimile or telegram, when sent; (c) If given by prepaid or certified mail with return receipt requested, on the date of the execution of the return receipt; and (d) If sent by reputable delivery service or courier, when received. Notices addressed to the parties shall be given at the parties' address set forth above or at such address as such party shall hereafter otherwise direct in writing to the other party.

3.24 **Attorneys Fees.** Should any party commence proceeding for arbitration to enforce the provisions of or claims or actions arising out of this Agreement, then such party that prevails in that arbitration proceeding shall be entitled to recover reasonable attorneys' fees, costs, expert witness fees, consultants' fees and testing fees in connection therewith, including such fees for prosecuting, defending any appeal, or incurred in any supplemental proceeding as may be fixed by the arbitrator.

3.25 **Execution of Duplicate Originals.** This Agreement shall be executed by all parties in duplicate, each of which shall be considered an original agreement. The agreements with each of the other parties shall be the same as this Agreement, and each agreement may not be altered or changed without the consent of all of the remaining parties.

3.26 **Refund to District.** City agrees to refund to District the amount of overpaid interest that resulted from the Revised Lease Payment Schedule to the Lease Purchase Agreement between Monte Vista Water District and San Bernardino County Waterworks No. 8, effective October 16, 1989, for the acquisition of District Annexation No. 21. City further agrees to accept the Revised Lease Payment schedule for lease payments after December 1, 1997. District agrees to revise the amount due from City for lease payments for the Water Facilities Authority Treatment

Plant Capacity to recognize District's decrease in debt service payments to the Water Facilities Authority.

Dated: 7/20/98

CITY OF CHINO HILLS

By [signature]
Gwenn Norton-Perry, Mayor

Attest:

By [signature]
Linda D. Ruth, City Clerk

Approved as to Form:

By [signature]
Mark D. Hensley
Attorney for City of Chino Hills

Dated: 7-20-98

MONTE VISTA WATER DISTRICT

By [signature]
Robb D. Quincey
Its President, Board of Directors

By [signature]
Calvin W. Good, Jr.
Its Acting General Manager

Approved as to Form:

By [signature]

Attorney for Monte Vista Water District

Ref#: 422.2

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Attorneys for Plaintiff

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF SAN BERNARDINO

CHINO BASIN MUNICIPAL WATER DISTRICT, Plaintiff, v. CITY OF CHINO, et al. Defendants.	No. 164327

RCN 51010

JUDGMENT

Appendix F
Optimum Basin Management Program

Optimum Basin Management Program

Phase I Report

Prepared for
Chino Basin Watermaster

August 19, 1999

WE Wildermuth Environmental

Optimum Basin Management Program

Phase I Report

Prepared for the

Chino Basin Watermaster

August 19, 1999

Wildermuth Environmental, Inc.
415 North El Camino Real, Suite A
San Clemente, CA 92672
949.498.9294
www.wild-environment.com

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SECTION 1
INTRODUCTION

An Optimum Basin Management Program (OBMP) for the Chino Basin (Figure 1-1) is being developed pursuant to a Judgment entered in the Superior Court of the State of California for the County of San Bernardino and a February 19, 1998 ruling as described below. Pursuant to the Judgment, the Chino Basin Watermaster (Watermaster) files an annual report of Watermaster activities with the Court each year. The information presented below regarding the Judgment, Watermaster, and the events leading up to the February 19, 1998 ruling was obtained from these annual reports.

THE CHINO BASIN JUDGMENT AND WATERMASTER

The Chino Basin Watermaster was established under a Judgment entered in the Superior Court of the State of California for the County of San Bernardino, entitled "Chino Basin Municipal Water District v. City of Chino *et al*," (originally Case No. SCV 164327, file transferred August 1989, by order of the Court and assigned new Case No. RCV 51010). The Honorable Judge Howard B. Wiener signed the Judgment on January 27, 1978. The effective date of this Judgment for accounting and operations was July 1, 1977.

The Judgment resulted from studies and discussions that began in the early 1970's and continued for several years. The initial action to formalize the producers' intentions was the passage in 1974 of a "Memorandum of Agreement on the Chino Basin Plan." In January 1975, Senator Ruben S. Ayala introduced Senate Bill 222 (S.B. 222) in the California Legislature. This bill authorized a production assessment levy of $2.00 per acre-foot per year for a period of three years. The funds were utilized to finance the essential studies and negotiations to implement a water management program for the Chino Groundwater Basin.

S.B. 222 was subsequently renumbered as a part of the Municipal Water District Law at Section 74120 of the Water Code. It was approved by Governor Ronald Reagan and filed with the Secretary of State on June 28, 1975. Three major groups that represented the majority of the producer's interests became active in the early negotiations under S.B. 222. The groups formalized into committees and eventually became known as the: Overlying (Agricultural) Pool, including the State of California and minimal producers; Overlying (Non-Agricultural) Pool representing industries; and Appropriative Pool, representing cities, water districts and water companies. Engineering, legal and other working sub-committees were formed to analyze and define specific problem areas. Representatives of the three pools, when acting together, were called the "Watermaster Advisory Committee." The Watermaster Advisory Committee forwarded recommendations for formal action to the Chino Basin Municipal Water District (CBMWD), which was assigned the responsibility of administering S.B. 222. Socio-economic, safe yield and other studies were conducted to provide the information necessary to reach an agreement regarding the allocation of rights between and within the pool committees.

The Watermaster Advisory Committee was established as the policy setting body and charged with oversight of Watermaster's discretionary activities. Members of each of the three pool committees met regularly to transact the business concerns of its respective producers. Decisions affecting more than one pool committee were forwarded to the Watermaster Advisory Committee. The Judgment provided a method to determine the voting power of the producers on the committees, through a formula based on assessments paid in the prior year and allocated safe yield.

The Judgment declares that the safe yield of the Chino Basin is 140,000 acre-ft/yr, which is allocated among the three pools as follows:

Overlying agricultural pool	82,800 acre-ft/yr
Overlying non-agricultural pool	7,366 acre-ft/yr
Appropriative pool	49,834 acre-ft/yr

A fundamental premise of the Judgment (aka the physical solution) is that all Chino Basin water users will be allowed to pump sufficient water from the Basin to meet their requirements. To the extent that pumping exceeds the share of the safe yield, assessments are levied by the Watermaster to replace the overproduction. The Judgment recognizes that there exists a substantial amount of available groundwater storage capacity in the Chino Basin that can be utilized for storage and conjunctive use of supplemental water and basin waters; makes utilization of this storage subject to Watermaster control and regulation; and provides that any person or public entity, whether or not a party to the Judgment, may make reasonable beneficial use of the available storage, provided that no such use shall be made except pursuant to a written storage agreement with the Watermaster.

EVENTS LEADING UP TO THE FEBRUARY 19, 1998 RULING

During fiscal year 1995-96, it was determined that the reappointment of the CBMWD board as Watermaster had not been submitted to the Court for approval in 1993. In January 1996, a motion was made and supported by a majority of the Advisory Committee to appoint the Advisory Committee to serve as Watermaster. Initially, this motion was supported by 71.64% of the Advisory Committee and as provided in Paragraph 16 of the Judgment, Watermaster Counsel was directed by the Advisory Committee to file the motion with the Court. A Watermaster Ad Hoc Transition Committee of pool members and interested parties was formed to work out the logistics involved with changing the Watermaster. Shortly after the motion was filed, the case was assigned to the Honorable Judge J. Michael Gunn. Fifteen committee members attended the first Ad Hoc Transition Committee meeting on January 31, 1996, and agreed unanimously to propose that an arbitrator or an arbitration process be put in place to address initial concerns raised by some parties to the Judgment regarding the Advisory Committee serving as Watermaster.

By early March, the Overlying (Agricultural) Pool and a few appropriators had reconsidered their positions and were opposed to the motion to appoint the Advisory Committee as Watermaster, even with an arbitration process. As a result, the motion was taken off calendar and additional Ad Hoc Transition Committee meetings were held. These meetings resulted in the development of a proposal for a nine-member board, which was approved by the Advisory Committee in April 1996. Watermaster Counsel was directed to file a motion to appoint the nine-member board, which was set for hearing on June 18, 1996.

On June 3, 1996, CBMWD filed an ex-parte motion to shorten the time on a motion to appoint itself as Interim Watermaster, to appoint itself "*nunc pro tunc*" Watermaster and to disqualify Watermaster Counsel based on the allegation that Counsel had a conflict of interest in serving both Watermaster and the Advisory Committee. The motion to shorten time was granted and the hearing was set for June 18, 1996. At the June 18, 1996 hearing, the Honorable Judge J. Michael Gunn granted the motions to appoint CBMWD nunc pro tunc and Interim Watermaster, and denied the motion to disqualify Watermaster Counsel. The Judge also ordered the parties to meet and confer regarding the nine-member board proposal, which continued the matter to a *meet and confer* among all the interested parties, held July 29, 1996.

July 29, 1996, was the first of two *meet and confers*, held at the City of Chino Council Chambers. Although there was much discussion on that date, the only substantive decision made was to hold an additional *meet and confer* on August 28, 1996.

As a result of the second *meet and confer*, a three-member Watermaster Board proposal was submitted to the Court for hearing on September 18, 1996. As of the Court hearing date, only two of the three municipal water districts invited to participate on the proposed three-member Watermaster Board had responded affirmatively. CBMWD was expected to agree to participate after consideration at their October board meeting and the Court continued the motion until November 20, 1996. CBMWD did not take action to participate on the three-member Watermaster Board as anticipated and the motion was taken off calendar in November of 1996. Four additional workshops were held during late 1996 and into the early months of 1997. As a result, the original nine-member Watermaster Board proposal was modified and approved by the Watermaster Advisory Committee on January 30, 1997, by a majority vote of 67.99 percent.

On March 11, 1997, a new motion to appoint a nine-member Watermaster Board was heard by the Honorable Judge J. Michael Gunn. On April 29, 1997, Judge Gunn issued a ruling which:

- Appointed Anne J. Schneider, Esq. as Special Referee to make a recommendation to the Court regarding the issues raised by the motions.
- Ordered CBMWD, the Advisory Committee, and the DWR (Department of Water Resources) to negotiate terms for the DWR to serve as Interim Watermaster.
- Granted a motion submitted on March 6, 1997, by the law firm of Cihigoyenetche, Grossberg & Clouse, general counsel for CBMWD, to disqualify Watermaster Counsel.

Negotiations began regarding the DWR serving as interim Watermaster through Special Counsel to the Watermaster Advisory Committee, James L. Markman, CBMWD Counsel, Jean Cihigoyenetche, and the attorneys for the DWR.

Anne Schneider accepted the Court's appointment to become a Special Referee and began the process necessary to make a recommendation to the Court. No substantial decisions were reached by fiscal year end and the matter continued into fiscal year 1997-98.

The Special Referee held a special hearing on October 21, 1997, at the Watermaster offices. By mid December 1997, the Special Referee filed her written *Report and Recommendation* with the Court. Based on the *Report and Recommendation*, the Honorable J. Michael Gunn entered a ruling on February 19, 1998 which:

- Appointed the Nine-Member Board as Interim Watermaster.
- Directed that an Optimum Basin Management Program be developed.
- Directed negotiation with DWR be resumed.
- Set hearing dates regarding:
  - The Optimum Basin Management Program (October 28, 1999).
  - Continuance of the Nine-Member Board (October 28, 1999).

- Status of negotiations with DWR to serve as Watermaster and to carry out Watermaster operations (September 30, 1999).

This report documents the development of the OBMP for the Chino Basin pursuant to the Honorable J. Michael Gunn's February 19,1998 ruling.

PROCESS TO DEVELOP THE OBMP

Since the ruling, the Watermaster, the producers, and other interested parties have met twice a month and held special workshops to develop the scope of work to prepare an OBMP and to cooperatively develop the OBMP. The Court officially accepted the scope of work to develop the OBMP on November 5, 1998.

Development of the OBMP required three parallel processes: institutional, engineering, and financial. The institutional process defined the management agenda, directed the engineering and financial processes, and built an institutional support for OBMP implementation. The engineering process developed planning data and management elements, and evaluated the technical and economic performance of the management elements. The financial process was supposed to develop alternative financing plans for the OBMP through its evolution. However because of institutional complexity involved in developing regional water supply facilities and their related financing, most of the financial process will occur in the latter half of 1999 and into the year 2000 – after this document is submitted to the Court in October 1999.

Institutional Process

The institutional process consisted of the following tasks:

Task 1 Identify needs and interests of interested parties.

Task 2 Establish a meeting schedule necessary to complete the OBMP within the time frame allocated.

Task 3 Develop and refine the scope of work based on identified needs.

Task 4 Identify early implementation actions and develop a list of potential program (management) elements of the OBMP to balance needs and interests.

Task 5 Evaluate program elements and develop recommended management and implementation plan.

The first three tasks were completed with the submission of the recommended scope of work to the Special Referee and the Court. Task 4 work was begun in June 1998 with several early implementation action items having already been approved and with initial management concepts submitted to begin the list of potential program elements of the OBMP. The management concepts that were submitted represented concepts or implementation plans that described the party's vision of the OBMP. Submission of management concepts continued into July and August of 1998 and reflected the needs and interests that were previously identified for the OBMP. All proposals submitted were discussed and listed.

As part of Task 5, those proposals that appeared the most promising were forwarded to the engineering and financial consultants for reconnaissance-level, technical, economic and financial analyses. The results of the engineering and financial analyses were submitted to the producers and Watermaster for review. Working together, the producers and the Watermaster Board have developed an Optimum Basin Management Program for the Chino Basin.

Engineering Process

The engineering process consisted of the following tasks:

Task 1 Develop Optimum Basin Management Program Criteria

Task 2 Assess Current State of the Basin

Task 3 Prepare Sections 1, 2, and 3 of the Optimum Basin Management Program document

Task 4 Develop the Components of the Optimum Basin Management Program

Task 5 Develop Implementation Plan

Task 6 Finalize Optimum Basin Management Program document

Tasks 1 and 2 define the basin problems, planning environment, and the needs and interests of the basin producers. Tasks 1, 2, and 3 were completed in December 1998 and draft Sections 1, 2, and 3 of the OBMP were provided to all interested parties for review. A matrix was developed that contains the goals, impediments to the goal, action items to achieve the goals and the implications of the action items. This matrix was used to define the program elements of the OBMP. Tasks 4 and 5 were engineering efforts to develop these elements and to describe the implementation process.

Over time, the institutional process Tasks 4 and 5, and engineering process Tasks 4 and 5 merged and became one seamless process. Completion of engineering process Task 6 will be completed when the financial process is completed sometime in the year 2000.

ORGANIZATION OF THE OPTIMUM BASIN MANAGEMENT PROGRAM REPORT

The OBMP report is being presented in two phases. This document is the Phase I report and contains a description of the OBMP and the following additional sections:

Section 2 – Current Physical State of the Basin – This section describes the state of the Basin in terms of historical groundwater levels, storage, production, water quality, and safe yield. Current and projected water demands and water supply plans are described. Problems in these areas are identified and potential solutions or solution processes are described.

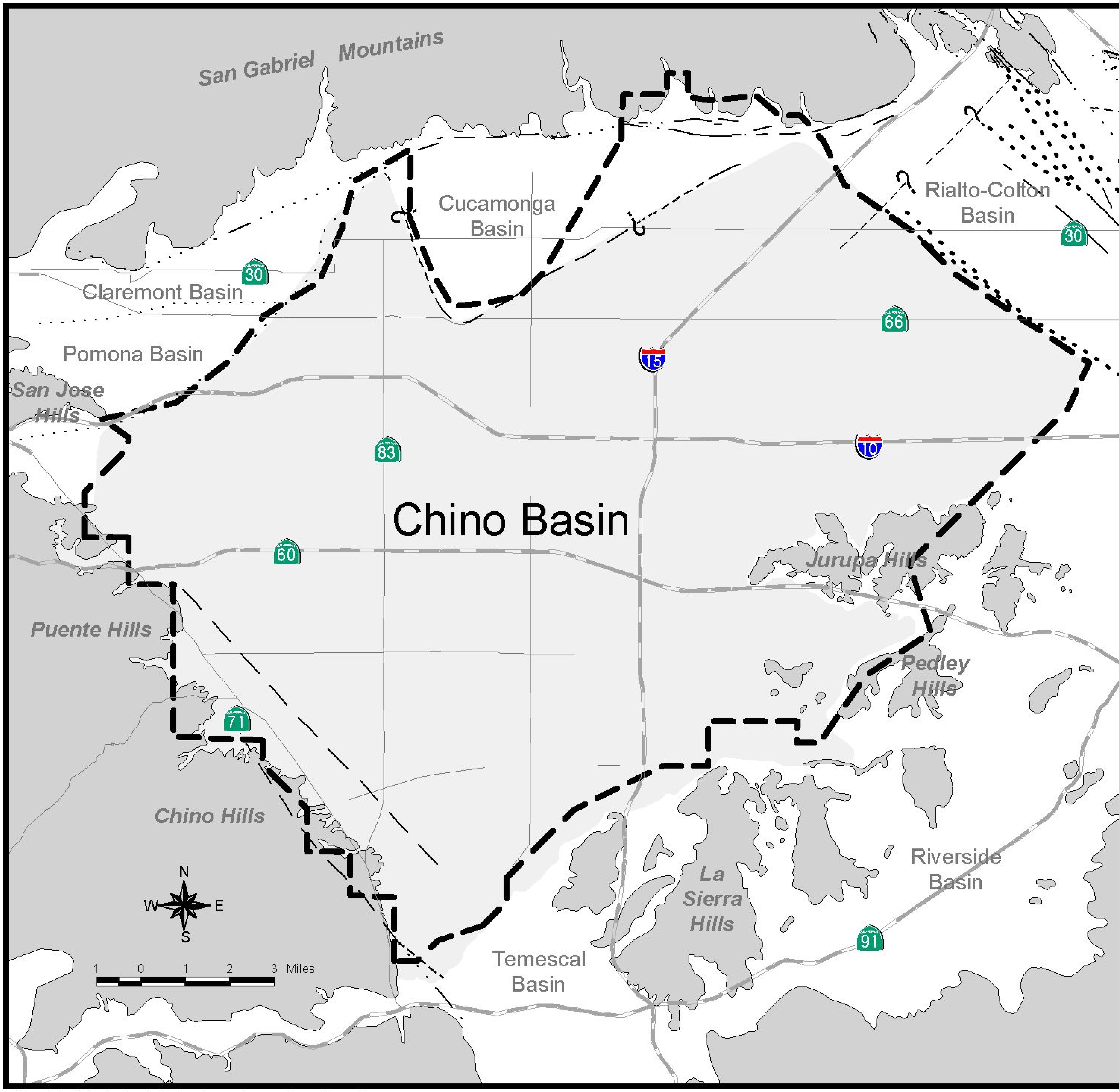
Section 3 – Goals of the Optimum Basin Management Program – This section describes the major issues defined by stakeholders in the OBMP process, the mission statement for the OBMP process and the goals for the OBMP process.

Section 4 – Management Plan – This section describes program elements to achieve the goals of the OBMP, a management plan, and a process to periodically review and update the OBMP.

Appendix A – Public Comments. This appendix contains written correspondence and a transcript of public comments on the OBMP from a Watermaster hearing held on September 15, 1999 (bound separately).

The technical memoranda produced to support the program elements and implementation process described in Section 4 are on file at the Watermaster offices. Copies are available upon request.

The Phase II report consists of more detailed descriptions of capital-intensive and institutionally complex features of the OBMP. The Phase 2 report will be bound separately.



Optimum Basin Management Program

Chino Basin Watermaster

Legend

Chino Basin Adjudicated Boundary

Hydrologic Chino Basin

Fault
- Dashed Where Approximate
- Dotted Where Concealed
- Queried Where Uncertain
- Large Dots Where Groundwater Barrier (Suspected Fault)

Bedrock

Vicinity Map

Figure 1-1

Chino Basin
Hydrologic and Legal Boundaries

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: November 9, 1999

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SECTION 2
STATE OF THE BASIN

This section has been prepared for the OBMP stakeholders so that they will have a common starting point or frame of reference from which to develop the OBMP. The stakeholders developed the outline of this section with input from the Special Referee.

This section of the OBMP report describes the Basin, its physical state, future water demands in the Chino Basin area, and concludes with a summary of problems within the Basin. The physical state of the Basin includes a description of groundwater levels, groundwater storage, production patterns, groundwater quality, and safe yield. These characteristics of the Basin are intimately related, as are the solutions to the problems associated with these characteristics. Water demands in the Chino Basin area include an estimate of current water usage and future water demand projections for groundwater and other sources, an assessment of water quality conditions, and future projections of wastewater generation – including the relationship of source water quality and wastewater quality.

DESCRIPTION OF THE BASIN

The Chino Basin consists of about 235 square miles of the upper Santa Ana River watershed. Figure 1-1 illustrates the boundary of the Chino Basin as it is legally defined in the stipulated Judgment in the case of Chino Basin Municipal Water District vs. the City of Chino *et al.* Figure 1-1 also shows the hydrologic boundary of the Basin, which is slightly different from the adjudicated boundary. Chino Basin is an alluvial valley that is relatively flat from east to west and slopes from the north to the south at a one to two percent grade. Valley elevation ranges from about 2,000 feet in the foothills to about 500 feet near Prado Dam. Chino Basin is bounded:

- on the north by the San Gabriel Mountains and the Cucamonga Basin;
- on the east by the Rialto-Colton Basin, Jurupa Hills, and the Pedley Hills;
- on the south by the La Sierra area and the Temescal basin; and
- on the west by the Chino Hills, Puente Hills, and the Pomona and Claremont Basins.

The Chino Basin is one of the largest groundwater basins in southern California with about 5,000,000 acre-ft of water in the Basin and an unused storage capacity of about 1,000,000 acre-ft. Cities and other water supply entities produce groundwater for all or part of their municipal and industrial supplies; and about 300 to 400 agricultural users produce groundwater from the Basin. The Chino Basin is an integral part of the regional and statewide water supply system. Prior to 1978, the Basin was in overdraft. After 1978, the Basin has been operated as described in the 1978 Judgment in Chino Basin Municipal Water District vs. City of Chino *et al*. (Chino Judgment or Judgment).

SURFACE WATER RESOURCES

The principal drainage course of the Chino Basin is the Santa Ana River. It flows 69 miles across the Santa Ana Watershed from its origin in the San Bernardino Mountains to the Pacific Ocean. The Santa Ana River enters the Basin at the Riverside Narrows and flows along the southern boundary to the Prado Flood Control Reservoir where it is eventually discharged through the outlet at Prado Dam. Chino Basin is traversed by a series of ephemeral and perennial streams that include: Chino Creek, San Antonio Creek, Cucamonga Creek, Deer Creek, Day Creek, Etiwanda Creek and San Sevaine Creek. Figure 2-1 illustrates the stream system in the Chino Basin. San Antonio Creek joins Chino Creek and along with Cucamonga Creek, discharges directly into the Prado Reservoir. Cucamonga Creek changes its name to Mill Creek just north of the Prado Reservoir. Deer Creek was realigned and now discharges into Cucamonga Creek. Currently, Etiwanda Creek discharges into Day Creek at Wineville Basin. In the near future, Etiwanda Creek will be joined with San Sevaine Creek. Day Creek and San Sevaine Creek flow south and enter the Santa Ana River upstream of the Prado Reservoir.

These creeks carry significant flows only during, and for a short time after, intermittent storms that typically occur from November through March. Year-round flow occurs along the entire reach of the Santa Ana River due to year round surface inflows at Riverside Narrows, discharges from municipal water recycling plants that discharge in the River between the narrows and Prado Dam, and rising groundwater. Rising groundwater occurs in Chino Creek, in the Santa Ana River at Prado Dam, and potentially other locations on the Santa Ana River depending on climate and season. The rising groundwater in Chino Creek and the Santa Ana River contains high concentrations of total dissolved solids (TDS). Year-round discharges are sustained:

- in Chino Creek from the Inland Empire Utilities Agency (IEUA) Regional Plant No. 2 (RP2) to the Prado Reservoir, the source of which is from recycled water discharges from RP2; and
- in Cucamonga Creek from IEUA Regional Plant No. 1 (RP1) to the Prado Reservoir, the source of which is from recycled water discharges from RP1.

Significant nuisance flows have developed in Cucamonga Creek above RP1, the source of which is excess landscape irrigation and other outside urban uses. Some of the storm water runoff from the San Gabriel Mountains and urban areas is diverted for recharge in flood retention and spreading basins. These basins are shown in Figure 2-1.

Geology

Chino Basin was formed when eroded sediments from the San Gabriel Mountains, the Chino Hills, Puente Hills, and the San Bernardino Mountains filled a structural depression. The formation of the Basin is described in detail in the *Final* Task 2.2 and 2.3 Report, Describe Watershed Hydrology and Identify Current TDS and TIN Inflows in the Watershed (Wildermuth, 1997). The bottom of the Basin – the effective base of the freshwater aquifer – consists of impermeable sedimentary and igneous rocks. The base of the aquifer is overlain by older alluvium of the Pleistocene period followed by younger alluvium of the Holocene period.

The younger alluvium varies in thickness from over 100 feet near the mountains to a just few feet, south of Interstate 10 and generally covers most of the north half of the Basin in undisturbed areas. The younger alluvium is not saturated and thus does not yield water directly to wells. Water percolates readily in the younger alluvium and most of the large spreading basins are located in the younger alluvium.

The older alluvium varies in thickness from about 200 feet thick near the southwestern end of the Basin to over 1,100 feet thick southwest of Fontana, and averages about 500 feet throughout the Basin. Well capacities range between 500 and 1,500 gallons per minute (gpm). Well capacities exceeding 1,000 gpm are common, with some modern production wells test-pumped at over 4,000 gpm (e.g., Ontario Wells 30 and 31 in southeastern Ontario). In the southern part of the Basin where sediments tend to be more clayey, wells generally yield 100 to 1,000 gpm. Three main water-bearing (hydrostratigraphic) units were identified by Montgomery Watson (1992) during the development of a three-dimensional groundwater model of the Basin. Figure 2-2 shows the locations of two (of seven) generalized cross-sections through the Chino Basin. These generalized cross-sections illustrate these main aquifer units and are shown in Figures 2-3 and 2-4.

Faults are one of the principal agents in the development of the landscape and restriction of groundwater flow in the Chino Basin. The basin is bounded by major fault systems along which the mountains and hills have been uplifted. The location of fault and groundwater barriers, and displacements in the effective base of the aquifer at faults are shown in Figure 2-2. The faults and groundwater barriers are significant in that they define the external boundaries of the Basin and influence the magnitude and direction of groundwater flow near the boundaries.

MAJOR FLOW SYSTEMS

While considered one basin from geologic and legal perspectives, the Chino Basin can be hydrologically subdivided into at least five flow systems that act as separate and distinct basins. Figure 2-5 is a groundwater elevation contour map for fall of 1997. Figure 2-5 also shows the location of five groundwater flow systems developed during the *TDS and Nitrogen Study* (Wildermuth, 1999) of which the Watermaster, the Chino Basin Water Conservation District (CBWCD), and the IEUA are study participants. Each flow system has a unique hydrology, and water resource management activities that occur in each flow system have little or no impact on the other systems. Each flow system can be considered a management zone. These management zones can be subdivided further if necessary to define and manage flow systems at a finer scale. These management zones are used to characterize the groundwater level, storage, production, and water quality conditions. Figure 2-6 shows these management zones relative to the subbasins used in the 1995 Regional Water Quality Control Plan (Basin Plan) for the Santa Ana Watershed. The Regional Water Quality Control Board, Santa Ana Region (Regional Board) has established water quality objectives for these subbasins and writes waste discharge requirements for waste dischargers based in part on these objectives. Presently, the Basin Plan subbasin boundaries and objectives are being rigorously reviewed. New boundaries similar to the management zone boundaries have been proposed. Revised boundaries and water quality objectives should be adopted sometime in the year 2000.

Management Zone 1. Management Zone 1 is bounded:

- on the southwest by the Chino and Puente Hills,
- on the northwest by the San Jose fault that separates Chino Basin from the Pomona and Claremont Heights Basins,
- on the north by an unnamed non-echelon fault system associated with the Cucamonga and Red Hill faults and separates the Chino Basin from the Cucamonga Basin,
- and on the east by a line that stretches from the southern most edge of the Red Hill fault to Prado Dam.

Groundwater in Management Zone 1 flows generally south with some localized flows to the west in response to groundwater production. Sources of water to Management Zone 1 include direct percolation of precipitation, returns from irrigation, recharge of storm flows and imported water in spreading basins, and subsurface inflow from the Pomona, Claremont Heights, and Cucamonga Basins. Discharge is through groundwater production and as rising groundwater in Chino Creek and the Santa Ana River.

Management Zone 2. Management Zone 2 is bounded:

- on the west by Management Zone 1,
- on the north by the Red Hill fault that separates the Chino Basin from the Cucamonga Basin,
- on the northeast by a segment of the Rialto-Colton fault,
- and on the east by a segment of Barrier J and a line extending from Barrier J in a southwesterly direction to a point of convergence with other management zone boundaries near Prado Dam.

Groundwater in Management Zone 2 flows generally in a southwesterly direction in the northern half of the management zone and then due south in the southern half of the zone. Sources of water to Management Zone 2 include direct percolation of precipitation, returns from irrigation, recharge of storm flows and imported water in spreading basins and subsurface inflow from the part of the Rialto Basin northwest of Barrier J and the Cucamonga Basin. Discharge is mainly through groundwater production and potentially small amounts of rising groundwater in the Prado Reservoir area.

Management Zone 3. Management Zone 3 is bounded:

- on the west by Management Zone 2,
- on the northeast by the Rialto-Colton fault that separates the Chino Basin from the Rialto Basin,
- on the southeast by the Bloomington divide, Jurupa Hills and line projecting from the most western extension of the Jurupa Hills to a point of convergence with other management zone boundaries near Prado Dam.

Groundwater in Management Zone 3 flows generally in a southwesterly direction. Sources of water to Management Zone 3 include direct percolation of precipitation, returns from irrigation, and subsurface inflow from the part of the Rialto Basin southeast of Barrier J. Discharge is mainly through groundwater production and potentially small amounts of rising groundwater in the Prado Reservoir area.

Management Zone 4. Management Zone 4 is bounded

- on the west by Management Zone 3,
- on the north by the Jurupa Hills,
- on the southeast by the Pedley Hills, and
- on the south by Management Zone 5.

Groundwater in Management Zone 4 flows west. Sources of water to Management Zone 4 include direct percolation of precipitation, and returns from irrigation. Discharge is through groundwater production.

Management Zone 5. Management Zone 5 is bounded:

- on the north and west by the Management Zones 3 and 4, Prado Dam,
- on the east by the Riverside Narrows, and
- on the south by the La Sierra area and Temescal Basin.

Sources of water to Management Zone 5 include streambed percolation in the Santa Ana River, direct percolation of precipitation, returns from irrigation and subsurface inflow from the Temescal Basin. Discharge is through groundwater production, consumptive use by phreatophytes, and rising groundwater in the Prado Reservoir area, and potentially other locations on the Santa Ana depending on climate and season.

GROUNDWATER LEVELS AND STORAGE

Historical Groundwater Level Monitoring

Various entities have collected groundwater-level data in the past. Municipal and agricultural water supply entities have historically collected groundwater-level data in programs that range from irregular, study-oriented measurements to long-term periodic measurements. Groundwater-level measurements were made for specific investigations such as various California Department of Water Resources (DWR) studies, the 1969 Judgment on the Santa Ana River (Orange County Water District *vs.* City of Chino *et al.*), and the Chino Basin Judgment (Chino Basin Municipal Water District vs. City of Chino *et al.*). The spatial extent and temporal history of groundwater-level measurements south of State Route 60 have always been less than north of State Route 60. The DWR and the San Bernardino County Flood Control District (SBCFCD) were very active in collecting groundwater-level measurements in the Chino Basin prior to the settlement of the Chino Basin adjudication. After the Judgment was entered in 1978, the water level monitoring south of State Route 60 stopped almost completely except for the cities of Chino, Chino Hills, and the Jurupa Community Services District (JCSD). Most of the pre-1978 measurements were digitized by the DWR.

Watermaster conducted its first mass groundwater-level monitoring program for the Chino Basin in the spring of 1986. In 1989, Watermaster initiated a more regular monitoring program for the Basin with groundwater-level measurements obtained in 1990, and periodically thereafter through 1997. Watermaster's program relies on municipal producers and other government agencies supplying their groundwater-level measurements on a cooperative basis. Watermaster staff supplements these data with groundwater-level measurements collected by staff, primarily south of State Route 60. In addition to Watermaster staff efforts, private contractors conducting well efficiency tests collect groundwater-level measurements and submit these measurements to Watermaster. Watermaster has digitized all of these recent measurements. Watermaster has combined digitized groundwater-level measurements from all known sources into a database structure that is maintained at Watermaster's office.

Watermaster began a process to develop a comprehensive groundwater-level monitoring program in the spring of 1998. The process consists of collecting groundwater-level data at all wells in the Basin from which groundwater-level measurements can be obtained for fall 1999, spring 2000, fall 2000, and spring 2001. These data will be mapped and reviewed. Based on this review and Watermaster management needs, a long-term water-level monitoring program will be developed and implemented in the fall of 2001.

Historical Groundwater Levels

This section describes the groundwater-level time histories in the Chino Basin by management zone and characterizes the differences between management zones. Figure 2-7 illustrates the location of wells whose groundwater-level time histories are discussed herein and the management zone boundaries described in Section 1. The wells were selected based on length of record, completeness of record, and geographical distribution. Wells discussed herein are identified by their state well number. The behavior of groundwater-levels at specific wells is compared to climate, to pre- and post-Judgment periods, and to other factors as appropriate.

Management Zone 1. Wells 01S07W08N01 (Figure 2-8) and 01S08W11R01 and 01S08W14A03 (Figure 2-9) illustrate typical groundwater-level time histories in the northern end of Management Zone 1. The accumulated departure from mean precipitation (ADFM) curve is plotted on Figures 2-8 and 2-9 to illustrate climatic conditions. Positive sloping lines on the ADFM curve imply wet years or wet periods. Negatively sloping lines imply dry years or dry periods. For example, the period between 1937 to 1944 and 1978 to 1983 are extremely wet periods, and are represented as positively sloping lines. The period 1945 through 1977 is a drought period and is represented as a negatively sloping line, punctuated with a few wet years (positively sloped in 1952, 1958 and 1969). Short-term groundwater-level fluctuations shown in these figures are caused by including static and dynamic observations in the groundwater-level time histories. These time histories follow the climatic trends very closely with the 01S08W11R01 and 0S08W14A03 (westernmost wells) being slightly more sensitive to high rainfall years than 01S7W08N01 (eastern well). The groundwater-level response in well 01S7W08N01 lags the 1937 to 1944 and the 1978 to 1983 wet periods by about three to four years. By comparison, wells 01S08W11R01 and 0S08W14A03 responded to the 1978 to 1983 wet period within a year. The difference in response time is due to proximity of recharge to the area near the wells. Wells 01S08W11R01 and 0S08W14A03 are relatively close the Upland and Montclair Basins. Well 01S7W08N01 is two miles east of wells 01S08W11R01 and 0S08W14A03 with no significant recharge facilities nearby. In addition, the Metropolitan Water District of Southern California (MWDSC) recharged large quantities of State Water Project (SWP) water in the Montclair Basins during the period 1978 to 1983. The depth to water in the vicinity of these wells ranged from about 460 feet in the late 1920s to about 600 feet in 1996.

Wells 01S08W28E01 (Figure 2-10) and 01S08W31J01 and 01S08W33D01 (Figure 2-11) are about three miles south of wells 01S08W11R01 and 01S08W14A03 (Figure 2-9). These wells follow the general climatic trend, but show essentially no response to intermittent wet years in 1952, 1958, and 1969. The post-1977 groundwater-level increase is due to the 1978 to 1983 wet period, the reduction in overdraft following the implementation of the Chino Basin Judgment, the initiation of groundwater replenishment with imported water, and the reduction in pumping due to increased use of imported surface water. The groundwater-level response in these wells responded to the 1978 to 1983 wet period within a year. The depth to water in the vicinity of these wells ranged from about 130 to 160 feet in the late 1920s to about 150 to 280 feet in 1996 with well 01S08W28E01 showing the greatest depth to water. Well 01S08W28E01 is a municipal production well owned by the City of Pomona and is located in an area of regionally depressed groundwater levels.

Wells 02S08W04P01 and 02S08W12F01 (Figure 2-12) are located about two to three miles south of well 01S08W28E01 (Figure 2-10) and wells 01S08W31J01 and 01S08W33D01 (Figure 2-11). These wells follow the general climatic trend, but show essentially no response to intermittent wet years in 1952, 1958 and 1969. The groundwater-level responses in these wells lag the 1937 to 1944 and the 1978 to 1983 wet periods by about two to three years. The response to the 1937 to 1944 wet period is surprisingly subtle compared to most other wells with contemporaneous time histories in Management Zone 1. This suggests that recharge in the area is low and that production is high. The post-1977 groundwater level increase for 02S08W04P01 is due to the 1978 to 1983 wet period, the reduction in overdraft following the implementation of the Chino Basin Judgment, the initiation of groundwater replenishment with imported water, and the reduction in pumping due to increased use of imported surface water. The depth to water in the vicinity of these wells ranged from about 20 to 40 feet in the late 1920s to about 200 feet in 1982.

From north to the south, the following observations can be made regarding time histories of groundwater levels in Management Zone 1:

- groundwater levels are down from observed period of record highs in the late 1920s;
- the lowest groundwater levels were observed around 1977;

- groundwater levels have recovered slightly since 1977 due in part to the wet period of 1978 to 1983, reduction in overdraft after 1977, the initiation of groundwater replenishment with imported water, and the reduction in pumping due to increased use of imported surface water;
- a condition of long-term overdraft has occurred in this management zone with groundwater levels dropping by about 100 to 140 feet between the late 1920s to the present with most of the decline prior to 1977 and the Chino Basin Judgment (1978).

Management Zone 2. Figure 2-13 contains groundwater-level time histories for 01S07W14G01, 01S07W27D01, and 02S07W09M01. These wells are aligned north to south, approximately along a flow line. The groundwater-level time histories in Figure 2-13 show a general decline since before the 1937 to 1944 wet period, with little or no response to wet years until 1978. The post-1977 increase is probably due to the combination of 1978 to 1983 wet period, reduction in overdraft following the implementation of the Chino Basin Judgment, the start of artificial replenishment with imported water in the San Sevaine and Etiwanda flood control basins, and the increased use of imported surface water. The depth to water for 01S07W27D01 ranged from about 200 feet in the late 1920s to about 380 feet in 1974, a decline in groundwater levels of about 180 feet.

Management Zone 3. Figure 2-14 contains time histories for wells 01S06W11B01 and 01S05W16C01 that are located in the most upgradient part of Management Zone 3. The groundwater-level observations in these wells follow the general climatic trend. The groundwater-level time history for well 01S06W16C01 shows a general decline since the 1920s and a general non-responsiveness to significant wet years or periods. For example, there is a slight response to the 1937 to 1944 and 1978 to 1983 wet periods and no response to wet years in 1952, 1958, and 1969. Well 01S06W11B01 behaves in a similar manner with slightly less responsiveness. The lack of responsiveness is due to the lack of significant sources of recharge. There are no major streams or recharge basins in the upper part of Management Zone 3. The peak groundwater levels for both of these wells are lagged about three years behind the peaks in the ADFM curve for the 1937 to 1944 and 1978 to 1983 wet periods. The depth to water ranges from about 360 to 430 feet in the late 1920s to about 430 to 540 in 1978 for wells 01S05W16C01 and 01S06W11B01, respectively. The groundwater decline from the 1920s to the early 1990s is about 20 feet and 60 feet for wells 01S05W16C01 and 01S06W11B01, respectively. Figure 2-15 is a similar plot for wells 01S05W30L01 and 01S06W23D01. These wells have similar response characteristics as 01S06W11B01 and 01S05W16C01 with about 60 to 70 feet of groundwater decline over the period from the late 1920s to the early 1990s.

The relative amount of decline from 1920s to 1977 is less in Management Zone 3 than in Management Zone 1. This is due to greater production in Management Zone 1 than in Management Zone 3 and because of the specific yield (fraction of usable groundwater per unit volume), which is greater in the eastern portion of Chino Basin than in the western portion. The alluvium in the eastern part of the Chino Basin is derived from granitic rocks of the San Gabriel Mountains. The alluvium on the west side of Chino Basin is derived in part from the San Gabriel Mountains and marine sedimentary rocks of the Chino and Puente Hills. The latter produce finer-grained alluvium with more clay and poorer storage properties.

Figure 2-16 contains time histories for wells 02S06W05B01 and 02S07W34H01. These wells are aligned northeast to southwest, approximately along a flow line. The groundwater-level time histories end in the late 1970s or early 1980s, as is typical for agricultural wells in the southern half of the Basin. These time histories follow the general climatic trend, however, there is trend among the wells of a decreasing climatic influence from northeast to southwest. The depth to water for 02S06W05B01 ranged from 130 feet in the late 1920s, to about 200 feet in 1978, a decline in groundwater levels of about 70 feet.

Management Zone 4. Management Zone 4 is bounded on the north by the Jurupa Hills, on the east by the Pedley Hills, on the south by Management Zone 5 and on the west by Management Zone 3. The only outflow from Management Zone 4 is by production. Figure 2-17 contains groundwater-level time histories for wells 02S06W16B02 and 02S06W14C02. These wells generally follow the climatic trend. The depth to water for 02S06W14C02 ranged from about 7 feet in 1945 to about 17 feet in 1993, corresponding to an overall decline in groundwater levels of about 10 feet for this period.

Management Zone 5. Management Zone 5 is bounded on the north and west by the Management Zones 3 and 4, on the east by the Riverside Narrows and on the south by various unnamed hills. Figure 2-18 contains time histories for wells 02S07W36H02, 02S06W26D02, and 03S07W03N01. Groundwater levels in these wells follow the general climatic trend. However, wells 2S07W36H02 and 03S07W03N01 are much less responsive than well 02S07W26D02 due to the stabilizing effects of being adjacent to the Santa Ana River. The depth to water for 02S07W26D02 ranged from about 24 feet in 1939 to about 28 feet in 1992, corresponding to an overall decline in groundwater levels of about 4 feet for this period.

For the most part, the response of groundwater levels in the Chino Basin to significant storms and wet climatic periods is small. There are two reasons for this. First, the mountain drainage areas tributary to the Chino Basin are relatively small compared to the size of Chino Basin (235 square miles) and the amount of water in storage (~5,000,000 acre-ft). The mountain drainage areas tributary to the Chino Basin areas are:

San Antonio Creek	17.7	sq mi
Cucamonga Creek	13.6	
Deer Creek	6.4	
Day Creek	7.7	
Etiwanda Creek	6.7	
San Sevaine Creek	9.7	
Total	61.7	sq mi

San Antonio Creek is mostly diverted for direct use and recharge in the Claremont Heights and Cucamonga Basins. Cucamonga, Deer, and Day Creeks are diverted for direct use and recharge in the Cucamonga Basin. Large storm flows from these creeks can make it into the Chino Basin, however these channels are concrete-lined and consequently large amounts of storm flow are not recharged. In contrast, San Bernardino area groundwater basins (Bunker Hill and Lytle Basins) – located just to the east of the Chino Basin – consist of about 120 square miles of aquifer and with about 466 square miles of tributary areas in the San Gabriel and San Bernardino mountains. The groundwater level response in the Chino Basin due to wet years is small, on the order of a few feet to tens of feet. In contrast, the San Bernardino area groundwater-level response to significant wet years and climatic periods could range from 100 to 300 feet.

Regional Groundwater Level Changes

Figures 2-19 and 2-20 are groundwater elevation contour maps for the Chino Basin for 1997 and 1933, respectively. The 1997 map is based on data collected in Watermaster's ongoing monitoring programs and is representative of current conditions. The 1933 map is based on groundwater-level data compiled and mapped by the DWR. Figure 2-21 shows the change in groundwater level from 1933 to 1997 based on the groundwater elevation maps for 1933 and 1997. The regional groundwater decline by management zone is:

Management Zone	Range
1	50 to 150 feet
2	50 to 100 feet
3	50 to 100 feet
4	less than 50 feet
5	less than 50 feet

Figure 2-22 is a map similar to Figure 2-21 with the water service area boundaries shown in place of management zone boundaries. The areas of greatest regional groundwater decline underlie the city of Pomona, the Monte Vista Water District, the City of Chino, and the western half of the City of Ontario.

Figure 2-23 shows the depth to water for fall 1997. Mendenhall surveyed the Basin in 1902 and found parts of the Chino Basin to be artesian as evidenced by springs and marshy areas (Mendenhall, 1904). This artesian area is also shown on Figure 2-23. In the artesian areas, the historical groundwater level or piezometric surface was at or exceeded the ground surface. Figure 2-23 suggests that the regional groundwater decline in the western Chino Basin is up to 200 feet since 1902. Groundwater levels appear to have stabilized since the Chino Basin Judgment was implemented and groundwater production has been managed within the Basin's safe yield. However, there may still be areas experiencing localized overdraft including the area overlain by the Cities of Chino, Chino Hills, Pomona, the western portion of the City of Ontario, and the Monte Vista Water District. Todd defines the *safe yield* of a groundwater basin as the amount of water that can be withdrawn annually without producing an undesirable result. Withdrawal or production is excess of safe yield is an *overdraft*. Domenico (1972) defines undesirable results to include not only the depletion of groundwater in storage but also intrusion of water of undesirable quality, contravention of existing water rights, and the deterioration of the economic advantages of pumping. Cherry (1979) includes subsidence in the list of undesirable results.

The significant issues related to large-scale regional groundwater declines in the Chino Basin include: decline in storage, higher pumping costs, loss of production capacity, water quality degradation, and subsidence.

In the mid-1970s, ground fissuring was identified in the southwestern portion of Chino Basin. Ground fissuring in this area has continued to the present, and subsidence has been documented and identified as the cause of ground fissuring (Kleinfelder, 1993; 1996). Kleinfelder documented regional subsidence through an analysis of topographic benchmarks from 1987 to 1993, 1993 to 1995, and from 1995 to 1999. The resulting contour maps of equal differences in elevation revealed a north-south trending, elongated area of subsidence underlying the City of Chino and California Institute of Men (CIM) (see Figures 2-23 and 2-24). Maximum subsidence over the period 1987-1995 was reported to be about 2 feet located along Central Avenue between Schaefer and Eucalyptus Avenues. However, about one foot (or 50 percent) of this subsidence occurred over the period from 1993-1995 – indicating that the rate of subsidence has increased. This was confirmed independently by scientists at the Jet Propulsion Laboratories using remote sensing (see www-radar.jpl.nasa.gov/sect323/InSar4crust/LosAngeles.html). Kleinfelder (1993; 1996) concluded that regional subsidence was caused by localized groundwater overdraft and declining groundwater levels. The reasoning to support this conclusion is four-fold:

- As shown in Figure 2-23, the area of regional subsidence and ground fissuring geographically coincides with the late 1800s artesian area mapped by Mendenhall (1904, 1908) – an area that has experienced extreme declines in groundwater levels.

- Subsidence is well documented in areas where underlying soils have experienced extensive fluid withdrawal. In saturated soils, buoyant conditions exist, where stresses between soil particles are low. But as the water level drops, the stresses between soil particles increase and overburden pressure causes soil consolidation.
- The initiation of ground fissuring temporally coincides with new groundwater production by the city of Chino Hills in the area of maximum subsidence. By 1975, groundwater levels had declined by a maximum of 200 feet in the former artesian area.
- Regional subsidence and ground fissuring is not attributable to other potential causes of subsidence. The area does not coincide with known faults or groundwater barriers and the area has not experienced significant petroleum extractions.

Methodology for Estimating Groundwater Storage

Estimating groundwater storage within the Chino Basin is a critical exercise because of the direct influence of storage upon the safe yield and reliability of the aquifer. The safe yield of a groundwater basin approximates the average annual recharge in a basin if the storage in the basin is large. The larger the storage, the more reliable the basin will be in dry period. The amount of water in storage in the Chino Basin is directly proportional to groundwater level.

The methodology for computing the volume of groundwater in storage consists of the following steps:

1. develop groundwater elevation maps for the basin;
2. obtain and map aquifer storage properties;
3. obtain and map the effective base of the freshwater aquifer;
4. divide the basin into a regular grid – with each grid cell assigned a:
   - groundwater elevation,
   - tops and bottom elevations of each aquifer
   - elevation of the effective base of the bottommost aquifer (*e.g.*, bedrock elevation), and
   - storage properties;
5. compute the volume of groundwater in storage for each grid cell, and sum the storage values of all grid cells.

In most parts of the Chino Basin, unconfined aquifers overlie confined aquifers. Thus, the storage in some grid cells consists of the sum of water in storage in confined and unconfined aquifers. The volume of groundwater in storage in each grid cell is estimated from the following equations:

volume in an unconfined aquifer in a grid cell is given by:

$$V_{i,l} = (GWE_{i,l} - B_{i,l}) * A_i * P_{i,l} \qquad \text{(Equation 1)}$$

volume in a confined aquifer in a grid cell is given by:

$$V_{i,l} = [(GWE_{i,l} - T_{i,l}) * SC_{i,l} + (T_{i,l} - B_{i,l}) * P_{i,l}] * A_I \qquad \text{(Equation 2)}$$

where:

$GWE_{i,l}$ is the groundwater/piezometric elevation for grid cell *i* and aquifer *l*
$T_{i,l}$ is the effective top elevation of a grid cell *i* and aquifer *l*
$B_{i,l}$ is the effective bottom elevation of grid cell *i* and aquifer *l*
A_i is the surface area of grid cell *i*
$P_{i,l}$ is the effective porosity of grid cell *i* and aquifer *l*
$SC_{i,l}$ is the storage coefficient of a grid cell *i* and aquifer *l*

Not all the water in storage is available for production. A minimum volume of groundwater must be maintained in storage to ensure that groundwater can flow to wells. This minimum storage is included in the volume computations described above.

A maximum storage could also be defined, although it is more difficult to do so. The difficulties associated with maximum storage relate to defining which high groundwater-level impacts are acceptable and to whom. An across-the-basin increase of 50 feet would probably impact only those lands near the Santa Ana River with unknown water quality impacts everywhere.

Time History of Groundwater Storage for the Basin

Groundwater-level maps were prepared using all available data for 1933, 1965, 1969, 1974, 1977, 1983, 1991, and 1997. Aquifer geometry and storage properties were developed from the Chino Basin Water Resources Management Study (CBWRMS) (Montgomery Watson, 1995). Equations 1 and 2 were used to estimate the groundwater in storage for these years. Figures 2-19 and 2-20 illustrate the spatial distribution of groundwater elevations within the Chino Basin for the fall 1997 and 1933, respectively. The estimated volume of groundwater in storage in the Chino Basin using this methodology and information was:

Year	Volume (acre-ft)
1933	6,300,000
1997	5,300,000

Groundwater storage decreased by about 1,000,000 acre-ft during the 64-year period of 1933 to 1997. Table 2-1 lists the estimated storage in each of the management zones shown in Figure 2-5 and aggregations of the management zones into the Lower Chino Basin (south of State Route 60), the Upper Chino Basin (north of State Route 60) and the Total Chino Basin. The storage estimates in Table 2-1 are shown graphically in Figures 2-25 and 2-26. The lowest level of groundwater storage during the period 1960 to the present occurred in 1977 at the end of a 33-year drought. Prior to 1977, groundwater storage was falling at a rate of about 25,500 acre-ft/yr. The decline in storage was due to drought and groundwater production in excess of sustainable yield. The period of 1978 though 1983 was an extremely wet period. The physical solution with the Chino Basin Judgment was implemented in 1978. The end of the drought and the elimination of basin-wide overdraft caused an increase in storage. Table 2-1 shows the change in storage relative to 1977 (the lowest level of storage) for the period 1965 to 1997. The losses in storage that occurred during the period 1965 to 1977 have been partially offset by gains in storage that occurred after 1977.

Figure 2-27 shows the time history of storage in the upper and lower parts of the Chino Basin. There was a decline in storage prior to 1977. After 1977, storage in the upper basin increases, however the rate of increase declines over time. This continued increase in storage after 1983 probably is due to:

- accumulation of unproduced safe yield rights in local storage accounts;
- lagged inflows from the deep unsaturated zone in the northern half of the Basin; and
- lagged subsurface inflows from the Lytle Basin north of Barrier J and the Riverside Basin through the Bloomington divide.

After 1977, storage in the lower part of the Basin appears to have stabilized and follows the general climatic pattern.

Table 2-2 and Figure 2-28 show a comparison of the time history of total Chino Basin storage to groundwater production, volume of water stored in cyclic and local storage accounts, and climate. As of fall 1997, the combined volume of water in cyclic and local storage accounts was about 274,000 acre-ft and is greater than the increase in total storage that occurred between 1977 (pre-Judgment) and the present. The increase in storage since 1977 is about 174,000 acre-ft. This is counter intuitive, that is, the change in total storage since 1977 should be greater than the volume of water in cyclic and local storage accounts – especially given that the Basin has experienced a wetter than average period since 1977. The discrepancy may be due in part to under reporting of production in the agricultural pool, storage losses to the Santa Ana River, and inaccuracies in the methods used to compute storage herein.

Losses From Storage

The surface water discharge in the Santa Ana River consists of storm flow and baseflow. Baseflow is divided into two components: wastewater discharged from publicly-owned treatment plants (POTWs) and rising groundwater. The rising groundwater component in the Santa Ana River can be divided into two components: short-term storage water from seasonal recharge along the river, and persistent rising water caused by the regional groundwater gradient towards the river. The short-term storage component of rising water will decrease when total groundwater storage is increased either naturally (wet years) or artificially. If total groundwater storage is maintained at higher levels, recharge of surface water from the Santa Ana River will decrease.

Because of the spatial distribution of storage, the rising groundwater response to increases in groundwater storage is often lagged and variable in time. For example, the baseflow at Riverside Narrows (the location where the Santa Ana River enters the Chino Basin) peaks about five to seven years after heavy recharge years in the upstream groundwater basins. Chino Basin groundwater discharge to the river also exhibits a slight lag time. The time history of baseflow at Prado consists of a complicated mix of rising water responses from the Bunker Hill, Riverside, Chino and Temescal Basins. Analysis of the increase in rising water in the Chino Basin caused by an increase in groundwater storage requires the filtering out of these other sources of surface discharge from historical records and modeling results.

The accumulation of groundwater in storage will cause an increase in groundwater discharge in the Santa Ana River and its tributaries Chino Creek and Mill Creek – losses from storage that are not recoverable. The physics of the groundwater storage-baseflow relationship can be represented by linear reservoir theory where outflow is directly proportional to storage:

$$O = K * S \qquad \text{(Equation 3)}$$

where:

O is the outflow from storage (L^3/T)

S is volume of water in storage (L^3)
K is the linear reservoir coefficient (T^{-1})
L denotes units of length and
T denotes unites of time.

This formula can be calibrated to a specific range of storage and groundwater management conditions. The flow in the Santa Ana River in the Chino Basin was decomposed into rising water from the Chino Basin and other components. The rising water component was subdivided into short-term storage water from seasonal recharge along the river in Management Zone 5, and persistent rising water caused by the regional groundwater gradient towards the River from all management zones. This decomposition was done using simulation model results from the **C**hino Basin **I**ntegrated **G**roundwater and **S**urface Water **M**odel (CIGSM) developed for the Chino Basin Water Resources Management Task Force (Montgomery Watson, 1995, and unpublished modeling results for calibration and planning simulations).

Historical Storage Losses to the Santa Ana River. Rising groundwater estimates were made for the period of model calibration 1960 to 1989, and the forecasting period of 1990 to 2040. Certain historical periods were studied to isolate the spatial effects of groundwater production patterns and hydrology on rising groundwater. For example, the period 1960 to 1977 represents the pre-Judgment period that has higher groundwater production than the period after 1978 that represents the period when the Basin was managed by Watermaster without basin-wide overdraft. Linear reservoir theory was used to develop a simple relationship of change in groundwater discharge to the Santa Ana River to incremental change in groundwater storage.

Hydrograph decomposition for the historical period was done using water balance tables from CIGSM for reaches of the Santa Ana River and its tributaries. Analysis of the hydrology of the period suggest that two periods could be used to develop a linear reservoir relationship:

- 1970 to 1977 representing a pre-Judgment period; and
- 1984 to 1989 representing a post-Judgment period.

The period 1970 to 1977 was a dry period following significant recharge along the river from the 1969 storms. The 1984 to 1989 period was also a dry period following the wet period from 1978 to 1983. Both of these periods exhibit recession flows typical of streams fed by groundwater systems. CIGSM model-estimated rising water was plotted against the model-estimated storage in the Chino Basin. The annual rising water estimates and respective storage estimates are shown graphically in Figures 2-34 and 2-35. Simple linear regressions were done for the 1974 to 1977 period and 1987 to 1989 period to estimate the linear reservoir coefficient (K) for the linear reservoir equation (Equation 3). The linear reservoir coefficient is the slope of the best-fit lines in Figures 2-34 and 2-35. The resulting linear reservoir coefficients are 0.0254 for the 1970 to 1977 period, and 0.0203 for the 1987 to 1989 period. Physically, the linear reservoir coefficient represents the fraction of the storage that annually becomes rising water. Thus, an increase in storage of 100,000 acre-ft in the 1987 will cause about 2,000 acre-ft of new rising water in the first year. Groundwater storage after the first year would be reduced to 98,000 acre-ft. In the second year, the storage would be reduced another 2.03 percent, or 1,970 acre-ft, and so on. The 0.0051 difference in linear reservoir coefficients for the pre- and post-Judgment periods is due in part to changes in groundwater production patterns, hydrology, and CIGSM modeling artifacts.

Future Storage Losses to the Santa Ana River. An estimate of the linear reservoir coefficient for the period 1990 through 2040 was estimated by comparing the total Santa Ana River flow at Prado Dam and groundwater storage for Alternatives 3 and 4 of the CBWRMS. Alternative 3 represents a specific groundwater management strategy that could be implemented. Alternative 4 is identical to Alternative 3 with the addition of a conjunctive use program and an increase in limits for local storage accounts. The conjunctive use program has three cycles of build up in storage to approximately 300,000 acre-ft and subsequent pump-out periods. The increase in storage in local storage accounts is gradual and incremental throughout the period. The rising water losses from the conjunctive use storage and the increase in local storage accounts are simply the difference in Santa Ana River flow between these alternatives. Table 2-3 lists the differences in groundwater storage and Santa Ana River flow. The linear reservoir coefficient for future conditions is estimated to be about 0.0408, or 4.1 percent of storage – about double that of the 1984 to 1989 period. The increase in the linear reservoir coefficient was caused by changes in groundwater production patterns, hydrology, and CIGSM modeling artifacts.

Computation of Storage Losses to Santa Ana River. The linear reservoir equation can be used to estimate losses from groundwater storage accounts to the Santa Ana River:

$$q_t = K * (S_t + 0.5 * T *(I_t - Q_t)) \qquad \text{(Equation 4)}$$

where:

q_t	is the annual loss from a storage account in period *t* to *t+1* (acre-ft/yr)
K	is the linear reservoir coefficient
S_t	is water in a storage account at the end of period *t* (acre-ft)
I_t	is the water put into a storage account in period *t* to *t+1* (acre-ft/yr)
Q_t	is the water taken from the storage account for use in period *t* to *t+1* (acre-ft/yr)
T	duration of time between *t* to *t+1*, assumed to be one year

The volume of water in storage accounts at the end of a period is equal to:

$$S_{t+1} = S_t + T * (I_t - Q_t - q_t) \qquad \text{(Equation 5)}$$

Using a linear reservoir coefficient of 0.0201 and Equation 4, the total water lost from local storage accounts and cyclic storage since the Judgment became active in 1978 is estimated to be about 50,000 acre-ft or about 18 percent of the volume that Watermaster currently assumed was in storage. The time history of accumulating storage accounts and estimated losses to baseflow are listed in Table 2-4. Watermaster does not currently compute losses from storage accounts. This means that when water in storage accounts is produced, additional overdraft of the Basin will occur. Losses from conjunctive use projects could be very large. In the example in Table 2-3, three filling and withdrawal cycles were done over a 40-year period with each reaching a fill capacity of 300,000 acre-ft. The model estimated losses of over 300,000 acre-ft over three fill and extraction cycles – a loss of over one-third of the water stored. If these losses were not accounted for, the Basin would be overdrafted by 300,000 acre-ft over the 40-year period.

The losses described above were developed from modeling studies. Monitoring to verify these losses has not been done in the past nor is it practical in the future. The measuring errors associated with such a program would be larger than the probable losses from storage. The only practical ways to estimate such losses are to:

- Use a linear reservoir model as described above, or
- Calibrate a groundwater flow model over the period that water is held in cyclic, local, and conjunctive use storage and compare it to a simulation run with the same hydrology that did not have water in these storage accounts. The difference in groundwater discharge to the river would be the losses due to cyclic, local, and conjunctive use storage. Adjustments to storage accounts could be made retroactively or a new loss factor established for the next period.

GROUNDWATER PRODUCTION

Historical Groundwater Production Monitoring

Prior to 1975, groundwater production monitoring was not formally done by a single entity for the benefit of the Basin. Municipal and some industrial producers kept production records with some submitting annual production reports to the State Water Resources Control Board (SWRCB). Very few agricultural wells had meters and fewer kept records of production. During the period 1975 to 1978, production monitoring at agricultural wells improved slightly. Most of the agricultural production volumes for the period preceding 1978 are comprised of estimates provided by producers and are not based on direct measurements from in-line flow meters.

Since 1978, Watermaster has collected information to develop production estimates. Production estimates in the appropriative pool and overlying non-agricultural pool are based on totalizing in-line flow meter data provided to Watermaster on a quarterly basis by these producers. Watermaster aggregates these quarterly values to obtain annual production for these pools. Production estimates for the agricultural pool are based in part on totalizing in-line flow meter data, water duty methods, and hour-meter data combined with well efficiency tests. As with the other pools, reporting is done by the producers. However, not all agricultural pool producers provide Watermaster with estimates of their production. About one third of agricultural pool producers either did not file production reports or filed incomplete reports in fiscal year 1997/98 (telephone discussion with Jim Theirl, 1998).

Historical Groundwater Production

Table 2-4 contains estimates of annual groundwater production in the Chino Basin from three different sources: summaries of SWRCB filings and interviews with some producers; Watermaster estimates, and production estimates developed for calibration of CIGSM developed for the CBWRMS. The second column in Table 2-5 contains annual production estimates that were used to develop the safe yield in the Judgment. The third column contains Watermaster estimates of annual production that are based on production reports submitted to Watermaster by the producers. The fourth column contains annual production estimates that are based on SWRCB filings, production reports from producers, and water duty methods. In the latter case, water duty methods were used as a check on reported production and supplemented reported production data when production data was missing or under-reported at wells.

The safe yield of the Chino Basin was based on the hydrology of the period 1965 to 1974. The average annual groundwater production for that period from SWRCB filings and interviews was estimated at 152,100 acre-ft/yr. The engineer working on the historical production data knew there was *unaccounted for* production and assumed that actual production was 20 percent more than the estimate from SWRCB filings and interviews, or about 180,000 acre-ft/yr (Carroll, 1977). This estimate is close to the 189,400 acre-ft/yr average for the same period from the CBWRMS.

In Table 2-5, the period of Watermaster groundwater production estimates overlaps the period of CBWRMS production estimates. For their common period of record (1975 through 1989), the CBWRMS estimates are consistently higher. This occurs in part because some of the agricultural producers fail to report production or fail to provide production information to Watermaster. For the CBWRMS, water demands based on land use were compared to reported production. If the water demand for the land uses in a given area was greater than reported production, then reported production was increased to meet the demands based on land use. This method was validated in the CIGSM model calibration process (Montgomery Watson, 1993). In the latter years, the CBWRMS production estimates increasingly diverge from Watermaster estimates. For their common period of record, the average annual groundwater production was estimated at 147,900 acre-ft/yr by Watermaster and 174,000 acre-ft/yr by the CBWRMS – a difference of about 26,000 acre-ft/yr. Actual production is probably somewhere in between Watermaster and CBWRMS estimates.

Spatial and Temporal Changes in Groundwater Production

Table 2-6 lists Watermaster's estimates of Chino Basin production by pool for the period of fiscal year 1974/75 to 1997/98, and the relative amount of production by pool. Over this period, groundwater production has ranged from a high of 181,000 acre-ft/yr (1975/76) to a low of about 122,600 acre-ft/yr (1982/83), and has averaged about 147,100 acre-ft/yr. The distribution of production by pool has shifted since 1975 with the agricultural pool production dropping from about 55 percent in 1974/75 to 28 percent in 1996/97. During the same period, appropriative pool production increased from about 40 percent in 1974/75 to 68 percent in 1996/97. The increases in appropriative pool production have kept pace with decline in agricultural production. Production in the overlying non-agricultural pool declined from about 5 percent in 1974/74 to about 2 percent in the mid-1980s, rose to about 4 percent by 1990/91 and has remained at about 4 percent of total production thereafter.

Figure 2-29 is a plot that compares the change in total groundwater production in the Chino Basin to the change in urban and agricultural/other non-urban land uses. Prior to 1980, the decline in groundwater production appears proportional to the decline in agricultural and other non-urban land uses. After 1980, groundwater production appears to be relatively stable even though the decline in agricultural and other non-urban land uses is accelerating.

Figures 2-30 and 2-31 are similar to Figure 2-29 except they represent the Basin north of State Route 60 and south of State Route 60, respectively. North of State Route 60, the pattern of land use change is similar to the entire basin, but the groundwater production that was declining from 1960 to 1980 rose sharply after 1980. South of State Route 60, groundwater production was generally declining throughout the period of 1960 to 1990. The rate of decline in production in the southern half of the Basin after 1980 matches the rate of increase in production north of State Route 60, such that the total annual production in the Basin after 1980 is relatively constant (see Figure 2-29).

Figures 2-32 through 2-36 illustrate the location and magnitude of groundwater production at wells in the Chino Basin for years 1960, 1970, 1980, 1989 and 1997. These maps are based on production estimates developed in the *Chino Basin Water Resources Management Study* (Montgomery Watson, 1995) and by Watermaster. Two trends are evident in the period 1960 through 1998:

- In the southern half of the Basin there is an increase in the number of active wells and a decrease in the per well production. This is due to the land use transition from predominately irrigated agriculture uses to predominately dairy uses and due to a recent well inspection program, resulting in more wells of record.

- In the northern half of the Basin there is an increase in the number of wells producing over 2,000 acre-ft/yr. This is consistent with the land use transition from agricultural uses to urban uses and with the trend for increasing imported water costs.

Groundwater Production and Safe Yield

Recent and past studies have provided some insight into the influence of groundwater production in the southern end of the Chino Basin on the safe yield of the Basin. Three studies were done that quantified the impacts of proposed desalters in the lower Chino Basin on groundwater discharge to the Santa Ana River. The proposed desalters were first described in *Nitrogen and TDS Studies, Upper Santa Ana Watershed* (James M. Montgomery, Consulting Engineers, Inc., 1991). This study matched desalter production to meet future potable demands in the lower Chino Basin through the year 2015. The well fields were sited to maximize the interception of rising water and to induce streambed percolation in the Santa Ana River. The decrease in rising water and the increase in streambed percolation were projected to range from 45 to 65 percent of total desalter production.

Well field design studies for the SAWPA desalter provided estimates of the volume of rising water intercepted by the currently proposed desalter – scheduled for completion in March 2000 (Wildermuth, 1993). These studies used a very detailed model of the lower Chino Basin (rectangular 400-foot by 400-foot grid covering the lower Chino Basin) to evaluate the hydraulic impacts on rising water and groundwater levels at nearby wells. These studies showed the relationship of interception of rising water to well field location and well field capacity. The fraction of the desalter production composed of decreased rising water and the increased stream bed percolation water was estimated to range from 40 to 50 percent.

No formal studies and estimates of desalter well field interception of rising water were made during the *Chino Basin Water Resources Management Study* (Montgomery Watson, 1995). An informal estimate of the interception of rising water was made by Wildermuth (letter to Neil Cline, dated August 9, 1993). Wildermuth used the groundwater model developed in *Chino Basin Water Resources Management Study* for a well field similar to the SAWPA desalter well field and used the model calibration period of 1960 to 1989. This study estimated the interception of rising groundwater at about 80 percent of desalter production capacity.

These three studies suggest that the yield of the Basin could be increased by simply increasing the production near the river, and that for every two acre-ft of new, near-river production the safe yield could be increased by one acre-ft, that is the marginal change in safe yield with increased near-river production is about 0.5 acre-ft/yr per acre-ft/yr of production. The opposite is also true. That is, if production were to decrease in the southern half of the Basin, the safe yield will also decrease. Agricultural production is projected to decrease about 40,000 acre-ft/yr when current agricultural land use transitions to urban use. If the magnitude and spatial distribution of current agricultural production is not replaced with new production then the yield of the Chino basin will decrease by a comparable amount.

HISTORICAL AND CURRENT GROUNDWATER QUALITY

Historical Groundwater Quality Monitoring

Various entities have collected groundwater quality data in the past. Municipal and agricultural water supply entities have collected groundwater quality data to comply with Department of Health Services requirements under Title 22 or for programs that range from irregular study-oriented measurements to long-term periodic measurements. Groundwater quality observations have been made by the DWR, by participants in the 1969 Judgment on the Santa Ana River (Orange County Water District *vs.* City of Chino *et al.*), by dischargers under order from the Regional Board, and by the County of San Bernardino. The DWR and the SBCFCD were very active in collecting groundwater quality data in the Chino Basin prior to the settlement of the Chino Basin adjudication. After the Judgment was entered in 1978, monitoring south of State Route 60 stopped almost completely except for the cities of Chino, Chino Hills, and Norco, and the Jurupa Community Services District (JCSD). Most of the pre-1978 measurements were digitized by the DWR. In 1986, Metropolitan Water District of Southern California (Metropolitan) conducted the first comprehensive survey of groundwater quality covering all constituents regulated in California Code of Regulations Title 22.

In 1989, Watermaster initiated a regular monitoring program for the Basin with groundwater quality data obtained in 1990 and periodically thereafter to the present. Watermaster's program relies on municipal producers and other government agencies supplying their groundwater quality data on a cooperative basis. Watermaster staff supplements this data with data obtained through a Watermaster sampling and analysis program in the area south of State Route 60. Water quality data are also obtained from special studies and monitoring that takes place under orders of the Regional Board. Watermaster has combined previously digitized groundwater quality data from all known sources into a database structure that is maintained at Watermaster's office.

Watermaster plans to begin the development of a new, more comprehensive water quality monitoring program to support the OBMP starting in July 1999. The program consists of two phases. The initial phase consists of collecting and analyzing groundwater quality samples at all producing wells in the over a three year period starting in July 1999. These data will be mapped and reviewed. Based on this review and Watermaster management goals in the OBMP, a long-term monitoring program will be developed The second phase consists of implementing the long term monitoring program and will start in July 2002.

Water Quality Conditions

Sources of water quality degradation can be classified into point and non-point sources. Point sources are confined to point discharges to the soil, groundwater, or stream systems. Examples include conventional wastewater and industrial discharges to streams or ponds, and leaky underground storage tanks. Non-point sources are areal discharges to soil, groundwater and surface waters, such as land application of waste and fertilizers and atmospheric deposition of contaminants to the soil and water bodies. The discussion below describes the water quality state of the Basin as it exists today for specific constituents of concern. The constituents described below are regulated for drinking water purposes in *California Code of Regulations, Title 22* or are regulated in the *1995 Water Quality Control Plan for the Santa Ana River Basin* (Basin Plan).

Figures 2-37a-h illustrate land uses in the Chino Basin in 1933, 1949, 1957, 1963, 1975, 1984, 1990 and 1993. These land use maps were developed from DWR land use surveys for 1933 through 1984, and from Southern California Association of Governments surveys for 1990 and 1993. The maps show a steady, dramatic change over time from agricultural to urban land uses. An exception to this occurs in the southern Chino Basin where dairies have moved in to replace irrigated and non-irrigated agriculture. These maps are useful in characterizing water quality degradation associated with non-point source loading from agriculture. The land uses shown in these maps are quantified in Table 2-7.

Total Dissolved Solids (TDS). TDS is regulated as a secondary contaminant in Title 22. The recommended drinking water maximum contaminant level (MCL) for TDS is 500 mg/L, however the upper limit is 1,000 mg/L. For irrigation uses, TDS should generally be less than 700 mg/L. The Regional Board has established TDS limitations for all municipal wastewater plants that discharge recycled water to the Santa Ana River. A problem arises in that TDS concentrations increase through municipal use -- typically by about 150 to 250 mg/L. The TDS limitations for water recycling plants that discharge to the Santa Ana River in the Chino Basin are listed below:

Plant	**TDS Limit (mg/L)**
IEUA RP1	540
IEUA RP2	610
IEUA Carbon Canyon	555
IEUA RP4	505
Western Riverside Regional	625
City of Riverside	650
Jurupa Indian Hills	650

The TDS in source (drinking) water generally must be kept well below 500 mg/L (preferably less than 300 mg/L) to ensure that recycled water discharged to the Santa Ana River and its tributaries meets Regional Board limitations. The treatment cost to remove TDS from water is very expensive – about $500 to $700 per ton.

Table 2-9 provides the average TDS concentrations by well for five-year periods from 1961 to 1995. These wells are grouped by management zones. Figures 2-38, 2-39, and 2-40 show average TDS concentrations in groundwater measured at wells for the periods 1961 to 1965, 1971 to 1975, and 1991 to 1995. Historically, TDS has not been measured at wells on an annual basis. The choice of one year, say 1963 for example, might have only one-third as many TDS measurements at wells compared to a five-year period. Thus, averaging TDS over a five-year period was necessary to get adequate spatial coverage of measurements.

TDS concentrations in the northeast part of the Basin range from about 170 to about 300 mg/L for the period 1960 through 1990, with typical concentrations in the mid- to low-200s. TDS concentrations in excess of 200 mg/L indicate degradation from overlying land use. With few exceptions, areas with significant irrigated land use or dairy waste disposal histories overlie groundwater with elevated TDS concentrations. The exceptions are areas where point sources have contributed to TDS degradation, such as the former Kaiser Steel site in Fontana and the former wastewater disposal ponds near IEUA Regional Plant No. 1 (RP1) in South Ontario. The TDS anomaly from Kaiser is not shown on Figures 2-38, 2-39 and 2-40. A TDS anomaly from former municipal wastewater ponds can be seen in the east central part of Management Zone 2.

The impacts of agriculture on TDS in groundwater primarily are caused by fertilizer use on crops, consumptive use, and dairy waste disposal. The TDS impacts from the dairies located in the southern half of the Basin is reflected at least partially in Figures 2-39 and 2-40. The intensity of the TDS loading from dairy waste to the Basin is illustrated in Table 2-8 (Table 2-1 from *Final Task 6 Memorandum, Development of a Three-Dimensional Groundwater Model*, Montgomery Watson, 1994). This table shows the steady buildup of the dairy cattle population in the southern Chino Basin between 1949 and 1989. The total amount of TDS from manure discharged to the southern half of the Basin that will reach groundwater is estimated to be about 1,200,000 tons through 1989 and averages about 29,000 tons per year. The dairy loading numbers in Table 2-8 assume that half of the manure was hauled out of the Basin after 1973, which was a requirement of the Santa Ana watershed Water Quality Control Plan enacted in

1973. The amount of manure exported out of the Basin was never verified until the late 1990's. The TDS loading to groundwater from dairy waste disposal activities could be far greater than estimated in Table 2-8.

As irrigation efficiency increases, the impact of consumptive use on TDS in groundwater also increases. For example, if source water has a TDS concentration of 250 mg/L, and the irrigation efficiency is about 50 percent (flood irrigation), the resulting TDS concentration in the returns to groundwater will be 500 mg/L, exclusive of the mineral increments from fertilizer. If the irrigation efficiency were increased to 75 percent, the resulting TDS concentration in the returns to groundwater will be 1,000 mg/L, exclusive of the mineral increments from fertilizer. For modern irrigated agriculture, the TDS impacts of consumptive use are more significant than mineral increments from fertilizers.

TDS concentrations in groundwater have increased slightly or remained relatively constant in the northern parts of Management Zones 1, 2, and 3. TDS concentrations are significantly higher in the southern parts of Management Zones 1, 2, and 3, and all of Management Zone 5 where they typically exceed the 500 mg/L recommended MCL and frequently exceed the upper limit of 1,000 mg/L.

Nitrate. Nitrate is regulated in drinking water in Title 22 with an MCL of 10 mg/L (as nitrogen). Table 2-10 provides the average nitrate concentrations by well for 5-year periods from 1961 to 1995. These wells are grouped by management zones. Figures 2-41, 2-42, and 2-43 show the average nitrate concentrations in groundwater measured at wells for the periods 1961 to 1965, 1971 to 1975, and 1991 to 1995. Nitrate measurements in the surface water flows in the San Gabriel Mountains and in groundwater near the foot of these mountains are generally less than 0.5 mg/L (Montgomery Watson, 1993). Nitrate concentrations in excess of 0.5 mg/L indicate degradation from overlying land use. Similar to TDS, areas with significant irrigated land use or dairy waste disposal histories overlie groundwater with elevated nitrate concentrations. The primary areas of nitrate degradation are the areas formerly or currently overlain by:

- Citrus in the northern parts of Management Zones 1, 2 and 3; and
- Dairy areas in the southern parts of Management Zones 1, 2 and 3 and all of Management Zone 5.

Nitrate concentrations in groundwater have increased slightly or remained relatively constant in northern parts of Management Zones 1, 2 and 3 over the period 1960 to the present. These are areas formerly occupied by citrus and vineyard land uses (see Figures 2-37a-d), and nitrate concentrations underlying these areas rarely exceed 20 mg/L (as nitrogen). Over the same period, nitrate concentrations have increased significantly in the southern parts of Management Zones 1, 2 and 3, and all of Management Zone 5. These are areas where land use has progressively converted from irrigated/non-irrigated agriculture to dairy uses (see Figures 2-37e-h), and nitrate concentrations typically exceed the 10 mg/L MCL and frequently exceed 20 mg/L by 1991-1995.

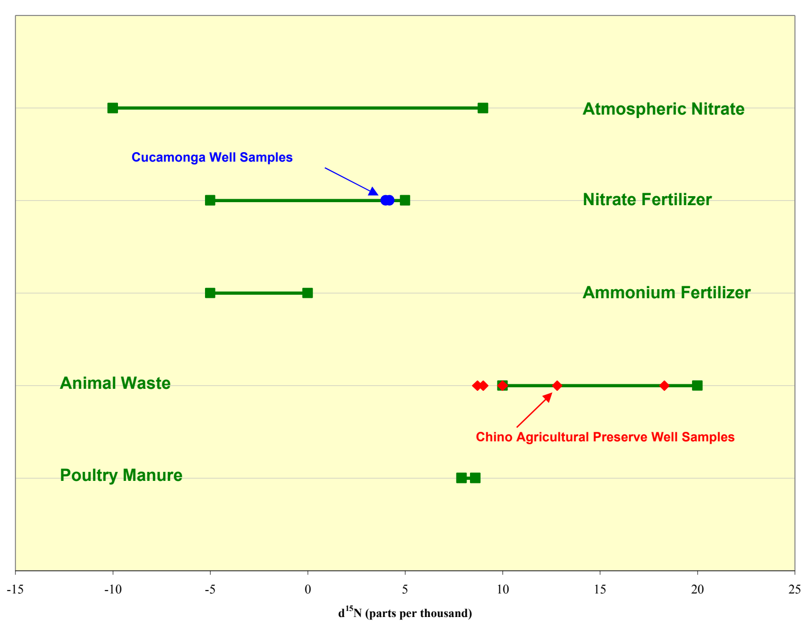
There are two stable isotopes of nitrogen: ^{14}N and ^{15}N. Within the nitrogen cycle, thermodynamic and kinetic processes occur which fractionate these isotopes in various nitrogen-bearing compounds. Most biologically-mediated reactions (*e.g.*, assimilation, nitrification, and denitrification) result in ^{15}N enrichment of the substrate and depletion of the product. Nitrogen isotope chemistry is a technique to help distinguish potential sources of nitrogen in the environment (Clark and Fritz, 1997). The enrichment of ^{15}N relative to atmospheric nitrogen is expressed as $\delta^{15}N$ and has units of parts per thousand (permil). The following table shows the ranges of nitrogen isotopes of potential sources of nitrate (Battaglin *et al.*, 1997):

Source of Nitrate	$d^{15}N$ of Nitrate (permil)
Atmospheric Nitrate	-10 to 9
Nitrate Fertilizer	-5 to 5
Ammonium Fertilizer	-5 to 0
Animal Waste	10 to 20
Poultry Manure	7.9 to 8.6

As part of the 1997 groundwater-monitoring program, samples were collected from six wells for nitrogen isotope analysis:

State Well Number	Region	Nitrate-N (mg/L)	$d^{15}N$ (permil)
01S07W14D01	Cucamonga – Former Citrus	3.2	4.0
01S07W14D02	Cucamonga – Former Citrus	4.0	4.2
02S07W34D	Chino Agricultural Preserve	106.0	12.8
03S07W05G	Chino Agricultural Preserve	77.3	18.3
02S07W20A	Chino Agricultural Preserve	64.5	10.0
02S07W16D	Chino Agricultural Preserve	63.6	8.7
02S07W16D - Duplicate		63.6	9.0

The samples from the wells in areas where the antecedent land use was predominantly citrus had nitrate values that were significantly below the maximum contaminant level (MCL) of 10 mg/L. Nitrate values in samples from the Chino Agricultural Preserve all exceeded the MCL by at least a factor of six. In addition, the $\delta^{15}N$ values for the Cucamonga wells were about 4 permil, while the $\delta^{15}N$ values for the Chino Agricultural Preserve wells ranged from 8.7 to 18.3 permil. The nitrogen isotope results are compared graphically with ranges from known sources in the figure below.



The high nitrate concentrations shown in Figure 2-43 probably depict the nitrate impacts from the agricultural waste disposal areas located in the southern half of the Basin.

Other Constituents of Potential Concern. Tables 2-11a through 2-11c summarize inorganic and organic constituents that have been analyzed for and detected in groundwater samples from wells in the Chino Basin through July 1998. Table 2-12 summarizes the information in Tables 2-11a through 2-11c for the constituents detected at or above their MCLs. This is a synoptic analysis and includes all available data, including data from several monitoring programs and studies. The water quality data reviewed in this synoptic analysis are derived from production wells and monitoring wells. Hence, the data do not represent a programmatic investigation of potential sources nor do they represent a randomized study designed to ascertain the water quality status of the Chino Basin. The data do represent the most comprehensive information available to date.

A large subset of this data was extracted from the California Department of Health Services (DHS) database (current through July 1998). For each constituent, the tables lists:

- the number of measurements at or above one-half the applicable MCL;
- the number of wells with measurements at or above one-half the applicable MCL;
- the number of measurements at or above the applicable MCL;
- the number of wells with measurements at or above the applicable MCL; and
- the applicable MCL.

The tables are organized as follows:

- Table 11a: Inorganic constituents, total trihalomethanes (THMs) and radioactivity with primary MCLs;
- Table 11b: Organic chemicals with primary MCLs;
- Table 11c: Inorganic constituents and organic chemicals with secondary MCLs, lead and copper rule, and California DHS Action Levels.

Table 12 summarizes the constituents that were detected at concentrations greater than one-half their MCL, and are grouped by chemical type. These values represent a mixture of data from monitoring and production well samples. Monitoring wells targeted at a potential source will likely have a greater concentration than a municipal or agricultural production well. Wells with constituent concentrations greater than one-half the MCL represent areas that warrant concern and inclusion in a long-term monitoring program. Groundwater in the vicinity of wells with samples greater than the MCL may be impaired from a beneficial use standpoint.

Inorganic Constituents. Five inorganic constituents were detected at or above their MCL in more than 20 wells:

- TDS;
- nitrate;
- fluoride;
- iron; and
- manganese.

TDS and nitrate have been discussed in previous subsections. Fluoride, iron, and manganese naturally exist in groundwater. Their concentrations depend on mineral solubility, ion exchange reactions, surface complexations, and soluble ligands. These speciation and mineralization reactions, in turn, depend on pH, oxidation-reduction potential, and temperature. Fluoride occurs naturally in groundwater in concentrations ranging from less than 0.1 mg/L to 10-20 mg/L (Freeze and Cherry, 1979). Based on the available data, none of these constituents shows a spatial pattern throughout Chino Basin (see Figures 2-44, 2-45 and 2-46). However, site-specific monitoring wells may reveal point sources (*e.g.*, wells near landfills have shown relatively high concentrations of manganese).

In addition, perchlorate has recently been detected in several wells in the Chino Basin (Figure 2-47), in other basins in California and other states in the West. The probable reason that perchlorate was not detected in groundwater until recently is that analytical methodologies did not previously exist that could attain a low enough detection limit. Prior to 1996, the method detection limit for perchlorate was 400 μg/L. By March 1997, an ion chromatographic method was developed with a detection limit of 1 μg/L and a reporting limit of 4 μg/L.

Perchlorate (ClO_4^-) originates as a contaminant in the environment from the solid salts of ammonium perchlorate (NH_4ClO_4), potassium perchlorate ($KClO_4$), or sodium perchlorate ($NaClO_4$). The perchlorate salts are quite soluble in water. The perchlorate anion (ClO_4^-) is exceedingly mobile in soil and groundwater environments. It can persist for many decades under typical groundwater and surface water conditions, because of its resistance to react with other available constituents. Perchlorate is a kinetically stable ion, which means that reduction of the chlorine atom from a +7 oxidation state in perchlorate to a -1 oxidation state as a chloride ion requires activation energy or the presence of a catalyst to facilitate the reaction. Since perchlorate is chemically stable in the environment, natural chemical reduction in the environment is not expected to be significant.

At very high levels, perchlorate interferes with the function of the thyroid gland and the production of hormones necessary for normal human development. In the extreme cases, it can cause brain damage in fetuses and a potentially fatal form of anemia in adults. However, effects of chronic exposures to lower levels currently detected in groundwater are not known.

Ammonium perchlorate is manufactured for use as an oxygenating component in solid propellant for rockets, missiles, and fireworks. Because of its limited shelf life, inventories of ammonium perchlorate must be periodically replaced with a fresh supply. Thus, large volumes of the compound have been disposed of since the 1950s in Nevada, California, Utah, and likely other states. While ammonium perchlorate is also used in certain munitions, fireworks, the manufacture of matches, and in analytical chemistry, perchlorate manufacturers estimate that about 90 percent of the substance is used for solid rocket fuel

Perchlorate is of concern because of the existing uncertainties in:

- the toxicological database documenting its health effects at low levels in drinking water;
- the actual extent of the occurrence of perchlorate in ground and surface waters, which is compounded by some uncertainty in the validation of the analytical detection method;
- the efficacy of different treatment technologies for various water uses such as drinking water or agricultural application; and
- the extent and nature of ecological impact or transport and transformation phenomena in various environmental media.

The requisite toxicology data available to evaluate the potential health effects of perchlorate are extremely limited. The US Environmental Protection Agency (EPA) Superfund Technical Support Center issued a provisional reference dose (RfD) in 1992 and a revised provisional RfD in 1995. Standard assumptions for ingestion rate and body weight were then applied to the RfD to calculate the reported range in the groundwater cleanup guidance levels of 4 to 18 (µg/L). In 1997, the DHS and California EPA's Office of Environmental Health Hazard Assessment reviewed the EPA risk assessment reports for perchlorate. Consequently, California established its provisional action level of 18 µg/L. On August 1, 1997, DHS informed drinking water utilities of its intention to develop a regulation to require monitoring for perchlorate as an unregulated chemical. Legislative action to establish a state drinking water standard for perchlorate has been introduced but has not been brought to a vote (CA Senate Bill 1033).

Volatile Organic Chemicals. Six volatile organic chemicals (VOCs) were detected at or above their MCL in more than 10 wells:

- 1,1-dichloroethene;
- 1,2-dichloroethane;
- benzene;
- tetrachloroethene (PCE);
- trichloroethene (TCE); and
- vinyl chloride.

TCE and PCE were/are widely used industrial solvents. TCE was commonly used for metal degreasing and was also used as a food extractant. PCE is commonly used in the dry-cleaning industry. About 80 percent of all dry cleaners used PCE as their primary cleaning agent (Oak Ridge National Laboratory, 1989). The areal distributions of PCE and TCE are shown in Figures 2-48 and 2-49. 1,1-Dichloroethane, 1,1-Dichloroethene, *cis*-1, 2-dichloroethene, 1,2-dichloroethane, and vinyl chloride are degradation by-products of PCE and TCE and their areal distributions are shown in Figures 2-50 though 2-54.

The spatial distributions of TCE and PCE appear to be correlatable to identified point sources in the Chino Basin (see the following subsection and Figure 2-58.) The areal distributions of 1,2-dichloroethane and vinyl chloride appear to be more extensive. 1,2-Dichloroethane is used as a lead-scavenging agent in gasoline (Oak Ridge National Laboratories, 1989) and the greater areal distribution of 1,2-dichloroethane and vinyl chloride may reflect numerous minor releases from gasoline stations, automobile service stations, *et cetera*. This hypothesis appears to be corroborated, in part, by the distribution of benzene, which is a minor contaminant in gasoline (see Figure 2-55). Gasoline used in the United States contains between 0.8 and 2 percent benzene (Oak Ridge National Laboratories, 1989).

Pesticides/herbicides. Two were detected at or above their MCL in more than 10 wells:

- dibromochloropropane (DBCP); and
- lindane.

DBCP was used as a fumigant for citrus, other orchards and some field crops prior to being banned in 1987. The areal distribution of DBCP appears to be related to historical citrus crop production in Chino Basin (see Figures 2-37a-d and 2-56). Lindane is used as an insecticide on foliar plants and fruit and vegetable crops; its areal distribution is shown in Figure 2-57.

Point Sources of Concern

The previous water quality discussion described water quality conditions broadly across the entire basin. The discussion presented below describes the water quality anomalies associated with known point source discharges to groundwater. Figure 2-58 shows the location of various point sources and areas of water quality degradation associated with these sources.

Chino Airport. The Chino Airport is located approximately four miles east of the City of Chino and six miles south of Ontario International Airport, and occupies an area of about 895 acres. From the early 1940s until 1948, the airport was owned by the federal government and used for flight training and aircraft storage. The County of San Bernardino acquired the airport in 1948 and has operated and/or leased portions of the facility ever since. Since 1948, past and present businesses and activities at the airport include modification of military aircraft, crop dusting, aircraft-engine repair, aircraft painting, stripping and washing, dispensing of fire-retardant chemicals to fight forest fires, and general aircraft maintenance. The use of organic solvents for various manufacturing and industrial purposes has been widespread throughout the airport's history (Regional Board, 1990). From 1986 to 1988, a number of groundwater quality investigations were performed in the vicinity of Chino Airport. Analytical results from groundwater sampling revealed the presence of VOCs above MCLs in six wells downgradient of Chino Airport. The most common VOC detected above its MCL is TCE. TCE concentrations in the contaminated wells ranged from 6.0 to 75.0 μg/L. Figure 2-58 shows the approximate areal extent of TCE in groundwater in the vicinity of Chino Airport at concentrations exceeding its MCL as of 1990. The plume is elongate in shape, about 2,200 feet wide and extends approximately 8,000 feet from the airport's northern boundary in a south to southwestern direction.

California Institute for Men. The California Institute for Men (CIM) located in Chino is bounded on the north by Edison Avenue, on the east by Euclid Avenue, on the south by Kimball Avenue and on the west by Central Avenue. CIM is a state correctional facility and has been in existence since 1939. It occupies approximately 2,600 acres – about 2,000 acres are used for dairy and agricultural uses and about 600 acres are used for housing inmates and related support activities (Geomatrix Consultants, 1996). In 1990, PCE was detected at a concentration of 26 μg/L in a sample of water collected from a CIM drinking water supply well. Analytical results from groundwater sampling indicate that the most common VOCs detected in groundwater underlying CIM are PCE and TCE. Other VOCs detected include carbon tetrachloride, chloroform, 1,2-dichloroethene, bromodichloromethane, 1,1,1-trichloroethane, and toluene. The maximum PCE concentration in groundwater detected at an individual monitoring well (GWS-12) was 290 μg/L. The maximum TCE concentration in groundwater detected at an individual monitoring well (MW-6) was 160 μg/L (Geomatrix Consultants, 1996). Figure 2-58 shows the approximate areal extent of VOCs in groundwater at concentrations exceeding MCLs as of May 1996. The plume is approximately 1,000 feet wide and extends about 3,600 feet southwest.

General Electric Flatiron Facility. The General Electric Flatiron Facility (Flatiron Facility) occupied the site at 234 East Main Street, Ontario, California from the early 1900s to 1982. Its operations consisted primarily of the manufacturing of clothes irons. Currently, the site is occupied by an industrial park. The Regional Board issued an investigative order to General Electric in 1987 after an inactive well in the City of Ontario was found to contain TCE and chromium above drinking water standards. Analytical results from groundwater sampling indicated that VOCs and total dissolved chromium were the major groundwater contaminants. The most common VOC detected at levels significantly above its MCL is TCE, which reached a measured maximum concentration of 3,700 μg/L. Other VOCs periodically detected, but commonly below MCLs, include PCE, toluene, and total xylenes, (Geomatrix Consultants, 1997). Figure 2-58 shows the approximate areal extent of TCE in groundwater at concentrations exceeding MCLs, as of November 1997. The plume is approximately 3,000 feet wide and extends about 8,400 feet south-southwest (hydraulically downgradient) from the southern border of the site.

General Electric Test Cell Facility. The General Electric Company's Engine Maintenance Center Test Cell Facility (Test Cell Facility) is located at 1923 East Avion, Ontario, California. Primary operations at the Test Cell Facility include the testing and maintenance of aircraft engines. A soil and groundwater investigation, followed by a subsequent quarterly groundwater-monitoring program, began in 1991 (Dames & Moore, 1996). The results of these investigations showed that VOCs exist in the soil and groundwater beneath the Test Cell Facility and that the released VOCs have migrated off site. Analytical results from subsequent investigations indicate that the most common and abundant VOC detected in groundwater is TCE. Other VOCs detected include PCE, *cis*-1,2-dichloroethene, 1,2-dicholoropropane, 1,1-dichloroethene, 1,1-dichloroethane, benzene, toluene and xylenes, among others. The historical maximum TCE concentration measured at an on-site monitoring well (directly beneath the Test Cell Facility) is 1,240 µg/L. The historical maximum TCE concentration measured at an off-site monitoring well (downgradient) is 190 µg/L (BDM International, 1997). Figure 2-58 shows the areal extent of VOC contamination exceeding federal MCLs as of March 1997. The plume is elongate in shape, about 1,000 to 1,200 feet wide and extends approximately 8,000 feet from the Test Cell Facility in a southwesterly direction.

Kaiser Steel Fontana Steel Site. Between 1943 and 1983, Kaiser Steel Corporation (Kaiser), operated an integrated steel manufacturing facility in Fontana. During the first 30 years of the facility's operation (1945-1974), a portion of the Kaiser brine wastewater was discharged to surface impoundments and allowed to percolate into the soil. In the early 1970s, the surface impoundments were lined to eliminate percolation to groundwater (Wildermuth, 1991). In July of 1983, Kaiser initiated a groundwater investigation that revealed the presence of a plume of degraded groundwater under the facility. In August of 1987, the Regional Board issued Cleanup and Abatement Order Number 87-121, which required additional groundwater investigation and remediation activities. The results of these investigations showed that the major constituents of the release to groundwater were inorganic dissolved solids and low molecular weight organic compounds. Wells sampled during the groundwater investigations measured concentrations of total dissolved solids (TDS) ranging from 500-1,200 mg/L and concentrations of total organic carbon (TOC) ranging from 1 to 70 mg/L. Figure 2-58 shows the approximate areal extent of the TDS/TOC groundwater plume as of November 1991. The plume is approximately 3,000 feet wide and extends about 17,000 feet southwest. As of November 1991, the plume had migrated almost entirely off the Kaiser site.

Milliken Sanitary Landfill. The Milliken Sanitary Landfill (MSL) is a Class III Municipal Solid Waste Management Unit located near the intersections of Milliken Avenue and Mission Boulevard in the City of Ontario. The facility is owned by the County of San Bernardino and managed by the County's Waste System Division. The facility was opened in 1958 and continues to accept waste within an approximate 140-acre portion of the 196-acre permitted area (GeoLogic Associates, 1998). Groundwater monitoring at the MSL began in 1987 with five monitoring wells as part of a Solid Waste Assessment Test investigation (IT, 1989). The results of this investigation indicated that the MSL has released organic and inorganic compounds to the underlying groundwater. At the completion of an Evaluation Monitoring Program (EMP) investigation (GeoLogic Associates, 1998), a total of 29 monitoring wells were drilled to evaluate the nature and extent of groundwater impacts identified in the vicinity of the MSL. Analytical results from groundwater sampling indicate that VOCs are the major constituents of the release. The most common VOCs detected are TCE, PCE, and dichlorodifluoromethane. Other VOCs detected above MCLs include vinyl chloride, benzene, 1,1-dichloroethane, and 1,2-dichloropropane. The historical maximum total VOC concentration in an individual monitoring well is 159.6 µg/L (GeoLogic Associates, 1998). Figure 2-58 shows the approximate areal extent of VOCs in groundwater at concentrations exceeding MCLs as of April 1998. The plume is approximately 1,900 feet wide and extends about 2,000 feet south of the MSL's southern border (GeoLogic Associates, 1998).

Municipal Wastewater Disposal Ponds. Treated municipal wastewater has been disposed into ponds located near the current IEUA Regional Plant 1 (RP1) located in south Ontario and the former Regional Plant 3 (RP3) located in south Fontana. The ponds located just east of RP1, commonly called the Cucamonga ponds, were used to dispose of untreated effluent collected by the Cucamonga County Water District (CCWD) and IEUA. RP3 and its disposal ponds are located on the southwest corner of Beech and Jurupa Avenues in the City of Fontana. Discharge to the Cucamonga ponds and the ponds of RP3 ceased between the early 1970s and the mid-1980s. The areas downgradient of these recharge ponds typically have elevated TDS and nitrate concentrations. The locations of these ponds are shown in Figure 2-58. Contaminant plumes emanating from these ponds have never been fully characterized.

Upland Sanitary Landfill. The closed and inactive Upland Sanitary Landfill (USL) is located on the site of a former gravel quarry at the southeastern corner of 15th Street and Campus Avenue in the City of Upland. The facility operated from 1950 to 1979 as an unlined Class II and Class III municipal solid waste disposal site. In 1982, USL was covered with a 10-inch thick, low permeability layer of sandy silt over the entire disposal site (GeoLogic Associates, 1997). Groundwater monitoring at the USL began in 1988 and now includes three on-site monitoring wells (an upgradient well, a cross-gradient well, and a downgradient well) (City of Upland, 1998). The results of groundwater monitoring indicate that USL has released organic and inorganic compounds to underlying groundwater (GeoLogic Associates, 1997). Groundwater samples from the downgradient monitoring well consistently contain higher concentrations of organic and inorganic compounds than samples from the upgradient and cross-gradient monitoring wells. Analytical results from groundwater sampling indicate that VOCs are the major constituents of the organic release. All three monitoring wells have shown detectable levels of VOCs. The most common VOCs detected above MCLs are dichlorodifluoromethane, PCE, TCE, and vinyl chloride. Other VOCs that have been periodically detected above MCLs include methylene chloride, *cis*-1,2 dichloroethene, 1,1-dichloroethane, and benzene. The 1990-95 average total VOC concentration in the downgradient monitoring well is 125 μg/L (GeoLogic Associates, 1997). Figure 2-58 shows the approximate areal extent of VOCs in groundwater at concentrations exceeding MCLs as of April 1998. However, the plume is defined only by the three on-site monitoring wells. The plume extent may be greater than is depicted on Figure 2-58.

National Priorities List Sites. Three facilities in, or directly tributary to, the Chino Basin are on the current National Priorities List (NPL) of Superfund sites:

- Stringfellow;
- Dodson Brothers; and
- Pacific Polishing (Figure 2-58).

Elevated levels of TCE and its degradation by-products have been detected in groundwater in the vicinity of the Dodson Brothers Superfund site (*cf.* Tables 2-44 and 2-53).

TCE/PCE Anomaly – South of the Ontario Airport. A plume containing TCE and PCE exists south of the Ontario Airport. The plume extends from approximately State Route 60 on the north, Turner Avenue on the east to Schaeffer Avenue on the south and Vineyard Avenue on the west. Figure 2-58 shows the approximate areal extent of the plume. The plume appears to be approximately 6,000 feet wide and 9,000 feet long. The maximum reported TCE and PCE concentrations are 142 μg/L and 2 μg/L, respectively.

Role of the Vadose Zone in Future Water Quality

The vadose zone is the unsaturated part of the aquifer that lies between the water table surface and the land surface. The vadose zone has become larger and thicker over time as the groundwater levels in the Basin have declined due to overdraft. Some of the contaminants discharged to the land surface or into ponds remain in the vadose zone. The mechanisms for retention of contaminants within the vadose zone are complex, but are generally caused by sorption and precipitation. Some contaminants move down towards the saturated zone at much lower rates (a few feet per year) than they can move once they get to the saturated zone (a few feet per day). MWDSC completed a study of the TDS and nitrate impacts in the Chino Basin from a proposed 700,000 acre-ft storage program California (MWDSC, 1988). The outcome of this study suggested that the raising of groundwater levels associated with the increase in storage would mobilize TDS and nitrates in the vadose zone and cause serious water quality problems throughout the Basin. The proposed storage program did not add contaminants – it flushed contaminants already in the vadose zone into the saturated zone. This potential effect could not be verified with more advanced modeling in the CBWRMS due to problems with the model. Real-world experiments to verify the TDS and nitrate contamination are not practical for a basin as large as the Chino Basin.

As the agricultural land uses in the Chino Basin convert, the loading of contaminants to the vadose zone will be significantly reduced, as will percolation at the land surface that drives the contaminants down towards the saturated zone. This will have the effect of reducing the rate of vadose zone loading to the saturated zone.

SAFE YIELD

The safe yield of the Chino Basin was established in the 1978 Judgment to be 140,000 acre-ft/yr. The basis for this estimate is described by William J. Carroll in his testimony on December 19 and 20, 1977, during the adjudication process. Table 2-13 lists the hydrologic components developed by Carroll to estimate the safe yield of the Chino Basin. These components were developed for the period 1965 to 1974, a period that Carroll referred to as the *base period*. The hydrologic components listed in Table 2-13 are described below.

Deep Percolation of Precipitation and Surface Inflow – consists of the deep percolation of precipitation and streamflow. Carroll developed the estimate of 47,500 acre-ft/yr based on an extrapolation of the early Chino Basin modeling results from the DWR.

Deep Percolation of Artificial Recharge – consists of the percolation of local runoff in spreading basins. Carroll estimated that the local runoff recharged in SBCFCD-controlled facilities to be about 2,800 acre-ft/yr during the base period. The Etiwanda Water Company also recharged about 1,000 acre-ft/yr of Deer and Day Creek water in the Chino Basin during the base period.

Deep Percolation of Chino Basin Groundwater Used for Irrigation (domestic and agricultural) – defined as the fraction of water applied for irrigation that percolates through the soil and recharges underlying groundwater. Carroll estimated that about 15 percent of the water used for domestic irrigation would percolate to groundwater; and that 45 percent of the water used for agricultural irrigation would percolate to groundwater. The volume of percolation of Chino Basin groundwater used for irrigation over the base period was estimated by Carroll to be about 61,700 acre-ft/yr.

Deep Percolation of Imported Water Used for Irrigation (domestic and agricultural) – same as deep percolation of Chino Basin groundwater except that the water used for irrigation is imported to and used over the Chino Basin. The volume of percolation of imported water used for irrigation over the base period was estimated by Carroll to be about 7,000 acre-ft/yr.

Recharge of Sewage – defined to be the percolation in ponds of wastewater discharged by municipal wastewater treatment plants. This component almost completely ceased during the base period and was known to be eliminated as a recharge source when the safe yield was estimated. The volume of sewage recharge over the base period was about 18,200 acre-ft/yr. The inclusion of recharge of sewage as a component of safe yield in the stipulated Judgment was therefore not hydrologically consistent with how the Basin was to be operated post-Judgment.

Subsurface Inflow – defined to be the groundwater inflow to the Chino Basin from adjacent groundwater basins and mountain fronts including:

Bloomington Divide (Riverside Basin)	3,500 acre-ft/yr
San Gabriel Mountain front	2,500 acre-ft/yr
Colton Rialto Basin	500 acre-ft/yr
Cucamonga Basin	100 acre-ft/yr
Claremont and Pomona Basins	100 acre-ft/yr
Jurupa Hills	500 acre-ft/yr
Total	**7,200 acre-ft/yr** **say 7,000**

Subsurface Outflow – defined as groundwater that rises to the ground surface in Prado Basin to become Santa Ana River flow. Estimates of subsurface outflow were based on studies by DWR, United States Geological Survey (USGS), and Carroll. Carroll estimated the subsurface outflow to average about 6,800 acre-ft/yr over the base period.

Extractions – consists of groundwater extractions from the Chino Basin. Carroll estimated the groundwater extractions to average about 180,000 acre-ft/yr during the base period.

In addition to these components, Carroll estimated the change in storage over the base period to be about 40,000 acre-ft/yr; that is, the groundwater in storage declined by about 400,000 acre-ft between 1965 and 1974. Carroll estimated the safe yield to be the equal to the average extraction over the base period minus the average annual overdraft during the base period:

safe yield = extraction - overdraft
= 180,000 - 40,000
= 140,000 acre-ft/yr

A more recent estimate the safe yield can be abstracted from the groundwater modeling work done for the *Chino Basin Water Resources Management Study -- Task 6 Memorandum Develop Three Dimensional Groundwater Model* (Montgomery Watson, 1994). The hydrologic components derived from the modeling results for a 30-year period -- October 1960 to September 1989 (water years 1961 to 1989) - are listed in Table 2-14. The safe yield based on the CBWRMS results (1961 to 1989) computed in a manner similar to Carroll is:

safe yield = extraction - overdraft
= 183,000 - 17,000

= 166,000 acre-ft/yr

The safe yield based on CBWRMS modeling results for the base period (1965 to 1974) used by Carroll would be:

safe yield = extraction - overdraft
= 189,000 - 20,000
= 169,000 acre-ft/yr

A more conceptually correct estimate of the safe yield would include a reduction for artificial recharge of imported water and other waters that are currently not part of the yield, such as recharge of reclaimed water. The adjusted estimates would then be:

Carroll's estimate 1965 to 1974	118,000 acre-ft/yr
CBWRMS estimate 1961 to 1989	151,000 acre-ft/yr
CBWRMS estimate 1965 to 1974	156,000 acre-ft/yr

Watermaster may decide to change the safe yield of the Basin based on new information such as that developed from the CBWRMS and subsequent studies. Safe yield is used to determine the need for replenishment obligation for individual parties to the judgment. New water from the capture and recharge of storm water, from induced recharge caused by increased southern basin production (or, conversely, the reduction of yield from reduced production in the southern Chino Basin), or from other sources will enhance the yield of the Basin and thereby reduce the cost of purchasing imported water for replenishment.

At the time the Chino Judgment was implemented (1978), about 41 percent of the safe yield was estimated to come from irrigation returns. Since that time, irrigated agriculture has declined and is projected to be almost completely gone by 2020. This will result in a decline in irrigation returns to groundwater and a potential decrease in the safe yield. In addition, San Bernardino County, Riverside County, and the US Army Corps of Engineers (USACE) have constructed flood control projects that capture and convey runoff to the Santa Ana River - effectively eliminating the groundwater recharge that formerly took place in the stream channels and flood plains in the Chino Basin. This also may have resulted in a decrease in the safe yield of the Chino Basin.

Water harvesting opportunities exist that can be used to offset the yield lost to urbanization and flood control improvements. Water harvesting consists of capturing and recharging runoff caused by urbanization. Most of the precipitation falling on undeveloped land or land in agricultural uses is lost to evapotranspiration. Runoff increases dramatically with urbanization due to drainage improvements, increased impervious land cover, and decreased evapotranspiration of rainfall. The potential yield from this additional runoff is numerically equal to the increase in runoff that occurs when the land is converted to urban uses. The actual yield is equal to the additional runoff that is captured and put to beneficial use. In the Chino Basin, the best and least expensive way to put this yield to beneficial use is groundwater recharge.

Urbanization also creates reclaimed water. Presently, most of this water is discharged to the Santa Ana River. IEUA currently plans to use some of their reclaimed water for direct uses, including non-potable industrial uses, irrigation, and groundwater recharge. Increasing the yield of the Chino Basin by increased capture of local runoff will improve the dilution of reclaimed water used for groundwater recharge and reduce the cost of mitigation requirements for such reclamation.

WATER DEMANDS AND WATER SUPPLY PLANS

Current and Future Water Demands

The purpose of this subsection is to describe the current and projected water demands and supplies for agencies that produce groundwater from the Chino Basin. This information will serve as the basis for identifying future water resources issues in the Chino Basin area. Updated forecasts of water demands and supplies were requested from each Chino Basin water agency and industrial producer. Requested data included demands, water supply plans by individual well or source, well construction and operating data, and water production and treatment costs. Many agencies provided updated information. Where responses were incomplete, previous information developed as part of the 1995 Chino Basin Water Resources Management Study (CBWRMS) was used. The planning period for this evaluation is 2000 to 2020.

Growth Projections. There are several indicators of potential growth within the Chino Basin study area. These include population, housing, employment, and land use. The Southern California Association of Governments (SCAG) periodically develops population, housing, and employment projections. SCAG prepares growth projections as part of its regional transportation planning for Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. The most recent SCAG projection is SCAG-98, which was adopted in April 1998.

The SCAG-98 projection indicates the six-county region will grow from 15.6 million people in 1994 to 22.4 million in 2015. This represents an increase 6.7 million people between 1994 and 2015 and a growth rate of 43 percent. San Bernardino and Riverside counties are projected to grow at a rate that is more than double the regional average. San Bernardino County is projected to grow from 1,558,000 people in 1994 to 2,830,000 in 2020. Riverside County is projected to increase from 1,377,000 people in 1994 to 2,816,000 in 2020.

Population. Table 2-15 summarizes the population projections for the Chino Basin area by water purveyor. The SCAG projections were desegregated by city and census tract and combined by water purveyor service area. These projections indicate population will increase from 971,000 in 1994 to 1,631,000 in 2020. This is a growth rate of 68 percent or 2.6 percent per year. The population in some water service areas in the San Bernardino County portion of the Basin are projected to increase by as much as 125 percent.

Housing. Total housing is projected to increase from 284,000 units in 1994 to 496,000 in 2020, a growth rate of 75 percent. By comparing population and housing, the average occupancy is projected to decrease slightly from 3.4 to 3.3 persons per dwelling unit.

Employment. Employment is projected to increase from 316,000 jobs in 1994 to 702,000 jobs in 2020, a growth rate of 122 percent.

Water Demand Projections. Current water demands and supply projections form the basis for evaluating future water management programs in the Chino Basin area. Water demands are developed based on the water service areas shown in Table 2-16.

Water demand projections can be developed by several different methods. These include per capita, water duty and units of use approaches. The most frequently used methods are the per capita consumption method and the water duty method.

For this assessment, all water demands are based on information provided by the water agencies. In the absence of agency data, the assumptions in the CBWRMS have been used. These projections have been compared with the current SCAG projections. However, no adjustments to he demands have been made.

Projected water demands for the Chino Basin are presented in Table 2-16. This table indicates that Chino Basin area water demands will reach 348,000 acre-ft/yr in 2000 to 418,000 acre-ft/yr in 2020. Significant municipal water demand growth is expected to occur in the agricultural preserve area. This will result in increased demands for the Cities of Chino, Chino Hills and Ontario, and Jurupa Community Services District. Agricultural water demands are expected to decrease during the planning period as land is converted to urban uses.

Water Supply Plans

The principal water supplies in the Chino Basin area are groundwater pumped from the Chino Basin, other local groundwater and surface water, imported water purchased from Metropolitan and recycled water. The amounts of water utilized from each source are based on data provided by each water purveyor. If data was not provided, the supplies area based on projections developed for the Chino Basin Water Resources Management Study (1995). Each of these sources is discussed below. Table 2-17 presents projected water supply plans for appropriators in the Chino Basin area. Table 2-18 summarizes the water demands by major source categories. The growth in demand and general source plan is shown is shown graphically in Figure 2-60. Review of Table 2-18 and Figure 2-60 shows that there will be about 40,000 to 50,000 acre-ft/yr of Chino Basin production that will incur a replenishment obligation. The replenishment obligation can be met by the recharge of imported and reclaimed water, in-lieu replenishment involving imported water, and from water in local storage accounts. In the long run, the replenishment obligation of about 40,000 to 50,000 acre-ft/yr will need to be met with imported and recycled water. Thus the imported and recycled water components in Table 2-18 and Figure 2-60 should sum to a total of 40,000 to 50,000 acre-ft/yr higher.

Chino Basin Groundwater. The Chino Basin is the largest groundwater basin in the Upper Santa Ana Watershed. Water is reallocated from the Overlying Agricultural Pool to the Appropriative Pool when it is not put to use by the agricultural users. As agricultural production declines, the reallocations to the Appropriative Pool will increase. Total production from the Chino Basin is projected to range between 180,000 to 190,000 acre-ft/yr over the planning period. Production in excess of safe yield must be replaced through the purchase of replenishment water, which is imported into the Chino Basin, by the Watermaster.

Other Local Supplies. Other local water sources provide a portion of the water supplies for Chino Basin water agencies. These supplies include surface water and groundwater.

Surface Water. A number of water supply agencies, which produce groundwater from the Chino Basin, obtain a portion of their water supplies from local surface water sources. These agencies include the: City of Pomona, City of Upland, Cucamonga County Water District, Fontana Water Company, San Antonio Water Company, West End Consolidated Water Company, and West San Bernardino County Water District. The principal surface water sources include San Antonio Canyon, Cucamonga Canyon, Day Creek, Deer Creek, Lytle Creek and several smaller surface sources. For the most part, these surface water sources are fully developed and no significant additional supplies are anticipated to be developed in the future. Usage is expected to remain at 16,000-17,000 acre-ft/yr.

Other Groundwater. Other local groundwater supplies represent a significant supplemental source of water for Chino Basin water agencies. Other groundwater supplies in the study area include the Claremont Heights, Live Oak, Pomona and Spadra Basins in Los Angeles County, the Riverside South and Temescal Basins in Riverside County, and the Colton-Rialto, Cucamonga, Lytle Creek Bunker Hill, and Riverside North Basins in San Bernardino County. Agencies using other local groundwater include: City of Pomona, City of Upland, Cucamonga County Water District, Fontana Water Company, San Antonio Water Company, Southern California Water Company, West End Consolidated Water Company, and West San Bernardino County Water District. These supplies may increase slightly in the future as additional wells are constructed. However, most of these sources are essentially fully developed. Descriptions of these groundwater basins were presented in the CBWRMS Final Report (1995). The aggregate supply from these basins is currently 63,000 acre-ft/yr and is projected to be 76,000 acre-ft/yr in 2020.

Imported Water. Two regional agencies are responsible for imported water deliveries within the study area: Metropolitan Water District of Southern California (Metropolitan) and San Bernardino Valley Municipal Water District (SBVMWD). Metropolitan is a wholesale water agency serving supplemental imported water to 27 members (city and water agencies) in portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura counties. This service area has a current population of more than 16 million people. Approximately one-half of the total water used throughout the entire Metropolitan service area is imported water purchased from Metropolitan to supplement the local water supplies in its service area. Metropolitan obtains imported supplies from the Colorado River and the State Water Project (SWP). The demand for direct delivery of imported water for the Chino Basin purchased from Metropolitan is projected to increase from about 68,000 acre-ft/yr in 1997 to 129,000 acre-ft/yr by 2020, an increase of about 90% percent. The demand for replenishment water in the Chino Basin could reach 40,000 acre-ft/yr by 2020 if reclaimed water is not used for replenishment or direct uses and water in local storage accounts is not available for use as replenishment.

SBVMWD is a wholesale water purveyor in the easternmost portion of the study area and adjacent portions of San Bernardino County. SBVMWD is a SWP Contractor having an entitlement of 102,600 acre-ft/yr. In addition, SBVMWD is responsible for basin management in the Bunker Hill basin. The City of Rialto and West San Bernardino County Water District obtain water from SBVMWD through its Baseline Feeder that supplies Bunker Hill groundwater (included in *other groundwater* above).

Recycled Water. There are several existing sources of recycled water in use within the Chino Basin study area. These are the Pomona Water Reclamation Plant (operated by the Los Angeles County Sanitation Districts), Regional Plants 1, 2 and 4, and Carbon Canyon Water Reclamation Plant operated by IEUA, Upland Hills Water Reclamation Plant operated by the City of Upland, CIM Water Reclamation Plant operated by the California Institution for Men at Chino, and Indian Hills Water Reclamation Plant operated by Jurupa Community Services District. For this section, only existing and planned recycled water uses that will be implemented in the next two years are included in the water supply plans. This is about 11,500 acre-ft/yr.

Summary. The plans summarized in this section represent the current non-OBMP water supply plans of each individual water agency, as qualified previously. Future evaluation of these plans may indicate problems relative to their long-term feasibility. Availability of imported water supplies will have a significant effect on plan feasibility.

WASTEWATER FLOWS, TREATMENT AND DISPOSAL

This section summarizes existing and proposed municipal wastewater treatment and disposal plans for the Chino Basin study area for the planning period of 2000 through 2020. Existing municipal wastewater treatment facilities are described briefly along with a review of present and projected wastewater flows. Future treatment and disposal plans for the study area are also discussed.

Wastewater Flow Projections

Wastewater flow projections are made using a combination of methods similar to water demand projections. Depending on the planning data available, wastewater flow projections are made using per capita-based, EDU-based, area-based, and water consumption-based methods. The per capita method uses projected populations and average unit wastewater flows per person (90-110 gallons per day per person). EDU-based projections use unit flows per equivalent dwelling unit (EDU), where an EDU is the average amount of sewage generated by a single-family residential household (about 270 gallons per day). EDUs are estimated for commercial and industrial land uses using fixture unit counts or estimated wastewater flows. Flow projections are computed by projecting future EDUs and multiplying by the unit flow per EDU. Area-based methods typically use unit flow factors for each land use type. Flows are computed by multiplying the unit factor for each land use type by the corresponding acreage and totaling the individual flows for each land use type. Water consumption-based methods compute wastewater flows based on the difference between water demand and water consumption. Water consumption is the amount of water that does not return to the sewer system and is a function of the particular land use type and water use group. Currently, most wastewater flow projections in the study area are based on either per capita or EDU methods. Figure 2-61 illustrates the projected wastewater flows for each service area described below.

LACSD Service Area. The Los Angeles County Sanitation Districts (LACSD) furnishes wastewater services for Pomona and Claremont. Using the SCAG-98 growth projections and a wastewater generation factor of 110 gpcd, the wastewater flows for this area are estimated to increase from 22,000 acre-ft/yr to 30,000 acre-ft/yr in 2020.

IEUA Service Area. IEUA develops ten-year wastewater forecasts for its service area in conjunction with its annual capital improvement plan (CIP). As part of its current CIP, IEUA also prepared a fifty-year projection of wastewater flows. These projections indicate wastewater flows will increase from 57,000 acre-ft/yr in 1997 to 112,000 acre-ft/yr in 2020. This represents an increase of 96 percent.

Riverside County Service Area. Wastewater collection for the portion of the study area in Riverside County is provided by several agencies including Jurupa Community Services District and Norco. Other portions are unsewered. Wastewater flows for the Riverside County area are estimated to increase from 10,000 acre-ft/yr in 1997 to 15,000 acre-ft/yr by 2020 based on projected population increases. This includes wastewater generated by unsewered areas. Additional wastewater from outside the study area is expected to be treated at the Western Riverside Regional Water Reclamation Plant. However, no estimates of these additional flows were received.

Treatment and Disposal

Seven agencies are responsible for wastewater treatment and disposal for their respective areas. In Los Angeles County, LACSD is the treatment and disposal agency. In western San Bernardino County, IEUA and the City of Upland perform this role. In the easterly portion of the study area, the City of Rialto provides this service. In Riverside County, several agencies are responsible for wastewater treatment, including the Cities of Riverside and Corona, and JCSD.

There are three basic wastewater service areas within the study area. These areas include:

- LACSD System (Los Angeles County)
- IEUA System (Western San Bernardino County)
- Riverside County

LACSD System. The LACSD provides regional wastewater collection and treatment for most of Los Angeles County. LACSD is divided into districts that handle wastewater management within their service areas. LACSD No. 21 provides this service for the Claremont, La Verne, and Pomona service areas. Urban and industrial wastewater flows from the Los Angeles County portion of the study area are collected by the cities of Claremont, La Verne, and Pomona. This wastewater is routed to LACSD No. 21 for treatment at LACSD's Pomona WRP and San Jose Creek WRP. With the exception of recycled water used by the City of Pomona from the Pomona WRP, all wastewater reaching the sewer system is exported out of the study area. The Pomona WRP has capacity of 15 MGD and is expected to operate at that level during the planning period.

IEUA System. IEUA has constructed a Regional Sewerage System within its service area to collect, treat and dispose of wastewater delivered by contracting local agencies. The contracting cities and water districts are responsible for wastewater collection within their individual service areas. A system of regional trunk and interceptor sewers that convey sewage to regional wastewater treatment plants is owned and operated by IEUA. IEUA's wastewater collection system is divided into two major service areas: the Northern Service Area and the Southern Service Area.

IEUA currently operates four wastewater treatment plants: Regional Plant No. 1 (RP1), Regional Plant No. 2 (RP2) Regional Plant No. 4 (RP4), and Carbon Canyon Water Reclamation Plant (CCWRP). A fifth regional plant, known as Regional Plant No. 3 (RP3), is no longer in service. One new treatment plant, Regional Plant No. 5 (RP5), is in the planning stages. All of these plants are or will be capable of producing effluent that meets Title 22 requirements for water reclamation. Figure 2-62 illustrates the projected flows and capacity staging of these plants. Each of these plants are described below

Regional Plant No. 1. Although RP1 is designed to treat 44 mgd, the capacity was downrated to 32 mgd in 1992 due to more stringent permit requirements. The plant is being operated at an interim capacity of 41 mgd while plant upgrades are completed. A 1996 Regional Board cease and desist order requires the plant to be restored to its design capacity by 1999. RP1 is expected to operate at near its design capacity and treat wastewater flows from its service area and excess flows from RP4 until 2014. A plant expansion to about 56 mgd is planned to be on-line by 2014 to meet increased flows from its service area.

Regional Plant No. 2. RP2 serves the City of Chino and surrounding areas. A 1994 cease and desist order by the Regional Board requires the plant to be flood protected or relocated. Consequently, the plant will be potentially abandoned and its capacity replaced by a new RP5 by 2001. Solids handling facilities will continue to operate at this site.

Regional Plant No. 4. RP4 is a 7-mgd wastewater treatment facility that recently began operation. The plant will be expanded to 14 mgd by 2008 and 21 mgd by 2021. Population growth and corresponding wastewater production in the northeastern region of the District, including portions of City of Fontana and Cucamonga County Water District will determine the rate of expansion.

Carbon Canyon Water Reclamation Plant. Carbon Canyon Water Reclamation Plant (CCWRP) became operational in May 1992. CCWRP is designed to produce recycled water that can be used for non-potable purposes including industrial and irrigation uses in the western region of the Chino Basin. The initial design capacity of 10.2 mgd is planned for increase to 15.3 mgd in the year 2014. Sludge generated at the CCWRP is treated at the RP2 sludge processing facilities and will be for the foreseeable future.

Regional Plant No. 5. Growth in the southern portion of the IEUA service area will require additional treatment capacity. IEUA plans to construct a new RP5 by 2001. The initial phase of this plant will be 12 mgd of which 5 mgd will replace capacity at RP2. The new RP5 is expected to serve the San

Bernardino Agricultural Preserve area as well as treating 3.6 mgd from southern Ontario. A second phase expansion to 18 mgd is projected to be completed by 2008 with a third phase expansion by 2021.

Western Riverside County Regional Wastewater Treatment System. The Western Riverside County Regional Wastewater Authority, a Joint Powers Authority, has constructed a regional wastewater treatment facility to serve portions of Jurupa CSD, Norco, Home Gardens Sanitary District and Western MWD. This facility is located in Western Riverside County near the intersection of McCarty Road and Hellman Avenue. This facility has an initial treatment capacity of 8.5 mgd. The treatment plant will be expanded to an ultimate capacity of 13.3 mgd. The facility provides tertiary filtration and nitrogen removal to meet projected discharge requirements. Effluent from this plant will be discharged to the Santa Ana River. Projections of flows to this plant are not available as of the date of this report.

SUMMARY OF GROUNDWATER LEVEL, STORAGE, PRODUCTION AND WATER QUALITY PROBLEMS

Groundwater Level Problems

Overall, groundwater levels have declined between 50 to 200 feet in the Chino Basin since the turn of the century. The western side of the Basin, notably Management Zones 1a and 1b, has experienced the greatest decline in groundwater levels. The City of Chino and CIM have recently experienced ground-surface fissures that are thought to be related to increased groundwater production in the vicinity of the City of Chino. Groundwater producers that affect groundwater levels in this area include the cities of Chino, Chino Hills, Ontario, Pomona, the Monte Vista Water District, CIM, and agricultural producers. The City of Chino Hills has reported loss of production at one well due to recently declining groundwater levels. The management steps to eliminate groundwater-level problems in this area are described below.

Ground Level Survey. Conduct a ground-level survey of the area in Management Zone 1. This would include a review of past surveys and new surveys. The survey results would be compared to historical surveys to determine the location, rate, and magnitude of subsidence in the Basin. Periodic surveys should be conducted afterwards to monitor for further subsidence.

Monitoring. Develop and implement a groundwater-level and quality monitoring program that can be used to observed groundwater trends. This program should be developed and implemented before a groundwater recharge/production management plan is developed for Management Zone 1 in order to define local groundwater flow systems for better management of recharge and production.

Balance Groundwater Production and Recharge. Balance groundwater production with recharge in Management Zone 1, or, if necessary, balance production and recharge more locally within Management Zone 1. This may require temporarily reducing production below the level at which balance occurs to bring groundwater levels up to a safe level. A *safe* level needs to be determined. Recharge of local or native and imported water should be increased as much as practical. Given that recharge in the area is maximized, production may still have to be reduced in Management Zone 1 and replaced with either production from Management Zone 2 or some other source of water.

Groundwater Storage

The Chino Basin has immense storage capacity. Since the Judgment was implemented, total groundwater storage appears to have stabilized. However, as noted earlier, the storage in the Basin has declined by about 1,000,000 acre-ft since 1933. Therefore, there is at least 1,000,000 acre-ft of unused storage capacity available in the Basin. Increasing storage has some costs. There will be losses to the Santa Ana River due to rising groundwater. The analysis previously presented suggests that the losses from local and cyclic storage accounts due to rising groundwater during the period 1978 to 1997 could be as high as 50,000 acre-ft (or 18 percent of the volume that Watermaster assumes is in storage). Ignoring these losses will result in overdraft of the Chino Basin. A significant increase in groundwater storage, say on the order of 100,000s of acre-ft, may induce large groundwater losses to the Santa Ana River. In addition, a storage increase of this magnitude may have groundwater quality impacts due to flushing of contaminants within the vadose zone. The volume of safe storage from a water quality perspective is unknown. The management steps to mitigate the significant issues with groundwater storage are described below:

Develop Storage Accounting System that Includes Losses. Presently, Watermaster keeps track of transfers to and from local and cyclic storage accounts without accounting for groundwater losses. Watermaster should adopt a loss-estimating procedure and adjust the volume in storage accounts each year.

Water Quality Impacts from Conjunctive Use Programs. Mitigation measures need to be developed to protect producers in the event that large conjunctive-use programs cause unacceptable water quality impacts.

Groundwater Production

The primary issues for groundwater production are localized overdraft in Management Zone 1, and the potential changes in safe yield that can occur with changes in the location and magnitude of pumping. The location and amount of groundwater production generally appears to be balanced in the Basin except for Management Zone 1. Groundwater levels need to be increased in Management Zone 1 to minimize future subsidence and ground fissures, maintain production at a sustainable level, and improve groundwater quality. The management steps for this issue are identical to those for *Groundwater Levels.*

Groundwater production in the southern half of the Basin will need to be managed to ensure that safe yield is not reduced as agricultural areas convert to urban uses. Losses in safe yield due to decreases in agricultural production in the southern part of the Basin are distributed among the appropriators based on their initial share of safe yield. Thus, the loss in yield is translated throughout the Basin. Increasing production near the Santa Ana River could enhance exiting safe yield. The management steps for addressing this issue are listed below.

Optimization Studies. Conduct studies to optimize groundwater production patterns in southern Chino Basin. These studies will involve geologic investigations and modeling of southern Chino Basin.

Southern Basin Water Supply Plan. Develop a groundwater production and treatment plan that matches the emerging water demands of development in the southern Chino Basin with facilities necessary to provide water of appropriate quality.

Water Quality

The TDS and nitrate problems in the Basin are the most costly ones to deal with and are primarily non-point source related. By contrast, point-source dischargers of organic solvents and other contaminants are dealing with most of their related groundwater plumes. The cost of TDS and nitrate removal is estimated to be about $700 per acre-ft. The cost to remove solvents is generally under $100 per acre-ft. Figure 2-59 shows the locations of known point sources and areas with impaired water quality in the Chino Basin.

The source of the TDS and nitrate contamination in the northern part of the Basin has mostly disappeared. The primary sources of TDS and nitrate contamination in the southern part of the Basin are dairies and they will probably remain active for the next 20 years. TDS and nitrate degradation should continue in the southern basin for the foreseeable future and the cost to treat contaminated groundwater will escalate over current costs due to past and continued animal waste disposal practices. The steps to manage groundwater quality problems in the Basin are described below.

Point-Source Management. Watermaster should work with the Regional Board, Department of Toxic Substances Control and other regulatory agencies to identify point-source discharge related problems, facilitate their solution, and where necessary, use its institutional influence to obtain prompt and satisfactory mitigation. In some cases, the solution to a point-source problem and a non-point source problem can be addressed through one coordinated capture and treat project with reduced cost to all parties.

Non-point Source Management. The groundwater contaminated from non-point sources in the northern and southern parts of the Basin will need to be treated through dilution, demineralization or some other process, so that the water can be put to beneficial use. This is absolutely necessary in the southern Chino Basin to maintain safe yield. The *Optimization Studies* and *Southern Basin Water Supply Plan* steps listed under *Groundwater Production* apply here as well. The export of dairy waste from the Basin should be maximized.

Safe Yield

All the problems listed above need to be addressed to maintain safe yield. In addition to those steps, maximizing the capture and recharge of storm water and reclaimed water could increase safe yield. The SBCFCD, Riverside County Flood Control and Water Conservation District (RCFCWCD), and the USACE have developed and continue to develop new flood control projects that efficiently convey flood waters out of the Chino Basin and reduce recharge. This has a negative impact on safe yield. Watermaster needs to participate in these flood control projects to maximize recharge. Watermaster and the Chino Basin Water Conservation District initiated a multiphase recharge master plan study and completed Phase 1 in May 1998. Phases 2 and 3 need to be completed.

Table 2-1
Estimated Volume of Groundwater in Storage in the Chino Basin for Selected Areas and Years
(acre-feet)

Year		Management Zone MZ 1	MZ 2	MZ 3	MZ 4	MZ 5	Lower Chino	Upper Chino	Total Chino Basin
1965	Volume	1,713,920	2,208,147	1,213,002	58,389	259,321	2,035,804	3,416,975	5,452,779
	%Change[a]	9%	6%	4%	6%	(1%)	6%	6%	6%
1969	Volume	1,671,715	2,204,049	1,220,580	60,093	266,271	2,042,278	3,380,430	5,422,708
	%Change[a]	6%	6%	5%	9%	2%	6%	5%	5%
1974	Volume	1,625,359	2,116,609	1,188,221	55,671	260,549	1,971,641	3,274,768	5,246,410
	%Change[a]	3%	1%	2%	1%	(0%)	3%	2%	2%
1977	Volume	1,578,063	2,086,177	1,165,445	55,264	261,721	1,921,216	3,225,454	5,146,671
	%Change[a]	0%	0%	0%	0%	0%	0%	0%	0%
1983	Volume	1,696,255	2,096,980	1,165,379	56,023	259,544	1,953,182	3,321,000	5,274,182
	%Change[a]	7%	1%	(0%)	1%	(1%)	2%	3%	2%
1991	Volume	1,653,396	2,120,942	1,176,420	56,657	251,797	1,921,934	3,337,277	5,259,211
	%Change[a]	5%	2%	1%	3%	(4%)	0%	3%	2%
1997	Volume	1,676,486	2,126,330	1,202,870	57,558	257,469	1,985,198	3,335,514	5,320,712
	%Change[a]	6%	2%	3%	4%	(2%)	3%	3%	3%

(a) Change relative to storage in 1977.

Table 2-2
Estimated Volume of Groundwater in Storage in the Chino Basin
Versus Climate Changes, Production Patterns, Volume of Local and Cyclic Storage and Artifical Recharge

Year	Storage (acre-feet)[a]		Climate Index[b]		Production (acre-feet)[c]		Volume of Local + Cyclic Storage (acre-feet)		Artificial Recharge of Imported Water (acre-feet)[d]		Landuse (acres)[a,e]		
	Volume	% Change	Volume	% Change	Volume	% Change	Volume	% Change	Volume	% Change	Urban	Ag	Other
1965	5,452,779	0%	-2.12	0%	199,904	0%			3,002	0%	*22,975*	*56,680*	*37,201*
1966	*5,430,225*	(0%)	-2.13	(0%)	186,264	(7%)			0	N/A	*23,426*	*55,891*	*37,538*
1967	*5,437,743*	(0%)	-1.73	19%	192,597	(4%)			526	(82%)	*23,878*	*55,102*	*37,876*
1968	*5,445,261*	(0%)	-1.88	12%	190,489	(5%)			2,229	(26%)	*24,329*	*54,313*	*38,214*
1969	5,422,708	(1%)	-0.83	61%	192,103	(4%)			0	N/A	*24,780*	*53,524*	*38,551*
1970	*5,281,669*	(3%)	-1.21	43%	197,057	(1%)			0	N/A	*25,231*	*52,735*	*38,889*
1971	*5,316,929*	(2%)	-1.51	29%	197,428	(1%)			0	N/A	*25,683*	*51,946*	*39,227*
1972	*5,352,188*	(2%)	-1.96	8%	166,826	(17%)			0	N/A	*26,134*	*51,157*	*39,565*
1973	*5,387,448*	(1%)	-1.85	13%	180,997	(9%)			0	N/A	*26,585*	*50,368*	*39,902*
1974	5,246,410	(4%)	-2.04	4%	191,536	(4%)			840	(72%)	*27,037*	*49,579*	*40,240*
1975	*5,179,917*	(5%)	-2.19	(3%)	189,637	(5%)			2,001	(33%)	27,488	48,790	40,578
1976	*5,213,163*	(4%)	-2.48	(17%)	174,498	(13%)			939	(69%)	*28,822*	*47,378*	*40,656*
1977	5,146,671	(6%)	-2.83	(33%)	163,705	(18%)			531	(82%)	*30,156*	*45,966*	*40,733*
1978	*5,252,930*	(4%)	-1.87	12%	167,410	(16%)			19,588	553%	*31,490*	*44,554*	*40,811*
1979	*5,231,678*	(4%)	-1.76	17%	167,669	(16%)	15,911	0%	829	(72%)	*32,824*	*43,142*	*40,889*
1980	*5,210,426*	(4%)	-0.74	65%	174,421	(13%)	24,715	55%	7,582	153%	*34,158*	*41,730*	*40,967*
1981	*5,189,174*	(5%)	-1.22	43%	162,814	(19%)	33,759	112%	17,183	472%	*35,492*	*40,319*	*41,045*
1982	*5,167,922*	(5%)	-1.14	47%	151,878	(24%)	36,599	130%	16,079	436%	*36,826*	*38,907*	*41,123*
1983	5,274,182	(3%)	0.01	100%	172,420	(14%)	55,995	252%	21,817	627%	*38,160*	*37,495*	*41,201*
1984	*5,261,082*	(4%)	-0.25	88%	176,218	(12%)	73,822	364%	0	N/A	39,494	36,083	41,279
1985	*5,262,954*	(3%)	-0.43	80%	167,119	(16%)	97,437	512%	18,404	513%	*44,349*	*34,891*	*37,615*
1986	*5,264,825*	(3%)	-0.13	94%	180,778	(10%)	113,362	612%	11,616	287%	*49,205*	*33,699*	*33,951*
1987	*5,266,696*	(3%)	-0.69	68%	180,115	(10%)	128,122	705%	8,586	186%	*54,061*	*32,507*	*30,288*
1988	*5,268,568*	(3%)	-0.85	60%	189,513	(5%)	165,990	943%	3,449	15%	*58,916*	*31,315*	*26,624*
1989	*5,270,439*	(3%)	-1.09	49%	164,752	(18%)	174,505	997%	6,452	115%	*63,772*	*30,123*	*22,960*
1990	*5,272,310*	(3%)	-1.46	31%			163,012	925%	3,793	26%	68,627	28,931	19,297
1991	5,259,211	(4%)	-1.53	28%			187,986	1,081%	3,310	10%	*68,740*	*28,808*	*19,307*
1992	*5,310,462*	(3%)	-1.52	28%			201,503	1,166%	8,246	175%	*68,853*	*28,684*	*19,318*
1993	*5,300,212*	(3%)	-0.36	83%			204,698	1,187%	11,566	285%	68,966	28,561	19,328
1994	*5,289,962*	(3%)	-0.71	67%			211,350	1,228%	23,003	666%	*68,627*	*28,931*	*19,297*
1995	*5,279,711*	(3%)	-0.08	96%			230,861	1,351%	120	(96%)	*68,740*	*28,808*	*19,307*
1996	*5,269,461*	(3%)	-0.09	96%			229,840	1,345%	82	(97%)	*68,853*	*28,684*	*19,318*
1997	5,320,712	(2%)	0.00	100%			223,587	1,305%	5,648	88%	*68,966*	*28,561*	*19,328*

(a) Italics indicates interpolated values
(b) Based on precipitation in Fontana normalized to 26.6 inches
(c) Production data is from the CIGSM Model of the Chino Basin
(d) As reported in the monthly MWD billings
(e) Adjusted land uses from JMM, SAWPA Basin Plan Upgrade Task Force, Appendices for Nitrogen and TDS Studies USAW, February 1991,

Table 2-3
Comparison of Groundwater Storage and Santa Ana River Flow for CBWRMS Alternatives 3 and 4
(acre-ft)

Simulation Year	Hydrologic Year	End of Year Storage Alt 3	End of Year Storage Alt 4	Total Santa Ana River Flow at Prado Alt 3	Total Santa Ana River Flow at Prado Alt 4	Difference in Storage	Difference in Outflow (Losses to River from Storage)
2000	1947	4,725,000	4,792,000	347,407	352,943	67,000	5,536
2001	1948	4,713,000	4,827,000	413,738	420,894	114,000	7,156
2002	1949	4,706,000	4,869,000	466,627	476,705	163,000	10,078
2003	1950	4,697,000	4,905,000	406,421	416,560	208,000	10,139
2004	1951	4,692,000	4,950,000	543,868	550,967	258,000	7,099
2005	1952	4,742,000	5,034,000	792,539	817,176	292,000	24,637
2006	1953	4,713,000	4,998,000	440,611	448,703	285,000	8,092
2007	1954	4,720,000	4,896,000	651,547	666,182	176,000	14,635
2008	1955	4,711,000	4,784,000	565,954	577,107	73,000	11,153
2009	1956	4,709,000	4,684,000	585,669	591,800	-25,000	6,131
2010	1957	4,703,000	4,682,000	661,933	664,800	-21,000	2,867
2011	1958	4,723,000	4,706,000	781,641	783,833	-17,000	2,192
2012	1959	4,697,000	4,683,000	466,853	469,124	-14,000	2,271
2013	1960	4,674,000	4,670,000	496,566	495,354	-4,000	-1,212
2014	1961	4,646,000	4,646,000	426,841	429,353	0	2,512
2015	1962	4,631,000	4,692,000	597,518	596,920	61,000	-598
2016	1963	4,614,000	4,727,000	587,424	591,025	113,000	3,601
2017	1964	4,586,000	4,750,000	487,997	493,835	164,000	5,838
2018	1965	4,584,000	4,796,000	717,162	727,487	212,000	10,325
2019	1966	4,571,000	4,833,000	623,701	635,886	262,000	12,185
2020	1967	4,572,000	4,874,000	699,926	719,041	302,000	19,115
2021	1968	4,540,000	4,840,000	488,588	497,664	300,000	9,076
2022	1969	4,576,000	4,783,000	1,041,947	1,055,875	207,000	13,928
2023	1970	4,556,000	4,678,000	830,366	836,723	122,000	6,357
2024	1971	4,530,000	4,570,000	517,684	522,635	40,000	4,951
2025	1972	4,501,000	4,545,000	424,518	427,887	44,000	3,369
2026	1973	4,492,000	4,540,000	639,882	642,372	48,000	2,490
2027	1974	4,481,000	4,533,000	607,742	610,451	52,000	2,709
2028	1975	4,451,000	4,510,000	479,146	481,087	59,000	1,941
2029	1976	4,422,000	4,491,000	502,324	500,819	69,000	-1,505
2030	1977	4,405,000	4,527,000	597,505	602,728	122,000	5,223
2031	1978	4,451,000	4,621,000	1,023,131	1,035,589	170,000	12,458
2032	1979	4,442,000	4,655,000	788,345	803,158	213,000	14,813
2033	1980	4,480,000	4,738,000	993,827	1,009,339	258,000	15,512
2034	1981	4,456,000	4,763,000	751,693	760,693	307,000	9,000
2035	1982	4,451,000	4,805,000	727,380	741,379	354,000	13,999
2036	1983	4,499,000	4,844,000	1,069,565	1,089,631	345,000	20,066
2037	1984	4,472,000	4,730,000	736,299	747,600	258,000	11,301
2038	1985	4,450,000	4,621,000	513,855	524,741	171,000	10,886
2039	1986	4,437,000	4,523,000	650,023	658,253	86,000	8,230
2040	1987	4,413,000	4,501,000	574,550	581,532	88,000	6,982
Total Lost From Conjunctive Use Storage and Expanded Local Storage (2000 to 2040)							335,538

Table 2-4

Comparison of Estimates of Water in Cyclic and Local Storage Accounts with and without Losses to the Santa Ana River

(acre-ft)

Year	---------- Cyclic and Local Storage Accounts ----------					
	Put	Take	Watermaster Estimated End of Period Storage	Accounting for Losses: Losses to Baseflow	Accounting for Losses: Estimated End of Period Storage	Accounting for Losses: Cumulative Losses
1978 / 79	16,074	0	16,074	163	15,911	-163
1979 / 80	19,898	10,678	25,295	417	24,715	-580
1980 / 81	12,665	3,021	34,938	600	33,759	-1,179
1981 / 82	6,015	2,454	38,500	721	36,599	-1,901
1982 / 83	20,345	0	58,846	949	55,995	-2,850
1983 / 84	19,158	0	78,004	1,331	73,822	-4,181
1984 / 85	25,986	615	103,375	1,756	97,437	-5,938
1985 / 86	18,192	106	121,461	2,162	113,362	-8,099
1986 / 87	31,257	14,021	138,698	2,476	128,122	-10,575
1987 / 88	58,037	17,153	179,582	3,016	165,990	-13,591
1988 / 89	43,990	31,983	191,588	3,491	174,505	-17,083
1989 / 90	26,742	34,774	183,555	3,461	163,012	-20,544
1990 / 91	34,451	5,877	212,129	3,599	187,986	-24,143
1991 / 92	83,614	66,103	229,640	3,994	201,503	-28,137
1992 / 93	30,388	23,028	237,000	4,165	204,698	-32,302
1993 / 94	32,807	21,889	247,918	4,266	211,350	-36,568
1994 / 95	30,333	6,288	271,963	4,534	230,861	-41,102
1995 / 96	38,488	34,785	275,666	4,724	229,840	-45,826
1996 / 97	20,698	22,301	274,063	4,649	223,587	-50,476

Table 2-5
Chino Basin Groundwater Production Estimates
(acre-ft)

Year	Production Estimates SWRCB(1)	Watermaster(2)	CBWRMS(3)
1947	108,079		
1948	121,367		
1949	127,427		
1950	138,168		
1951	152,784		
1952	145,957		
1953	164,175		
1954	159,944		
1955	174,205		
1956	192,319		
1957	172,818		
1958	167,383		
1959	179,794		
1960	186,465		
1961	194,763		217,536
1962	185,230		201,675
1963	172,008		190,548
1964	184,336		201,234
1965	158,389		190,358
1966	147,552		199,904
1967	156,900		186,264
1968	160,250		192,597
1969	153,975		190,489
1970	*154,000*		192,103
1971	149,150		197,057
1972	*157,000*		197,428
1973	*134,000*		166,826
1974	149,680		180,997
1975		175,757	191,536
1976		181,017	189,637
1977		173,355	174,489
1978		154,675	163,706
1979		141,314	167,410
1980		140,566	167,689
1981		144,416	174,421
1982		137,532	162,814
1983		122,635	151,878
1984		132,799	172,420
1985		134,563	176,218
1986		136,113	167,119
1987		147,068	180,778
1988		152,402	180,115
1989		143,998	189,513
1990		154,620	
1991		140,151	
1992		141,904	
1993		135,923	
1994		129,682	
1995		152,678	
1996		150,669	
1997		159,012	
1998		150,226	
	Averages		
1947 to 1974	158,861	na	na
1947 to 1960	156,492	na	na
1961 to 1974	161,231	na	193,215
1965 to 1974	152,090	na	189,402
1978 to 1989	na	147,881	173,983
1978 to 1998	na	142,997	na

(1) - From JMM notes on Chino Basin Adjudication.
(2) - Appendix H, Twentieth Annual Report of the Chino Basin Watermaster.
(3) - Chino Basin Water Resources Management Study, Task 6 Report.
na - not applicable.

Table 2-6
Chino Basin Production by Pool

Fiscal Year	Appropriative Pool			Overlying Agricultural Pool	Overlying Non-Agricultural Pool	Total	Distribution by Pool		
	Production	Exchanged with Metropolitan	Total				Appropriative Pool	Overlying Agricultural Pool	Overlying Non-Agricultural Pool
1974 - 1975	70,312	0	70,312	96,567	8,878	175,757	40%	55%	5%
1975 - 1976	79,312	0	79,312	95,349	6,356	181,017	44%	53%	4%
1976 - 1977	72,707	0	72,707	91,450	9,198	173,355	42%	53%	5%
1977 - 1978	60,659	0	60,659	83,934	10,082	154,675	39%	54%	7%
1978 - 1979	60,597	0	60,597	73,688	7,127	141,412	43%	52%	5%
1979 - 1980	63,834	0	63,834	69,369	7,363	140,566	45%	49%	5%
1980 - 1981	70,726	0	70,726	68,040	5,650	144,416	49%	47%	4%
1981 - 1982	66,731	0	66,731	65,117	5,684	137,532	49%	47%	4%
1982 - 1983	63,481	0	63,481	56,759	2,395	122,635	52%	46%	2%
1983 - 1984	70,558	0	70,558	59,033	3,208	132,799	53%	44%	2%
1984 - 1985	76,912	0	76,912	55,236	2,415	134,563	57%	41%	2%
1985 - 1986	80,859	0	80,859	52,061	3,193	136,113	59%	38%	2%
1986 - 1987	84,662	0	84,662	59,847	2,559	147,068	58%	41%	2%
1987 - 1988	91,579	7,634	99,213	57,865	2,958	152,402	60%	38%	2%
1988 - 1989	93,617	6,424	100,041	46,762	3,619	143,998	65%	32%	3%
1989 - 1990	101,344	16,377	117,721	48,420	4,856	154,620	66%	31%	3%
1990 - 1991	86,658	14,929	101,587	48,085	5,407	140,150	62%	34%	4%
1991 - 1992	91,982	12,202	104,184	44,682	5,240	141,904	65%	31%	4%
1992 - 1993	86,367	13,657	100,024	44,092	5,464	135,923	64%	32%	4%
1993 - 1994	80,798	20,195	100,993	44,298	4,586	129,682	62%	34%	4%
1994 - 1995	93,419	4,222	97,641	55,022	4,327	152,768	61%	36%	3%
1995 - 1996	101,606	6,167	107,773	43,639	5,424	150,669	67%	29%	4%
1996 - 1997	107,984	0	107,984	44,809	6,219	159,012	68%	28%	4%
1997 - 1998	101,710	4,275	105,985	43,344	5,171	150,225	68%	29%	3%
Totals	1,958,414	106,082	2,064,496	1,447,468	127,379	3,533,261			
Average	81,601	4,420	86,021	60,311	5,307	147,219	56%	41%	4%
Max	107,984	20,195	117,721	96,567	10,082	181,017	68%	55%	7%
Min	60,597	0	60,597	43,344	2,395	122,635	39%	28%	2%

Table 2-7
Estimated Historical Land Uses in Chino Basin

Land Use Category	Year 1933 (acres)	1949 (acres)	1957 (acres)	1963 (acres)	1975 (acres)	1984 (acres)	1993 (acres)
Non-irrigated Field Crops and Pasture	37,242	37,157	52,950	36,600	20,754	12,942	5,411
Irrigated Field Crops and Pasture	32,539	32,539	24,320	23,927	18,295	15,677	13,141
Irrigated and Non-irrigated Citrus	15,866	15,866	9,464	4,303	1,947	865	0
Irrigated Vineyards	1,332	1,332	7,268	18,057	9,353	8,195	2,975
Non-irrigated Vineyards	94	94	79	0	0	0	1,629
Dairies and Feedlots	259	259	3,963	4,140	6,280	6,517	7,611
Urban Residential, Commercial, Industrial and Vacant	7,135	7,157	17,695	25,598	41,405	53,260	65,115
Special Impervious	305	305	305	314	309	1,839	3,851
Native Vegetation	22,083	22,145	21,633	21,249	20,481	19,904	19,328
Total Urban	*7,440*	*7,462*	*18,000*	*25,912*	*41,714*	*55,099*	*68,966*
Total Non-urban	*109,415*	*109,393*	*119,678*	*108,276*	*77,109*	*64,101*	*50,095*
Potential Dairy Disposal Area	*87,073*	*86,988*	*94,082*	*82,887*	*50,349*	*37,680*	*23,156*

Table 2-8
Estimated Dairy Waste Generation and Mineral Loading in the Chino Basin

Year	Total Acreage (acres)	Area in Feedlots (acres)	Number of Milking Cows	Number of Non-Milking Cows (Equ. Milking Cows)	Total Mass of Manure Disposed in Basin (tons)	Mass of TDS from Manure to Groundwater (tons)	Mass of Nitrate from Manure Entering Soil (tons)	Theoretical Manure Disposal Area (acres)	Theoretical Manure Application Rate (tons/acre)
1949	55	47	1,079	324	4,217	329	53	86,988	0.05
1950	457	389	8,969	2,697	35,071	2,736	440	85,187	0.4
1951	860	731	16,860	5,071	65,925	5,142	828	83,386	1
1952	1,262	1,073	24,751	7,444	96,779	7,549	1,215	81,585	1
1953	1,665	1,415	32,642	9,817	127,632	9,955	1,603	79,784	2
1954	2,067	1,757	40,533	12,190	158,486	12,362	1,990	77,982	2
1955	2,469	2,099	48,424	14,563	189,340	14,769	2,377	76,181	2
1956	2,872	2,441	56,315	16,936	220,194	17,175	2,765	74,380	3
1957	3,274	2,783	64,205	19,309	251,048	19,582	3,152	72,579	3
1958	3,511	2,984	68,856	20,708	269,233	21,000	3,381	71,210	4
1959	3,748	3,186	73,507	22,107	287,419	22,419	3,609	69,840	4
1960	3,986	3,388	78,158	23,505	305,605	23,837	3,837	68,471	4
1961	4,223	3,589	82,809	24,904	323,790	25,256	4,066	67,102	5
1962	4,460	3,791	87,460	26,303	341,976	26,674	4,294	65,733	5
1963	4,697	3,992	92,111	27,702	360,162	28,093	4,522	64,364	6
1964	4,918	4,181	96,450	29,007	377,127	29,416	4,735	62,848	6
1965	5,140	4,369	100,789	30,311	394,092	30,739	4,948	61,331	6
1966	5,361	4,557	105,128	31,616	411,058	32,063	5,161	59,815	7
1967	5,582	4,745	109,467	32,921	428,023	33,386	5,374	58,299	7
1968	5,803	4,933	113,806	34,226	444,988	34,709	5,587	56,783	8
1969	6,025	5,121	118,145	35,531	461,953	36,032	5,800	55,267	8
1970	6,246	5,309	122,483	36,836	478,919	37,356	6,014	53,750	9
1971	6,467	5,497	126,822	38,141	495,884	38,679	6,227	52,234	9
1972	6,688	5,685	131,161	39,445	512,849	40,002	6,440	50,718	10
1973	6,910	5,873	135,500	40,750	529,815	41,326	6,653	49,202	11
1974	7,131	6,061	143,657	42,793	370,912	28,931	4,657	47,685	8
1975	7,352	6,249	152,052	44,859	391,155	30,510	4,912	46,169	8
1976	7,464	6,344	158,358	46,267	405,888	31,659	5,097	44,635	9
1977	7,575	6,439	164,784	47,673	420,808	32,823	5,284	43,100	10
1978	7,687	6,534	171,330	49,077	435,911	34,001	5,473	41,566	10
1979	7,799	6,629	177,995	50,478	451,194	35,193	5,665	40,031	11
1980	7,910	6,724	184,780	51,874	466,654	36,399	5,860	38,497	12
1981	8,022	6,819	191,684	53,264	482,287	37,618	6,056	36,962	13
1982	8,134	6,914	198,708	54,648	498,090	38,851	6,254	35,427	14
1983	8,245	7,009	205,852	56,024	514,059	40,097	6,455	33,893	15
1984	8,357	7,103	213,115	57,392	530,192	41,355	6,657	32,358	16
1985	8,469	7,198	220,498	58,750	546,484	42,626	6,862	31,091	18
1986	8,580	7,293	228,000	60,097	562,932	43,909	7,068	29,823	19
1987	8,692	7,388	200,070	54,019	498,200	38,860	6,256	28,556	17
1988	8,804	7,483	171,347	47,608	431,100	33,626	5,413	27,288	16
1989	8,915	7,578	173,520	48,212	436,568	34,052	5,482	26,020	17
1990	8,915	7,578	175,414	48,738	441,332	34,424	5,542	24,753	18
1991	8,915	7,578	177,308	49,264	446,097	34,796	5,601	23,485	19
1992	8,915	7,578	179,201	49,790	450,861	35,167	5,661	22,218	20
1993	8,915	7,578	181,095	50,316	455,626	35,539	5,721	20,950	22
1994	8,915	7,578	182,989	50,842	460,391	35,910	5,781	20,950	22
1995	8,915	7,578	184,883	51,369	465,155	36,282	5,841	20,950	22
1996	8,915	7,578	186,776	51,895	469,920	36,654	5,901	20,950	22
1997	8,915	7,578	188,670	52,421	474,684	37,025	5,960	20,950	23
Totals					18,678,084	1,456,891	234,530	na	na
Average	6,106	5,190	129,562	36,939	381,185	29,732	4,786	49,864	10

Sources: Final Task 6 Memorandum, Development of a Three-Dimensional Groundwater Model, Montgomery Watson, 1994; RWQCB 1997 Cow count.9 (personal conversation with Robert Holub of RWQCB, 1998)

Table 2-9
Average TDS Values for Selected Wells within Each Management Area

Well	Average TDS (mg/l) Per Period						
	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995
Management Zone 1A							
01S08W15J01	276	247	N/A	208	294	301	304
01S08W25Q02	N/A	181	233	209	213	219	206
01S08W15R00	N/A	N/A	N/A	213	216	200	219
01S08W34A01	N/A	N/A	250	219	331	376	N/A
01S07W08N01	209	227	199	226	239	214	224
01S08W11R01	N/A	312	383	345	394	333	371
01S08W14A03	374	292	295	388	358	N/A	N/A
01S08W27H01	N/A	N/A	483	434	443	678	607
01S08W31J01	N/A	N/A	N/A	N/A	N/A	411	408
Management Zone 1B							
02S08W23C01	390	N/A	N/A	205	N/A	259	208
02S08W11L04	N/A	236	222	206	208	N/A	228
02S08W15C03	N/A	N/A	284	295	291	353	349
02S08W22J01	N/A	261	N/A	645	N/A	N/A	781
Management Zone 2A							
01S06W31D01	160	134	N/A	164	N/A	250	193
01S07W14G01	N/A	N/A	189	193	186	224	172
01S07W27D01	N/A	183	250	220	232	247	N/A
02S07W04B01	236	218	215	N/A	N/A	N/A	N/A
01S07W13R01	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Management Zone 2B							
02S07W22K01	617	215	250	315	N/A	N/A	223
Management Zone 3A							
01S06W11B01	210	204	206	220	N/A	244	218
01S06W23D01	230	N/A	N/A	241	N/A	264	275
02S06W05A01	196	184	198	N/A	N/A	227	248
01S05W21B01	268	256	291	N/A	344	354	N/A
Management Zone 3B							
02S07W34K02	1305	1778	1977	735	N/A	N/A	N/A
03S07W03N01	399	574	592	N/A	N/A	N/A	N/A
Management Zone 4							
02S06W16B04	N/A	N/A	316	310	735	696	N/A
02S06W16B03	N/A	N/A	348	370	765	658	788
Management Zone 5							
03S07W11L03	600	578	633	645	771	660	841
02S06W26D02	497	580	650	685	N/A	720	N/A
02S07W36H02	N/A	1065	1477	1257	1156	1100	1047

Table 2-10
Average Nitrate Values for Selected Wells within Each Management Area

Well	Average Nitrate-N (mg/l) Per Period						
	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995
Management Zone 1A							
01S07W08N01	2.7	4.9	3.3	4.2	4.4	4.6	5.4
01S08W11R01	N/A	22.4	21.0	19.4	21.8	17.9	18.8
01S08W14A03	21.2	12.9	22.6	15.4	17.0	N/A	18.4
01S08W15J01	8.3	7.0	N/A	7.4	6.5	5.1	6.7
01S08W15R00	N/A	N/A	N/A	3.2	2.4	4.8	3.1
01S08W25Q02	N/A	2.7	3.8	4.3	3.4	4.0	5.2
01S08W27H01	N/A	N/A	1.5	13.8	20.4	4.9	4.0
01S08W31J01	N/A	N/A	N/A	N/A	N/A	6.4	6.8
01S08W34A01	N/A	N/A	5.2	4.0	11.7	17.7	N/A
Management Zone 1B							
02S08W11L04	N/A	2.6	1.8	1.7	1.9	N/A	4.8
02S08W15C03	N/A	N/A	3.0	2.2	3.4	4.8	5.6
02S08W22J01	N/A	1.8	N/A	12.3	N/A	17.9	19.5
02S08W23C01	5.0	N/A	N/A	3.2	N/A	5.6	5.2
Management Zone 2A							
01S06W31D01	0.4	0.5	N/A	1.3	1.9	2.5	1.9
01S07W13R01	0.8	N/A	N/A	N/A	N/A	N/A	N/A
01S07W14G01	N/A	N/A	2.9	0.4	0.4	0.5	0.7
01S07W27D01	2.7	2.9	3.0	5.0	5.0	4.6	0.0
02S07W04B01	1.8	2.3	2.4	N/A	N/A	N/A	N/A
Management Zone 2B							
02S07W22K01	9.5	1.6	1.7	5.9	N/A	N/A	3.5
Management Zone 3A							
01S05W21B01	6.5	8.6	8.9	N/A	15.2	15.2	N/A
01S06W11B01	1.9	1.1	1.8	2.5	2.5	4.3	5.5
01S06W23D01	4.0	N/A	N/A	5.8	3.3	7.2	12.2
02S06W05A01	1.4	1.3	1.5	N/A	N/A	2.9	5.2
Management Zone 3B							
02S07W34K02	4.8	8.3	16.5	0.5	N/A	N/A	N/A
03S07W03N01	3.1	5.7	8.0	N/A	N/A	N/A	N/A
Management Zone 4							
02S06W16B03	N/A	N/A	4.4	7.8	19.4	22.6	23.3
02S06W16B04	N/A	N/A	6.5	7.5	19.9	24.3	22.6
Management Zone 5							
02S06W26D02	3.6	3.4	5.4	8.1	N/A	8.6	N/A
02S07W36H02	N/A	3.8	6.7	4.3	6.9	2.7	6.5
03S07W11L03	0.5	0.8	0.7	3.6	3.2	6.1	14.9

Table 2-11a
Inorganic Constituents, THMs, Radioactivity with Primary MCLs

Constituent	Observations At or Above 1/2*MCL	Wells w/ Observations At or Above 1/2*MCL	Observations At or Above MCL	Wells w/ Observations At or Above MCL	MCL
Inorganic Chemicals					
Aluminum	2	2	0	0	1 mg/L
Antimony	0	0	0	0	0.006 mg/L
Arsenic	8	1	0	0	0.05 mg/L
Asbestos	0	0	0	0	0.05 mg/L
Barium	0	0	0	0	1 mg/L
Beryllium	7	5	2	1	0.004 mg/L
Cadmium	17	8	5	4	0.005 mg/L
Chromium	16	10	7	5	0.05 mg/L
Cyanide	0	0	0	0	0.2 mg/L
Fluoride	302	51	160	30	2 mg/L
Mercury	4	3	2	2	0.002 mg/L
Nickel	2	2	0	0	0.1 mg/L
Nitrate (as N)	4165	513	2053	322	10 mg/L
Selenium	3	1	3	1	0.05 mg/L
Thallium	0	0	0	0	0.002 mg/L
Total Trihalomethanes					
Total Trihalomethanes[a]	0	0	0	0	0.1 mg/L
Bromodichloromethane (THM)	0	0	0	0	see THM
Bromoform (THM)	0	0	0	0	see THM
Chloroform (THM)	0	0	0	0	see THM
Dibromochloromethane (THM)	0	0	0	0	see THM
Radioactivity					
Gross Alpha Particle Activity	39	16	11	7	15 pCi/L
Gross Beta Particle Activity	0	0	0	0	50 pCi/L
Radium-226 and 228[b]	0	0	0	0	pCi/L
Strontium-90	0	0	0	0	8 pCi/L
Tritium	0	0	0	0	20,000 pCi/L
Uranium	5	3	0	0	20 pCi/L

(a) Includes individual THM constituents analyzed separately
(b) Radium-226 MCL is 3 pCi/L; Radium-228 MCL is 2 pCi/L

Table 2-11b
Organic Chemicals with Primary MCLs

Constituent	Observations At or Above 1/2*MCL	Wells w/ Observations At or Above 1/2*MCL	Observations At or Above MCL	Wells w/ Observations At or Above MCL	MCL
Organic Chemicals					
1,1,1-Trichloroethane (1,1,2-TCA)	0	0	0	0	0.2 mg/L
1,1,2,2-Tetrachloroethane	0	0	0	0	0.001 mg/L
1,1,2-Trichloro-1,2,2-Trifluoroethane	0	0	0	0	1.2 mg/L
1,1,2-Trichloroethane (1,1,2-TCA)	0	0	0	0	0.005 mg/L
1,1-Dichloroethane	34	7	22	7	0.005 mg/L
1,1-Dichloroethylene	497	18	355	13	0.006 mg/L
1,2,4-Trichlorobenzene	0	0	0	0	0.07 mg/L
1,2-Dichlorobenzene	0	0	0	0	0.6 mg/L
1,2-Dichloroethane	134	77	122	76a	0.0005 mg/L
1,2-Dichloropropane	1	1	0	0	0.005 mg/L
1,3-Dichloropropane	0	0	0	0	0.0005 mg/L
1,4-Dichlorobenzene	3	2	2	1	0.005 mg/L
2,3,7,8-TCDD (Dioxin)	0	0	0	0	0.00000003 mg/L
2,4,5,-TP (Silvex)	0	0	0	0	0.05 mg/L
2,4-D	0	0	0	0	0.07 mg/L
Alachlor	0	0	0	0	0.002 mg/L
Atrazine	0	0	0	0	0.003 mg/L
Bentazon	0	0	0	0	0.018 mg/L
Benzene	155	89	43	23	0.001 mg/L
Benzo(a)Pyrene	0	0	0	0	0.0002 mg/L
Carbofuran	0	0	0	0	0.018 mg/L
Carbon Tetrachloride	1	1	1	1	0.0005 mg/L
Chlordane	0	0	0	0	0.0001 mg/L
cis-1,2-Dichloroethylene	9	3	4	1	0.006 mg/L
Di (2-ethylhexyl) Adipate	0	0	0	0	0.4 mg/L
Di(2-Ethlhexyl)Phthalate	25	10	25	10	0.004 mg/L
Dibromochloropropane (DBCP)	1068	45	758	41	0.0002 mg/L
Dinosep	0	0	0	0	0.007 mg/L
Diquat	0	0	0	0	0.02 mg/L
Endothal	0	0	0	0	0.1 mg/L
Endrin	0	0	0	0	0.002 mg/L
Ethylbenzene	0	0	0	0	0.7 mg/L
Ethylene Dibromide (EDB)	3	3	1	1	0.00005 mg/L
Glyphosate	0	0	0	0	0.7 mg/L
Heptachlor	0	0	0	0	0.00001 mg/L
Heptachlor Epoxide	0	0	0	0	0.00001 mg/L
Hexachlorobenzene	0	0	0	0	0.001 mg/L
Hexachlorocyclopentadiene	0	0	0	0	0.05 mg/L
Lindane (gamma-BHC)	61	46	20	15	0.0002 mg/L
Methoxychlor	0	0	0	0	0.04 mg/L
Molinate	0	0	0	0	0.02 mg/L
Monochlorobenzene	0	0	0	0	0.07 mg/L
Oxamyl	0	0	0	0	0.2 mg/L
Pentachlorophenol	0	0	0	0	0.001 mg/L
Picloram	0	0	0	0	0.5 mg/L
Polychlorinated Biphenyls (PCB's)	0	0	0	0	0.0005 mg/L
Simazine	0	0	0	0	0.004 mg/L
Styrene	0	0	0	0	0.1 mg/L
Tetrachloroethene (PCE)	521	59	198	54	0.005 mg/L
Thiobencarb	0	0	0	0	0.07 mg/L
Toluene	0	0	0	0	0.15 mg/L
Toxaphene	0	0	0	0	0.003 mg/L
trans-1,2-Dichloroethylene	0	0	0	0	0.01 mg/L
Trichloroethene (TCE)	1022	85	699	74	0.005 mg/L
Trichlorofluoromethane	0	0	0	0	0.15 mg/L
Vinyl chloride	154	81	136	79	0.0005 mg/L
Xylene	0	0	0	0	1.75 mg/L

(a) 67 wells at MCL only 2 wells have elevated results

Table 2-11c
Inorganic Constituents, Organic Chemicals with Secondary MCLs; Lead and Copper Rule; and Constituents with DHS Action Levels

Constituent	Observations At or Above 1/2*MCL	Wells w/ Observations At or Above 1/2*MCL	Observations At or Above MCL	Wells w/ Observations At or Above MCL	MCL
Secondary MCL					
Foaming Agents (MBAS)	41	22	37	19	0.5 mg/L
Iron	104	48	54	28	0.3 mg/L
Manganese	317	45	285	24	0.05 mg/L
Silver	1	1	1	1	0.1 mg/L
Total Dissolved Solids (TDS)[b]	2978	522	1077	219	500 mg/L
Total Dissolved Solids (TDS)[c]	1077	219	119	44	1,000 mg/L
Zinc	1	1	0	0	5 mg/L
Lead and Copper Rule					
Copper	1	1	0	0	1 mg/L
Lead	62	25	24	14	0.015 mg/L
DHS Action Levels					
	Inorganics				
Boron	122	47	48	19	1 mg/L
Perchlorate	7	4	1	1	0.018 mg/L
	Organics				
1,3-Dichlorobenzene	0	0	0	0	0.13 mg/L
2,4-Dimethylphenol	0	0	0	0	0.4 mg/L
2-Chlorotoluene	0	0	0	0	0.045 mg/L
4-Chlorotoluene	0	0	0	0	0.045 mg/L
a-Benzene Hexachloride	0	0	0	0	0.0007 mg/L
Aldicarb	0	0	0	0	0.01 mg/L
Aldrin	0	0	0	0	0.00005 mg/L
Baygon	0	0	0	0	0.09 mg/L
b-Benzene Hexachloride	0	0	0	0	0.0003 mg/L
Captan	0	0	0	0	0.35 mg/L
Carbaryl	0	0	0	0	0.06 mg/L
Diazinon	0	0	0	0	0.014 mg/L
Dichlorodifluoromethane	0	0	0	0	1 mg/L
Dieldrin	0	0	0	0	0.00005 mg/L
Dimethoate	0	0	0	0	0.14 mg/L
Diphenamide	0	0	0	0	0.04 mg/L
Ethion	0	0	0	0	0.035 mg/L
Formaldehyde	0	0	0	0	0.03 mg/L
Heptachlor	0	0	0	0	0.05 mg/L
Isopropyl N Carbamate	0	0	0	0	0.035 mg/L
Malathion	0	0	0	0	0.16 mg/L
Methyl Isobutyl Ketone	0	0	0	0	0.04 mg/L
Methyl Parathion	0	0	0	0	0.03 mg/L
Methyl-Tert-Butyl Ether	0	0	0	0	0.035 mg/L
n-Butylbenzene	0	0	0	0	0.045 mg/L
Parathion	0	0	0	0	0.03 mg/L
Pentachloronitrobenzene	0	0	0	0	0.0009 mg/L
Phenol	6	2	5	2	0.005 mg/L
Trithion	0	0	0	0	0.007 mg/L

(a) Not including constituents contained in Primary MCL standards
(b) Recommended Secondary MCL Range of 500 mg/l
(c) Upper Secondary MCL Range of 1,000 mg/l

Table 2-12
Constituents Detected at or Greater than their MCLs

Constituent	Observations At or Above 1/2*MCL	Wells w/ Observations At or Above 1/2*MCL	Observations At or Above MCL	Wells w/ Observations At or Above MCL	MCL
Inorganic Constituents					
Aluminum	2	2	0	0	1 mg/L
Arsenic	8	1	0	0	0.05 mg/L
Beryllium	7	5	2	1	0.004 mg/L
Boron	122	47	48	19	1 mg/L
Cadmium	17	8	5	4	0.005 mg/L
Chromium	16	10	7	5	0.05 mg/L
Copper	1	1	0	0	1 mg/L
Fluoride	302	51	160	30	2 mg/L
Iron	104	48	54	28	0.3 mg/L
Lead	62	25	24	14	0.015 mg/L
Manganese	317	45	285	24	0.05 mg/L
Mercury	4	3	2	2	0.002 mg/L
Nickel	2	2	0	0	0.1 mg/L
Nitrate (as N)	4165	513	2053	322	10 mg/L
Perchlorate	7	4	1	1	0.018 mg/L
Selenium	3	1	3	1	0.05 mg/L
Silver	1	1	1	1	0.1 mg/L
Total Dissolved Solids (TDS)[a]	2978	522	1077	219	500 mg/L
Total Dissolved Solids (TDS)[b]	1077	219	119	44	1,000 mg/L
Zinc	1	1	0	0	5 mg/L
Radioactivity					
Gross Alpha Particle Activity	39	16	11	7	15 pCi/L
Uranium	5	3	0	0	20 pCi/L
Volatile Organic Chemicals					
1,1-Dichloroethane	34	7	22	7	0.005 mg/L
1,1-Dichloroethylene	497	18	355	13	0.006 mg/L
1,2-Dichloroethane	134	77	122	76	0.0005 mg/L
1,2-Dichloropropane	1	1	0	0	0.005 mg/L
1,4-Dichlorobenzene	3	2	2	1	0.005 mg/L
Benzene	155	89	43	23	0.001 mg/L
Carbon Tetrachloride	1	1	1	1	0.0005 mg/L
cis-1,2-Dichloroethylene	9	3	4	1	0.006 mg/L
Phenol	6	2	5	2	0.005 mg/L
Tetrachloroethene (PCE)	521	59	198	54	0.005 mg/L
Trichloroethene (TCE)	1022	85	699	74	0.005 mg/L
Vinyl chloride	154	81	136	79	0.0005 mg/L
Semi-Volatile Organic Chemical					
Di(2-Ethlhexyl)Phthalate	25	10	25	10	0.004 mg/L
Pesticides/Herbicides					
Dibromochloropropane (DBCP)	1068	45	758	41	0.0002 mg/L
Ethylene Dibromide (EDB)	3	3	1	1	0.00005 mg/L
Lindane (gamma-BHC)	61	46	20	15	0.0002 mg/L
Aesthetic Standards					
Foaming Agents (MBAS)	41	22	37	19	0.5 mg/L

(a) Recommended Secondary MCL Range of 500 mg/l
(b) Upper Secondary MCL Range of 1,000 mg/l

Table 2-13
Components of Safe Yield
Adopted in the Chino Basin Judgment

Hydrologic Component	Annual Average (acre-ft/yr)	(%)
Inflows to Chino Basin		
Deep Percolation		
Precipitation and Surface Inflow	47,500	33%
Imported Water	7,000	5%
Irrigation		
Domestic	9,800	7%
Agriculture	51,900	36%
Artificial Recharge	3,900	3%
Recharge of Sewage	18,200	13%
Subsurface Inflow	7,000	5%
Total Inflow	145,300	100%
Outflows from Chino Basin		
Subsurface Outflow	7,200	4%
Extractions	180,000	96%
Total Outflow	187,200	100%
Hydrologic Balance		
Estimated Annual Average Change in Storage 1965-1974	-40,000	
Safe Yield (equal to average annual extraction plus annual average change in storage)	140,000	

Table 2-14
CIGSM Estimate of the Chino Basin Hydrologic Budget
1961 through 1989
(acre-ft)

Year	Total Inflow Native Hydrology	Net Recharge from Stream Flow	Artificial Recharge(1)	Groundwater Pumpage	Change in Storage	End of Period Storage
1961	125,306	-7,071	11,561	217,536	-87,740	5,202,000
1962	178,032	-4,822	10,785	201,790	-17,795	5,184,205
1963	133,270	-8,167	12,466	190,303	-52,734	5,131,471
1964	131,485	-13,229	13,959	201,234	-69,019	5,062,452
1965	128,015	-9,024	13,902	190,358	-57,465	5,004,987
1966	178,168	-8,248	14,362	199,904	-15,622	4,989,365
1967	195,119	-2,428	15,336	186,264	21,763	5,011,128
1968	143,669	-10,342	14,619	192,597	-44,651	4,966,477
1969	251,892	4,321	16,927	190,489	82,651	5,049,128
1970	135,837	-13,076	15,059	192,103	-54,283	4,994,845
1971	140,908	-10,250	16,179	197,057	-50,220	4,944,625
1972	133,383	-7,170	14,000	197,428	-57,215	4,887,410
1973	174,962	431	3,028	166,826	11,595	4,899,005
1974	145,476	-2,968	3,440	180,997	-35,049	4,863,956
1975	127,546	1,914	4,601	191,536	-57,475	4,806,481
1976	112,294	7,107	3,933	189,637	-66,303	4,740,178
1977	116,683	3,955	3,620	174,498	-50,240	4,689,938
1978	263,055	6,785	15,484	163,705	121,619	4,811,557
1979	189,299	-7,278	34,122	167,410	48,733	4,860,290
1980	250,304	-5,201	19,989	167,669	97,423	4,957,713
1981	129,165	-8,810	27,727	174,421	-26,339	4,931,375
1982	153,379	-6,532	28,096	162,814	12,129	4,943,504
1983	252,507	-5,897	32,589	151,878	127,321	5,070,825
1984	134,649	-11,399	21,737	172,420	-27,433	5,043,392
1985	139,320	-8,934	20,897	176,218	-24,935	5,018,457
1986	149,613	-4,196	18,425	167,119	-3,277	5,015,180
1987	104,914	-9,595	23,530	180,778	-61,929	4,953,251
1988	110,004	-5,589	2,667	180,115	-73,033	4,880,218
1989	107,188	-3,905	7,407	189,513	-78,823	4,801,395
Statistics for Period 1961 to 1989						
Average	156,395	-5,159	15,188	183,263	-16,839	4,955,683
Max	263,055	7,107	34,122	217,536	127,321	5,202,000
Min	104,914	-13,229	2,667	151,878	-87,740	4,689,938
Statistics for Period 1965 to 1974						
Average	162,743	-5,875	12,685	189,402	-19,850	4,961,093
Max	251,892	4,321	16,927	199,904	82,651	5,049,128
Min	128,015	-13,076	3,028	166,826	-57,465	4,863,956

Source: Revised and final calibration simulations for the CBWRMS; previously unpublished. The results listed above are slightly different than reported by Montgomery Watson (1993) and supersede previously reported values.

Table 2-15
SCAG-98 Population Projections

Water Purveyor	1994	2000	2005	2010	2015	2020
Chino	57,491	67,072	78,170	90,744	103,244	113,874
Chino Hills	40,947	52,646	61,513	69,396	82,693	93,351
Chino Institution for Men	7,358	7,745	8,138	8,548	8,990	9,435
Cucamonga County WD	120,292	137,574	154,865	172,072	190,953	210,258
Fontana Water Co	109,483	131,681	153,909	176,967	197,703	224,058
Jurupa CSD	52,151	57,502	62,324	67,133	71,833	76,151
Marygold Mutual Water Co	9,888	11,114	11,888	12,868	14,168	15,712
Monte Vista WD	42,610	47,647	52,118	57,225	62,540	68,668
Norco	24,705	26,735	28,765	30,794	32,586	34,456
Not Served	179	443	785	1,107	1,365	1,612
Ontario	146,898	160,188	175,176	192,089	209,274	223,838
Pomona	136,418	153,616	165,356	175,362	186,532	202,133
Rialto	65,202	73,262	81,290	89,732	99,231	108,620
San Antonio Water Co	3,159	3,491	3,866	4,223	4,919	5,292
Santa Ana River Water Co	7,088	7,367	7,656	7,944	8,321	8,539
Southern California Water Co	34,020	35,206	36,031	36,734	37,514	38,600
Upland	67,558	71,121	74,793	78,636	82,828	86,942
West San Bernardino Co WD	45,967	57,820	70,162	82,534	94,548	109,091
Total	971,414	1,102,230	1,226,805	1,354,107	1,489,242	1,630,630
Percent Growth since 1994	0%	13%	26%	39%	53%	68%

Table 2-16
Summary of Projected Water Demands by Purveyor
(acre-ft/yr)

Purveyor	2000	2005	2010	2015	2020
Ameron	9	9	9	9	9
City of Chino	14,800	17,250	20,000	22,800	25,150
City of Chino Hills	17,640	19,100	20,670	22,350	23,240
City of Norco	6,360	7,020	7,680	8,340	9,000
City of Ontario(a)	44,980	52,100	60,360	69,050	72,040
City of Pomona(a)	30,200	31,440	32,580	33,900	35,104
City of Upland	22,000	23,000	24,000	24,000	24,000
Cucamonga County Water District	49,910	54,440	58,960	63,480	68,000
Fontana Water Company	36,800	41,200	45,600	49,900	54,300
Jurupa Community Services District	14,550	17,550	19,550	22,820	25,820
Kaiser Ventures	670	0	0	0	0
Marygold Mutual Water Company	1,450	1,580	1,620	1,660	1,700
Mira Loma Space Center	25	25	25	25	25
Monte Vista Irrigation Company	270	230	0	0	0
Monte Vista Water District	14,160	14,160	14,160	14,160	14,160
San Antonio Water Company - Domestic	1,590	1,720	1,740	1,760	1,780
San Antonio Water Company - Non-Potable	2,510	2,630	2,740	2,870	2,750
San Bern. County Parks Dept.	75	75	75	75	75
San Bernardino Co Division of Airports - Domestic	300	300	300	300	300
Santa Ana River Water Company	2,000	2,090	2,120	2,140	2,170
Southern California Edison Company	3,300	3,300	3,300	3,300	3,300
Southern California Water Company	14,200	14,950	15,680	15,680	15,680
Sunkist	1,470	1,470	1,470	1,470	1,470
Swan Lake	350	350	350	350	350
West San Bernardino County WD	6,130	7,835	10,900	10,900	10,900
Others (Non-Ag)	2,682	2,682	2,682	2,682	2,682
Total Purveyor Demand	288,431	316,507	346,571	374,021	394,005
· Agricultural Producers	46,490	39,120	28,580	18,270	7,950
·(a) Recycled Water	8,300	8,300	8,300	8,300	8,300
Total Demand	343,221	363,927	383,451	400,592	410,255

Notes:
1 - SB County ag, CIM,and CIW included in the agricultural producers demand
2 - Mira Loma Space Center to be served by Jurupa Community Services District.
3 - Data from Chino Basin Water Resources Management Study Final Report, 1995
4 - Total Ag production from CBWCD and Watermaster Phase 1 Recharge Master Plan by Mark J. Wildermuth, Water Resources Engineers

Table 2-17
Water Supply Plans for Major Purveyors in the Chino Basin Area
(acre-ft/yr)

Purveyor Source	Year 2000	2005	2010	2015	2020
City of Chino					
Chino Basin wells	10,000	7,800	9,440	12,240	14,590
Chino Desalter No. 1 (SAWPA)	3,360	3,360	3,360	3,360	3,360
City of Chino Ion Exchange Plant (Chino GW)	0	2,200	2,200	2,200	2,200
Agua de Lejos Water Treatment Plant	1,440	3,890	5,000	5,000	5,000
Total	14,800	17,250	20,000	22,800	25,150
City of Chino Hills					
Chino Basin wells	3,610	3,610	3,610	3,610	3,610
Chino Desalter No. 1 (SAWPA)	2,240	2,240	2,240	2,240	2,240
Agua de Lejos Water Treatment Plant	11,790	13,250	14,820	16,500	17,390
Total	17,640	19,100	20,670	22,350	23,240
City of Norco					
Chino Basin wells	0	0	0	0	0
Chino Desalter No. 1 (SAWPA)	1,000	1,000	1,000	1,000	1,000
City of Corona	220	400	600	800	1,000
Jurupa Community Services District	400	400	400	400	400
Temescal Basin Groundwater	4,740	5,220	5,680	6,140	6,600
Total	6,360	7,020	7,680	8,340	9,000
City of Ontario					
Chino Basin wells	36,700	38,590	40,480	42,360	44,250
Reclaimed Water	1,300	1,300	1,300	1,300	1,300
Agua de Lejos Water Treatment Plant	7,430	12,660	19,030	25,840	26,940
San Antonio Water Co -- Ontario Supply	850	850	850	850	850
Total	46,280	53,400	61,660	70,350	73,340
City of Pomona					
Chino Basin wells	5,220	5,220	5,220	5,220	5,220
Pomona Nitrate Treatment Plant (Chino GW)	13,880	13,880	13,880	13,880	13,880
Reclaimed Water	7,000	7,000	7,000	7,000	7,000
Other groundwater basins	5,160	5,160	5,160	5,160	5,160
Pedley Treatment Plant	3,800	3,800	3,800	3,800	3,800
TVMWD Weymouth Treatment Plant	2,140	3,380	4,520	5,840	7,044
Total	37,200	38,440	39,580	40,900	42,104

Table 2-17
Water Supply Plans for Major Purveyors in the Chino Basin Area
(acre-ft/yr)

Purveyor Source	Year 2000	2005	2010	2015	2020
City of Upland					
Chino Basin wells	5,889	7,310	8,310	8,010	8,010
Agua de Lejos Water Treatment Plant	7,590	7,590	7,590	7,590	7,590
San Antonio Water Co -- Upland Supply (non-Chino GW)	4,920	4,520	4,520	4,520	4,520
Upland San Antonio Canyon Treatment Plant	2,411	2,390	2,390	2,690	2,690
West End Consolidated -- Upland	1,190	1,190	1,190	1,190	1,190
Total	22,000	23,000	24,000	24,000	24,000
Cucamonga County Water District					
Chino Basin wells	8,000	10,160	10,160	10,160	10,160
Other groundwater basins	12,650	11,180	12,390	12,390	12,390
CCWD Bridge Water Treatment Plant	1,000	1,000	1,000	1,000	1,000
CCWD Lloyd Michael Treatment Plant	21,710	25,550	28,860	33,380	37,900
CCWD Royer-Nesbit Treatment Plant	6,000	6,000	6,000	6,000	6,000
Deer Creek	550	550	550	550	550
Total	49,910	54,440	58,960	63,480	68,000
Fontana Water Company					
Chino Basin wells	16,700	21,100	14,300	18,600	23,000
Other groundwater basins	12,700	12,700	12,700	12,700	12,700
Fontana Water Treatment Plant	0	0	11,200	11,200	11,200
Sandhill Treatment Plant	7,400	7,400	7,400	7,400	7,400
Total	36,800	41,200	45,600	49,900	54,300
Jurupa Community Services District					
Chino Basin wells -- potable	10,400	9,200	9,600	12,670	15,470
Chino Basin wells -- non-potable	50	250	450	650	850
Other groundwater basins	500	3,600	4,500	4,500	4,500
Chino Desalter No. 1 (SAWPA)	3,600	4,500	5,000	5,000	5,000
Total	14,550	17,550	19,550	22,820	25,820
Marygold Mutual Water Company					
Other groundwater basins	1,450	1,580	1,620	1,660	1,700
Total	1,450	1,580	1,620	1,660	1,700

Table 2-17
Water Supply Plans for Major Purveyors in the Chino Basin Area
(acre-ft/yr)

Purveyor / Source	Year 2000	2005	2010	2015	2020
Mira Loma Space Center					
Jurupa Community Services District	25	25	25	25	25
Total	25	25	25	25	25
Monte Vista Water District					
Chino Basin wells	14,160	14,160	14,160	14,160	14,160
Agua de Lejos Water Treatment Plant	0	0	0	0	0
Total	14,160	14,160	14,160	14,160	14,160
San Antonio Water Company -- Domestic					
Chino Basin	70	200	220	240	260
Other groundwater basins	100	100	100	100	100
San Antonio Tunnel	1,420	1,420	1,420	1,420	1,420
Total	1,590	1,720	1,740	1,760	1,780
San Antonio Water Company -- Non-Potable					
Chino Basin	0	0	0	0	0
San Antonio Creek	2,410	2,550	2,690	2,820	2,700
San Antonio Water Company -- Domestic	100	80	50	50	50
Total	2,510	2,630	2,740	2,870	2,750
Santa Ana River Water Company					
Chino Basin Wells	700	700	700	700	700
Jurupa Community Services District	1,300	1,390	1,420	1,440	1,470
Total	2,000	2,090	2,120	2,140	2,170
Southern California Water Company					
Chino Basin	2,160	2,160	2,160	2,160	2,160
Other groundwater basins	4,950	4,490	4,850	4,850	4,850
West End Consolidated Water Company	400	400	400	400	400
TVWD -- Miramar Water Treatment Plant	6,690	7,900	8,270	8,270	8,270
Total	14,200	14,950	15,680	15,680	15,680

Table 2-17
Water Supply Plans for Major Purveyors in the Chino Basin Area
(acre-ft/yr)

Purveyor / Source	2000	2005	2010	2015	2020
	---------- Year ----------				
Swan Lake					
Chino Basin Wells	0	0	0	0	0
Jurupa Community Services District	350	350	350	350	350
Total	350	350	350	350	350
West San Bernardino County Water District					
Other groundwater basins	5,330	6,835	9,520	9,510	9,510
SBVMWD Baseline Feeder	800	1,000	1,380	1,390	1,390
Total	6,130	7,835	10,900	10,900	10,900
Ameron					
Chino Basin Wells	9	9	9	9	9
Total	9	9	9	9	9
San Bernardino County Division of Airports					
Chino Basin wells -- potable (domestic)	300	300	300	300	300
Chino Basin wells -- non-potable (irrigation)	370	370	370	370	370
Total	670	670	670	670	670
State of California, California Institute for Men, California Institute for Women					
Chino Basin wells -- potable (domestic)	1,320	1,320	1,320	1,320	1,320
Chino Basin wells -- non-potable (irrigation)	2,100	2,100	2,100	2,100	2,100
Total	3,420	3,420	3,420	3,420	3,420
Southern California Edison					
Chino Basin Wells	800	800	800	800	800
IEUA -- MWD Water from CRA	2,500	2,500	2,500	2,500	2,500
Total	3,300	3,300	3,300	3,300	3,300
Sunkist					
Chino Basin Wells	1,470	1,470	1,470	1,470	1,470
Total	1,470	1,470	1,470	1,470	1,470

Table 2-17
Water Supply Plans for Major Purveyors in the Chino Basin Area
(acre-ft/yr)

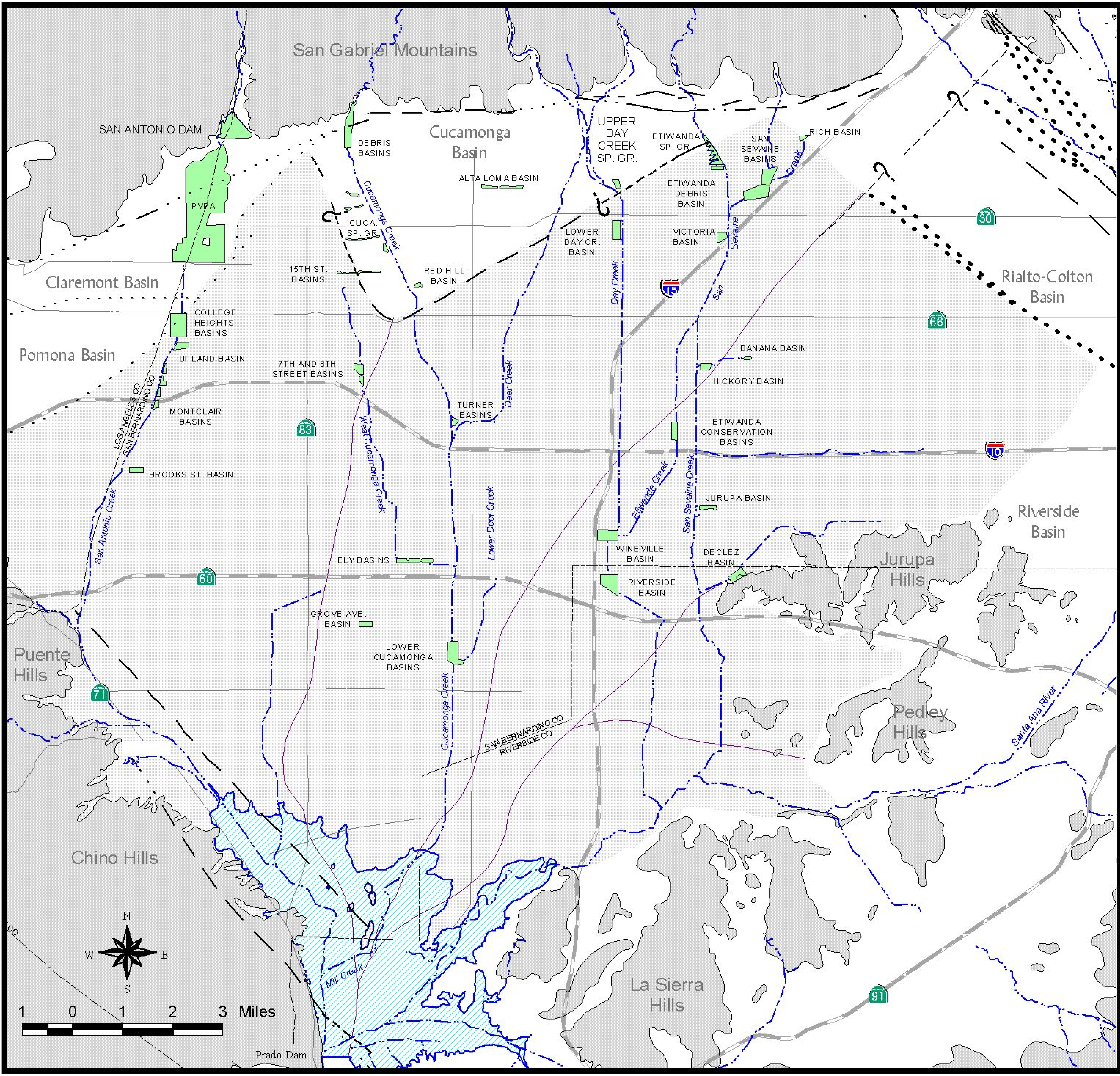
Purveyor Source	Year 2000	2005	2010	2015	2020
Kaiser Ventures					
Chino Basin Wells	670	0	0	0	0
Total	670	0	0	0	0
San Bernardino County Parks Department					
Chino Basin Wells	75	75	75	75	75
Total	75	75	75	75	75
Monte Vista Irrigation Company					
Chino Basin Wells	270	230	0	0	0
Total	270	230	0	0	0
Other Pool 1 Producers					
Chino Basin Wells	91	91	91	91	91
Total	91	91	91	91	91
Other Pool 2 Producers					
Chino Basin Wells	2,591	2,591	2,591	2,591	2,591
Total	2,591	2,591	2,591	2,591	2,591

Table 2-17
Water Supply Plans for Major Purveyors in the Chino Basin Area
(acre-ft/yr)

Purveyor Source	Year 2000	 2005	 2010	 2015	 2020
Totals By Source Type and Pool					
Pool 1 Overlying Agricultural Pool	46,490	39,120	28,580	18,270	7,950
Pool 2 Overlying Non-Agricultural Pool					
Chino Basin Groundwater	6,215	5,545	5,545	5,545	5,545
Other Local Supplies	0	0	0	0	0
Imported Water	2,500	2,500	2,500	2,500	2,500
Recycled Water	0	0	0	0	0
Total Pool 2	8,715	8,045	8,045	8,045	8,045
Pool 3 Appropriative Pool					
Chino Basin Groundwater	142,415	152,346	150,966	162,956	174,646
Other Local Supplies	77,711	80,895	86,890	88,010	88,590
Imported Water	59,590	75,220	100,670	115,010	122,724
Recycled Water	8,300	8,300	8,300	8,300	8,300
Total Pool 3	288,016	316,761	346,826	374,277	394,260
Total All Pools	343,221	363,926	383,451	400,592	410,255

Table 2-18
Summary of Average Annual Projected Water Demand by Source
(acre-ft/yr)

Source	2000	2005	2010	2015	2020
Imported Water	62,090	77,720	103,170	117,510	125,224
Chino Basin Production Pools 2 and 3	148,630	157,891	156,511	168,502	180,191
Chino Basin Production Pool 1	46,490	39,120	28,580	18,270	7,950
Other Local Supplies	77,711	80,895	86,890	88,010	88,590
Recycled Water	8,300	8,300	8,300	8,300	8,300
Total	343,221	363,926	383,451	400,592	410,255



Optimum Basin Management Program

Chino Basin Watermaster

Legend

- Stream System
- Management Zone Boundary
- Prado Dam Basin
- Fault
  - Dashed Where Approximate
  - Dotted Where Concealed
  - Queried Where Uncertain
  - Large Dots Where Groundwater Barrier (Suspected Fault)
- Bedrock
- Chino Basin
- Flood Control / Conservation Basins

Management Zone Index Map

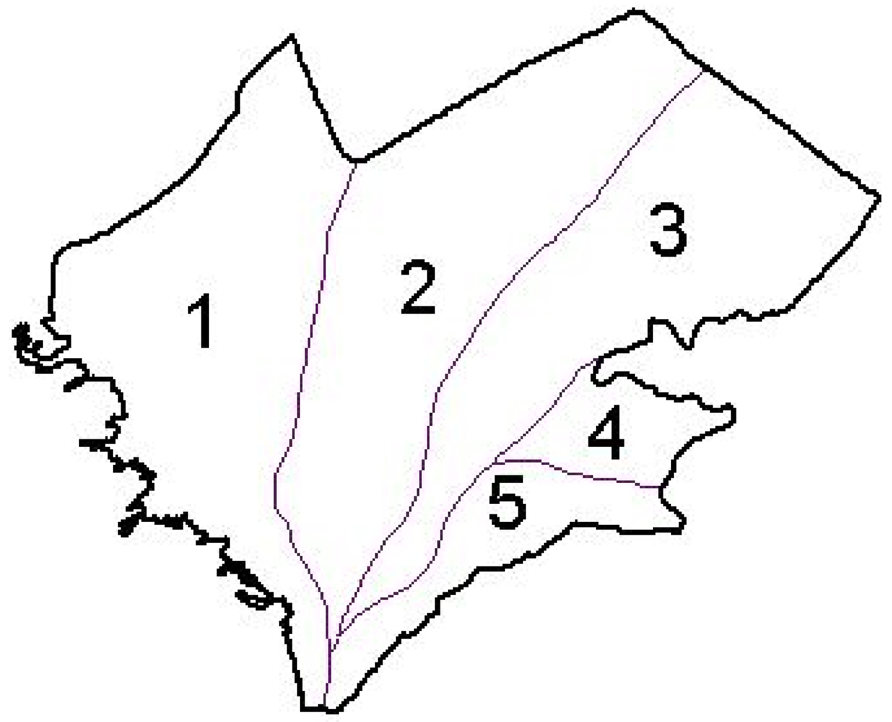


Figure 2-1

Chino Basin Drainage System

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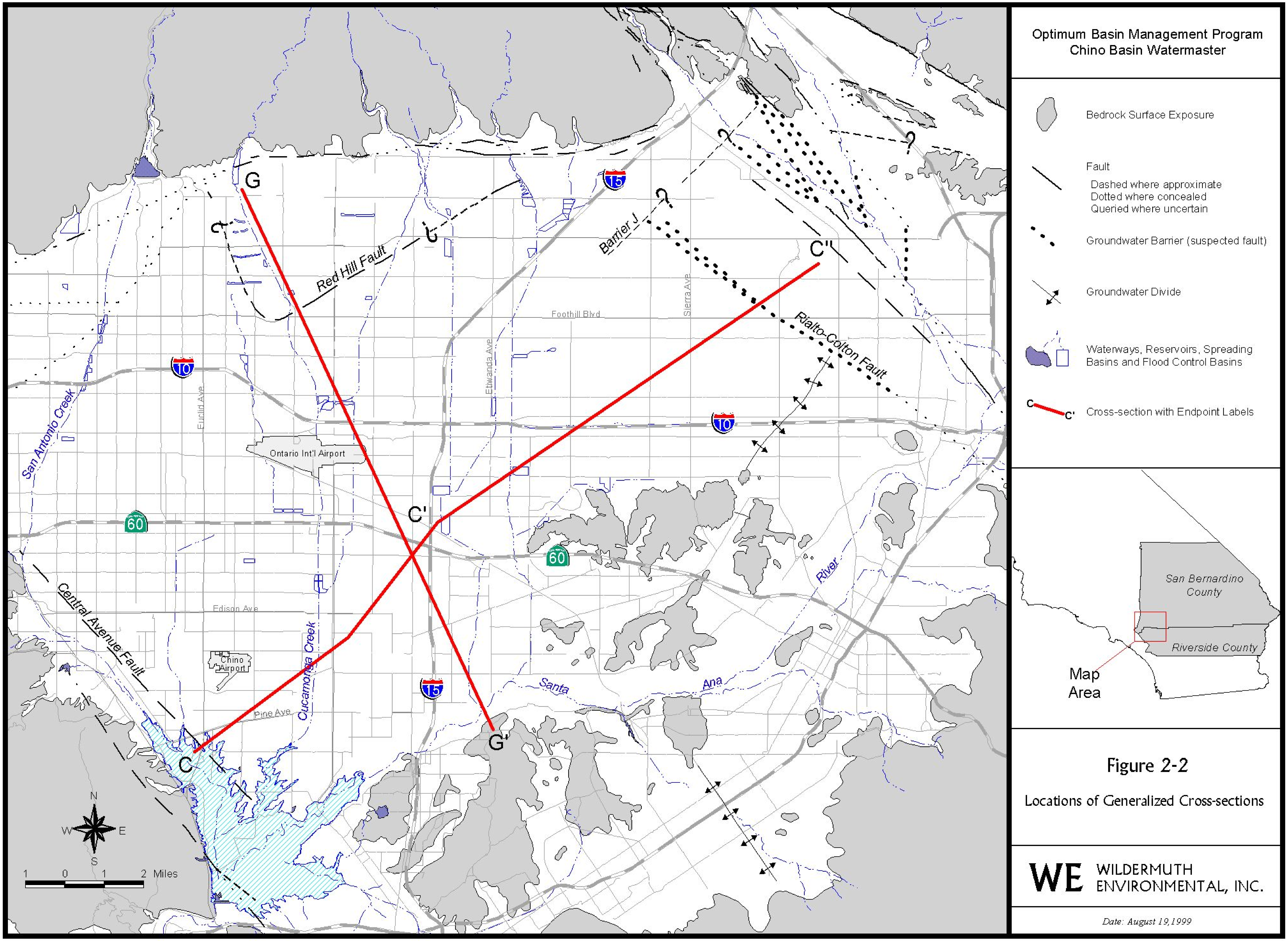

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Figure 2-3
Generalized Cross-seciton C-C'-C"

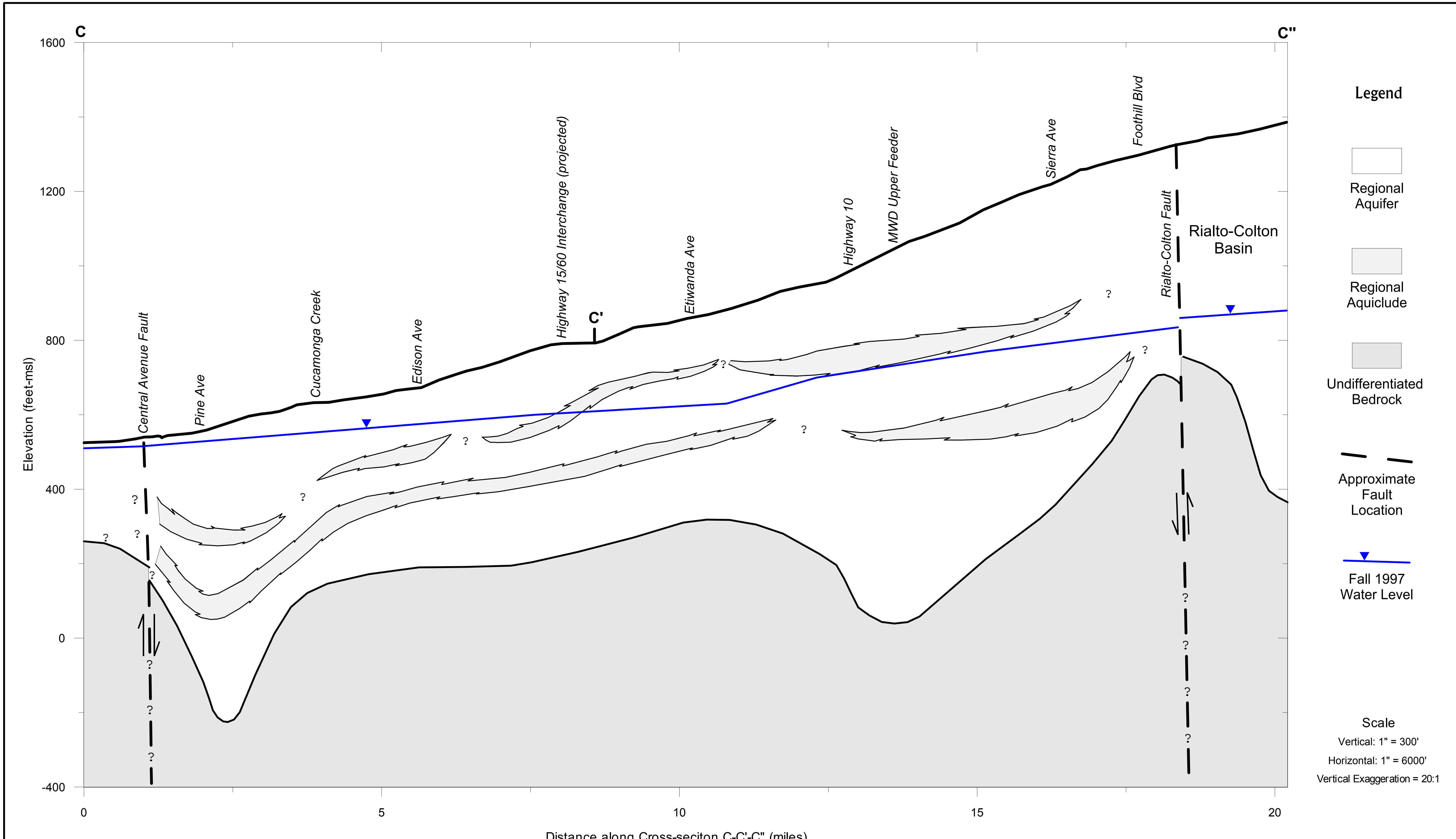

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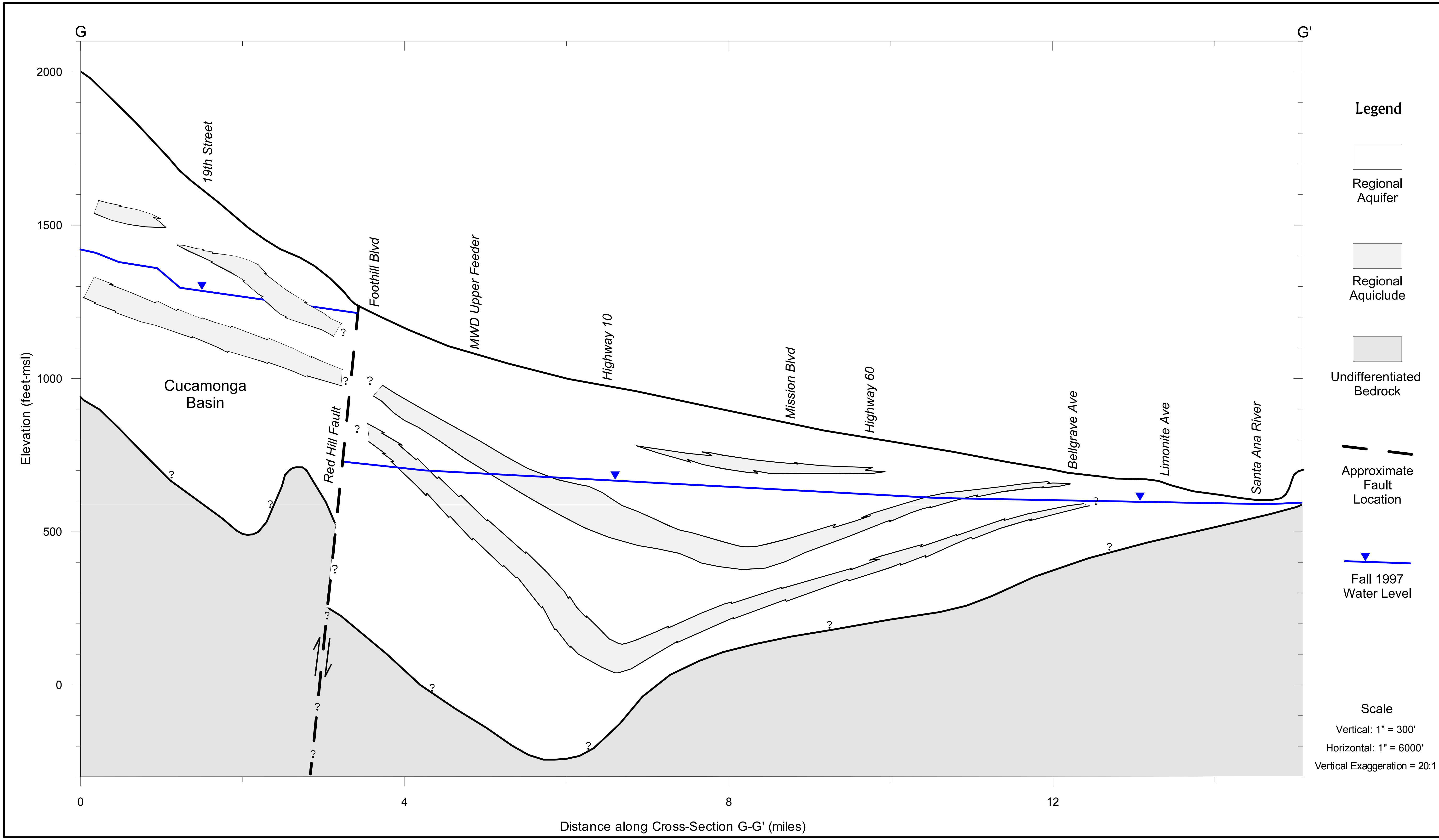
Figure 2-4
Generalized Cross-Section G-G'



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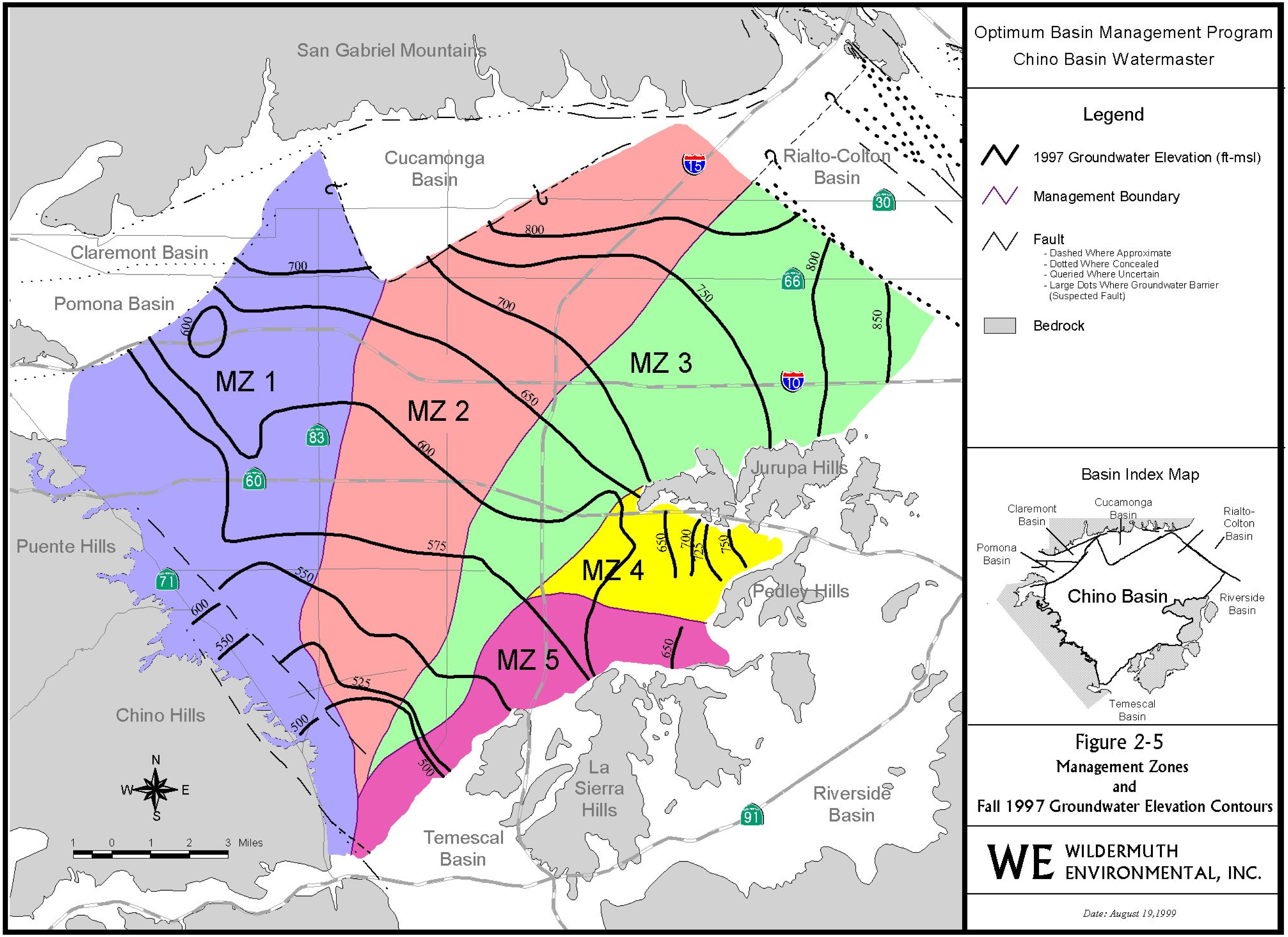

Figure 2-5
Management Zones and Fall 1997 Groundwater Elevation Contours

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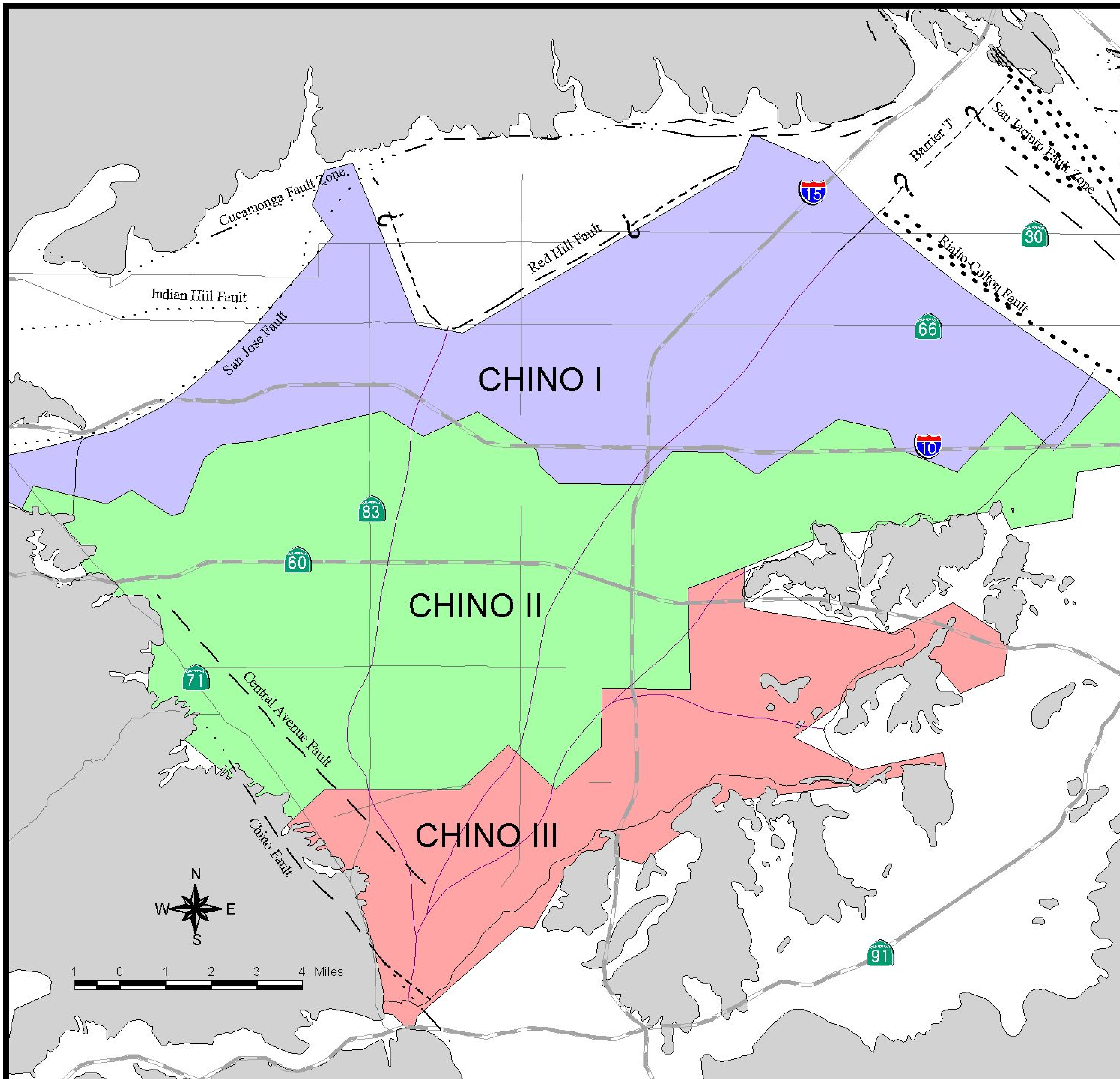

Optimum Basin Management Program
Chino Basin Watermaster

Legend

Management Boundaries

Fault
- Dashed Where Approximate
- Dotted Where Concealed
- Queried Where Uncertain
- Large Dots Where Groundwater Barrier (Suspected Fault)

Bedrock

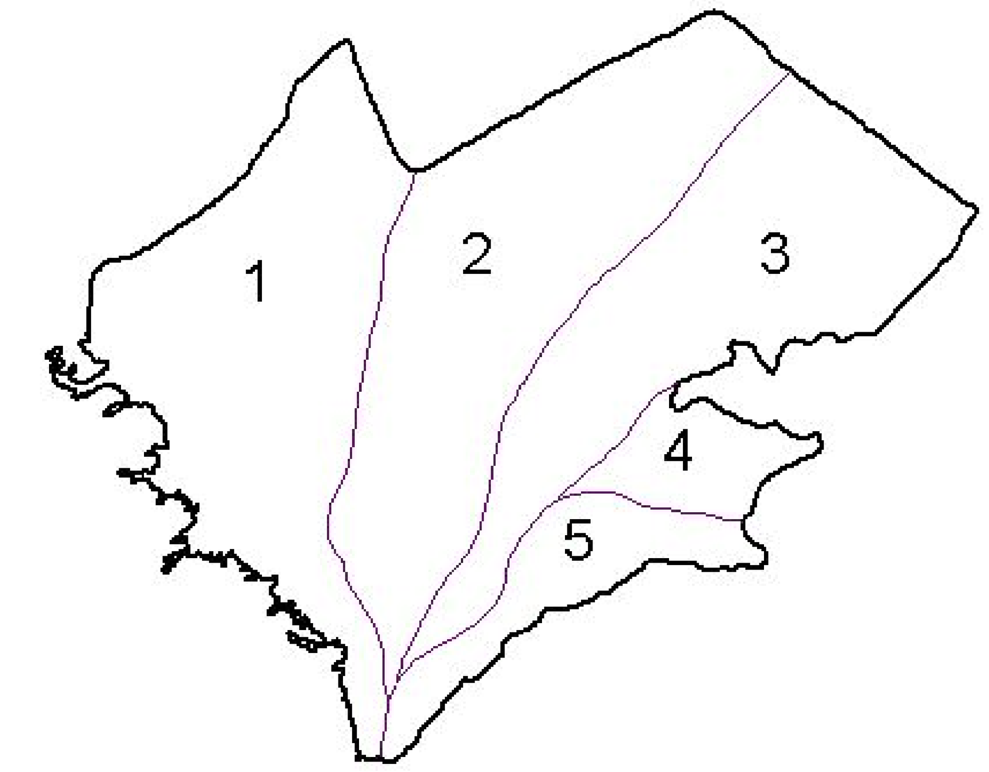

Figure 2-6
Chino Subbasins
Defined in the 1995 (and prior)
Water Quality Control Plans

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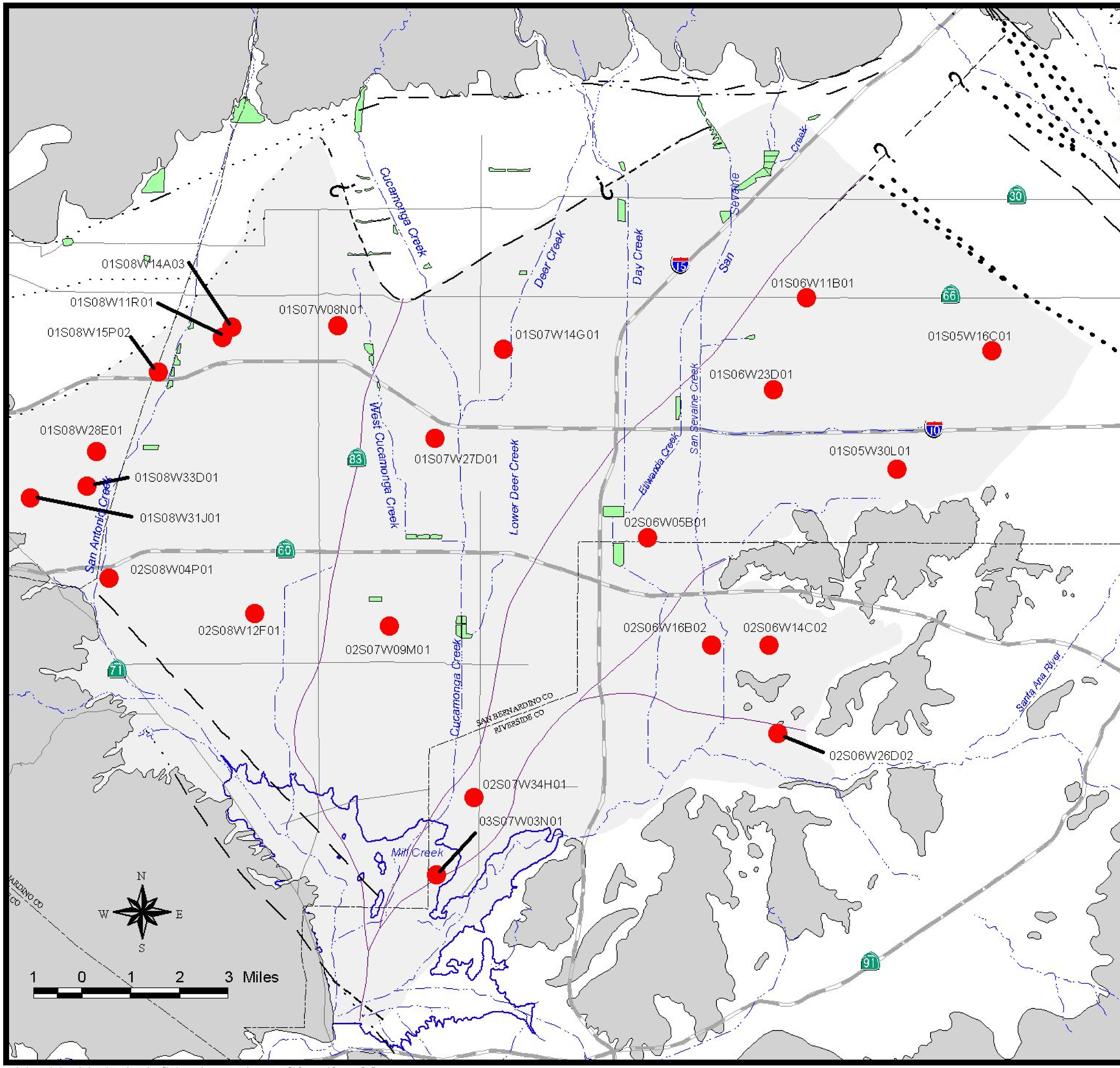

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Optimum Basin Management Program

Chino Basin Watermaster

Legend

- Well Location
- Rivers & Streams
- Management Zone Boundary
- Fault
  - Dashed Where Approximate
  - Dotted Where Concealed
  - Queried Where Uncertain
  - Large Dots Where Groundwater Barrier (Suspected Fault)
- Hydrologic Chino Basin
- Bedrock
- Flood Control / Conservation Basins

Management Zone Index Map

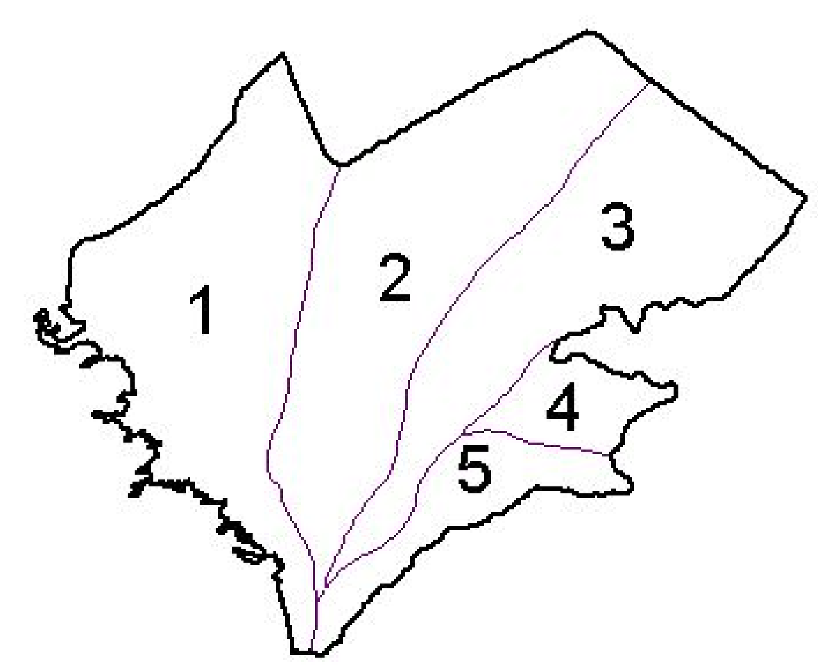

Figure 2-7

Well Location Map for Water Level Time Histories

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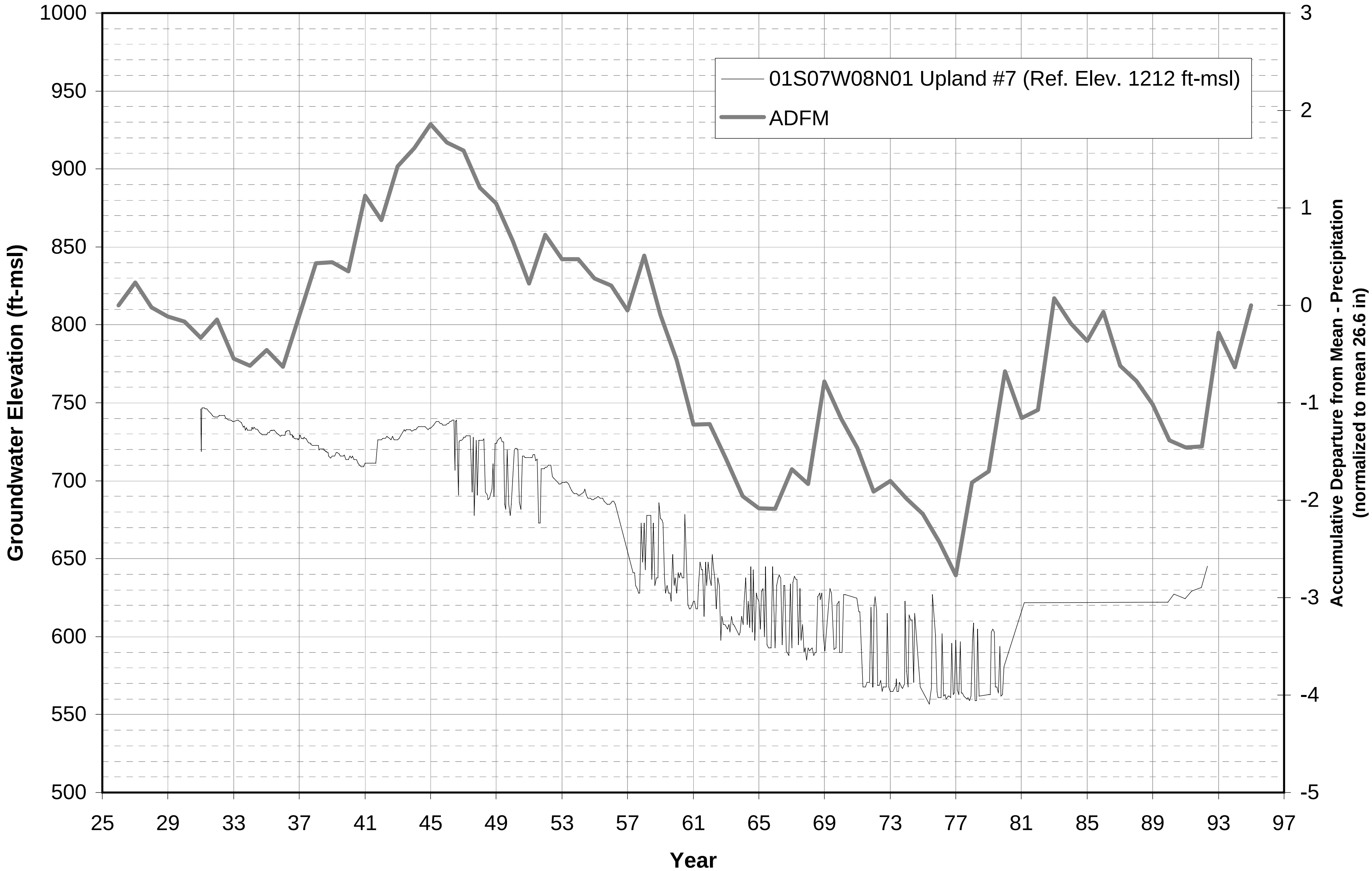
Date: August 19, 1999

Figure 2-8 Historical Groundwater Elevation (Management Zone 1)



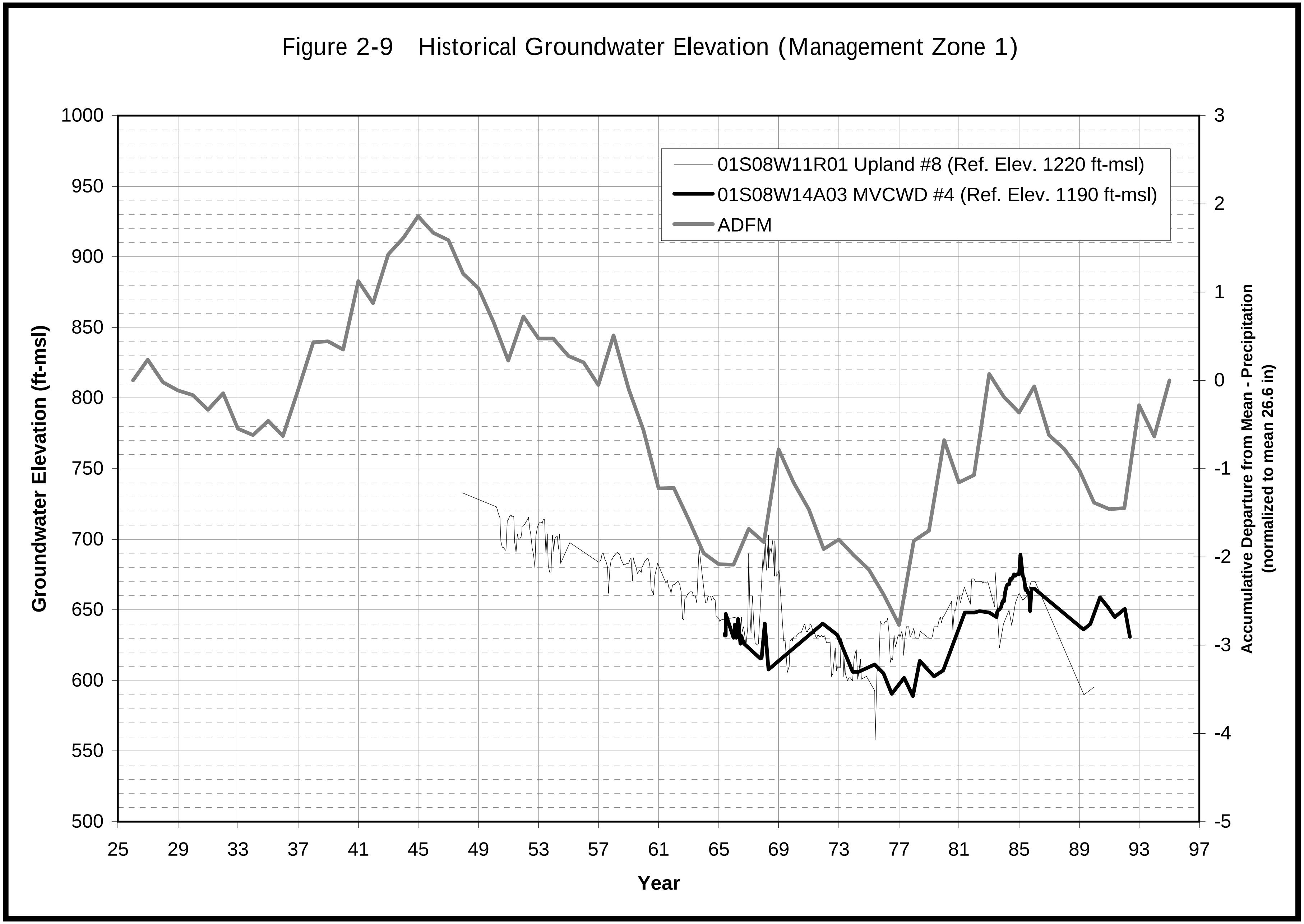
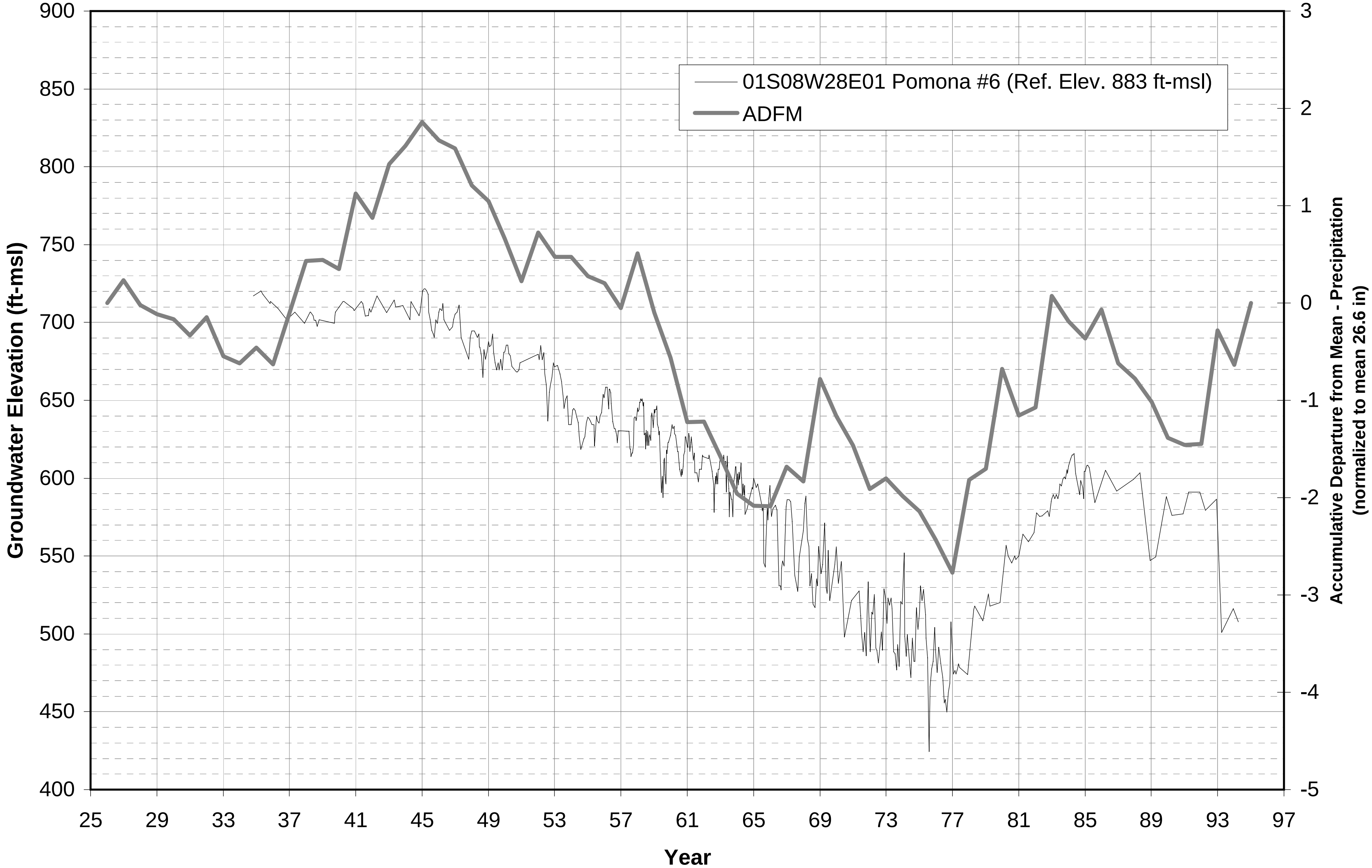
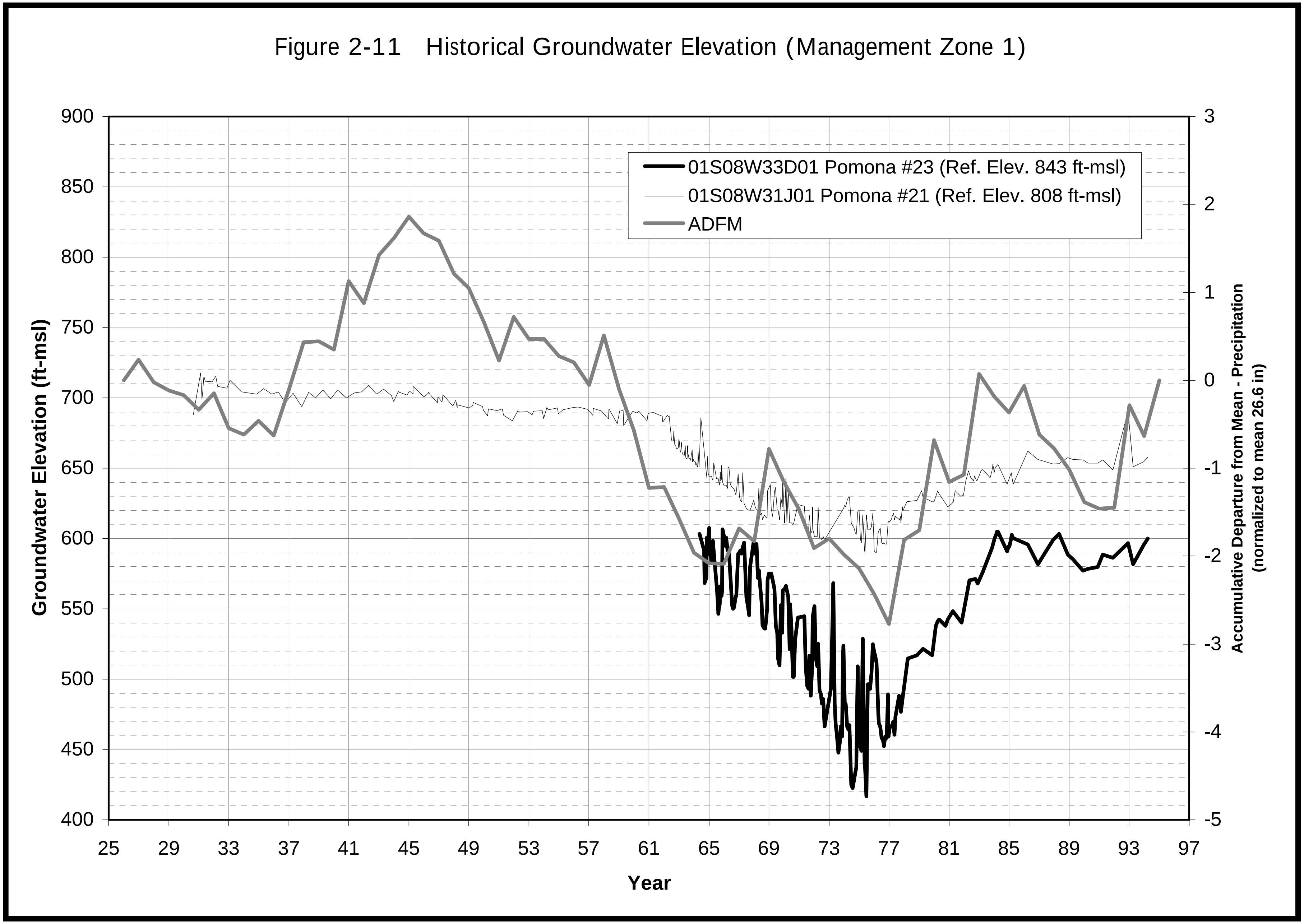


Figure 2-9 Historical Groundwater Elevation (Management Zone 1)
01S08W11R01 Upland #8 (Ref. Elev. 1220 ft-msl)
01S08W14A03 MVCWD #4 (Ref. Elev. 1190 ft-msl)
ADFM
Groundwater Elevation (ft-msl)
Accumulative Departure from Mean - Precipitation
(normalized to mean 26.6 in)
Year
1000
950
900
850
800
750
700
650
600
550
500
3
2
1
0
-1
-2
-3
-4
-5
25
29
33
37
41
45
49
53
57
61
65
69
73
77
81
85
89
93
97

Figure 2-10 Historical Groundwater Elevation (Management Zone 1)





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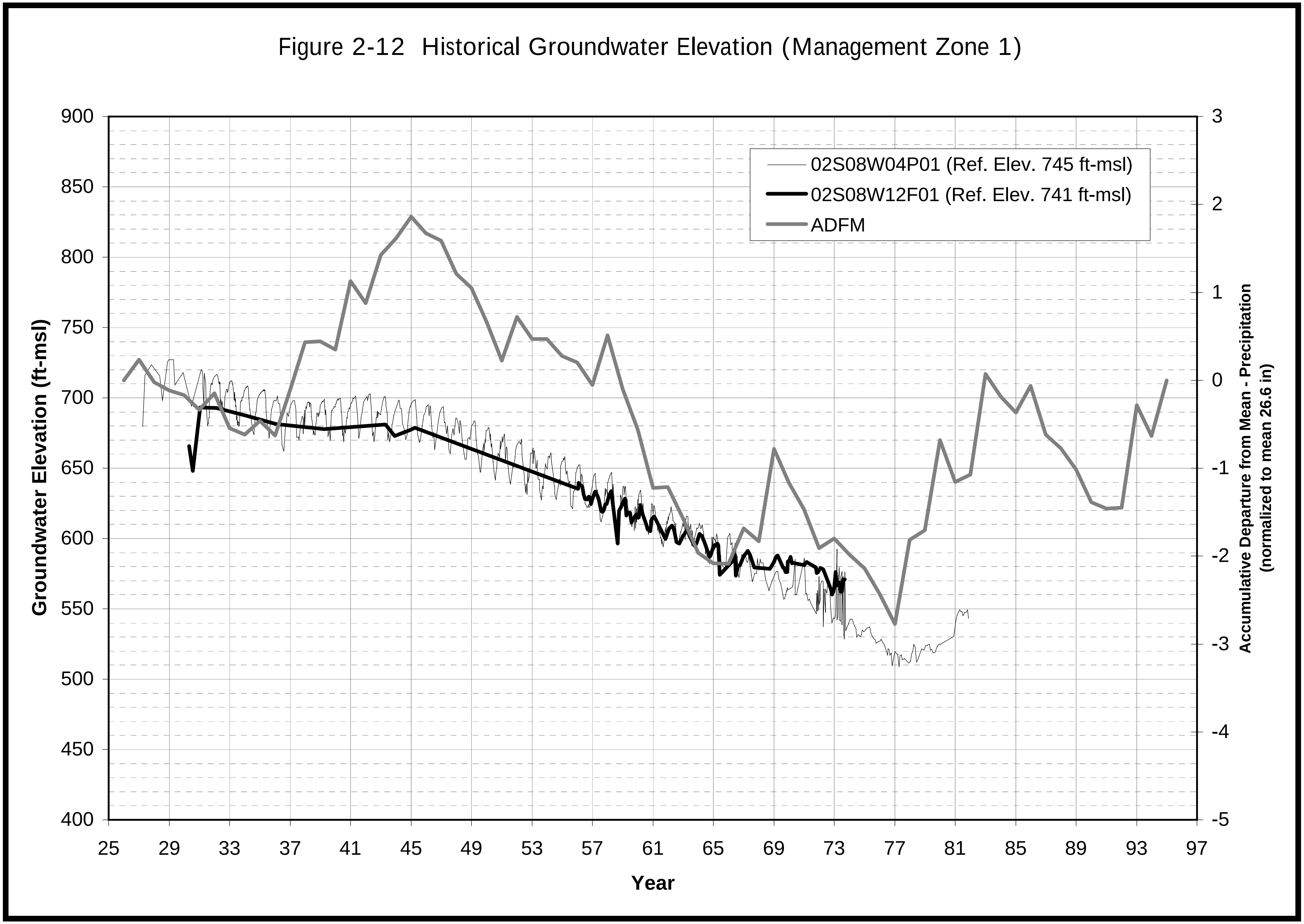


Figure 2-12 Historical Groundwater Elevation (Management Zone 1)
02S08W04P01 (Ref. Elev. 745 ft-msl)
02S08W12F01 (Ref. Elev. 741 ft-msl)
ADFM
Groundwater Elevation (ft-msl)
Accumulative Departure from Mean - Precipitation (normalized to mean 26.6 in)
Year
900
850
800
750
700
650
600
550
500
450
400
3
2
1
0
-1
-2
-3
-4
-5
25
29
33
37
41
45
49
53
57
61
65
69
73
77
81
85
89
93
97

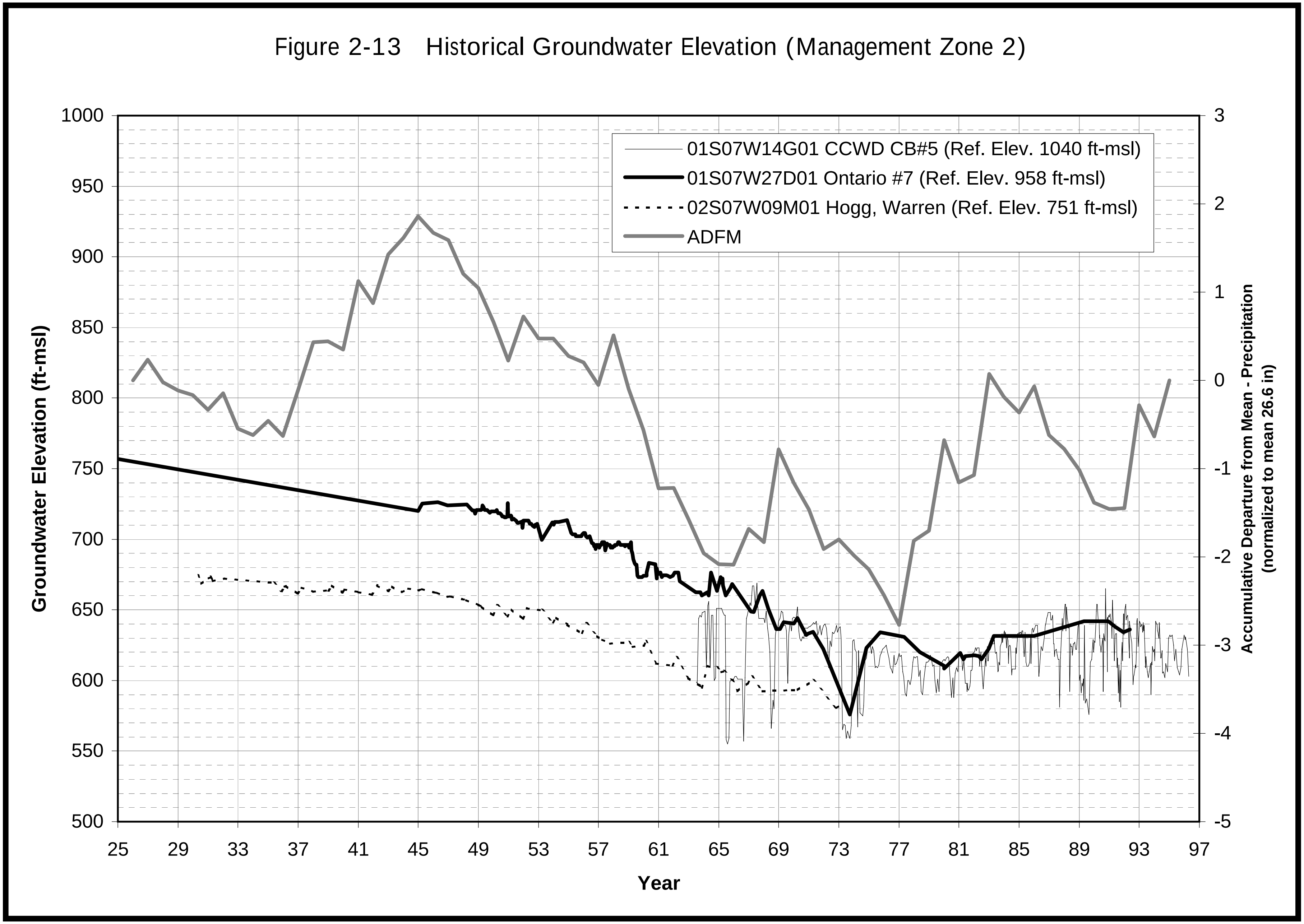
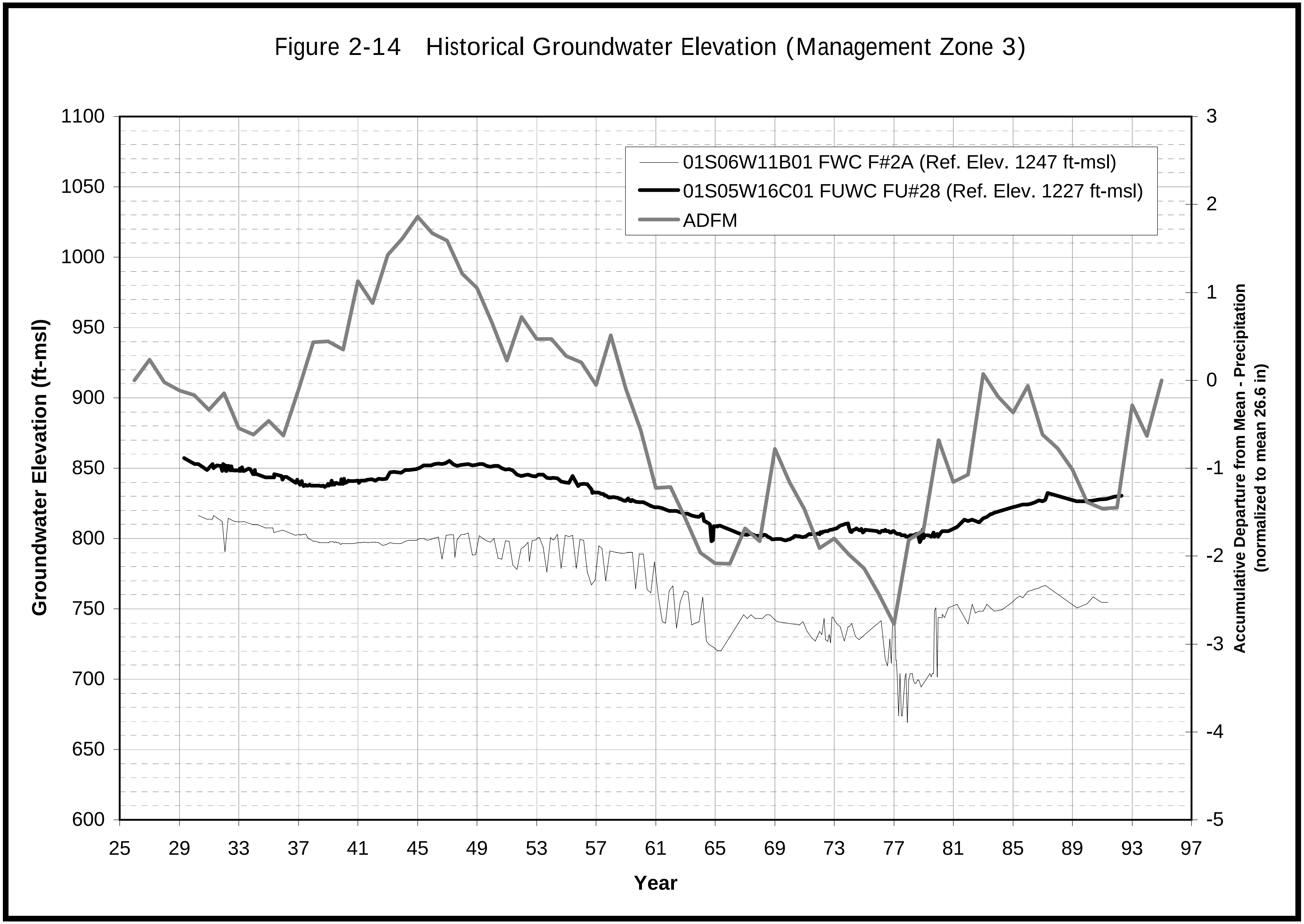


Figure 2-13 Historical Groundwater Elevation (Management Zone 2)
01S07W14G01 CCWD CB#5 (Ref. Elev. 1040 ft-msl)
01S07W27D01 Ontario #7 (Ref. Elev. 958 ft-msl)
02S07W09M01 Hogg, Warren (Ref. Elev. 751 ft-msl)
ADFM
Groundwater Elevation (ft-msl)
Accumulative Departure from Mean - Precipitation (normalized to mean 26.6 in)
Year
1000
950
900
850
800
750
700
650
600
550
500
3
2
1
0
-1
-2
-3
-4
-5
25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97



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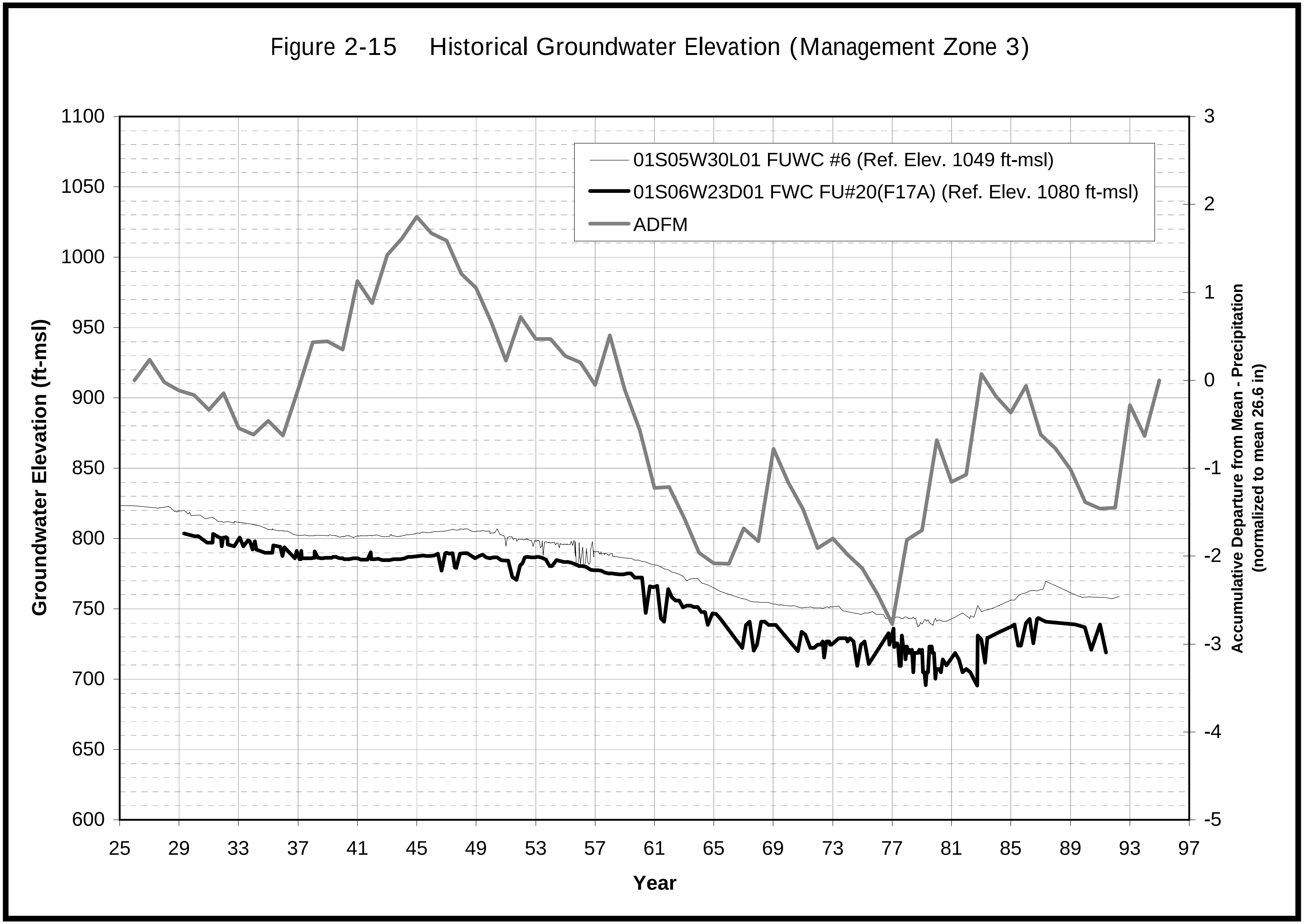
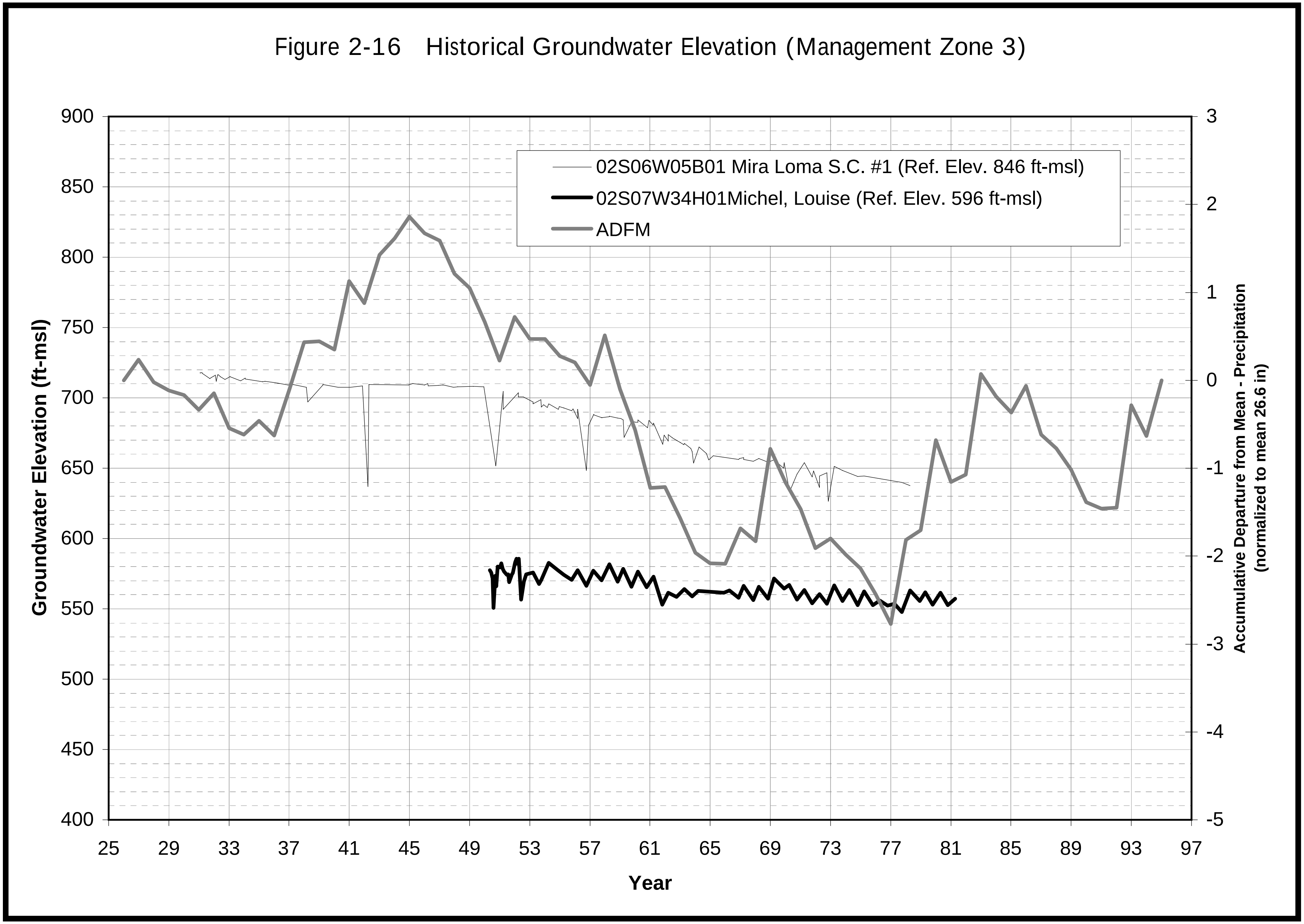


Figure 2-15 Historical Groundwater Elevation (Management Zone 3)
01S05W30L01 FUWC #6 (Ref. Elev. 1049 ft-msl)
01S06W23D01 FWC FU#20(F17A) (Ref. Elev. 1080 ft-msl)
ADFM
Groundwater Elevation (ft-msl)
Accumulative Departure from Mean - Precipitation (normalized to mean 26.6 in)
Year
1100
1050
1000
950
900
850
800
750
700
650
600
3
2
1
0
-1
-2
-3
-4
-5
25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97



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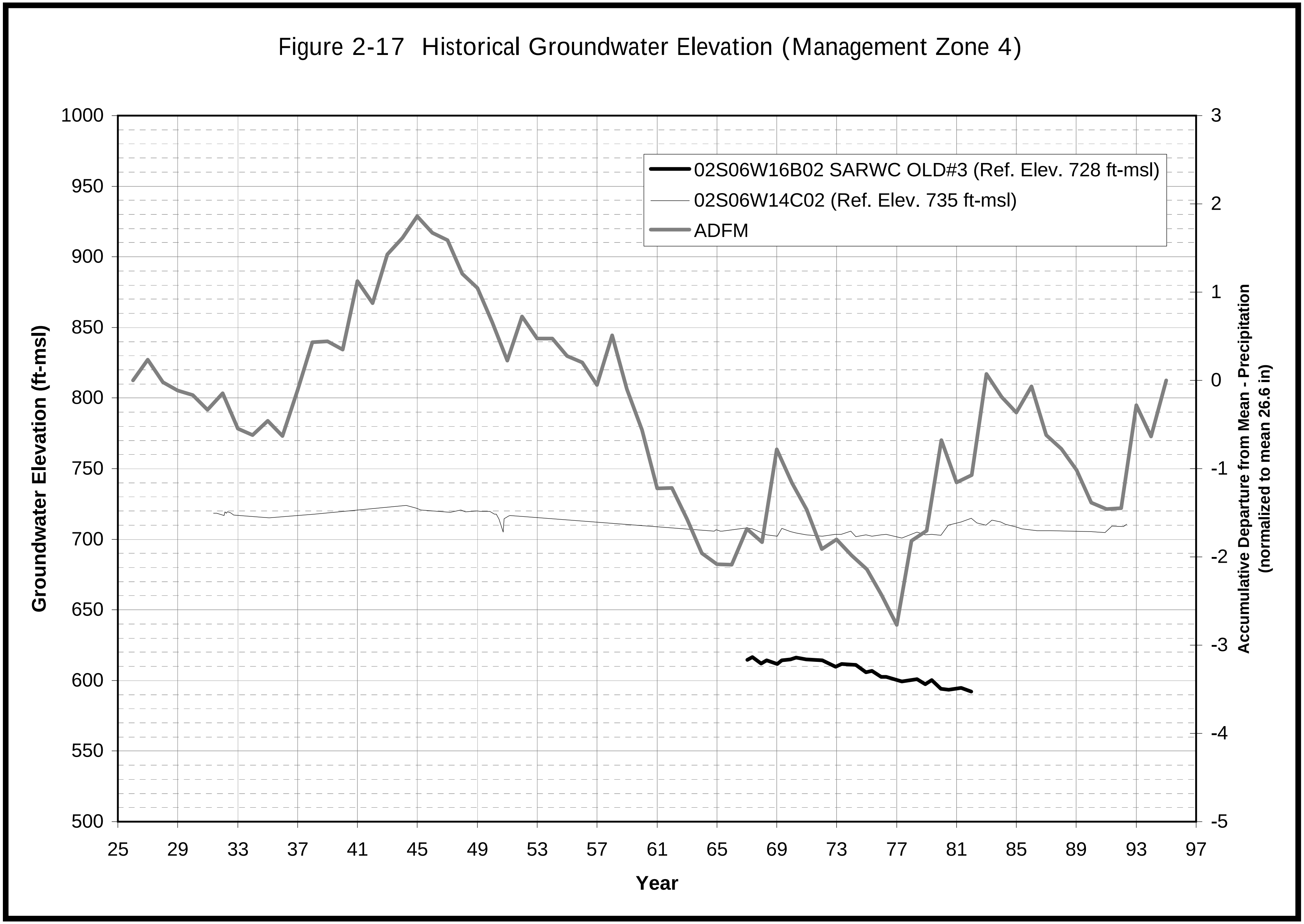

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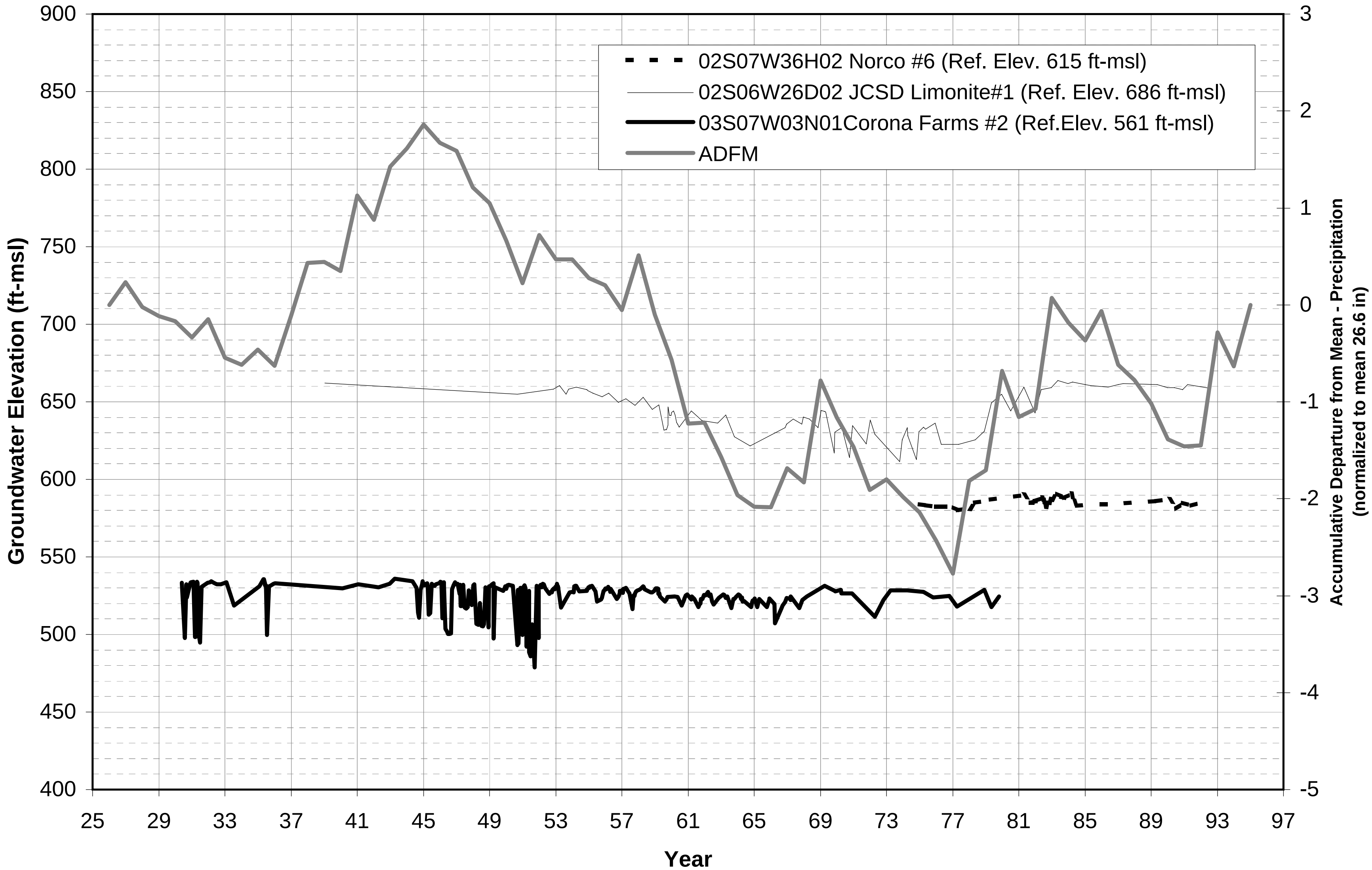
Figure 2-18 Historical Groundwater Elevation (Management Zone 5)



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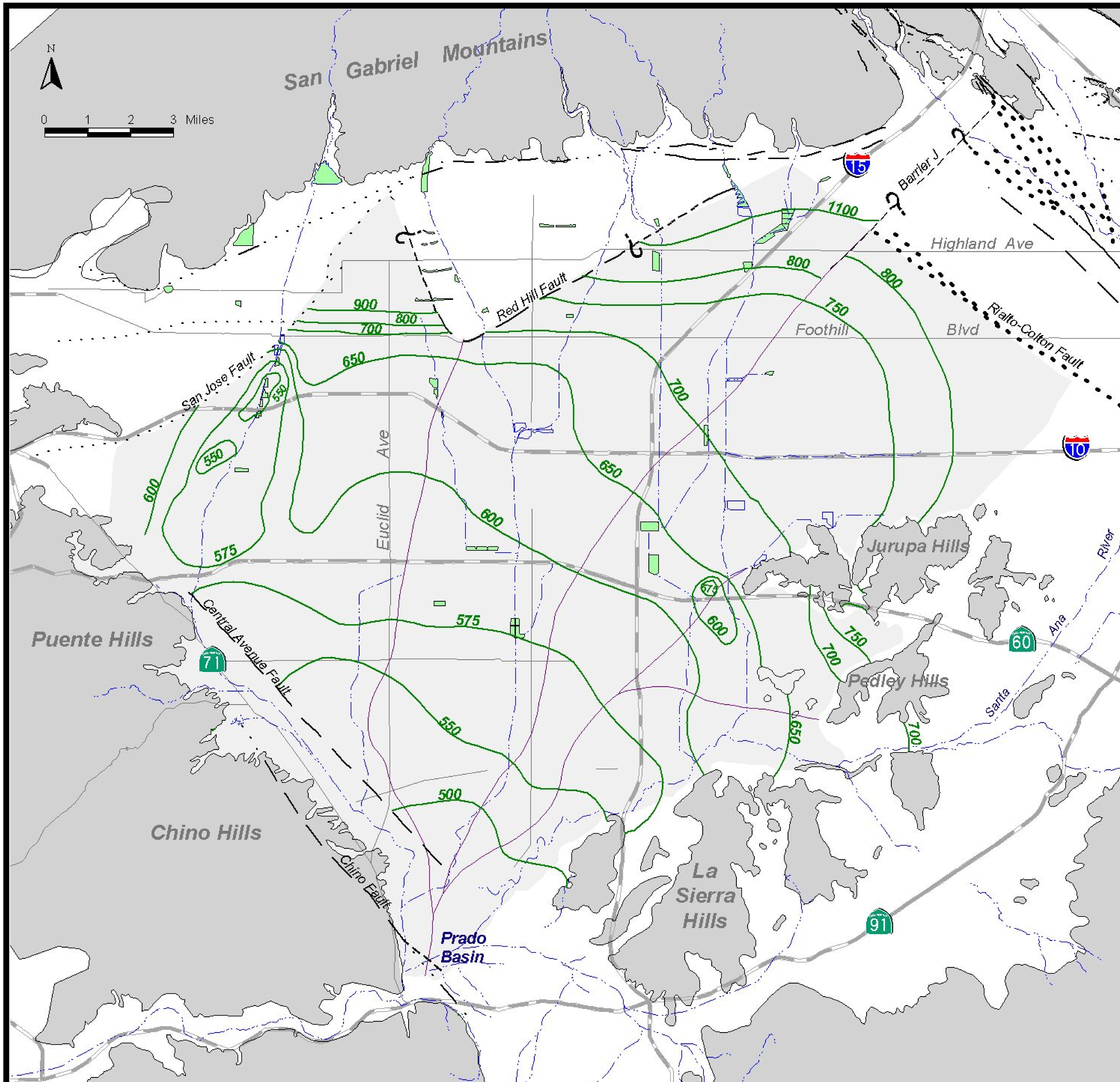

Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Fall 1997 Groundwater Elevation (ft-msl)
- Fault
  - Dashed Where Approximate
  - Dotted Where Concealed
  - Queried Where Uncertain
  - Large Dots Where Groundwater Barrier (Suspected Fault)
- Rivers & Streams
- Management Zone Boundary
- Hydrologic Chino Basin
- Recharge Basins
- Bedrock

Management Zone Index Map

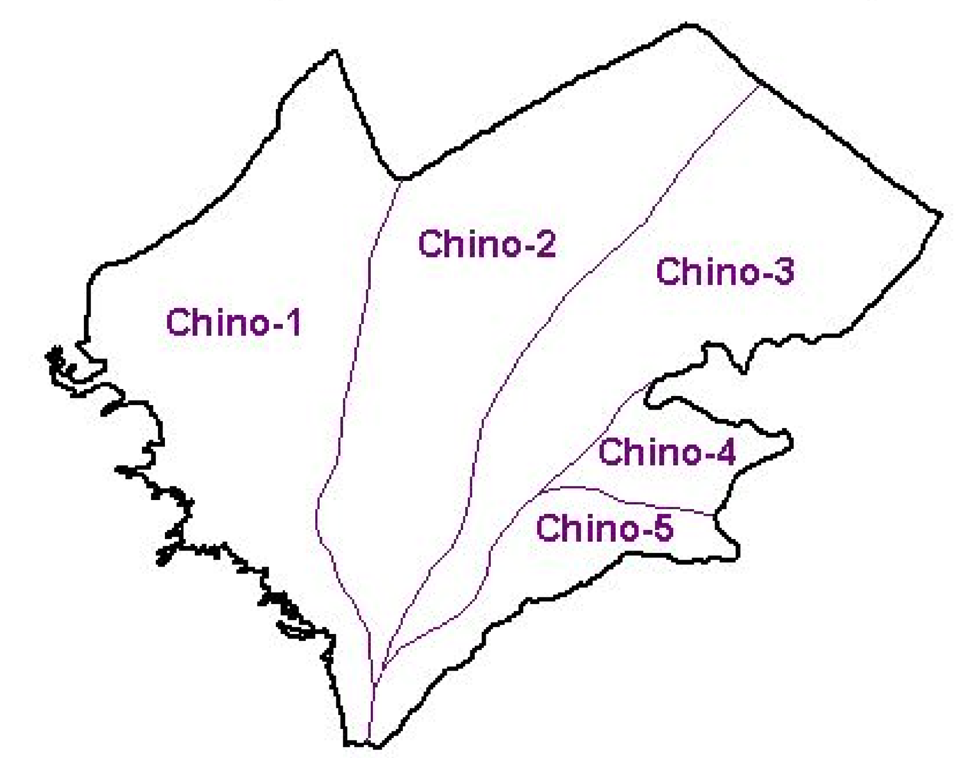

Figure 2-19
Fall 1997
Groundwater Elevation Map

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Date: August 19, 1999

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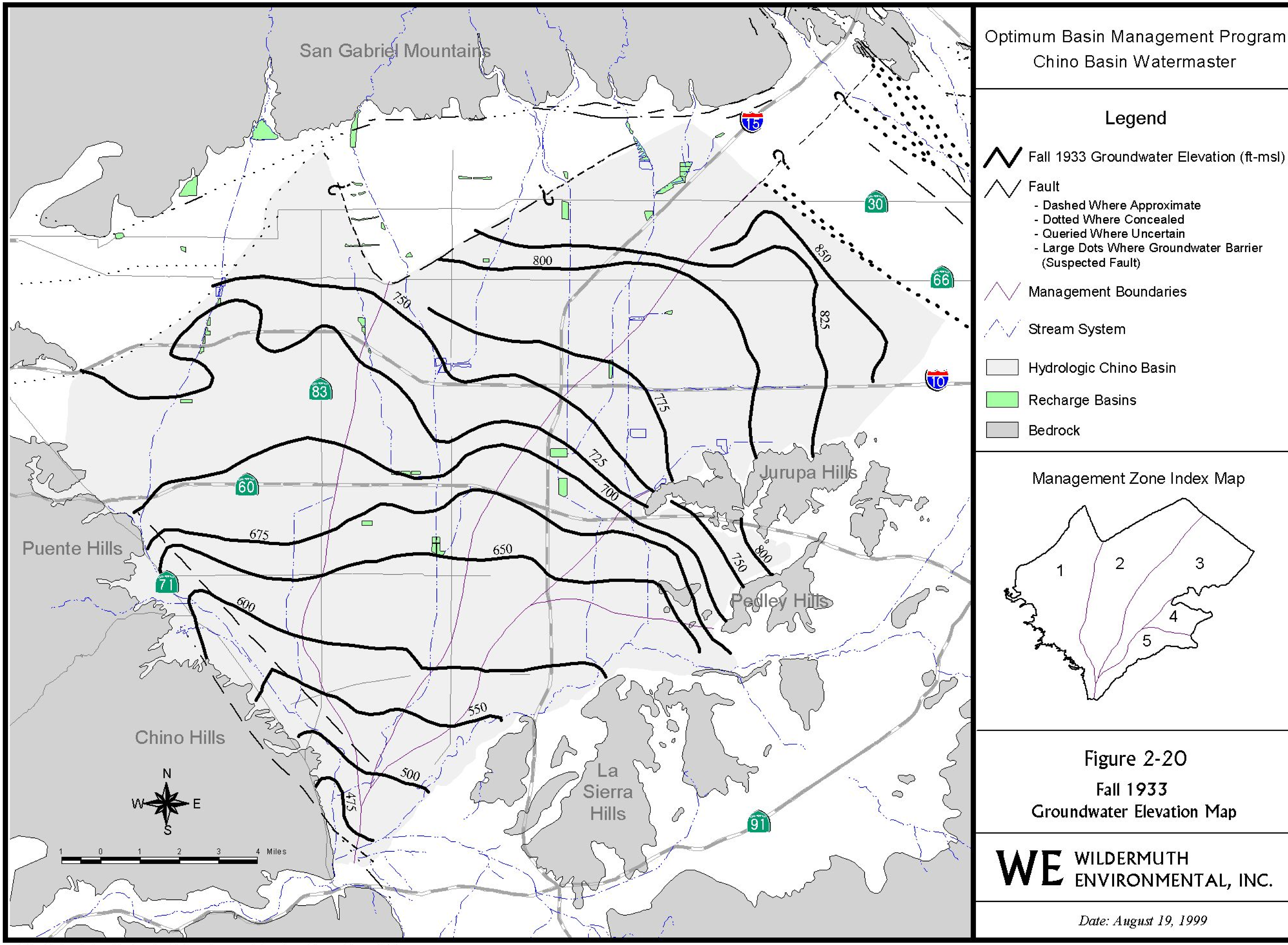

Figure 2-20
Fall 1933
Groundwater Elevation Map

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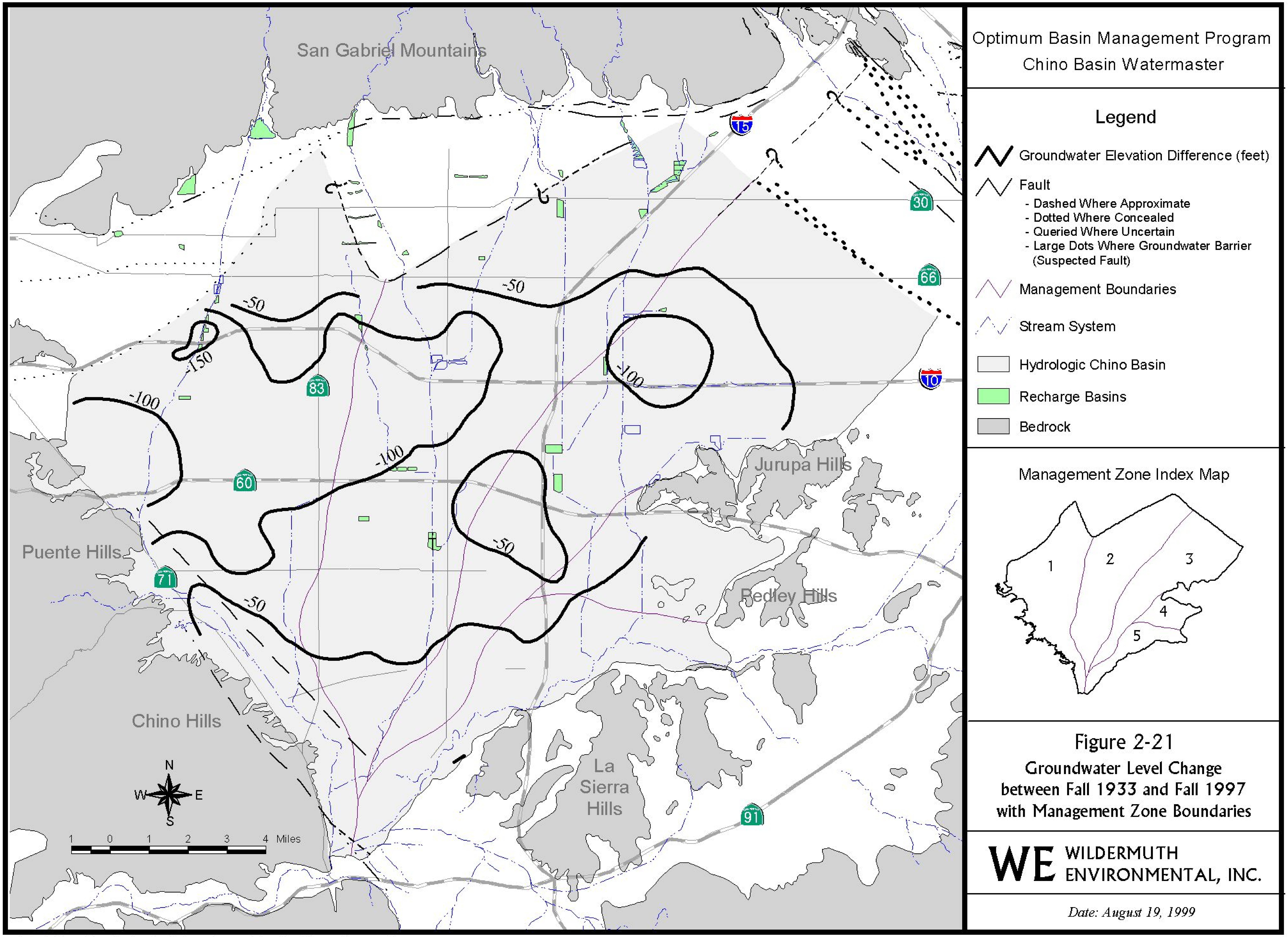

Figure 2-21
Groundwater Level Change between Fall 1933 and Fall 1997 with Management Zone Boundaries

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Date: August 19, 1999

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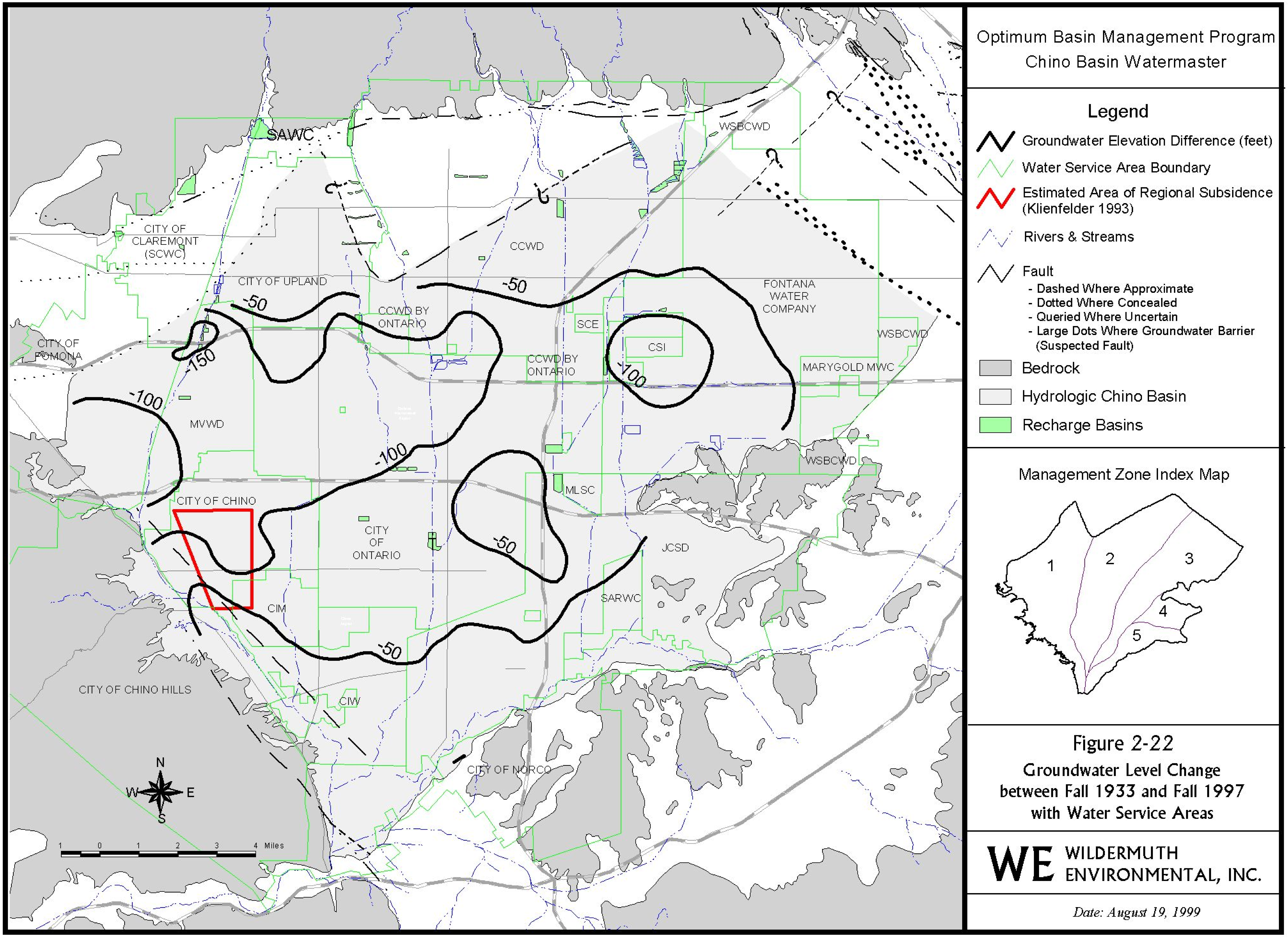

Figure 2-22
Groundwater Level Change between Fall 1933 and Fall 1997 with Water Service Areas

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Date: August 19, 1999

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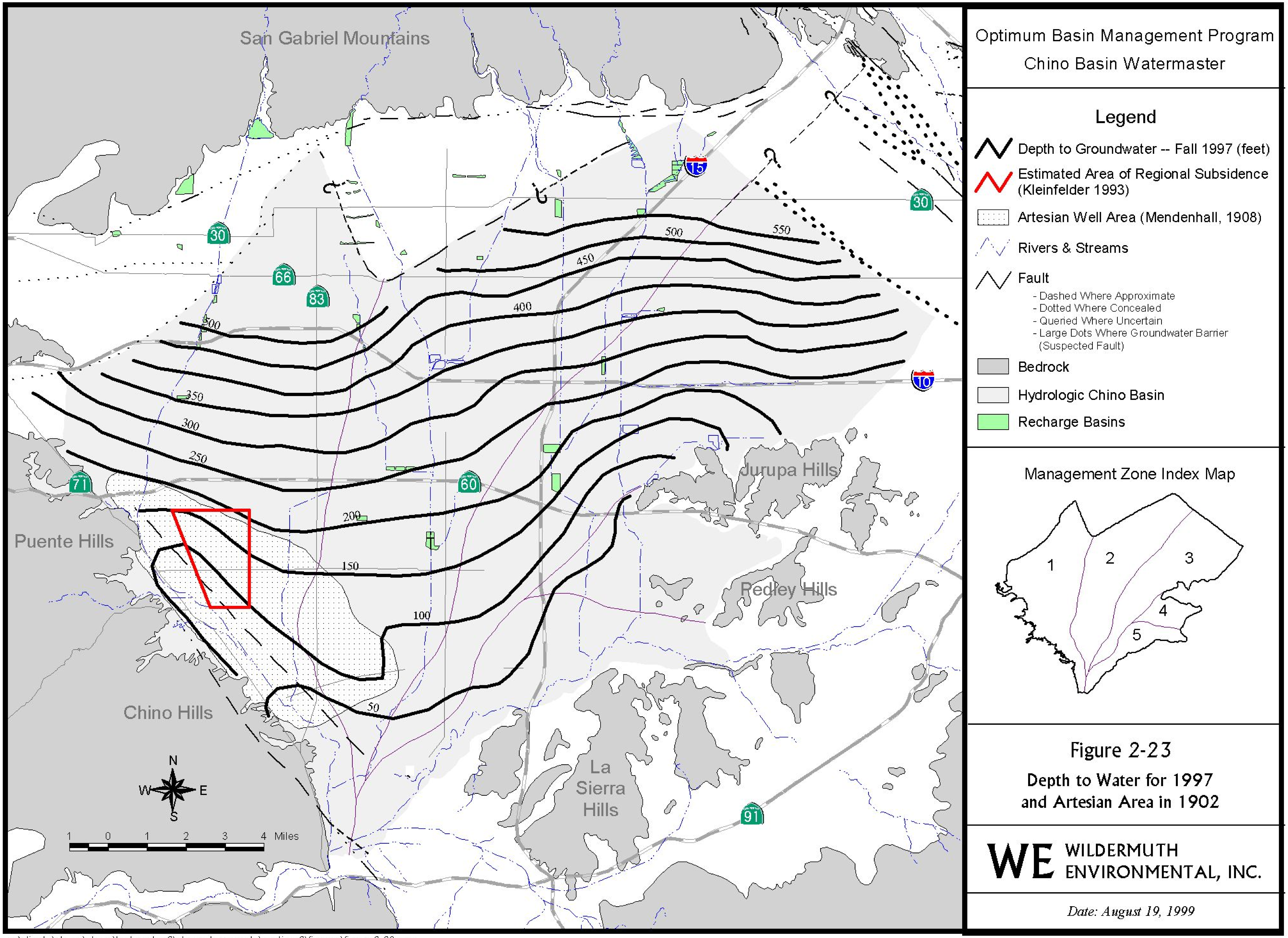

Figure 2-23
Depth to Water for 1997
and Artesian Area in 1902

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Figure 2-24

Subsidence Contours and Ground Fissures in the Chino Area

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Date: August 19, 1999

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Source Data: USGS, Kleinfelder (1999), Geomatrix (1994)

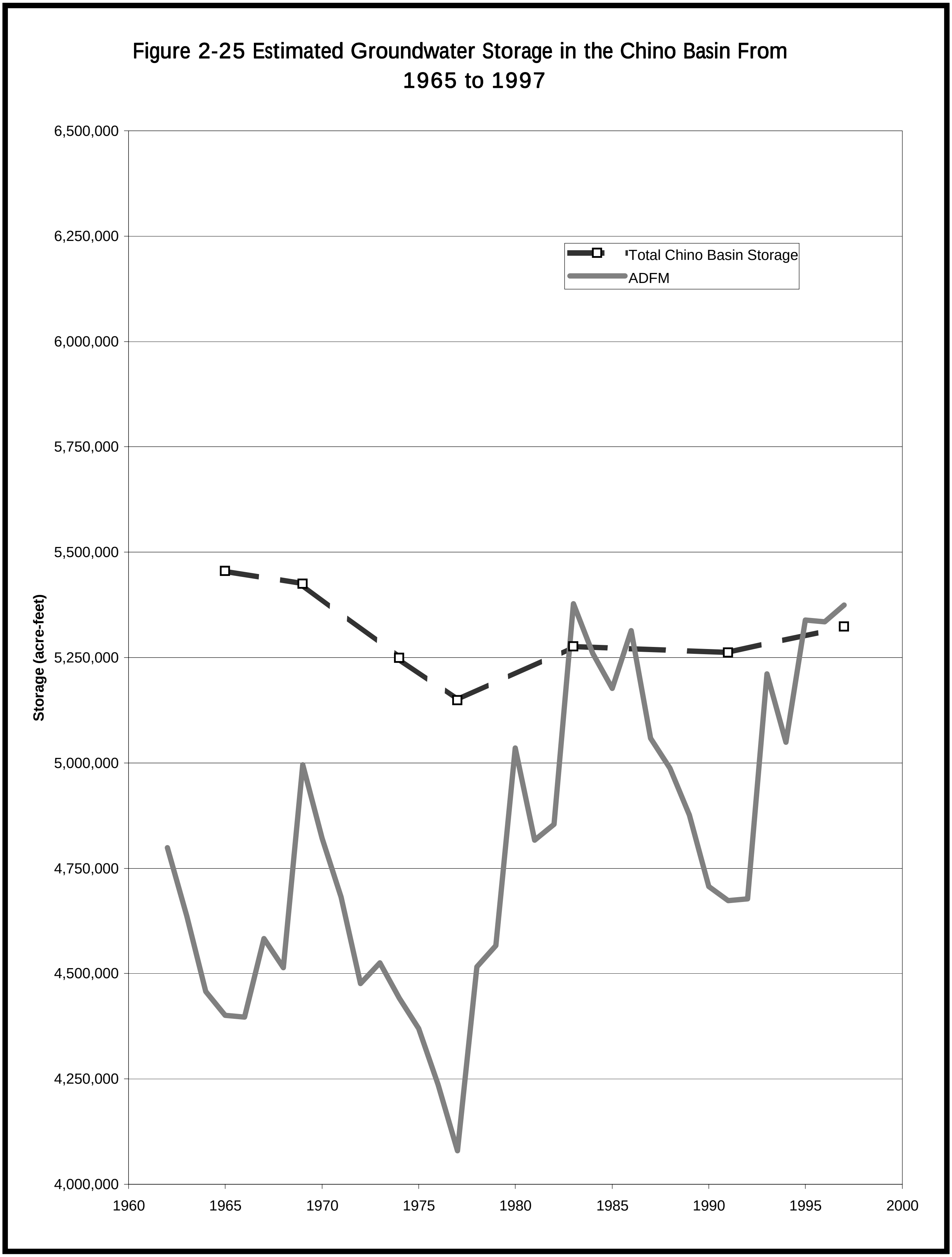


Figure 2-25 Estimated Groundwater Storage in the Chino Basin From
1965 to 1997
Total Chino Basin Storage
ADFM
Storage (acre-feet)
6,500,000
6,250,000
6,000,000
5,750,000
5,500,000
5,250,000
5,000,000
4,750,000
4,500,000
4,250,000
4,000,000
1960
1965
1970
1975
1980
1985
1990
1995
2000

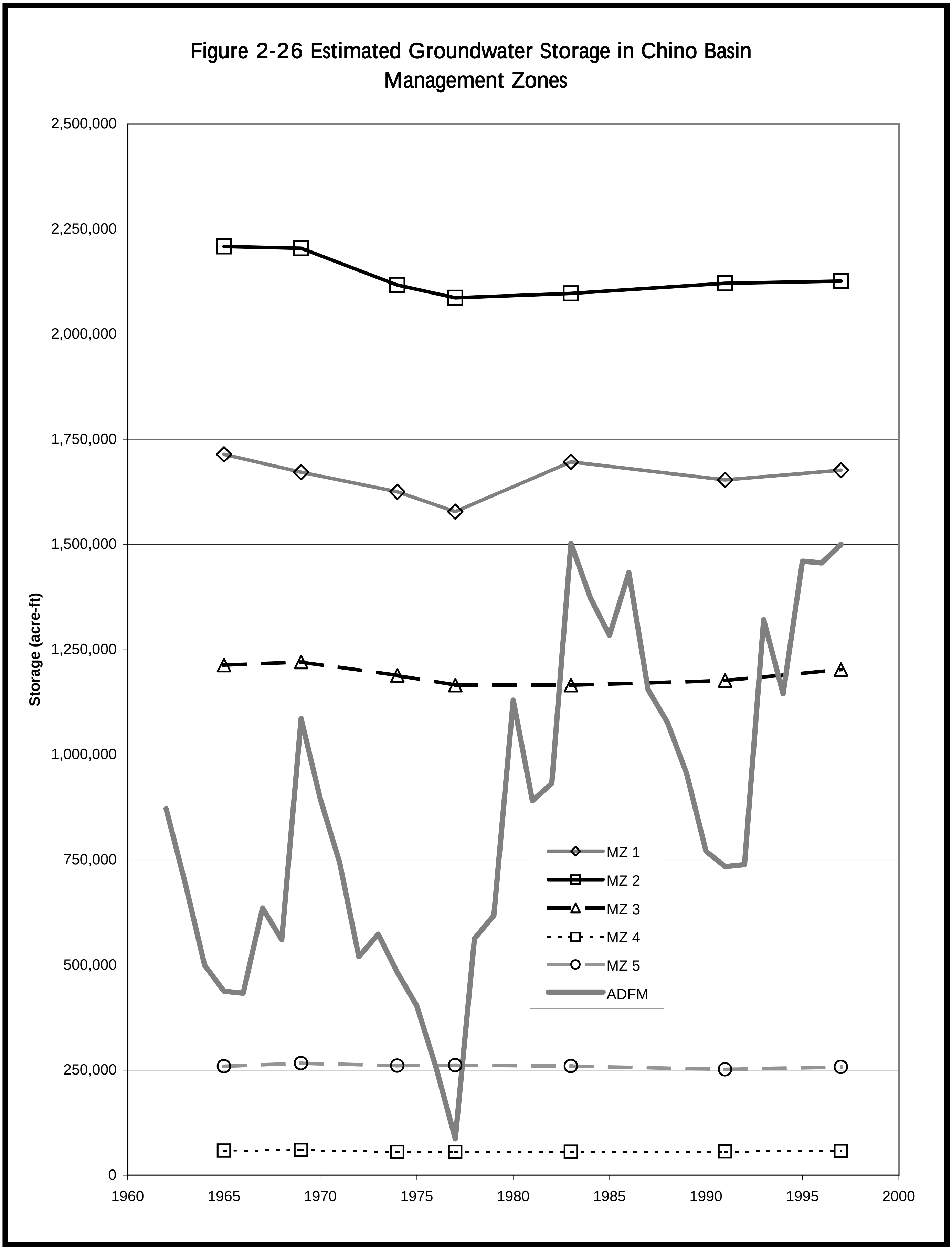
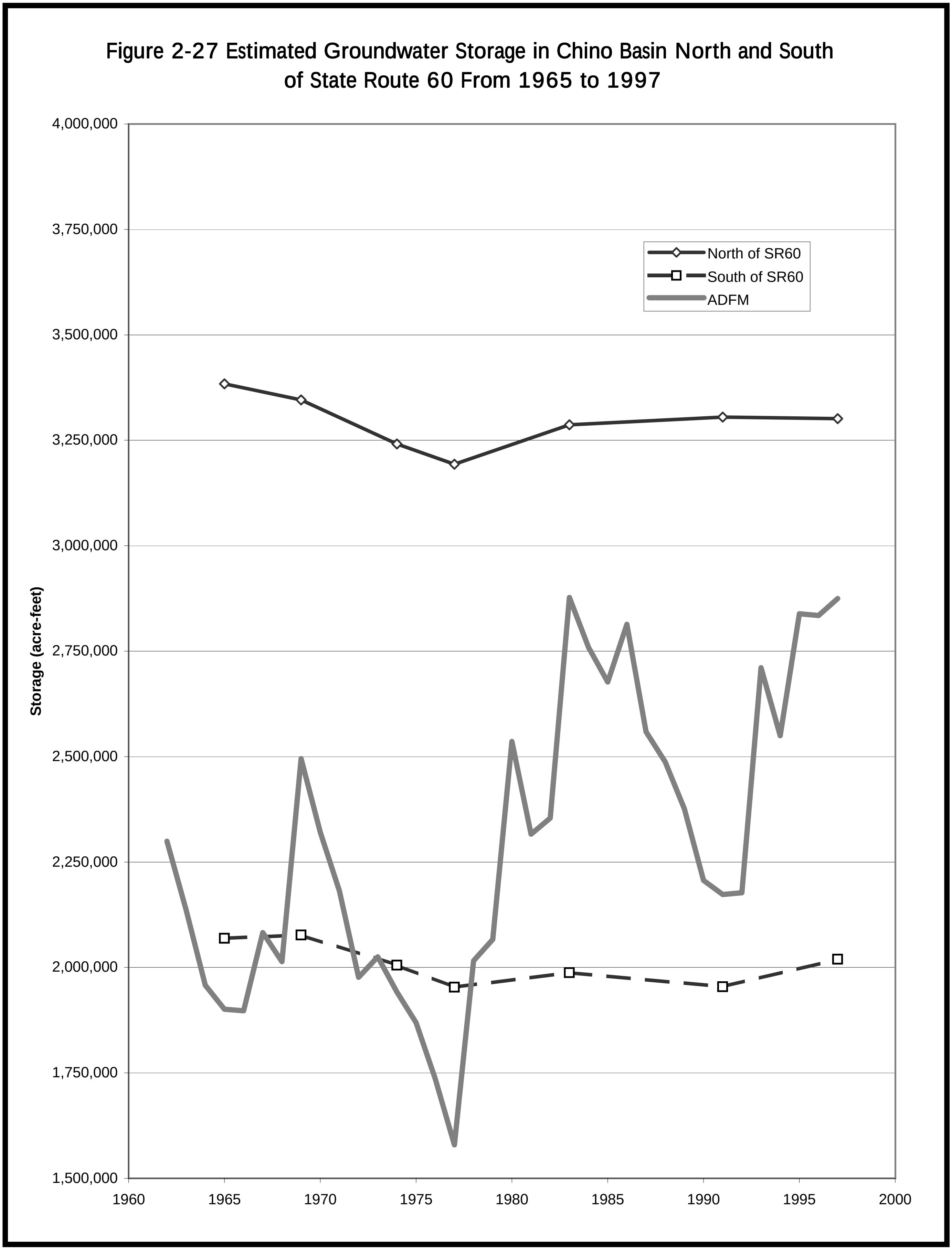


Figure 2-26 Estimated Groundwater Storage in Chino Basin Management Zones
Storage (acre-ft)
2,500,000
2,250,000
2,000,000
1,750,000
1,500,000
1,250,000
1,000,000
750,000
500,000
250,000
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
MZ 1
MZ 2
MZ 3
MZ 4
MZ 5
ADFM



Final Figures 2-25 to 2-28.xls -- Figure 2-27 Upper and Lower
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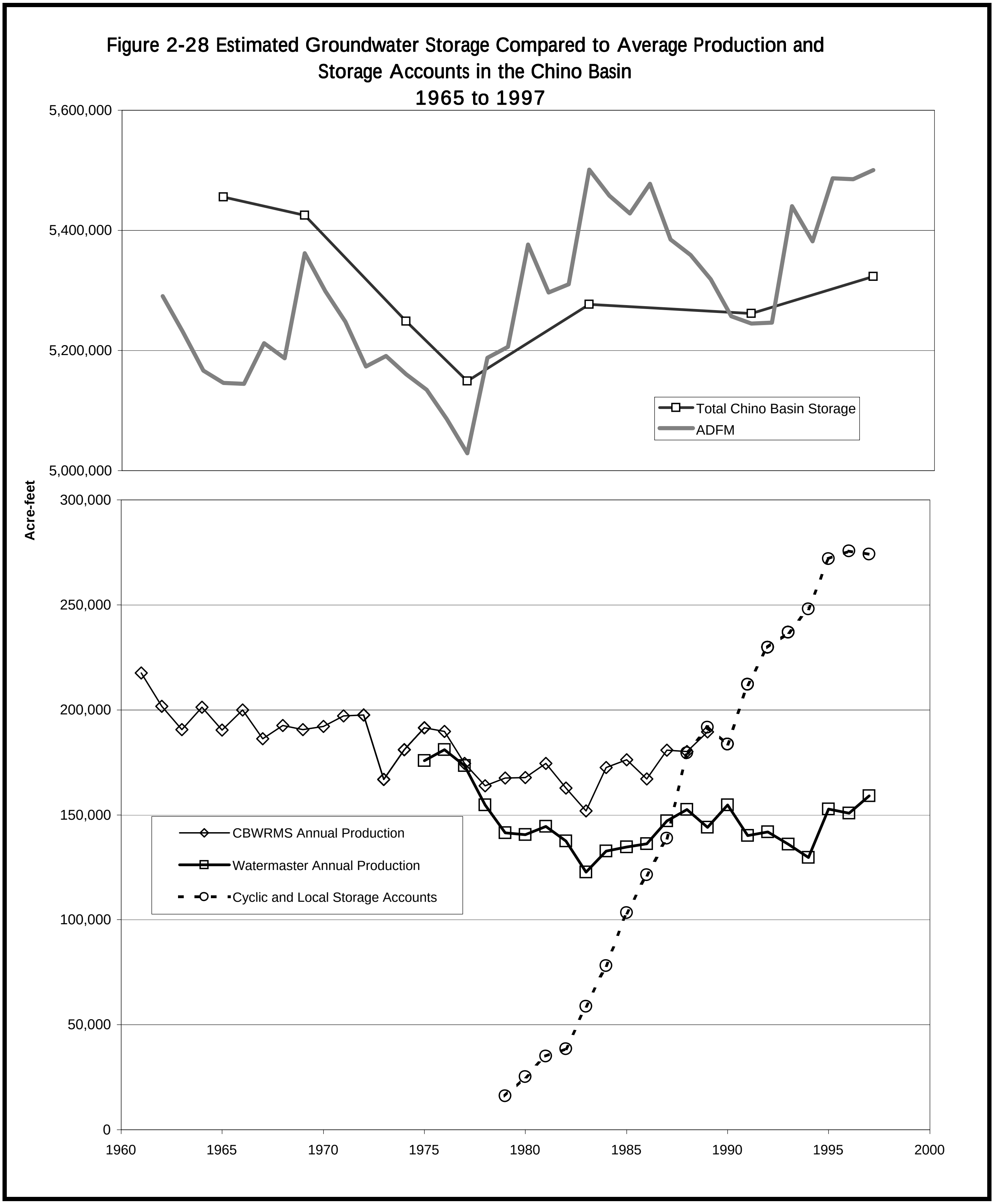
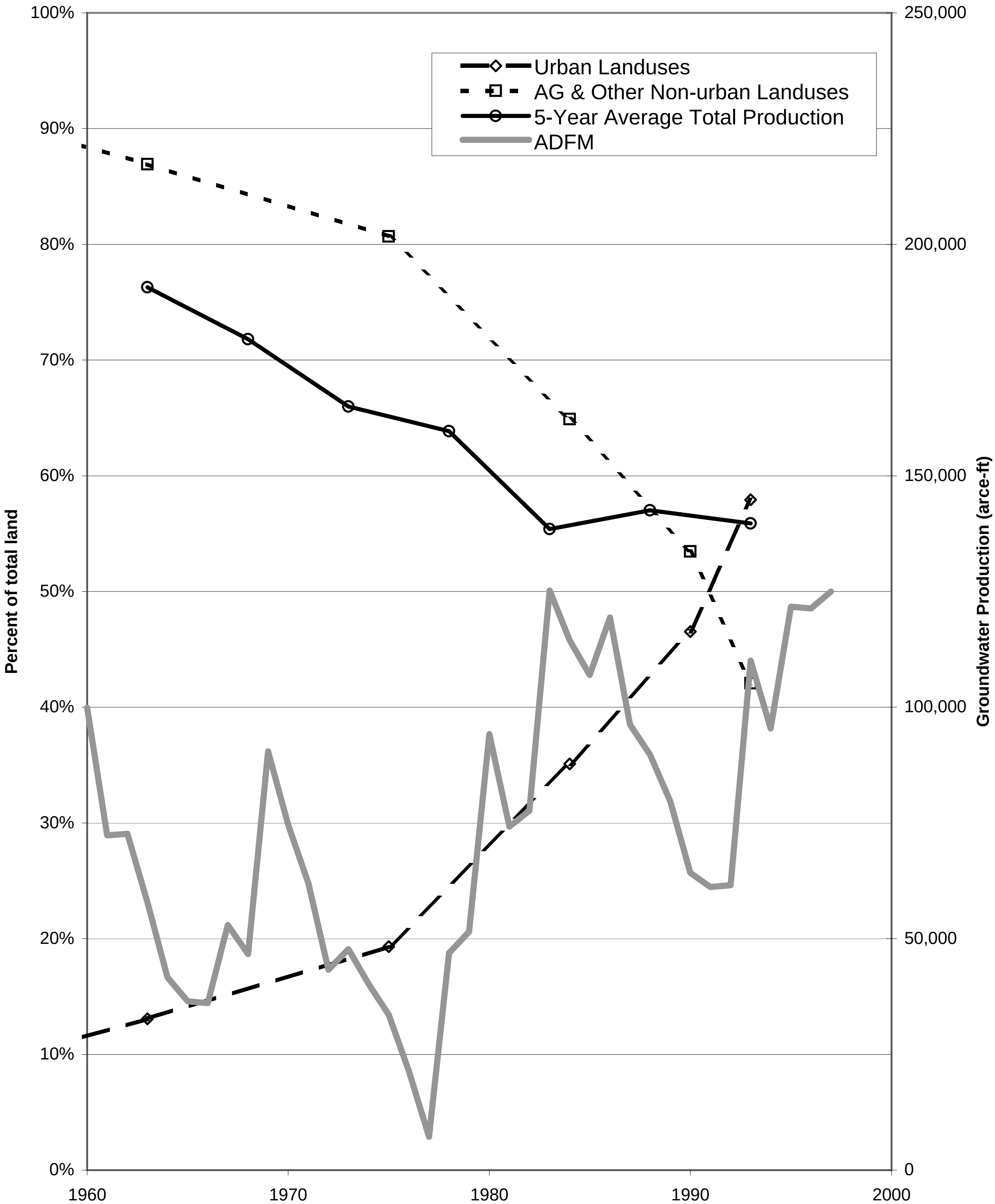


Figure 2-28 Estimated Groundwater Storage Compared to Average Production and Storage Accounts in the Chino Basin
1965 to 1997
5,600,000
5,400,000
5,200,000
5,000,000
Total Chino Basin Storage
ADFM
Acre-feet
300,000
250,000
200,000
150,000
100,000
50,000
0
CBWRMS Annual Production
Watermaster Annual Production
Cyclic and Local Storage Accounts
1960
1965
1970
1975
1980
1985
1990
1995
2000

Figure 2-29 Estimated Groundwater Production in the Chino Basin Compared to Climate and Urban and Non-urban Land Uses



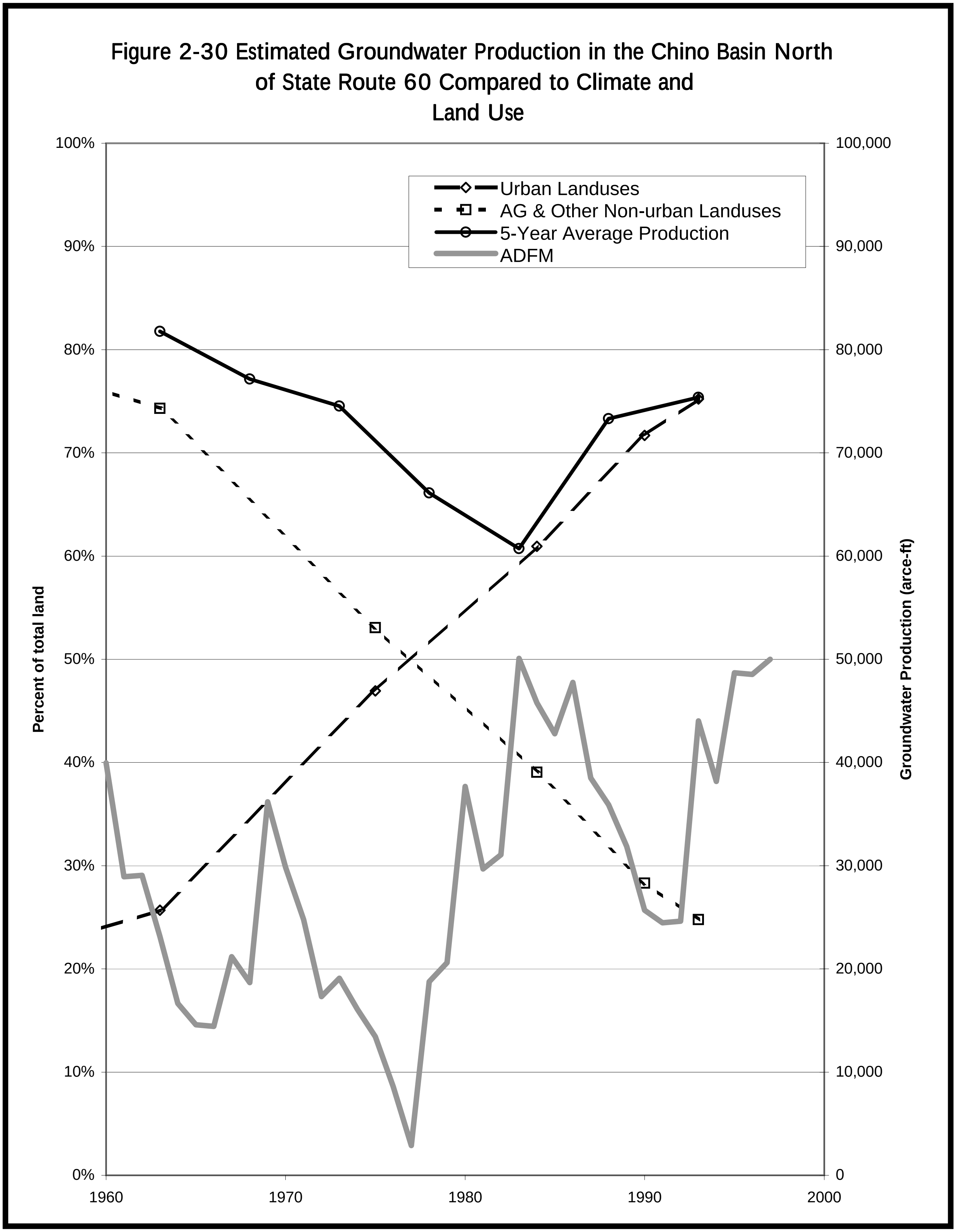


Figure 2-30 Estimated Groundwater Production in the Chino Basin North of State Route 60 Compared to Climate and Land Use
Urban Landuses
AG & Other Non-urban Landuses
5-Year Average Production
ADFM
Percent of total land
Groundwater Production (arce-ft)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1960
1970
1980
1990
2000

Figure 2-31 Estimated Groundwater Production in the Chino Basin South of State Route 60 Compared to Climate and Land Use

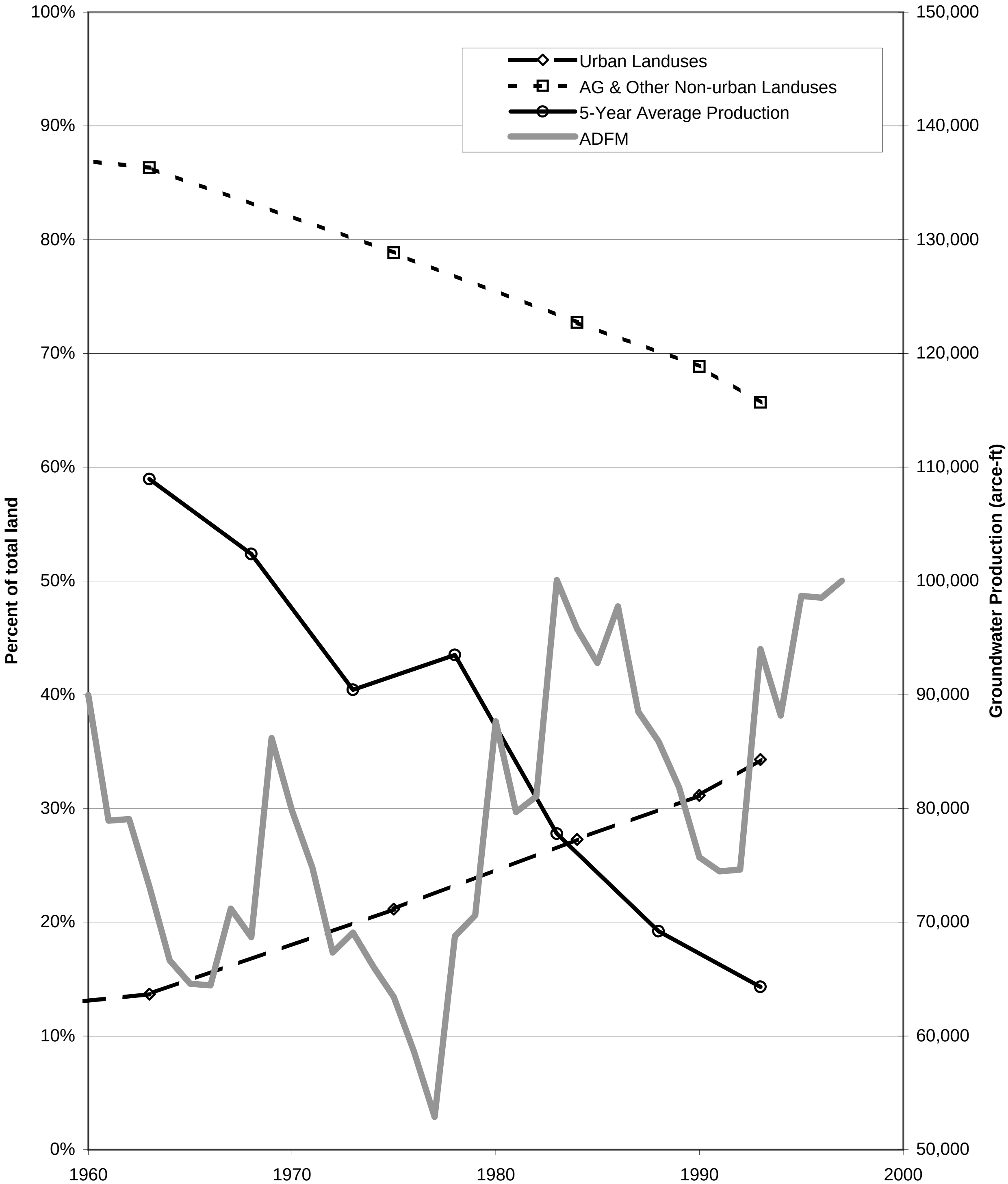


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Figure 2-33

1971 Annual Production Estimates by Well from CBWRMS

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Date: August 19, 1999

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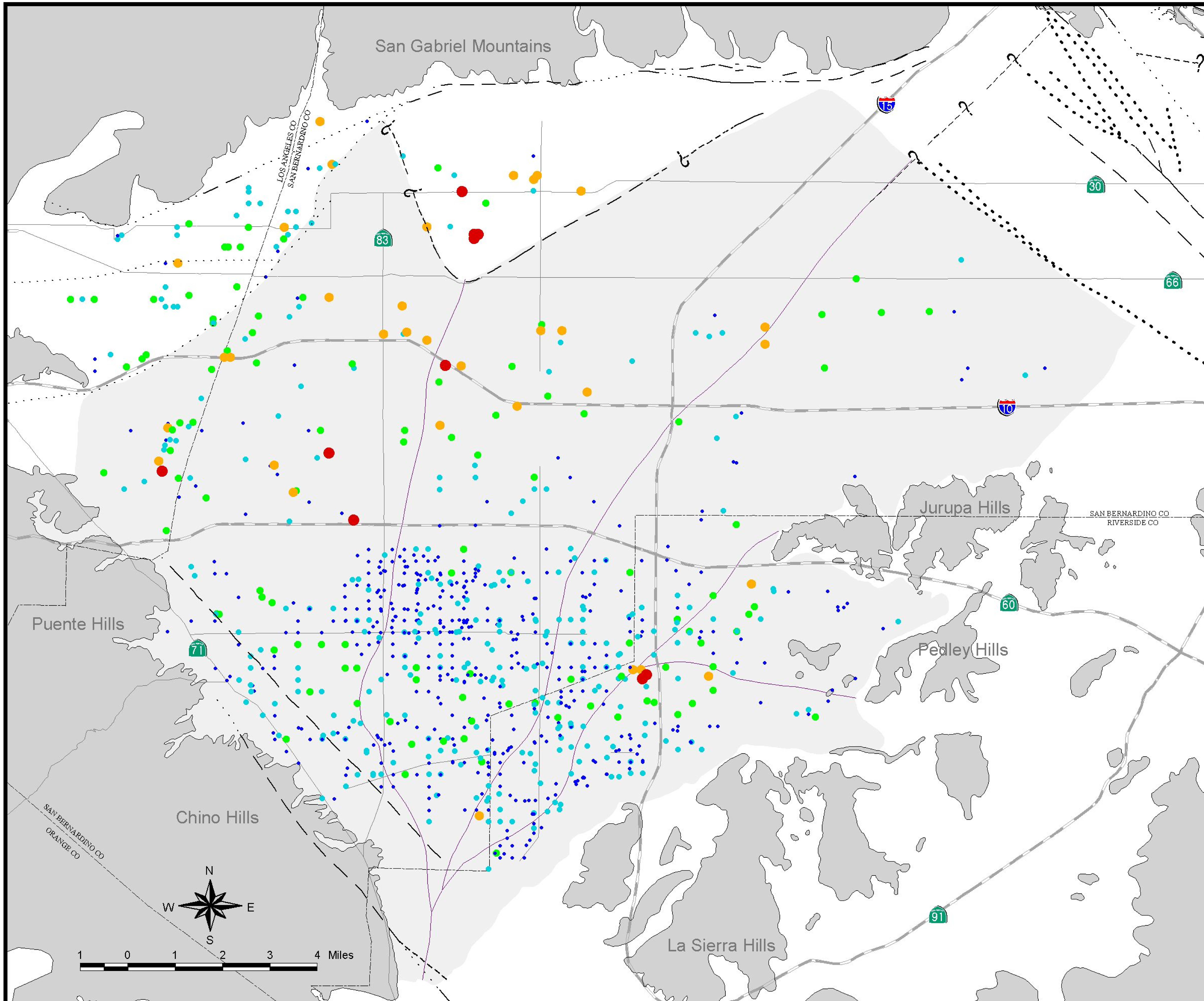

Optimum Basin Management Program
Chino Basin Watermaster

Legend

Well Production

- 1 - 100 acre-ft/yr
- 100 - 400
- 400 - 900
- 900 - 2000
- >2000

Management Zone Boundary

Fault
- Dashed Where Approximate
- Dotted Where Concealed
- Queried Where Uncertain
- Large Dots Where Groundwater Barrier (Suspected Fault)

Hydrologic Chino Basin

Bedrock

Management Zone Index Map

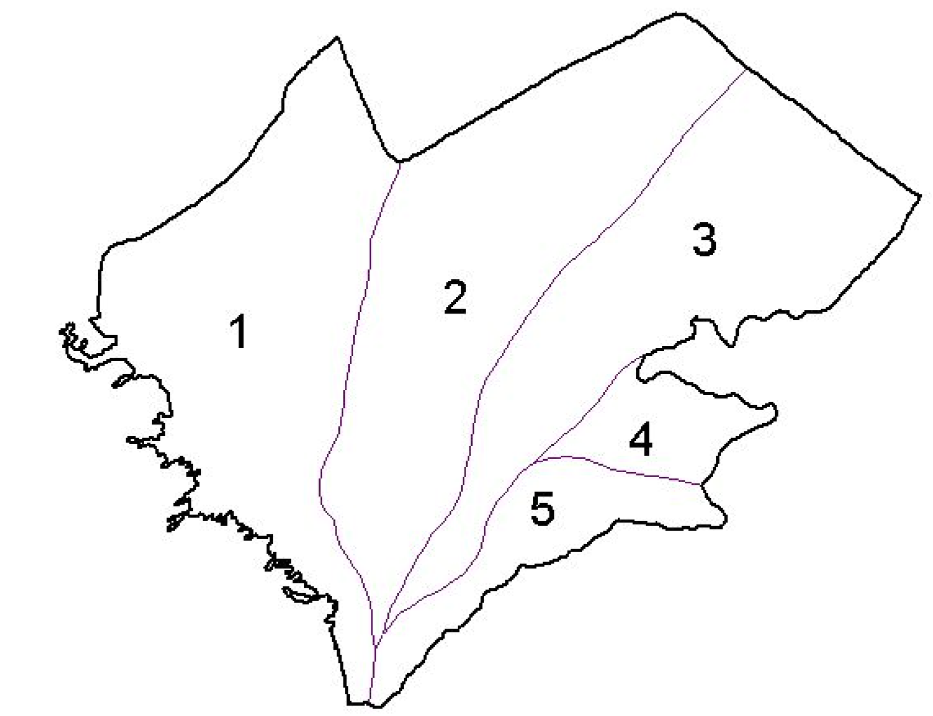

Figure 2-34

1981 Annual Production Estimates by Well from CBWRMS

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

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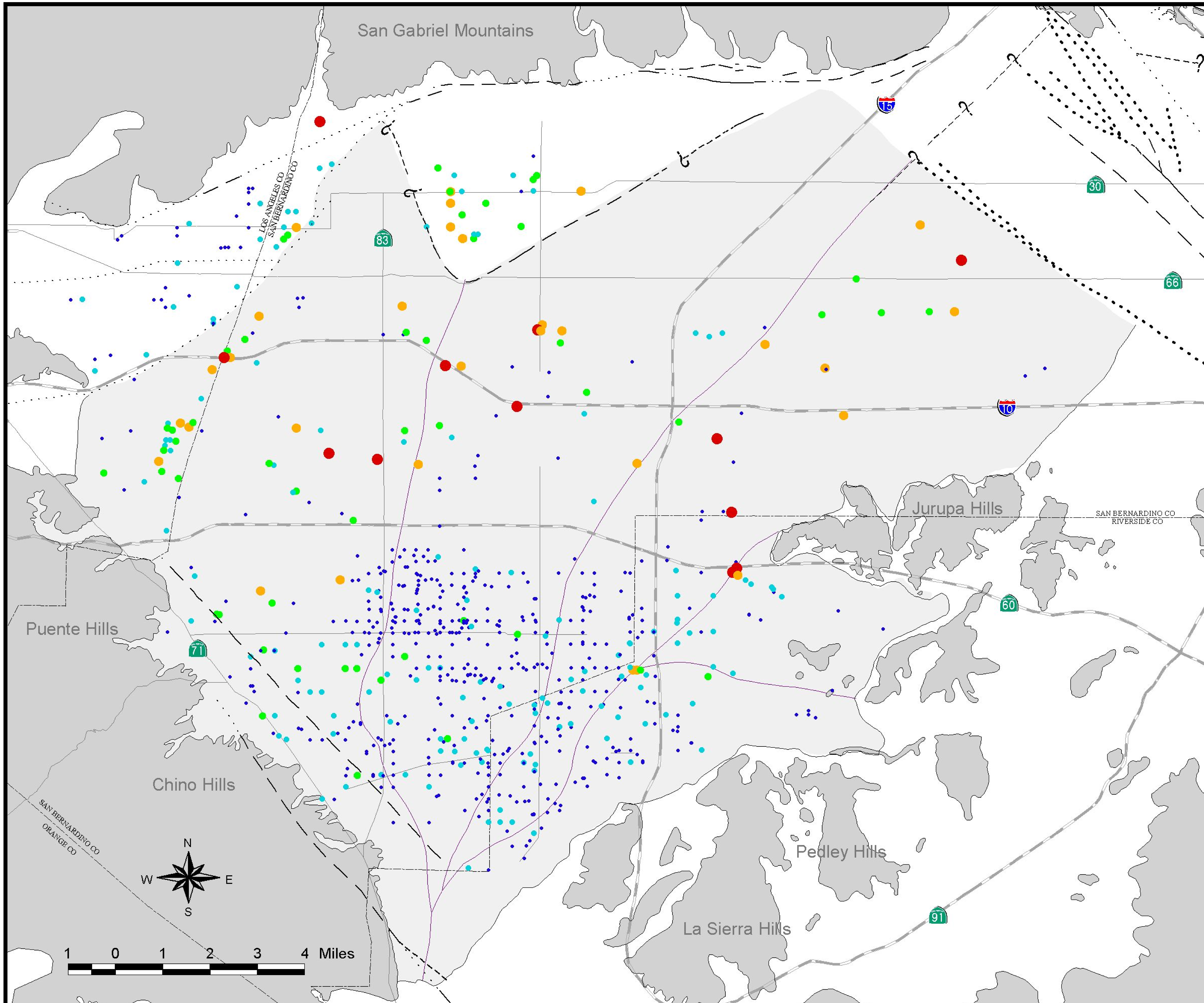
Optimum Basin Management Program
Chino Basin Watermaster



Legend

Well Production

- 1 - 100 acre-ft/yr
- 100 - 400
- 400 - 900
- 900 - 2000
- >2000

Management Zone Boundary

Fault
- Dashed Where Approximate
- Dotted Where Concealed
- Queried Where Uncertain
- Large Dots Where Groundwater Barrier (Suspected Fault)

Hydrologic Chino Basin

Bedrock

Management Zone Index Map

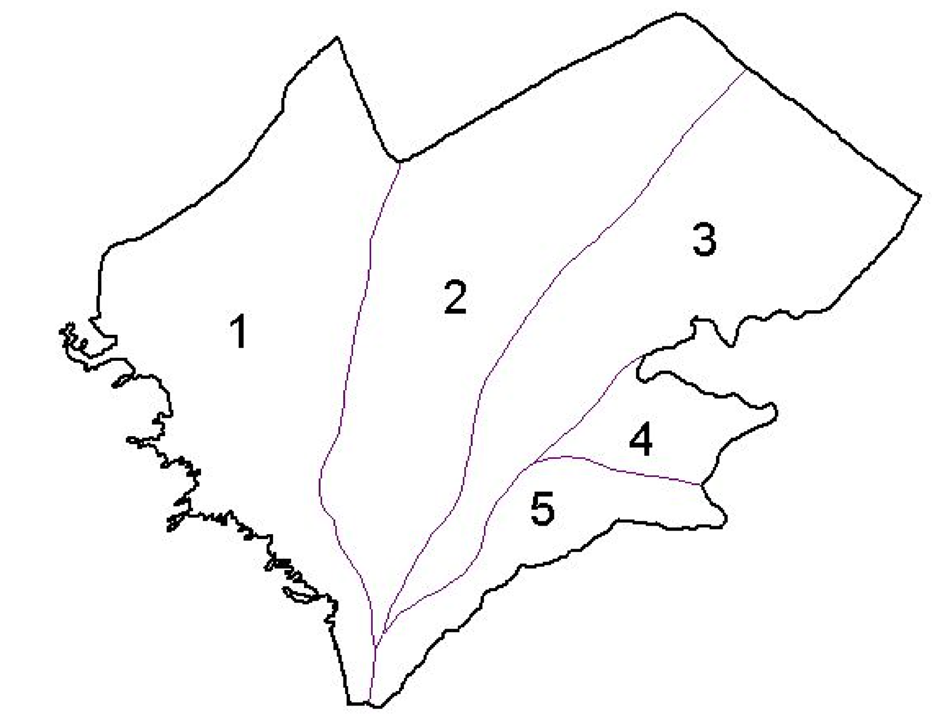


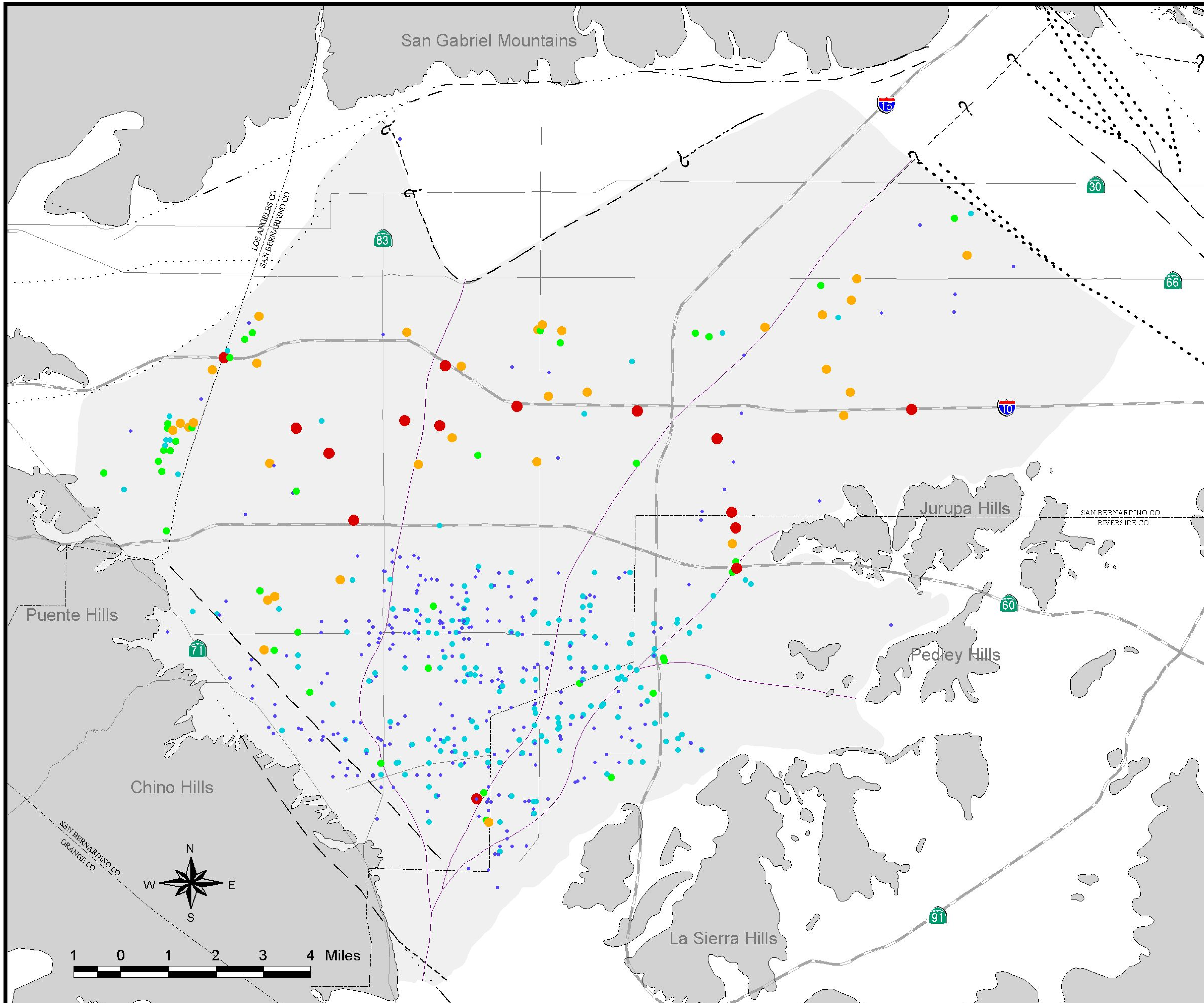
Figure 2-35

1989 Annual Production Estimates by Well from CBWRMS

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

s:\clients\cbwm\task 2\obmp documents\section 2\figures\figure 2-35.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

Well Production

- 1 - 100 acre-ft/yr
- 100 - 400
- 400 - 900
- 900 - 2000
- >2000

Management Zone Boundary

Fault
- Dashed Where Approximate
- Dotted Where Concealed
- Queried Where Uncertain
- Large Dots Where Groundwater Barrier (Suspected Fault)

Hydrologic Chino Basin

Bedrock

Management Zone Index Map

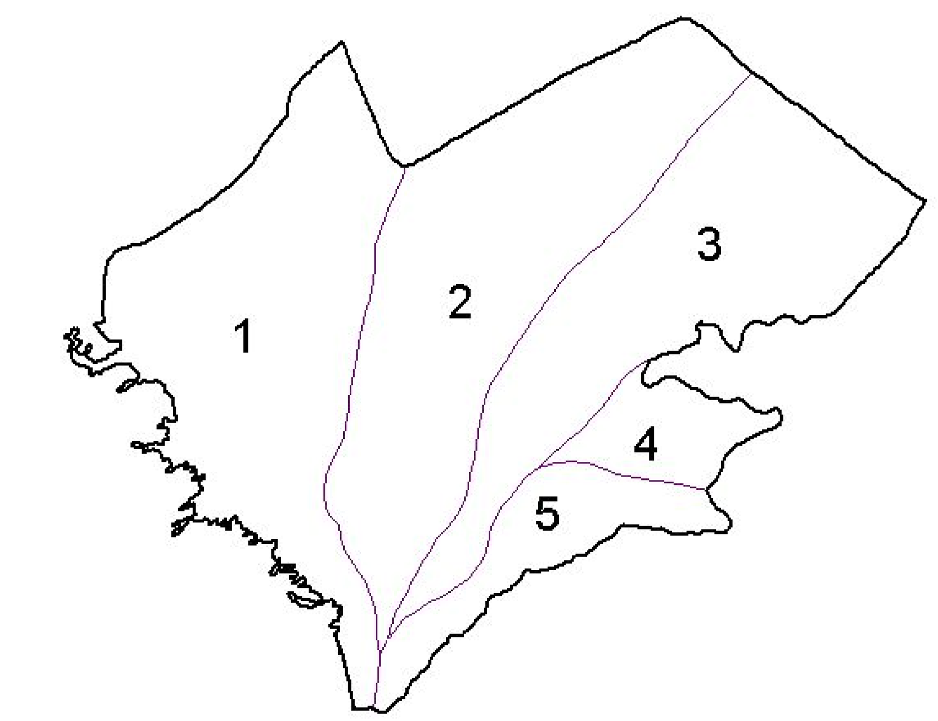


Figure 2-36

1998 Annual Production Estimates by Well from Watermaster

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

s:\clients\cbwm\task 2\obmp documents\section 2\figures\figure 2-36.apr

Figure 2 - 37a
1933 Land Use

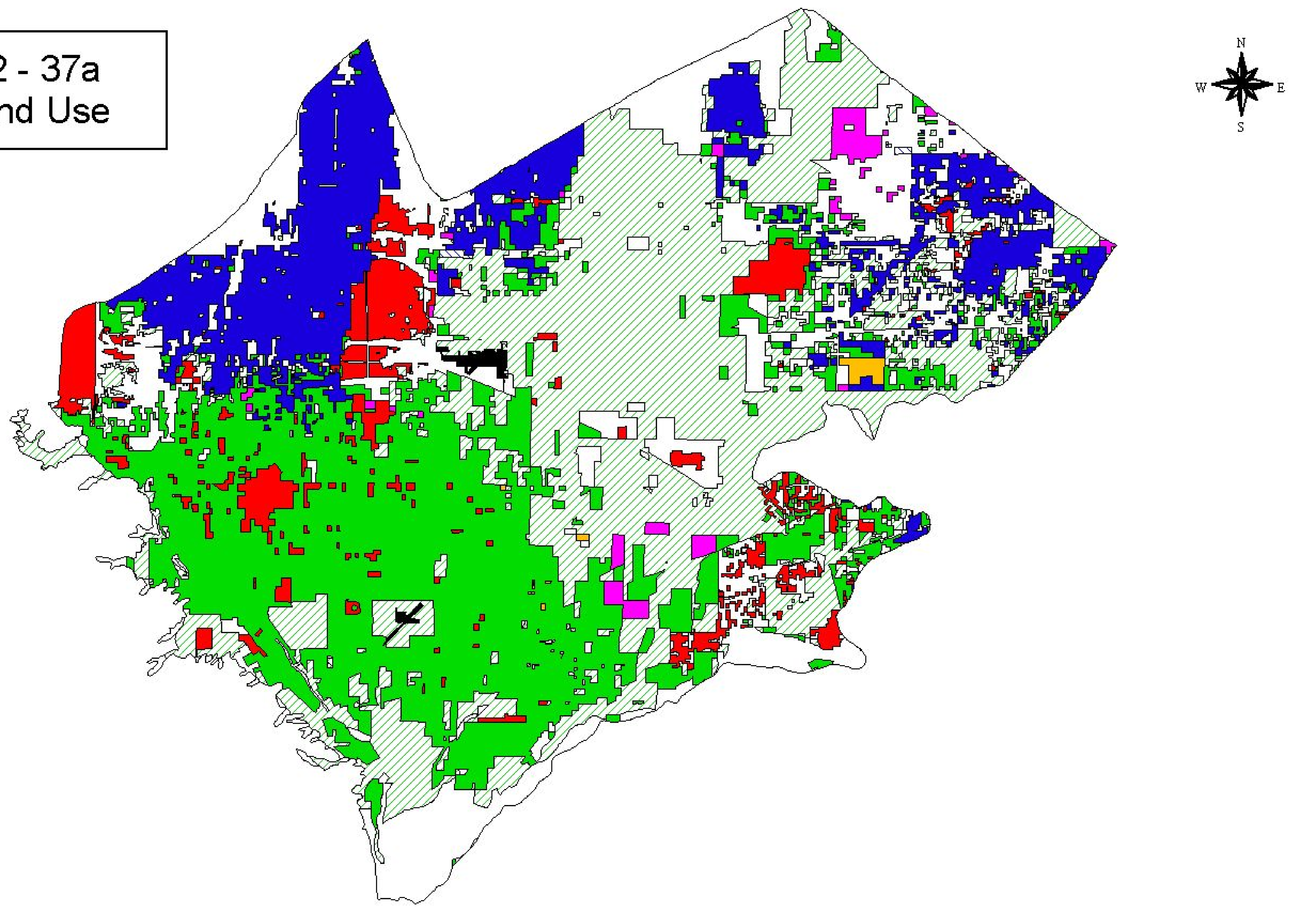
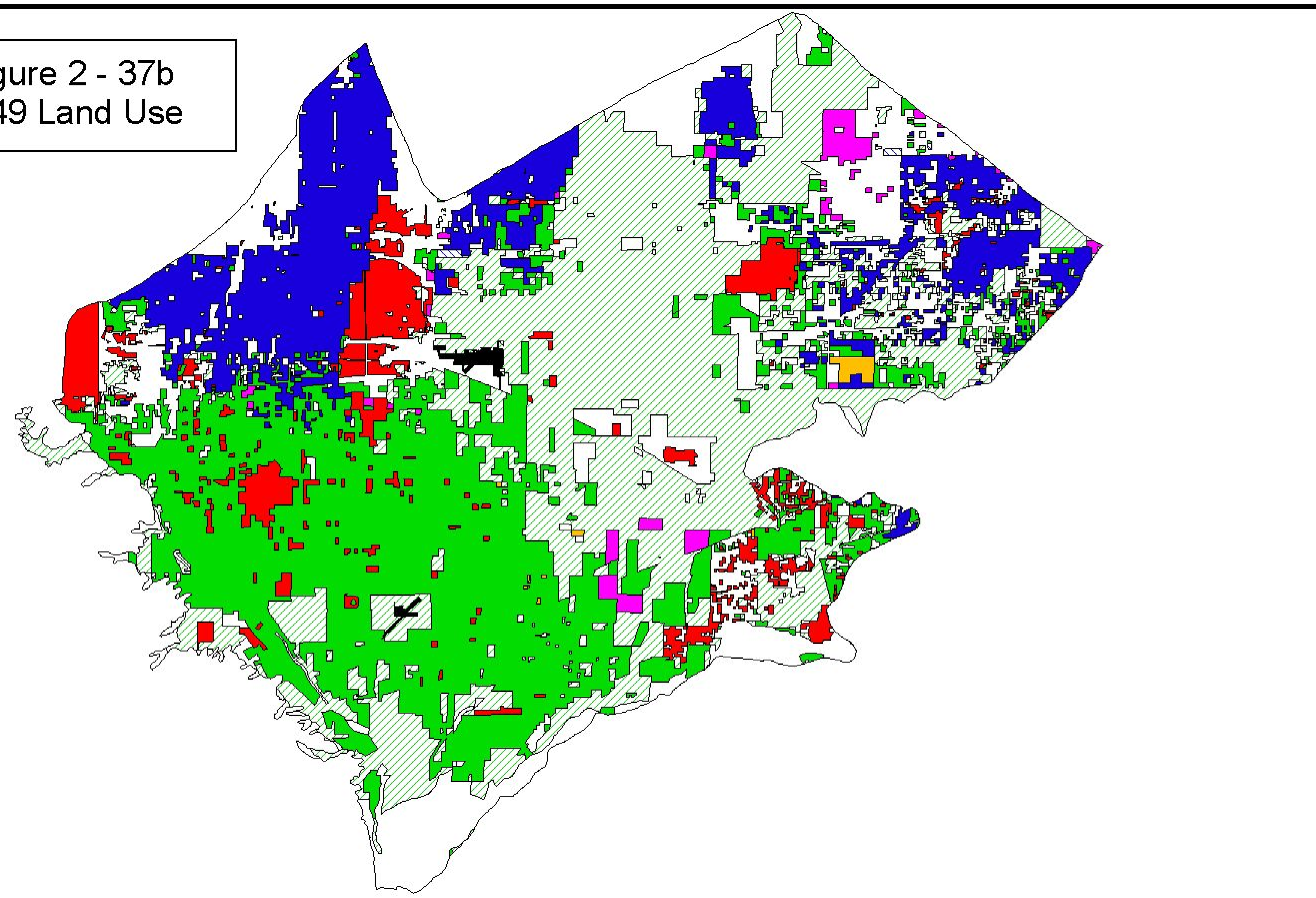


Figure 2 - 37b
1949 Land Use



- Non-Irrigated Fieldcrops, Pasture
- Irrigated Fieldcrops, Pasture
- Irrigated and Non-Irrigated Citrus
- Irrigated Vineyards
- Non-Irrigated Vineyards
- Dairies and Feedlots
- Urban, Residential, Commercial, Industrial, and Vacant
- Native Vegetation
- Special Impervious

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

Figure 2 - 37c
1957 Land Use

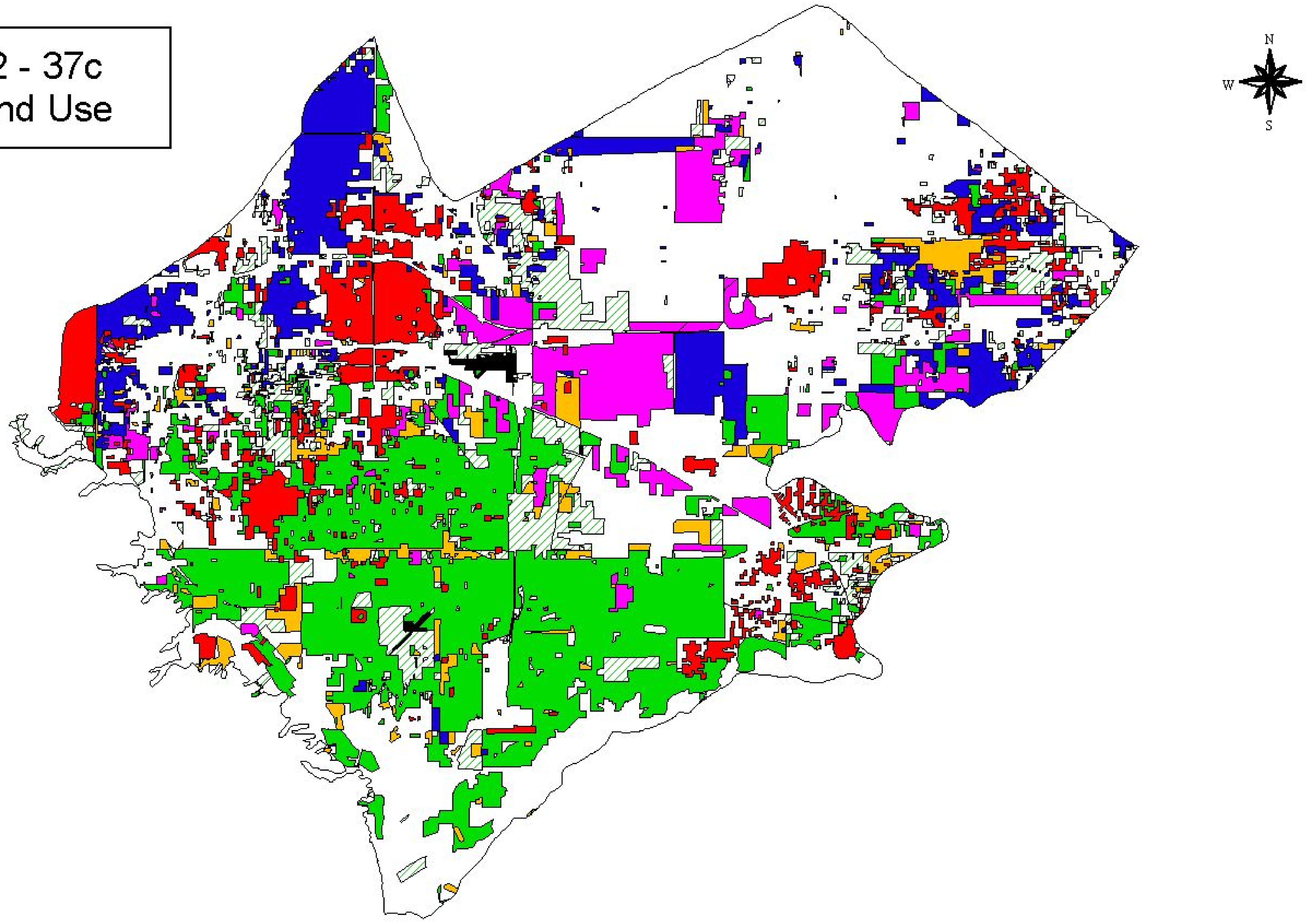
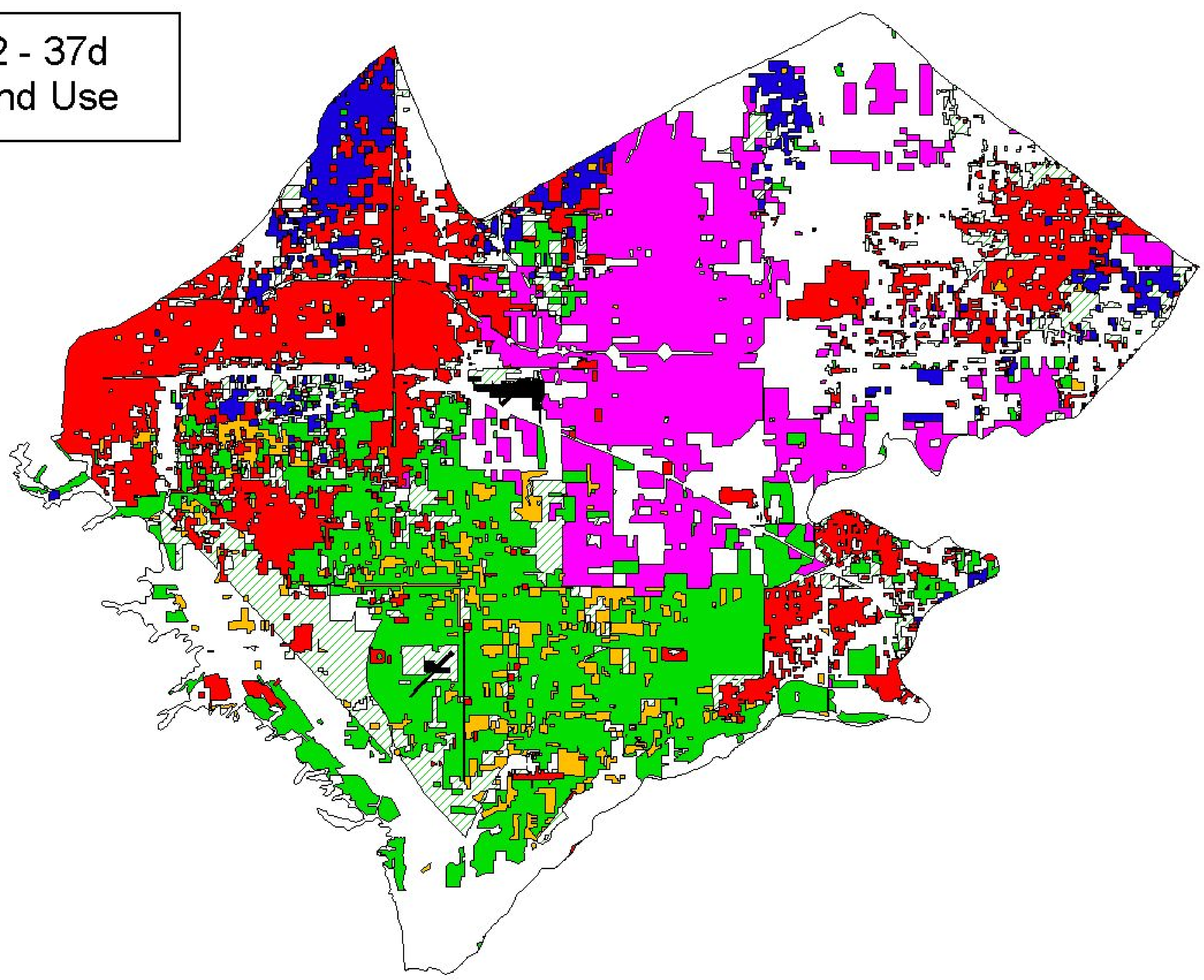


Figure 2 - 37d
1963 Land Use



- Non-Irrigated Fieldcrops, Pasture
- Irrigated Fieldcrops, Pasture
- Irrigated and Non-Irrigated Citrus
- Irrigated Vineyards
- Non-Irrigated Vineyards
- Dairies and Feedlots
- Urban, Residential, Commercial, Industrial, and Vacant
- Native Vegetation
- Special Impervious

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

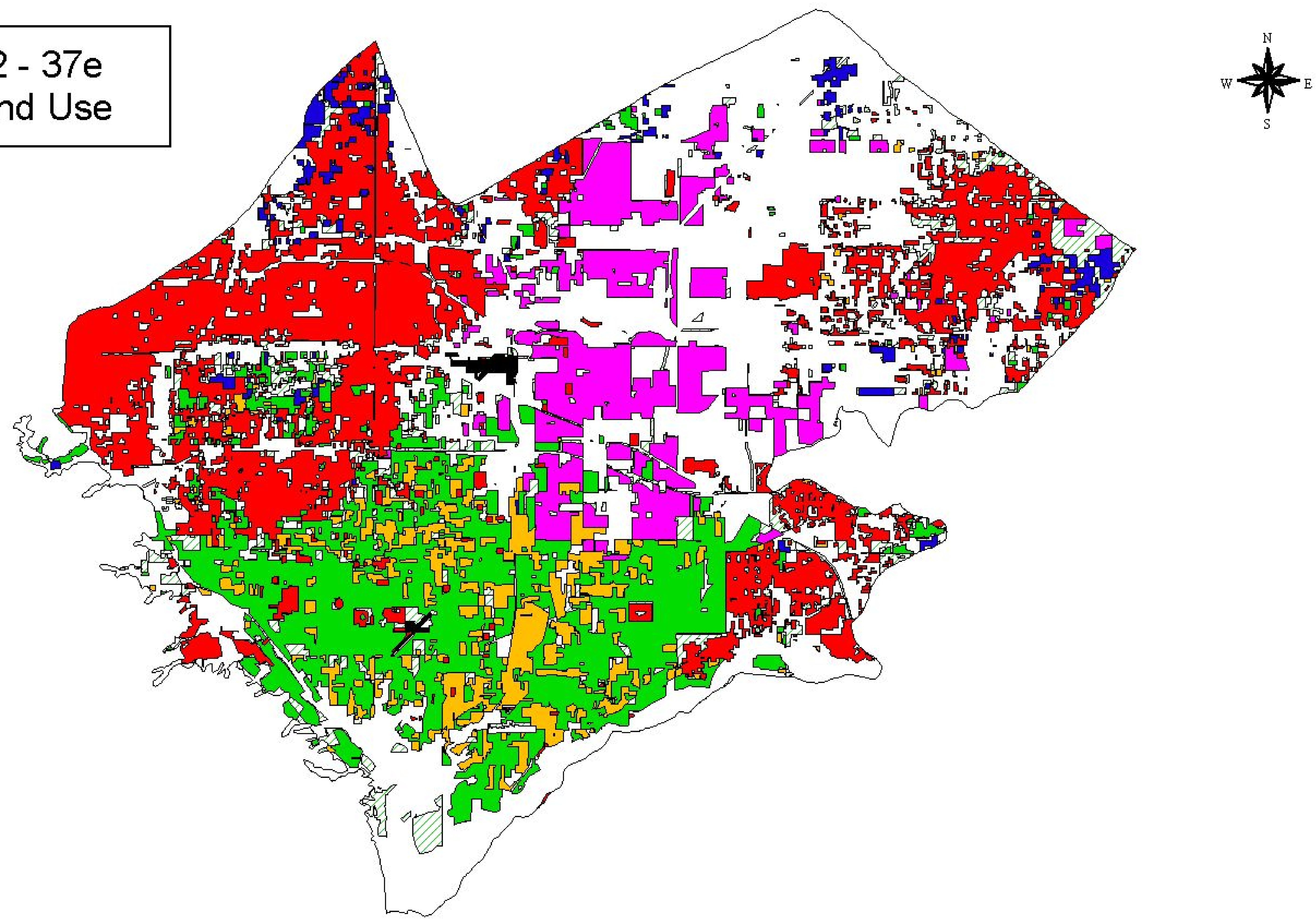


Figure 2 - 37e
1975 Land Use

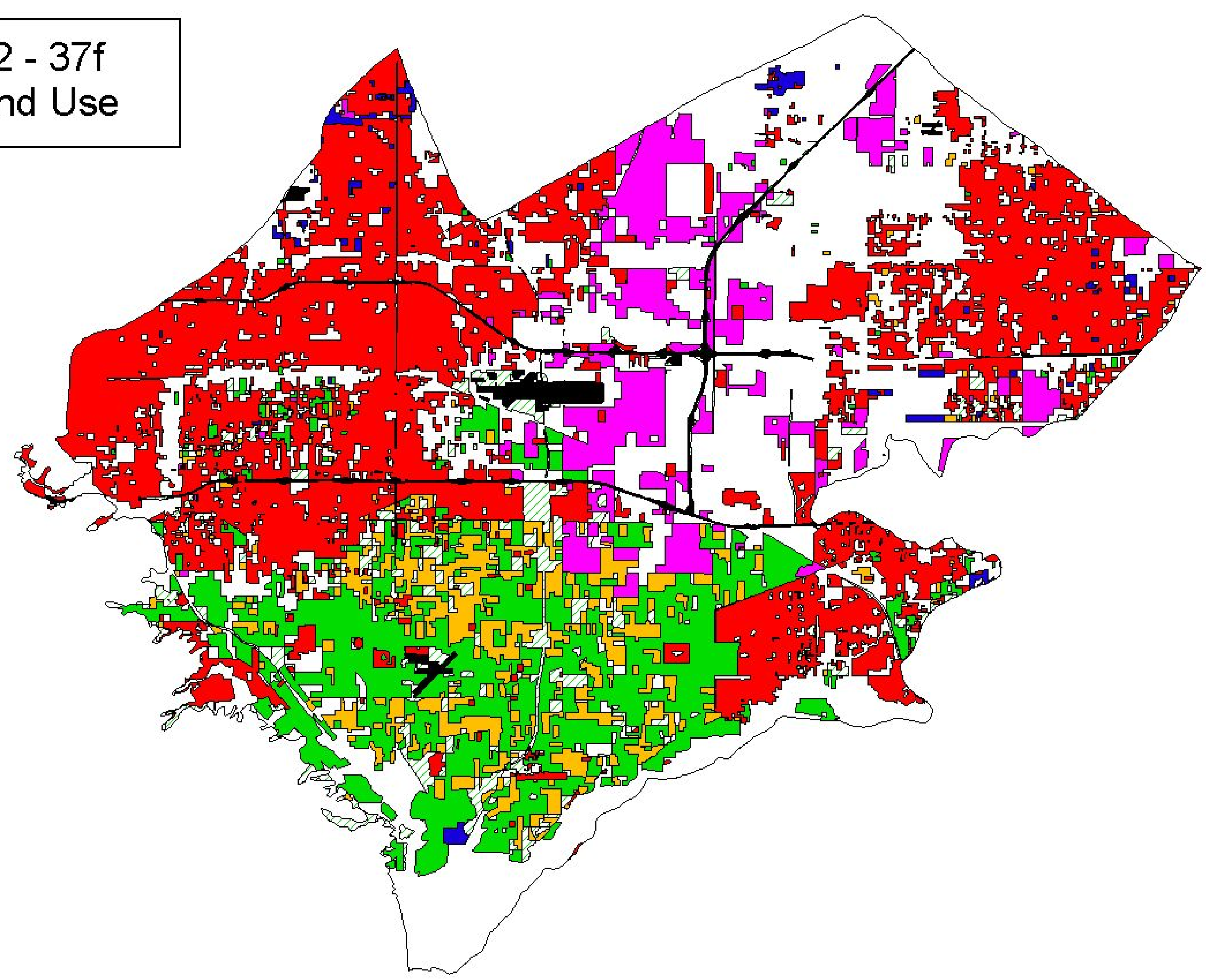


Figure 2 - 37f
1984 Land Use

- Non-Irrigated Fieldcrops, Pasture
- Irrigated Fieldcrops, Pasture
- Irrigated and Non-Irrigated Citrus
- Irrigated Vineyards
- Non-Irrigated Vineyards
- Dairies and Feedlots
- Urban, Residential, Commercial, Industrial, and Vacant
- Native Vegetation
- Special Impervious

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

Figure 2 - 37g
1990 Land Use

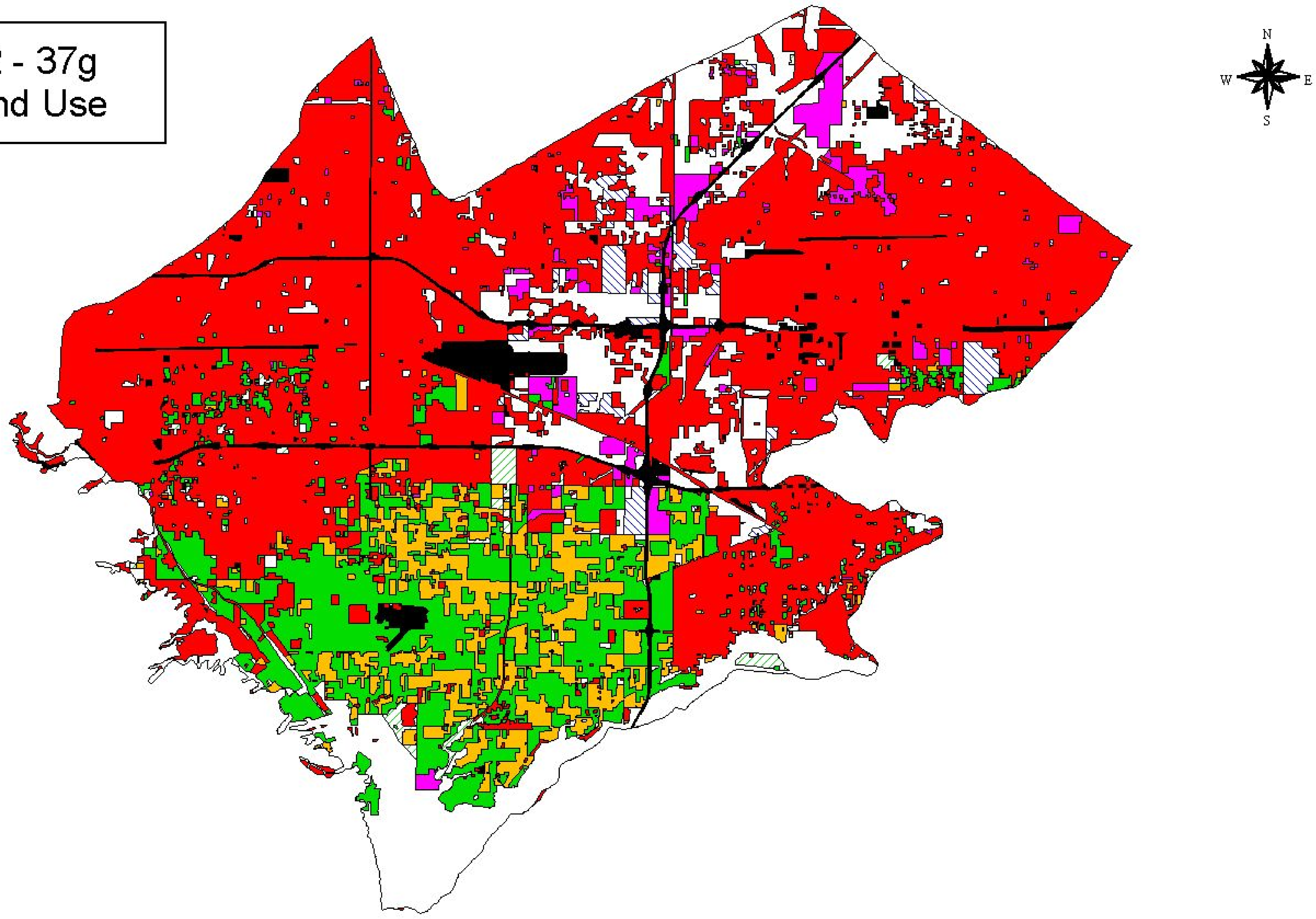
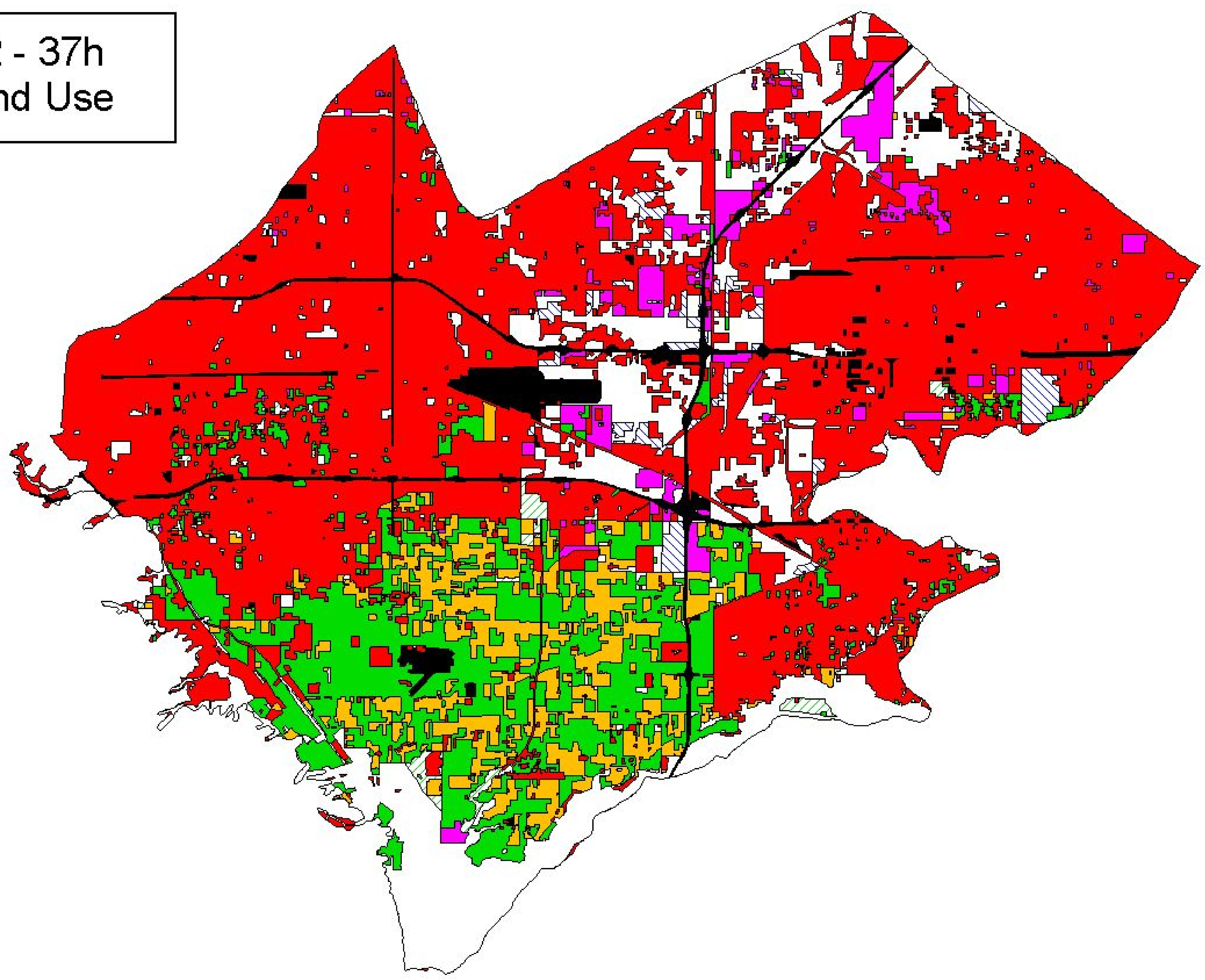


Figure 2 - 37h
1993 Land Use

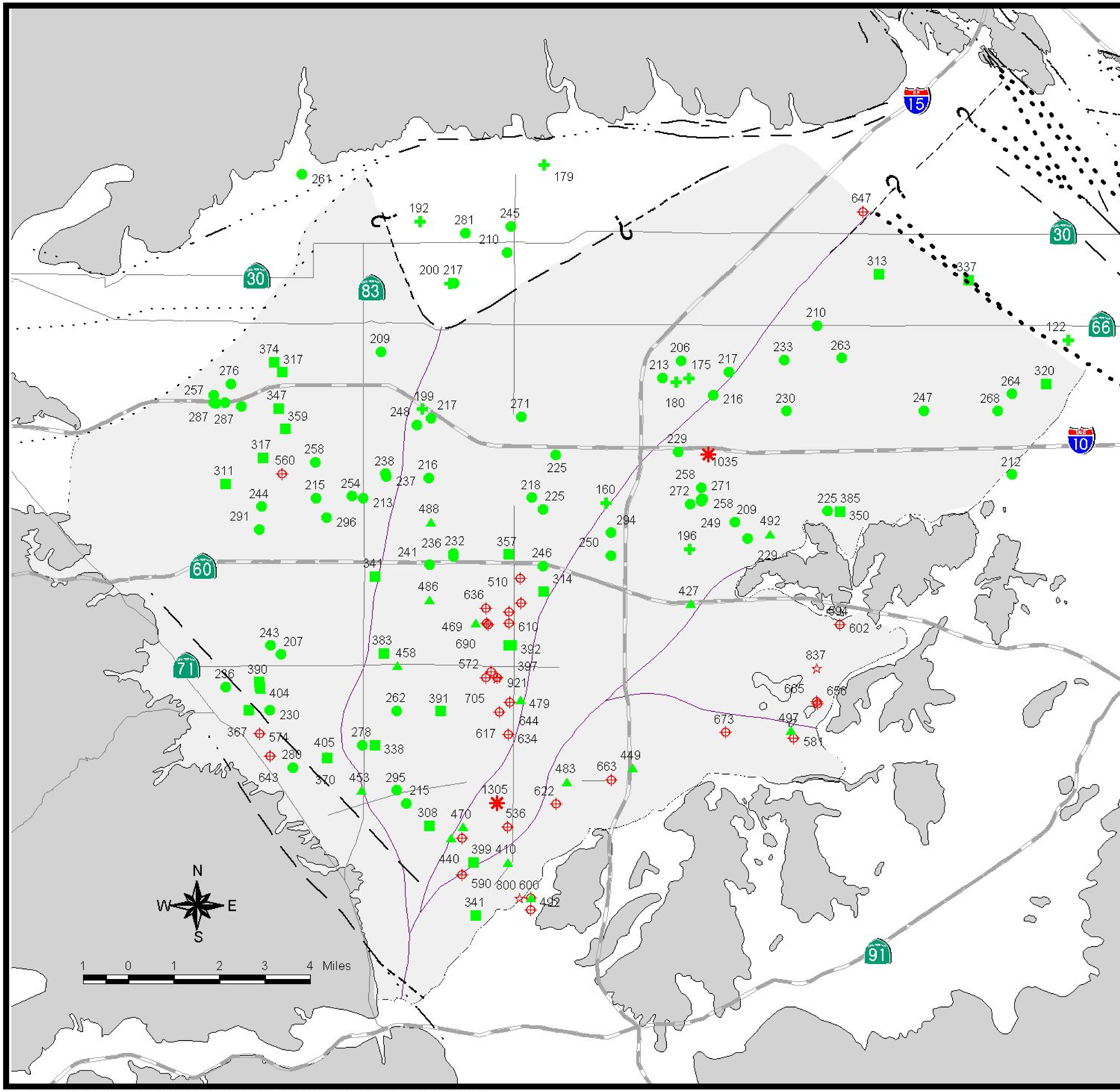


- Non-Irrigated Fieldcrops, Pasture
- Irrigated Fieldcrops, Pasture
- Irrigated and Non-Irrigated Citrus
- Irrigated Vineyards
- Non-Irrigated Vineyards
- Dairies and Feedlots
- Urban, Residential, Commercial, Industrial, and Vacant
- Native Vegetation
- Special Impervious

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

Optimum Basin Management Program
Chino Basin Watermaster



Legend

- <200 mg/L TDS
- 201 - 300 mg/L
- 301 - 400 mg/L
- 401 - 500 mg/L
- 501 - 750 mg/L
- 751 - 1000 mg/L
- >1000 mg/L

Management Zone Index Map

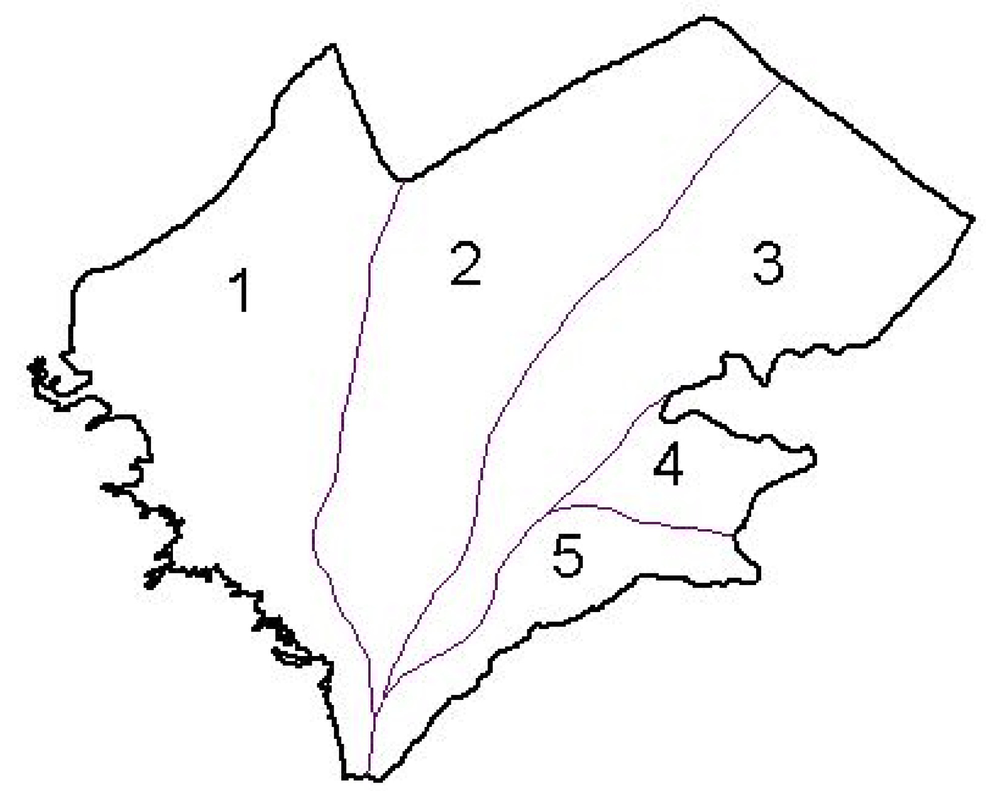


Figure 2-38

Average TDS Concentrations (mg/l) in the Chino Basin -- 1961 to 1965

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

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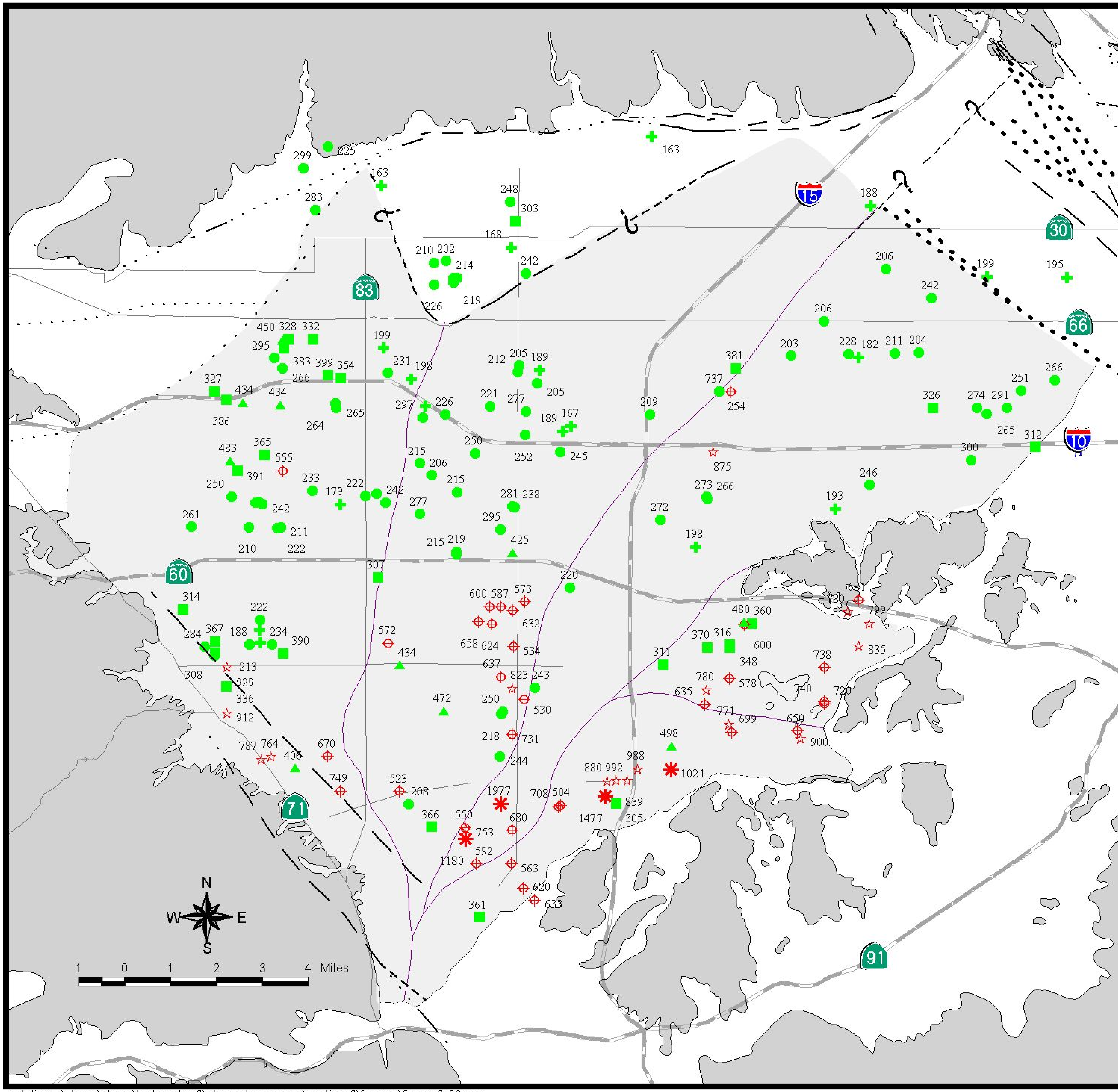
Optimum Basin Management Program
Chino Basin Watermaster



Legend

- <200 mg/L TDS
- 201 - 300 mg/L
- 301 - 400 mg/L
- 401 - 500 mg/L
- 501 - 750 mg/L
- 751 - 1000 mg/L
- >1000 mg/L

Management Zone Index Map

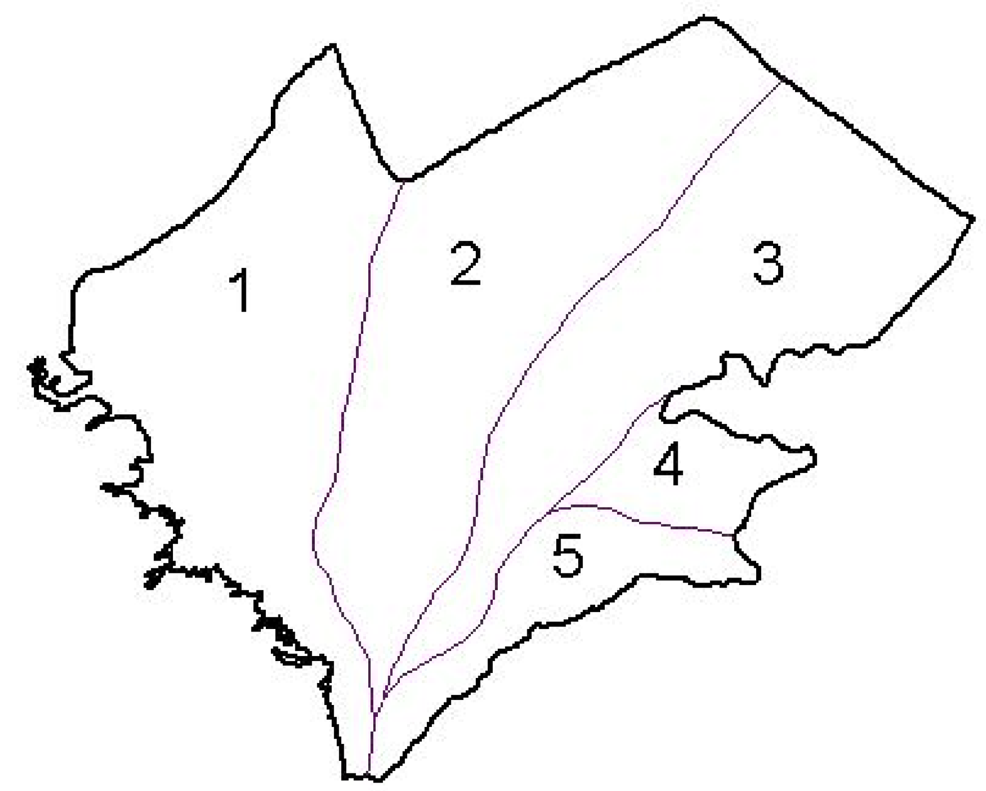


Figure 2-39

Average TDS Concentrations (mg/l) in the Chino Basin -- 1971 to 1975

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-39.apr

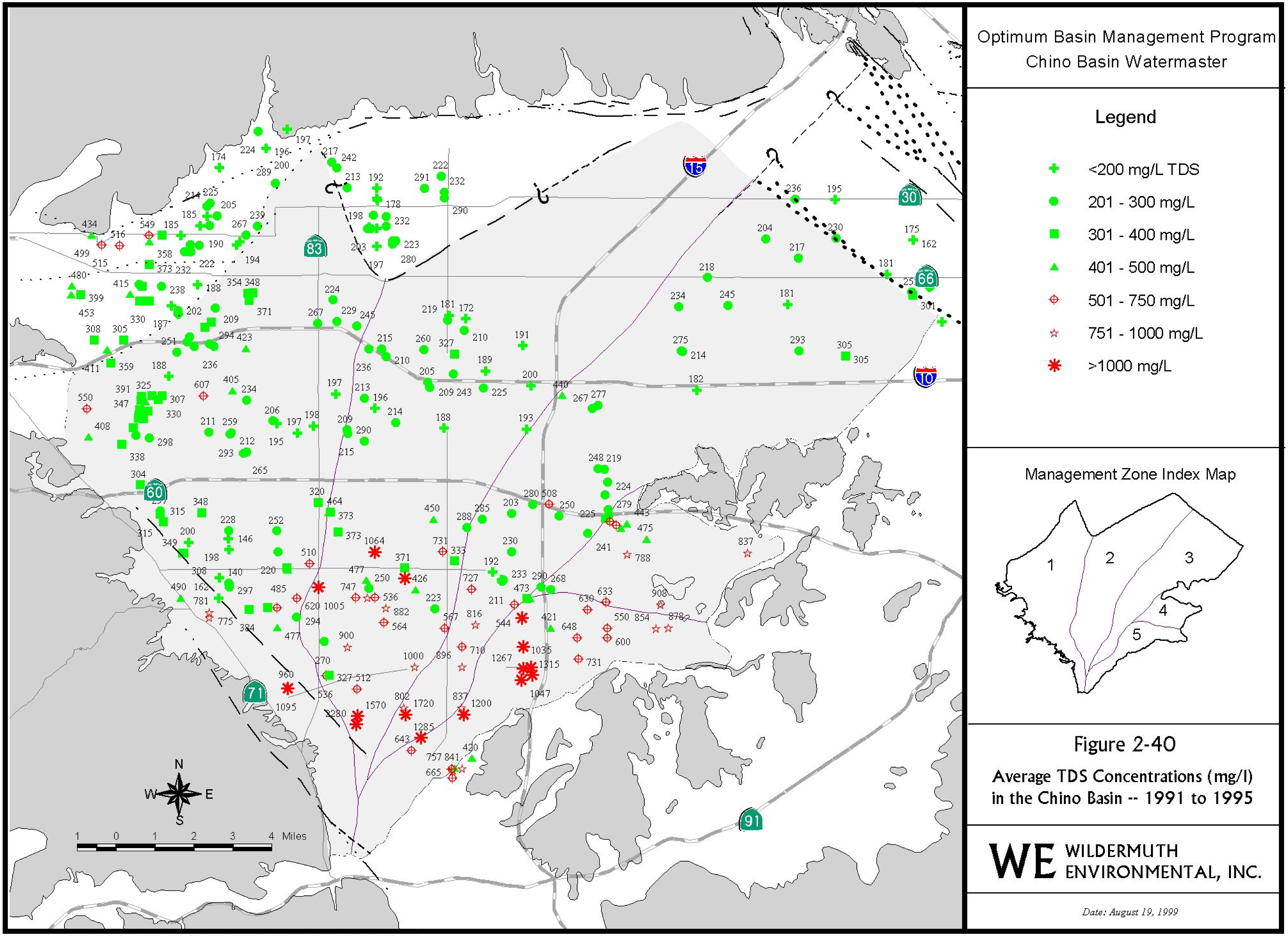
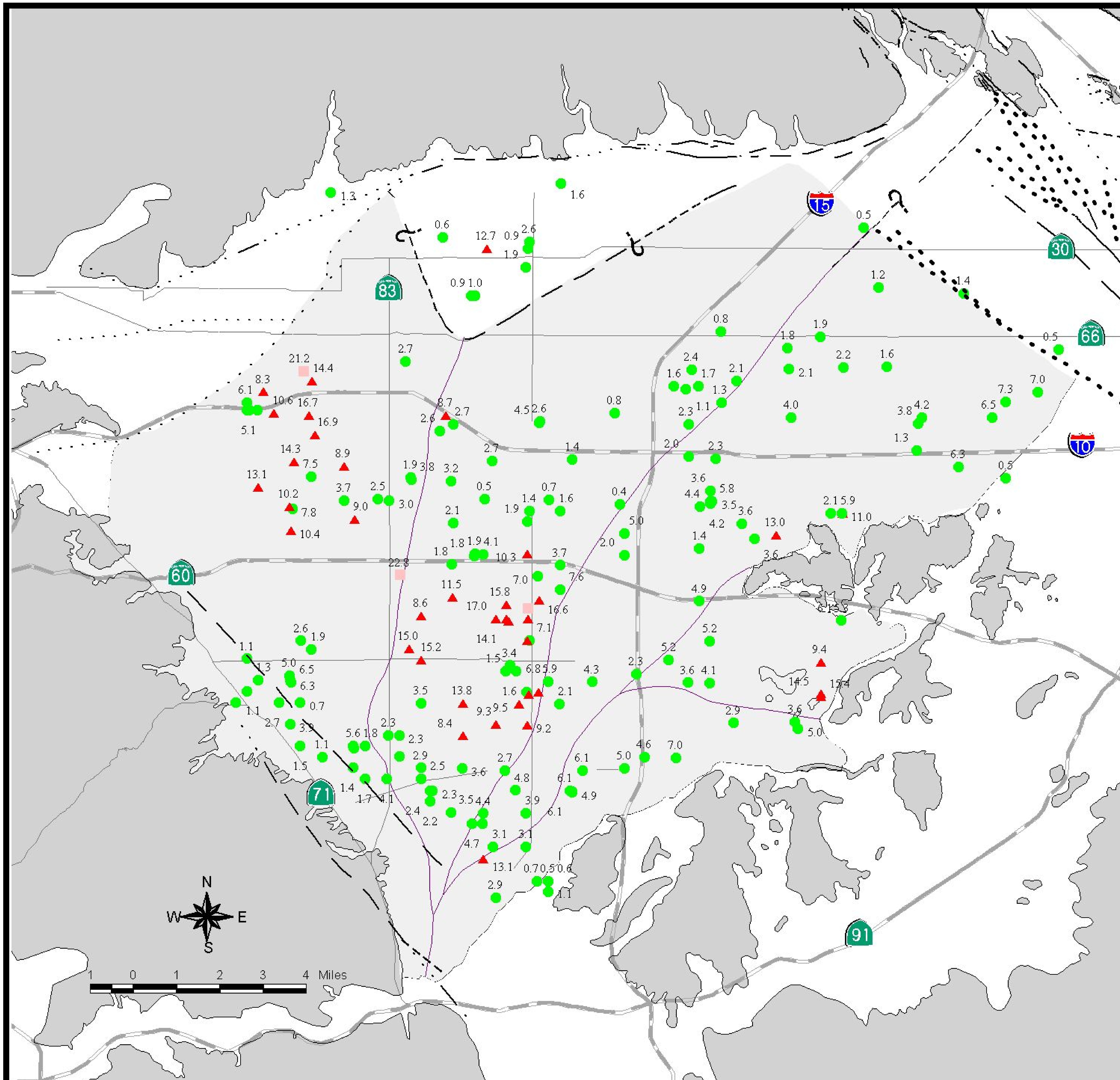


Figure 2-40

Average TDS Concentrations (mg/l) in the Chino Basin -- 1991 to 1995

Optimum Basin Management Program
Chino Basin Watermaster



Legend

- < 8.0 mg/L NO3-N
- 8.0 - 20.0 mg/L
- 20.0+ mg/L

Note: MCL = 10 mg/L

Management Zone Index Map

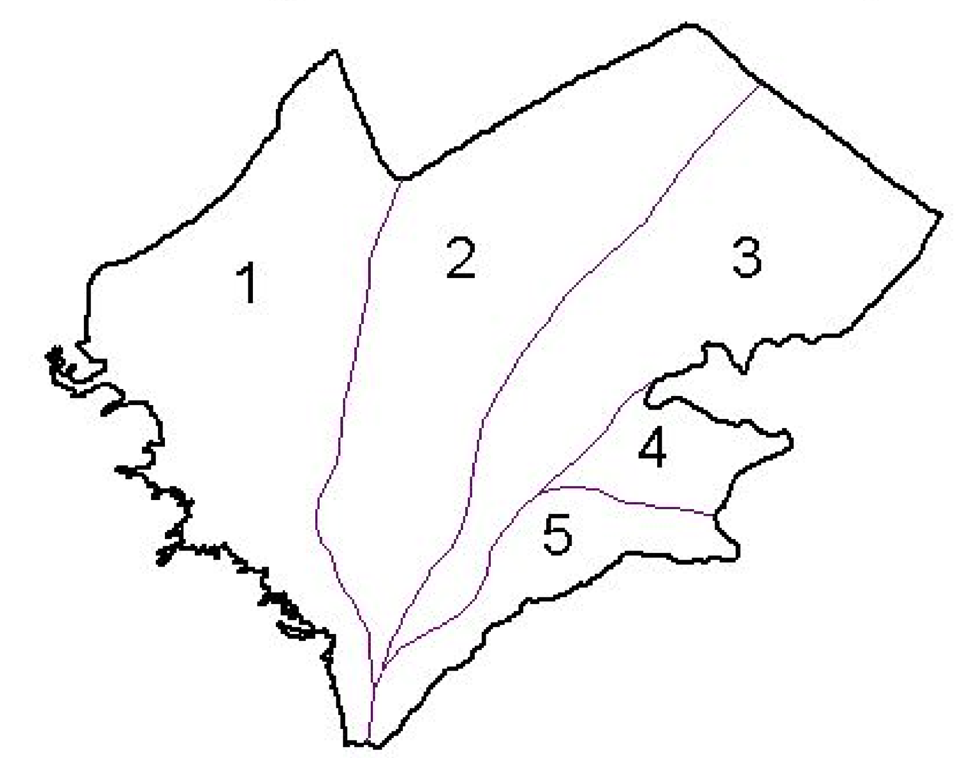


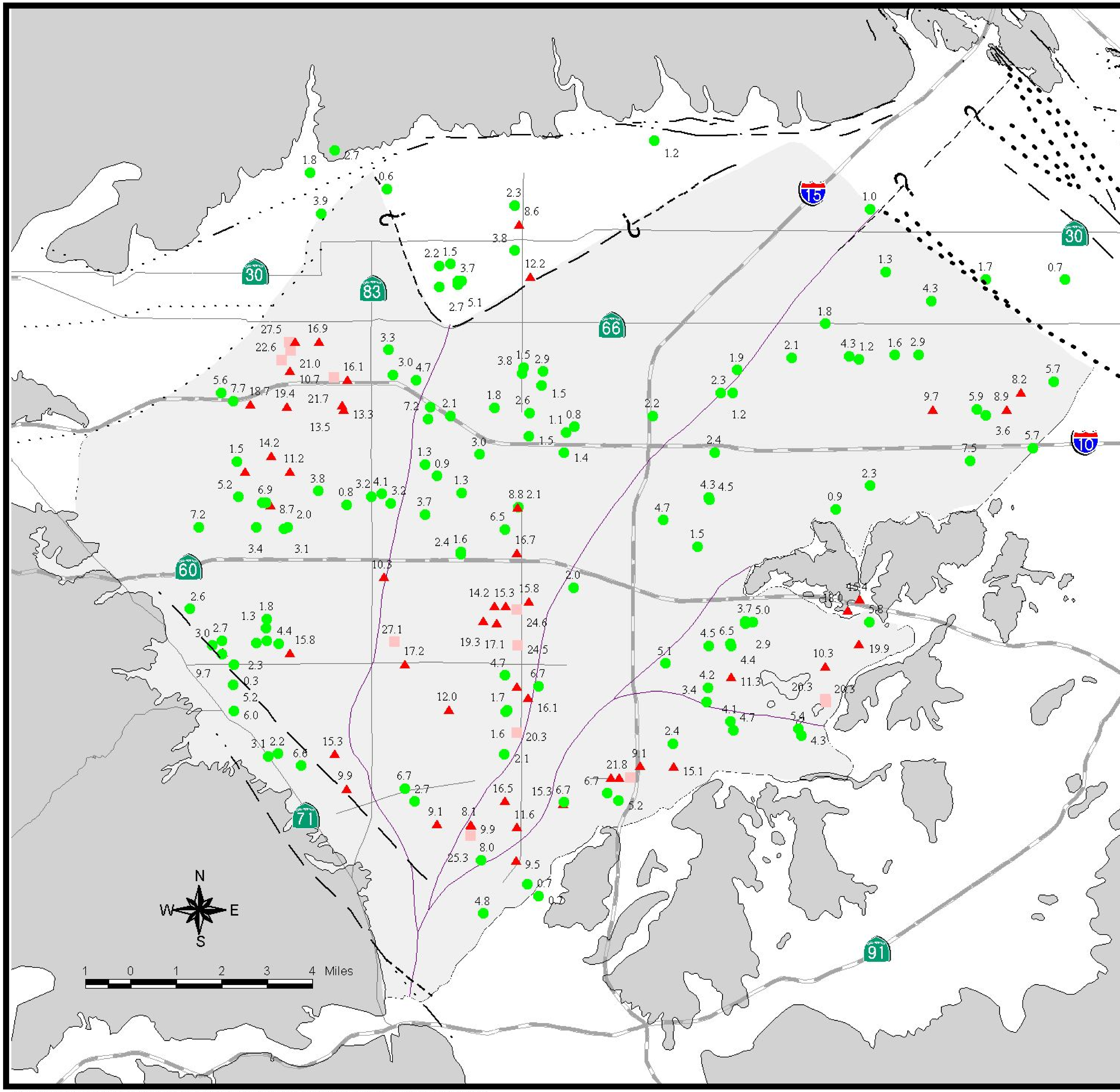
Figure 2-41

Average Nitrate-N Concentrations (mg/l) in the Chino Basin -- 1961 to 1965

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-41.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- < 8.0 mg/L NO3-N
- 8.0 - 20.0 mg/L
- 20.0+ mg/L

Note: MCL = 10 mg/L

Management Zone Index Map

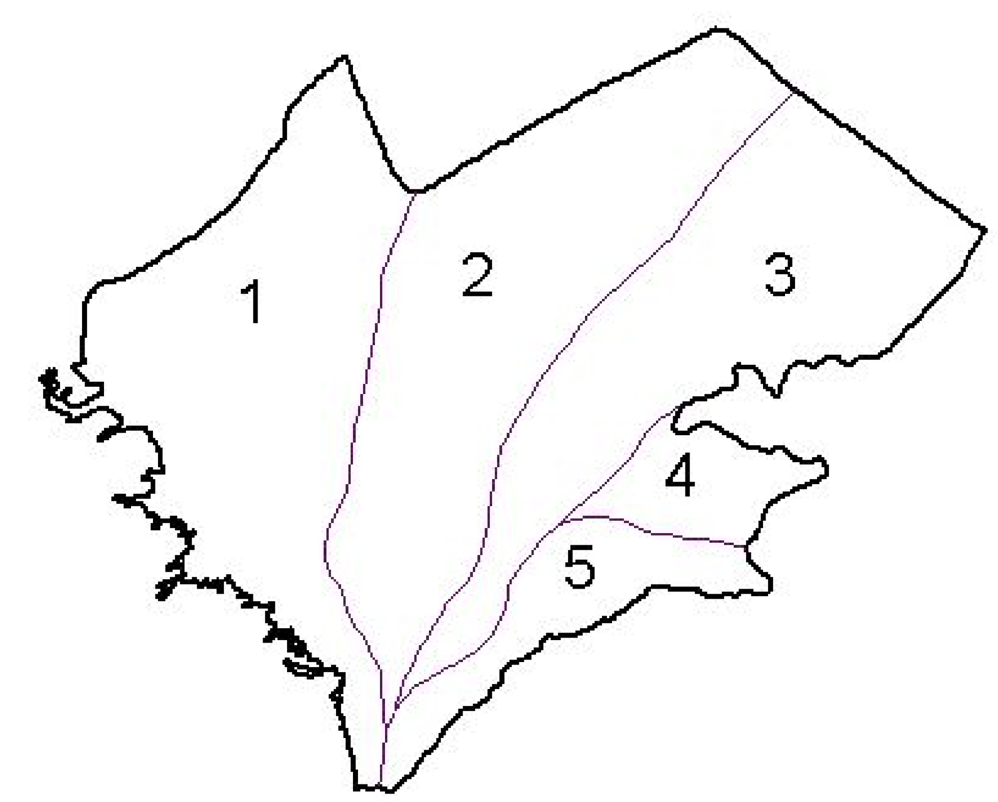


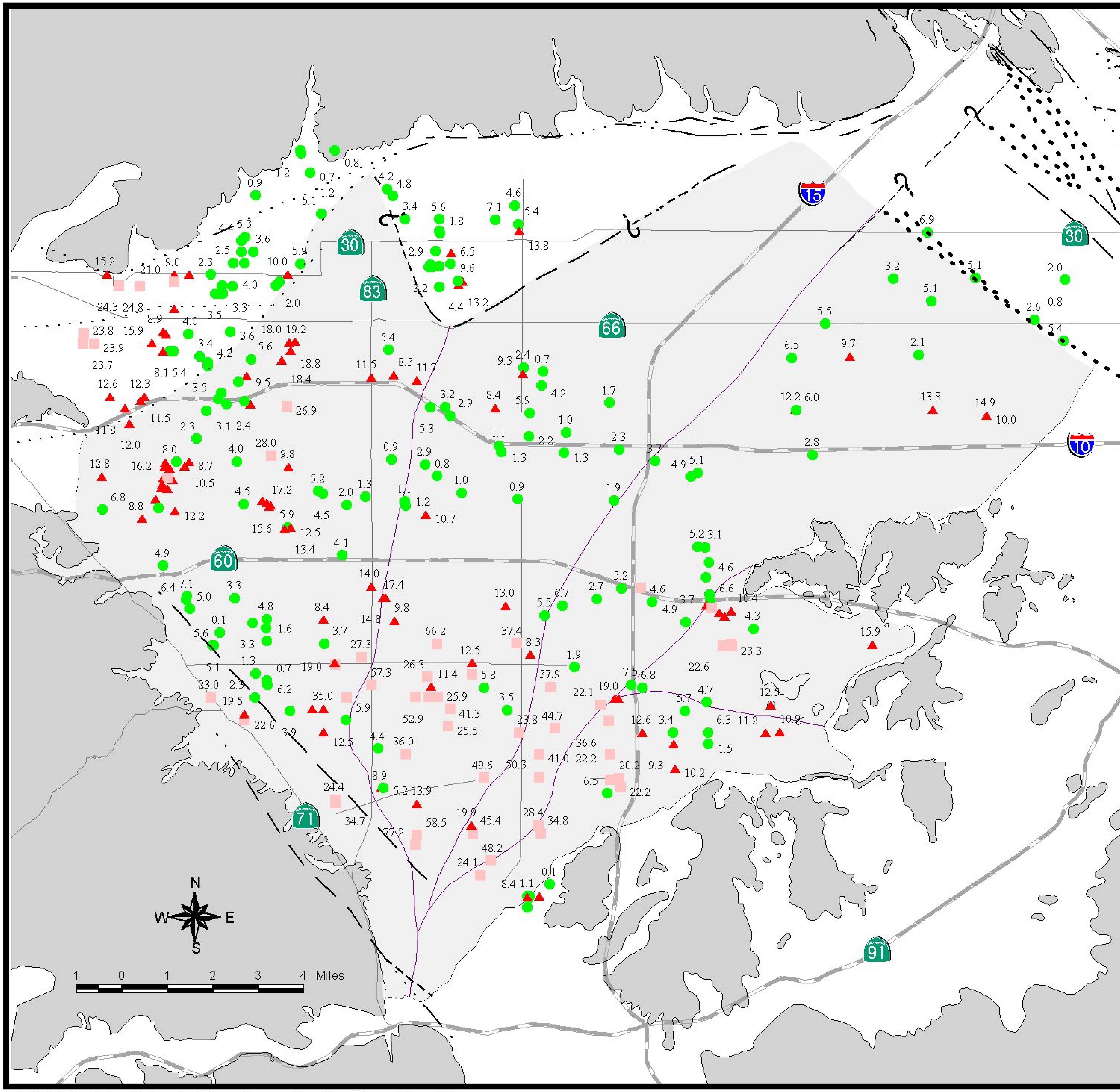
Figure 2-42

Average Nitrate-N Concentrations (mg/l) in the Chino Basin -- 1971 to 1975

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-42.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- < 8.0 mg/L NO3-N
- 8.0 - 20.0 mg/L
- 20.0+ mg/L

Note: MCL = 10 mg/L

Management Zone Index Map

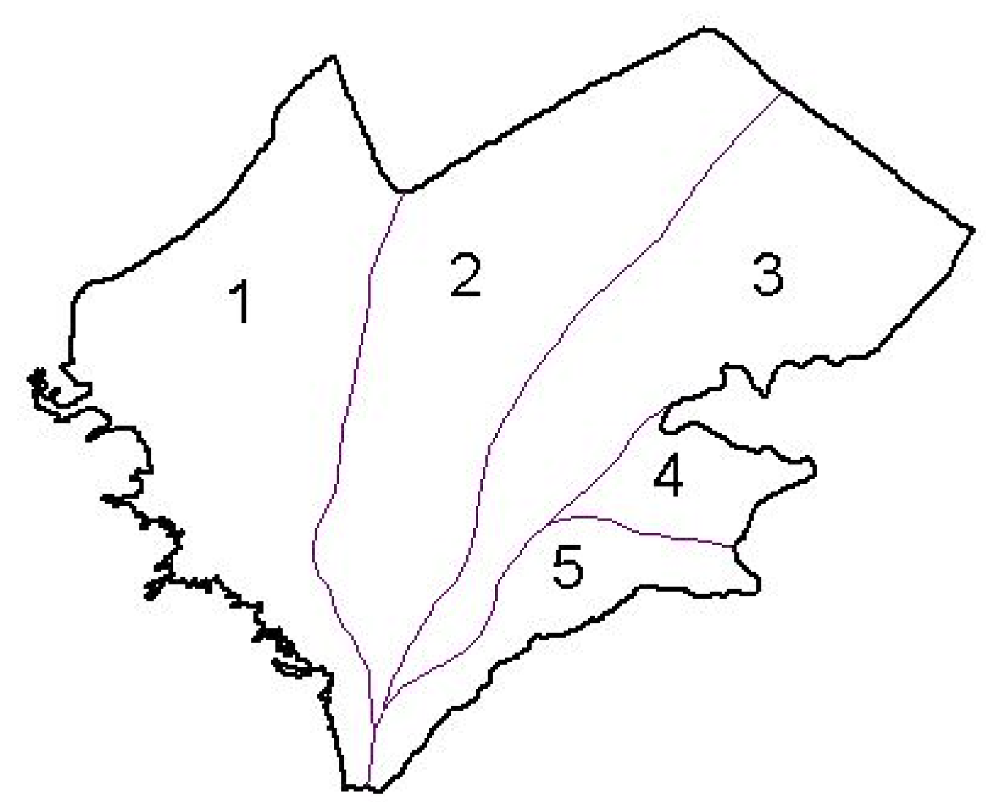
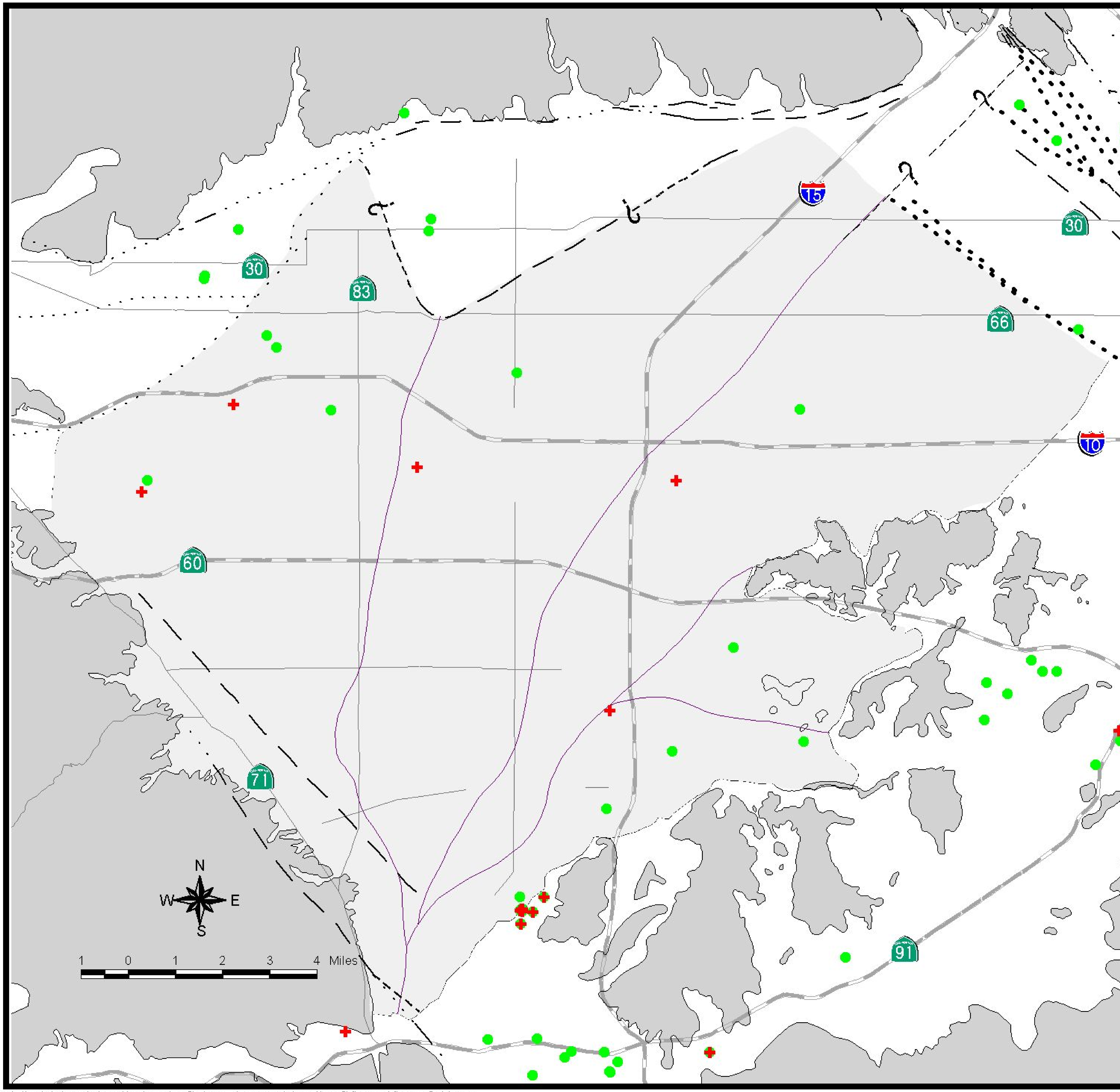


Figure 2-43

Average Nitrate-N Concentrations (mg/l) in the Chino Basin -- 1991 to 1995

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999



Optimum Basin Management Program
Chino Basin Watermaster

Legend

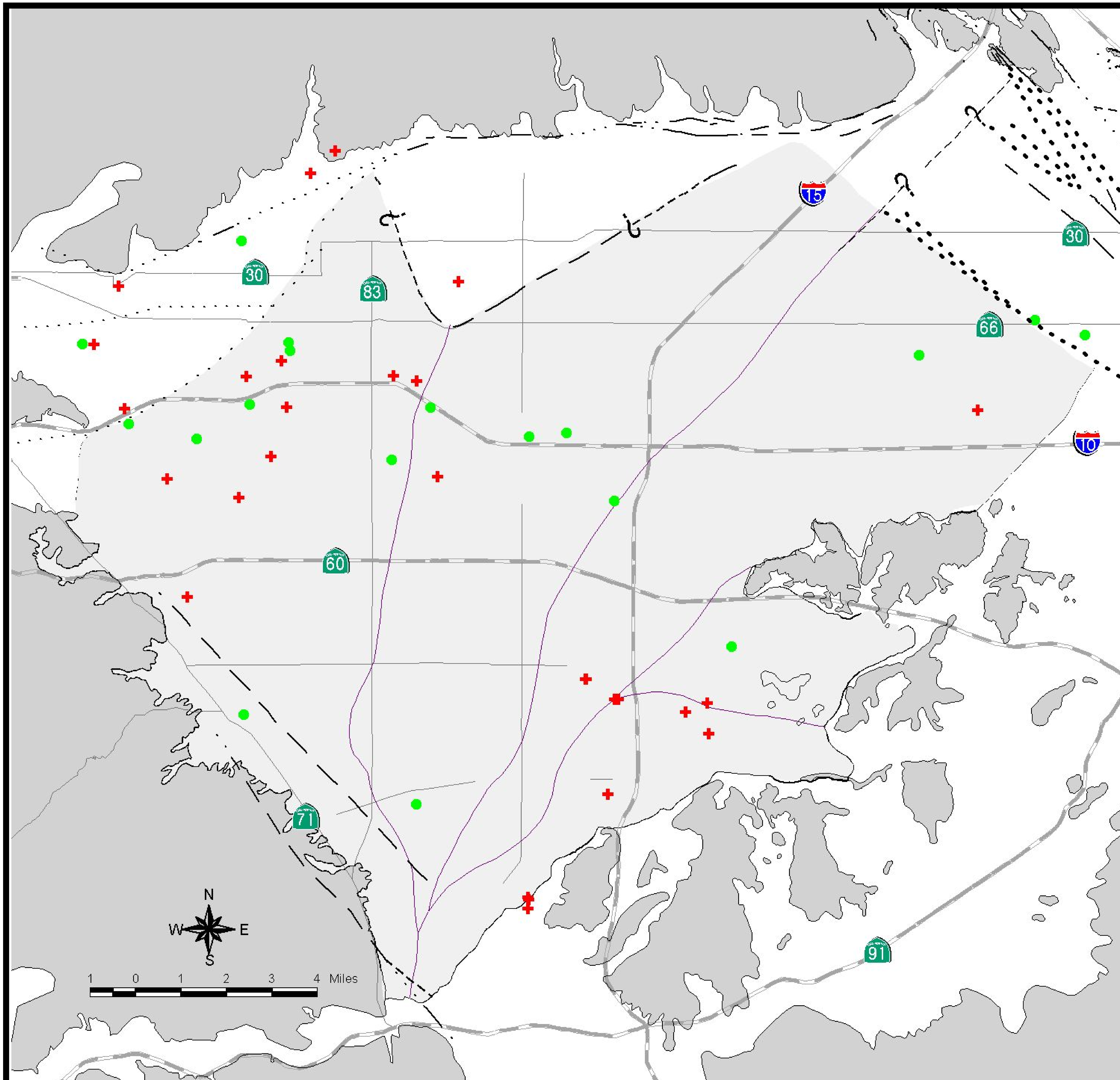
- Over 1/2 MCL (0.7 mg/l)
- Over MCL (1.4 mg/l)

Figure 2-44
Wells with One or More Historical Fluoride Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-44.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Over 1/2 MCL (0.15 mg/l)
- Over MCL (0.3 mg/l)

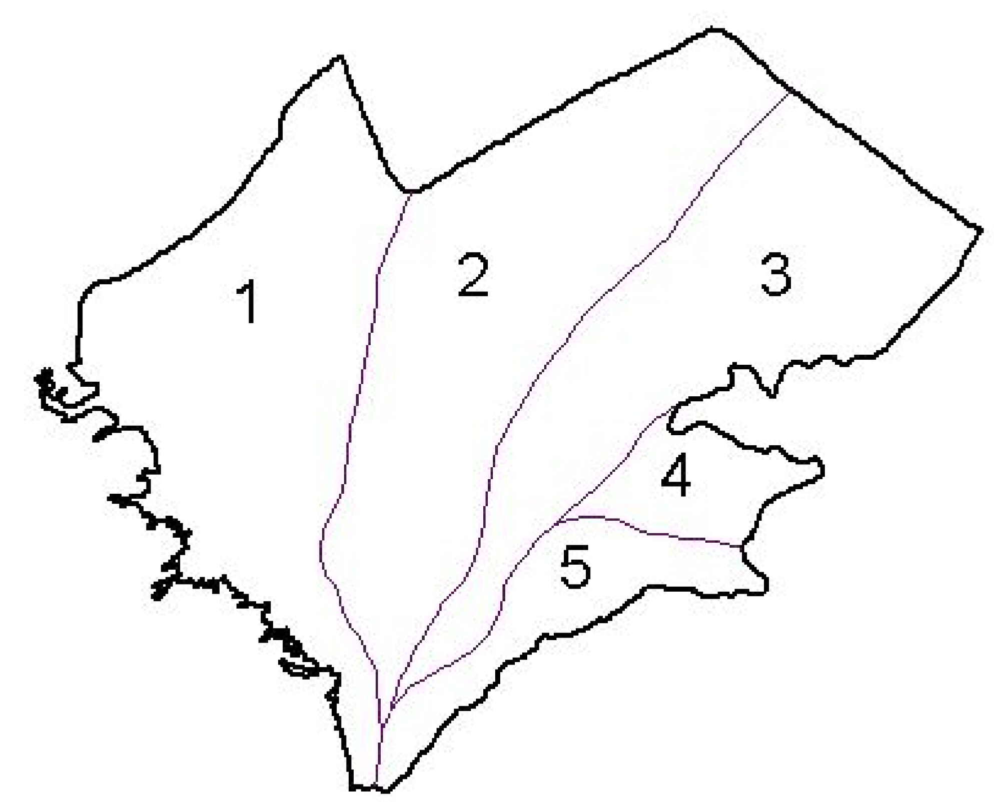
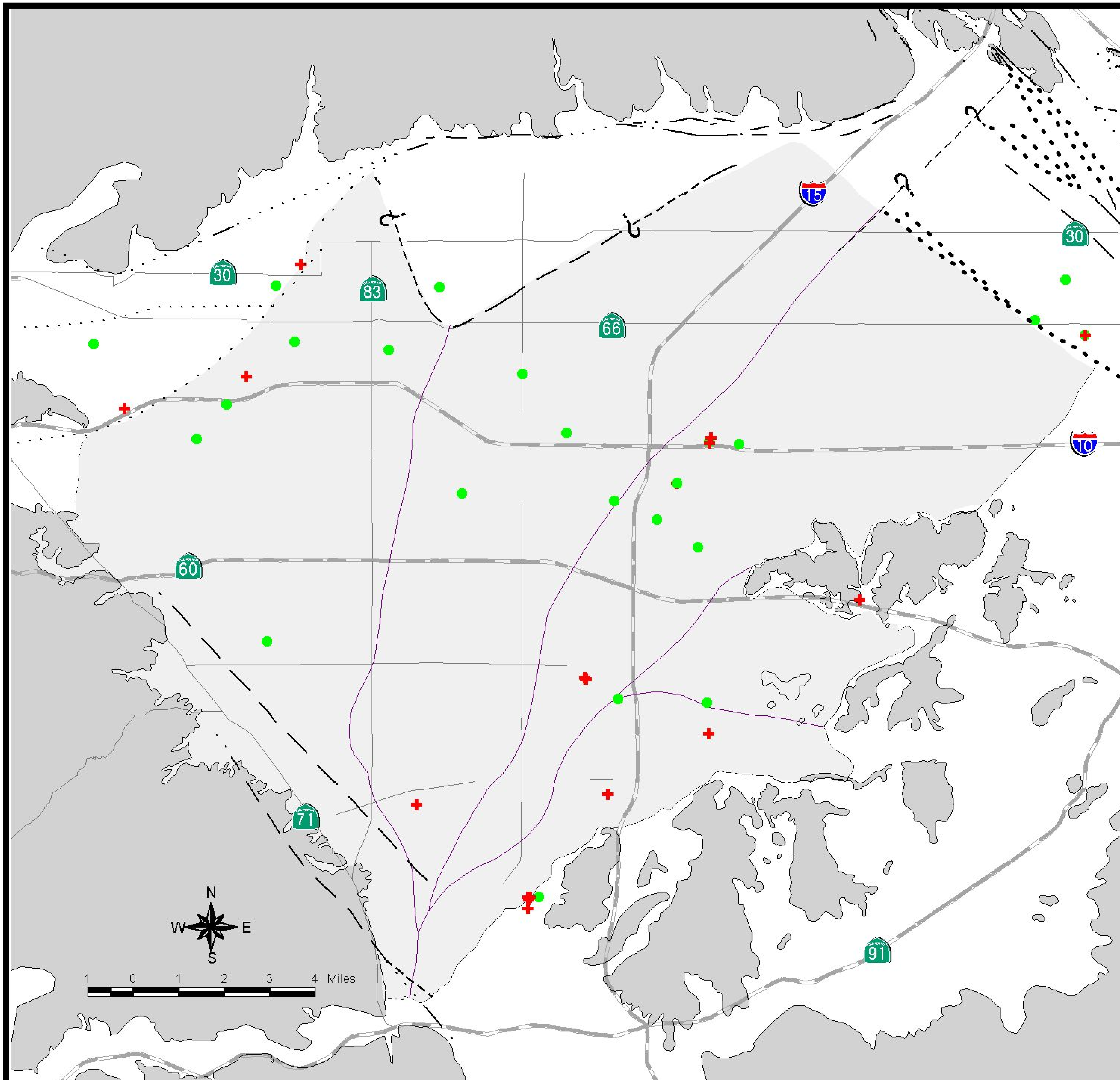


Figure 2-45
Wells with One or More Historical Iron Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-45.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Over 1/2 MCL (0.025 mg/l)
- Over MCL (0.05 mg/l)

Management Zone Index Map

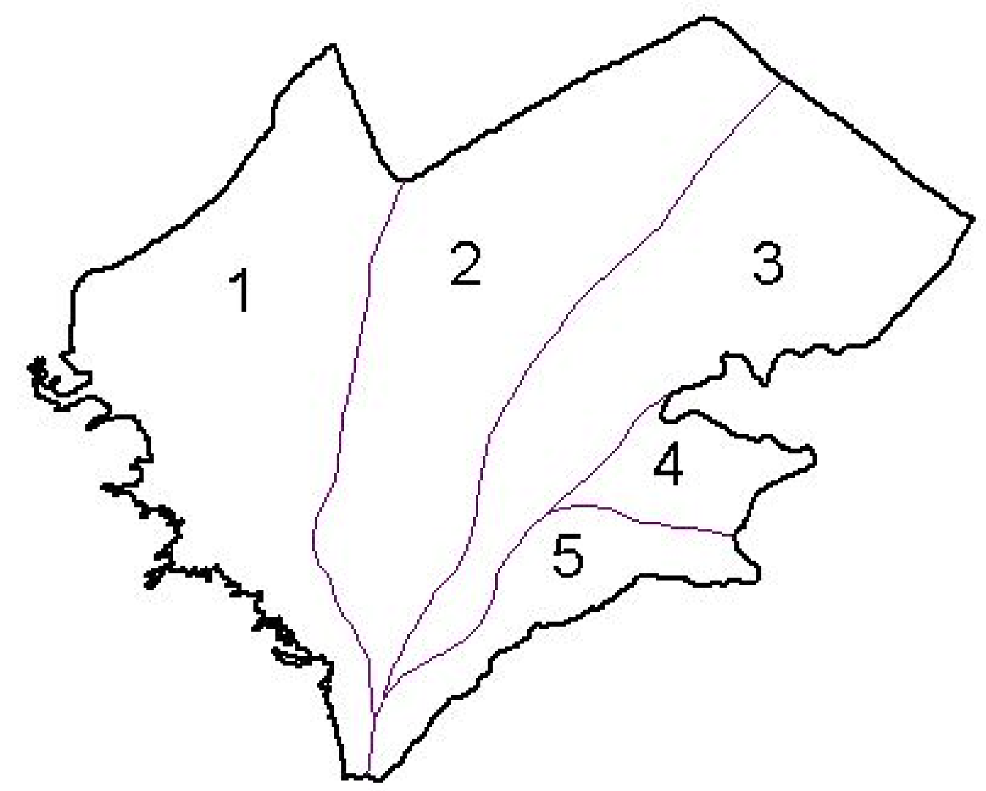
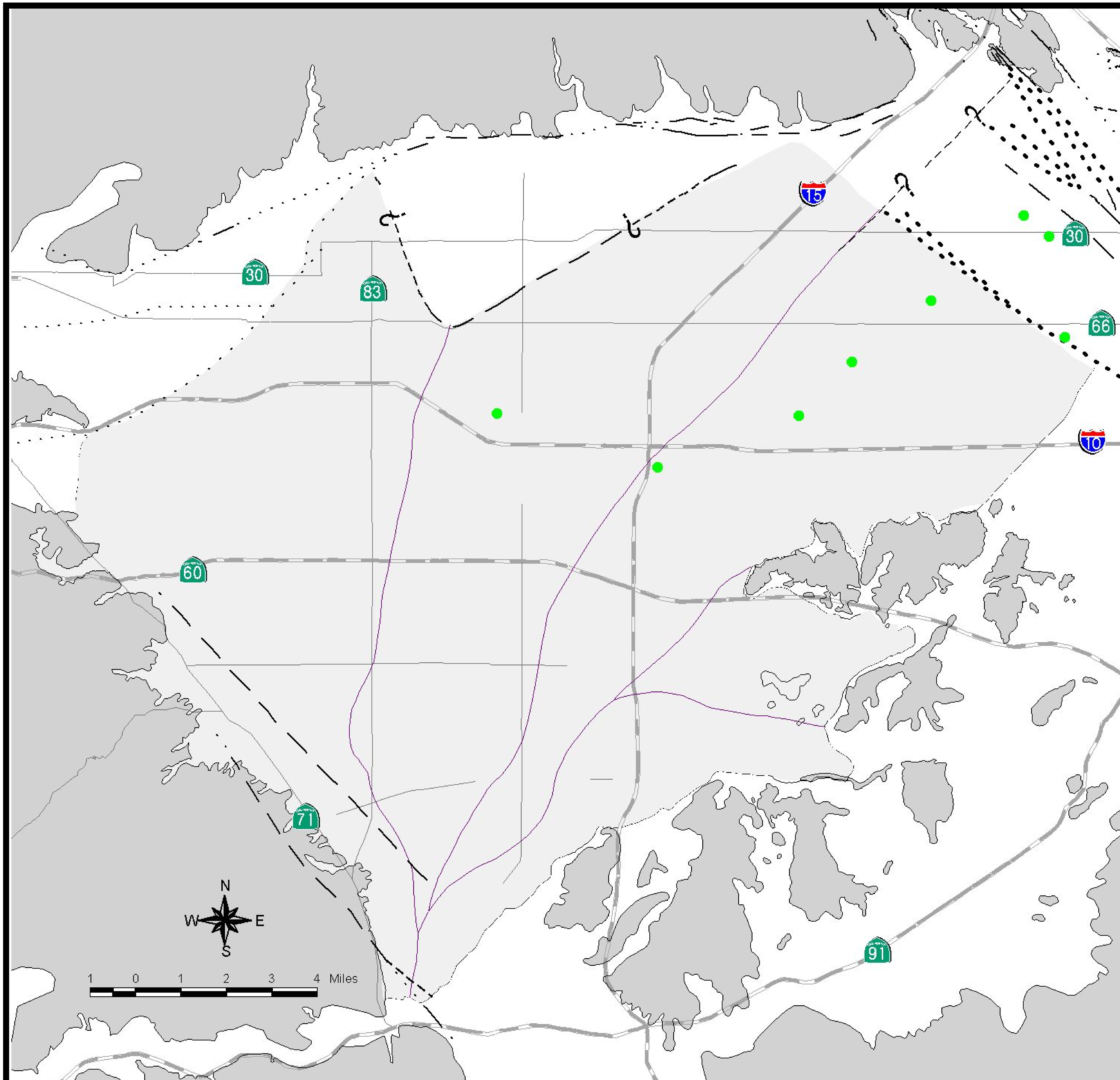


Figure 2-46
Wells with One or More Historical Manganese Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-46.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

Over MCL

Management Zone Index Map

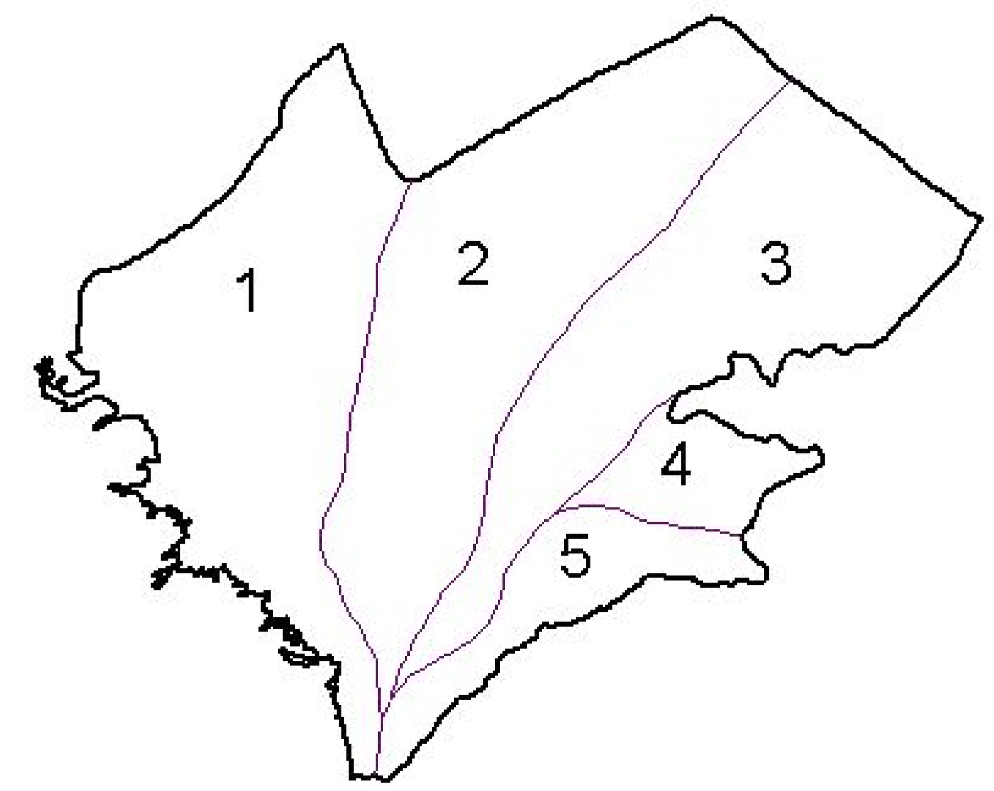
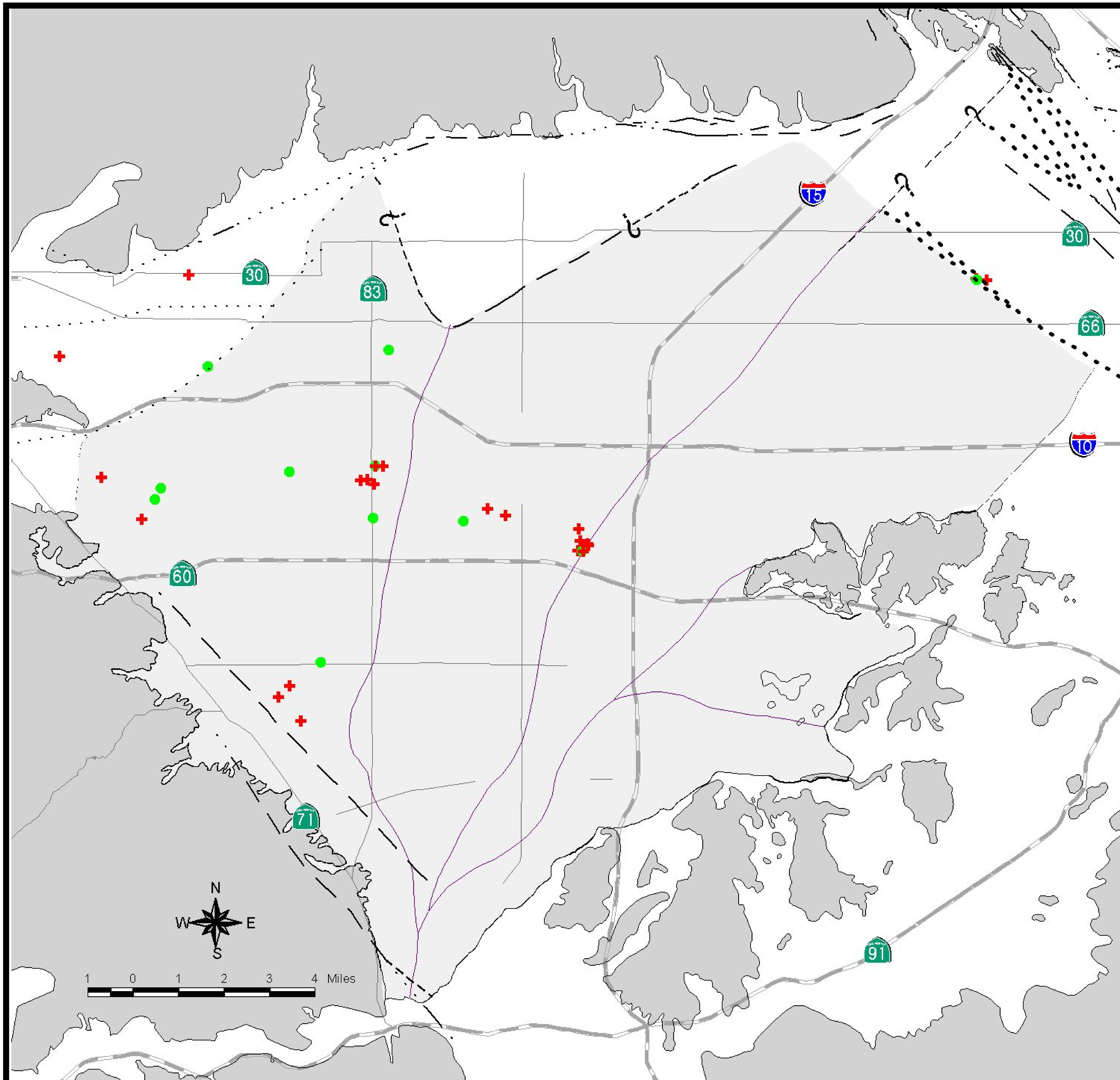


Figure 2-47
Wells with One or More Historical Perchlorate Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-47.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

Over 1/2 MCL (2.5 ug/l)
Over MCL (5.0 ug/l)

Management Zone Index Map

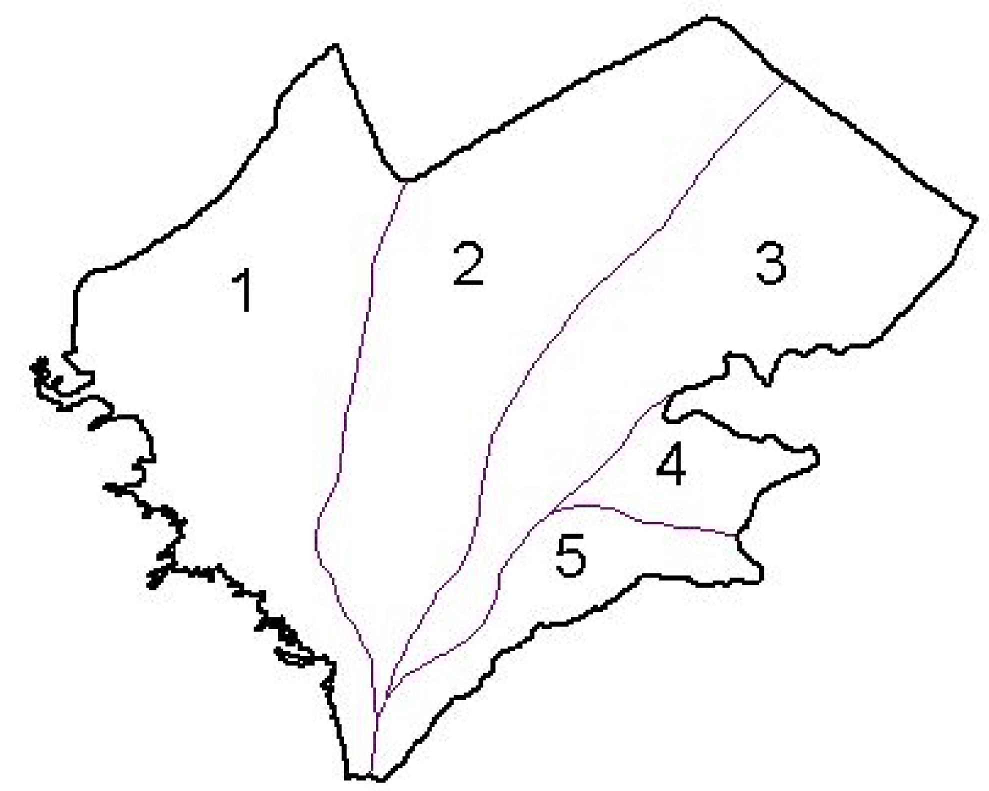


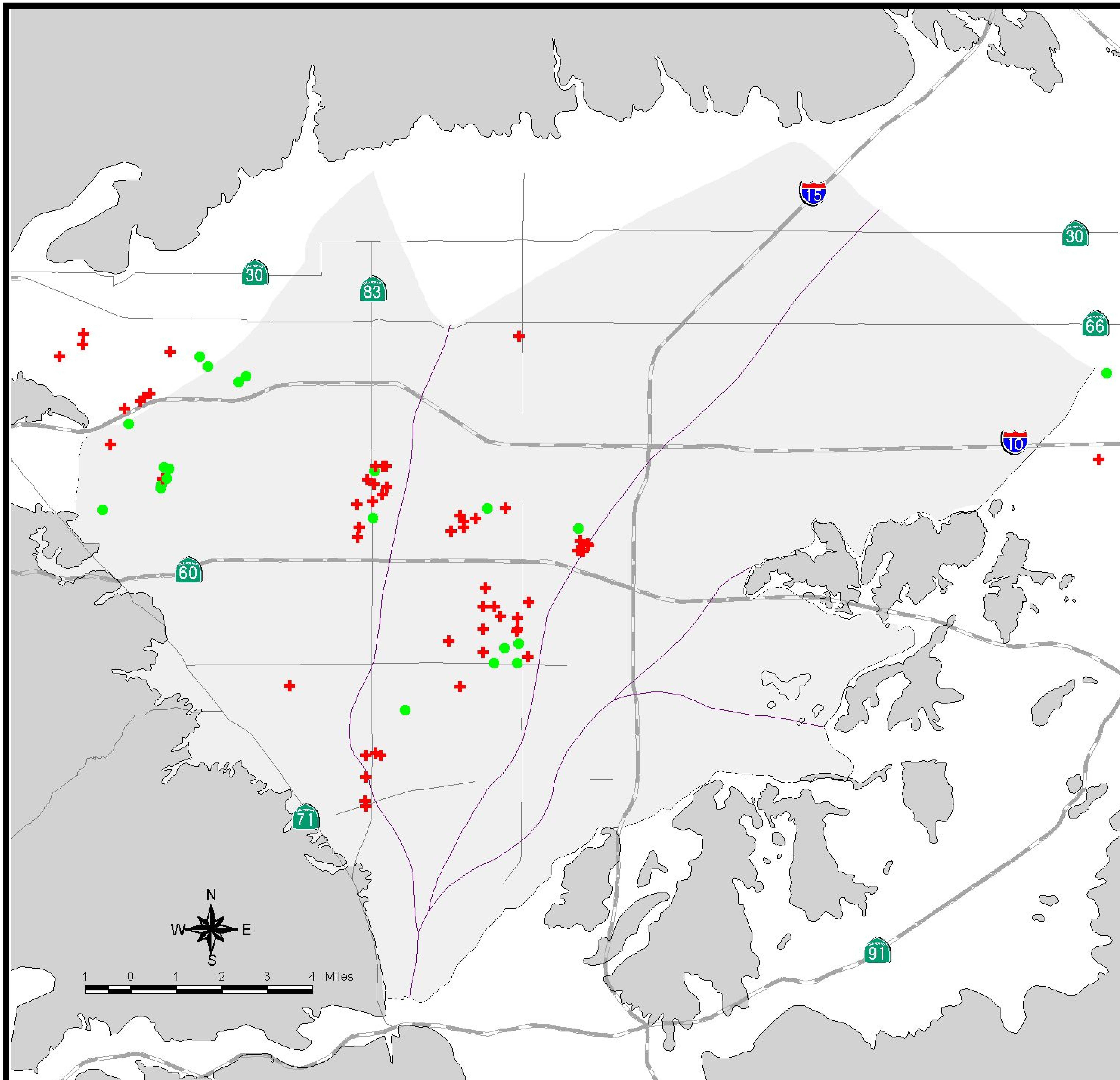
Figure 2-48
Wells with One or More Historical Tetrachloroethene Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-48.apr

Optimum Basin Management Program
Chino Basin Watermaster



Legend

- Over 1/2 MCL (2.5 ug/l)
- Over MCL (5.0 ug/l)

Management Zone Index Map

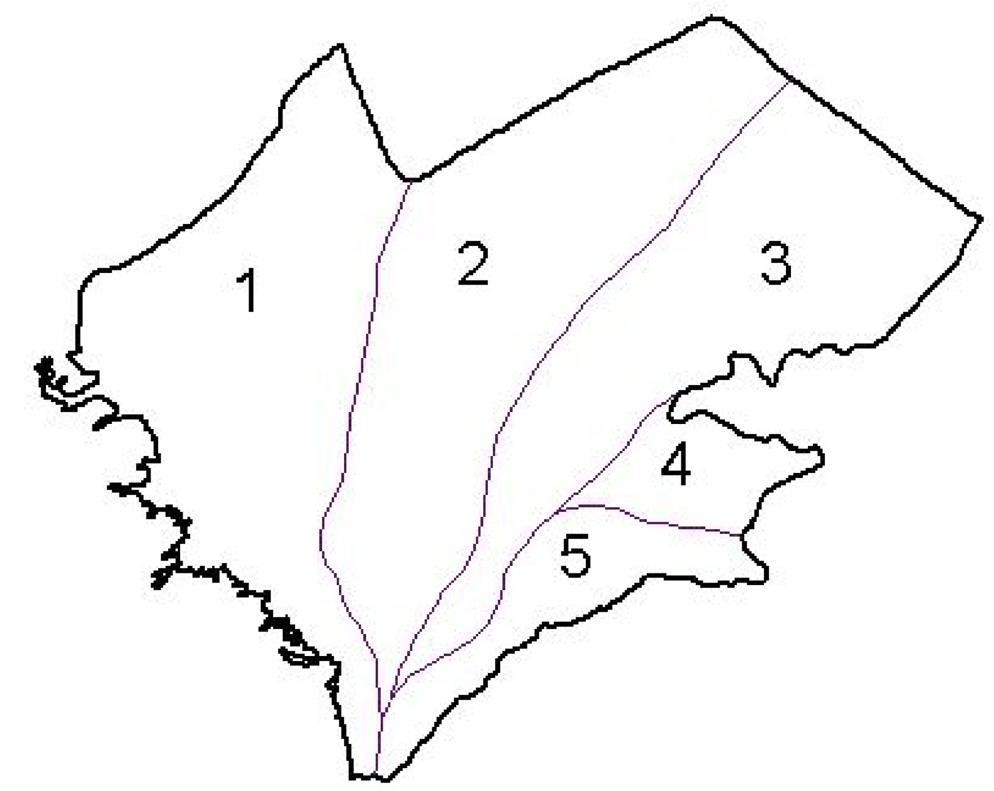
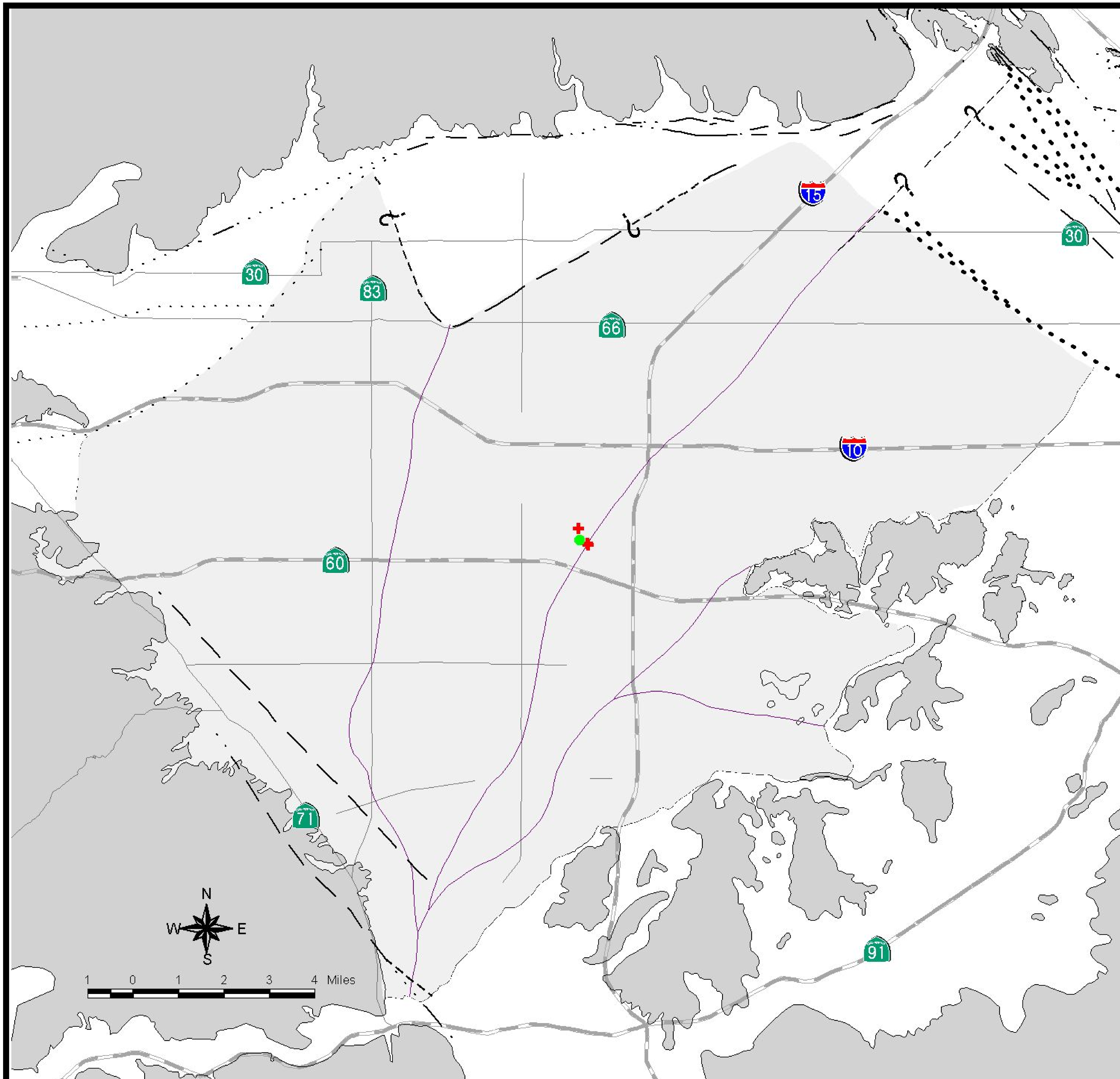


Figure 2-49
Wells with One or More Historical Trichloroethene Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-49.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Over 1/2 MCL (2.5 ug/l)
- Over MCL (5.0 ug/l)

Management Zone Index Map

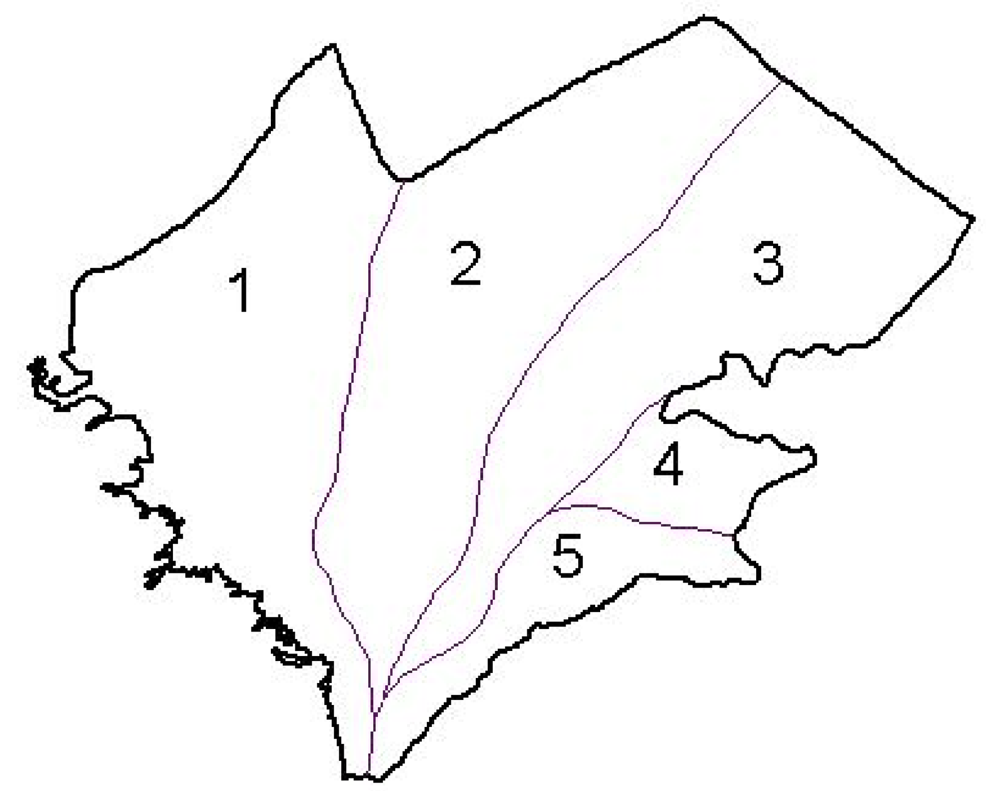
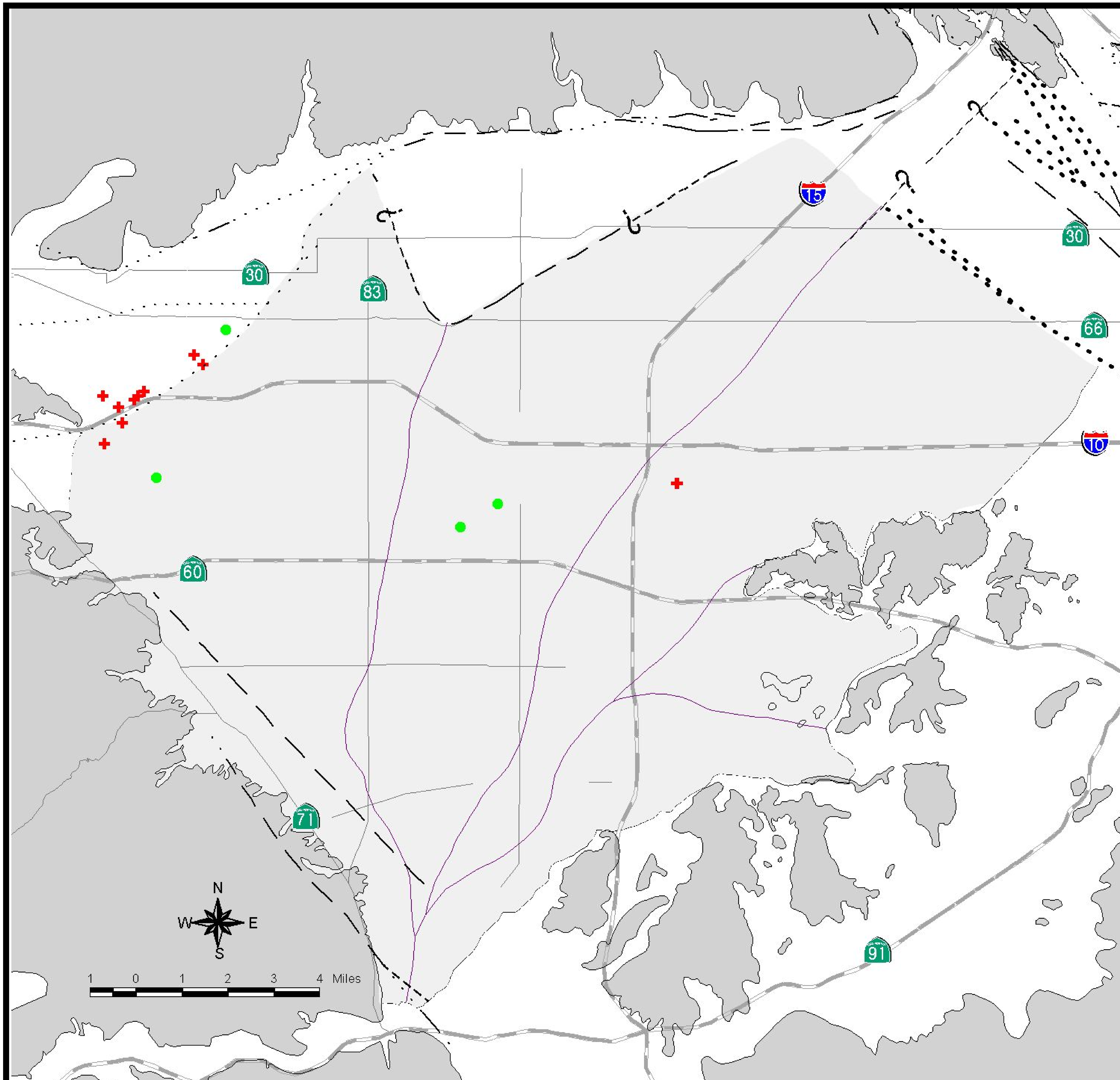


Figure 2-50
Wells with One or More Historical 1,1-Dichloroethane Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-50.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Over 1/2 MCL (3.0 ug/l)
- Over MCL (6.0 ug/l)

Management Zone Index Map

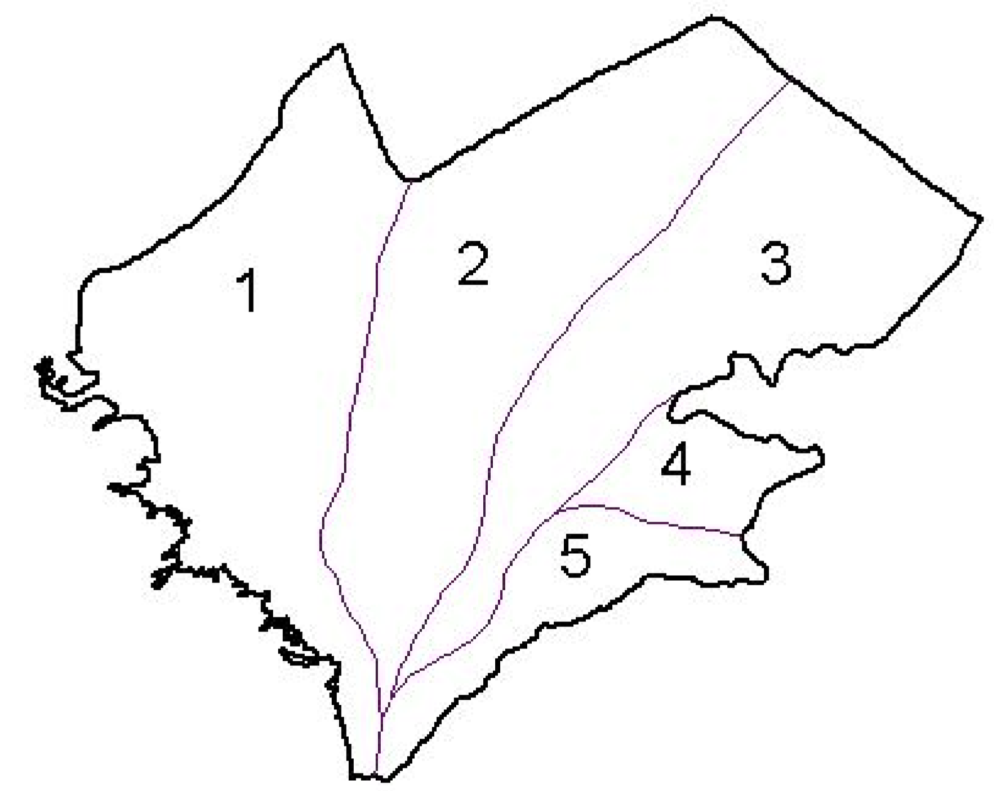
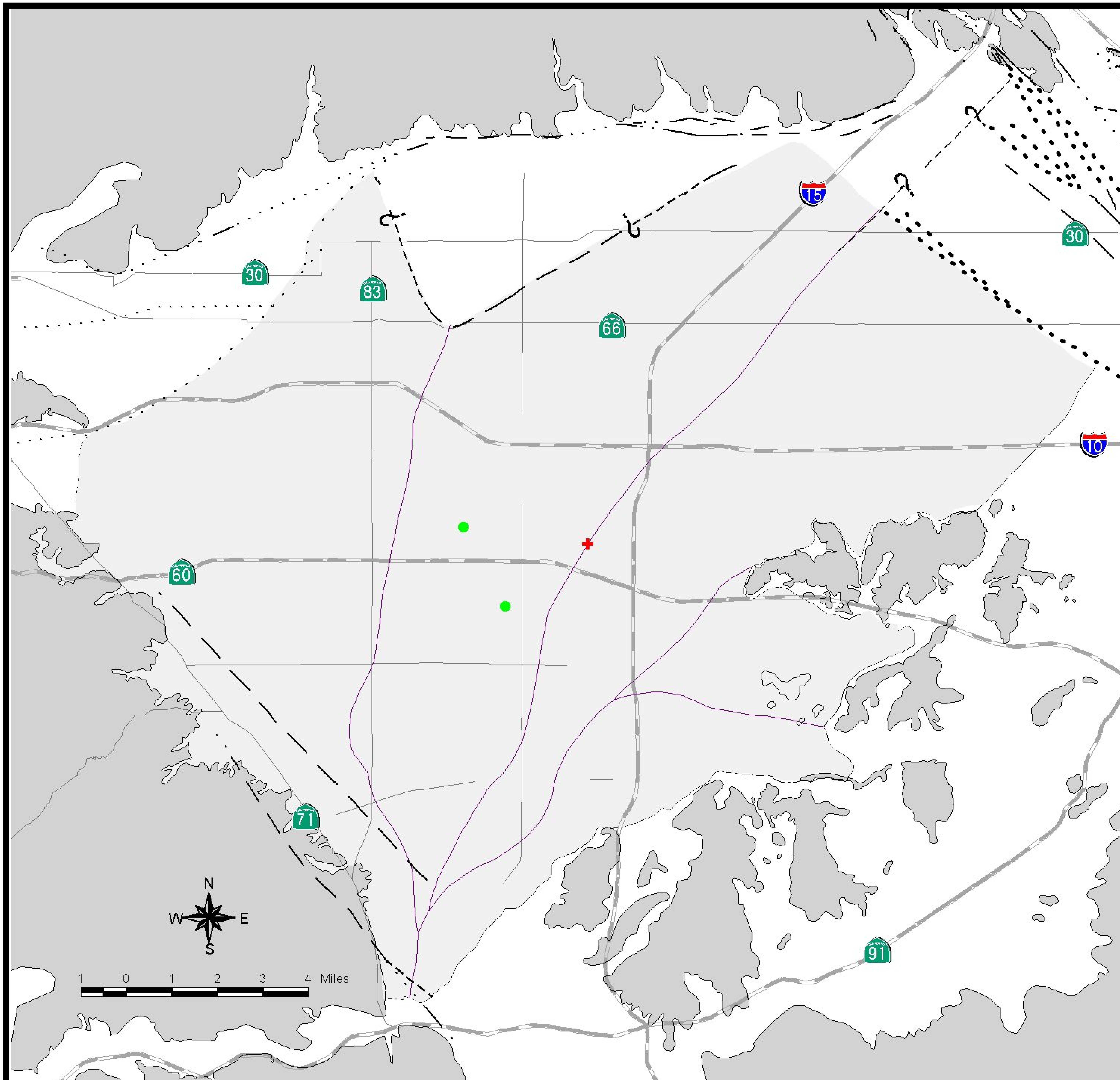


Figure 2-51
Wells with One or More Historical 1,1-Dichloroethene Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-51.apr



Optimum Basin Management Program
Chino Basin Watermaster

Legend

Management Zone Index Map

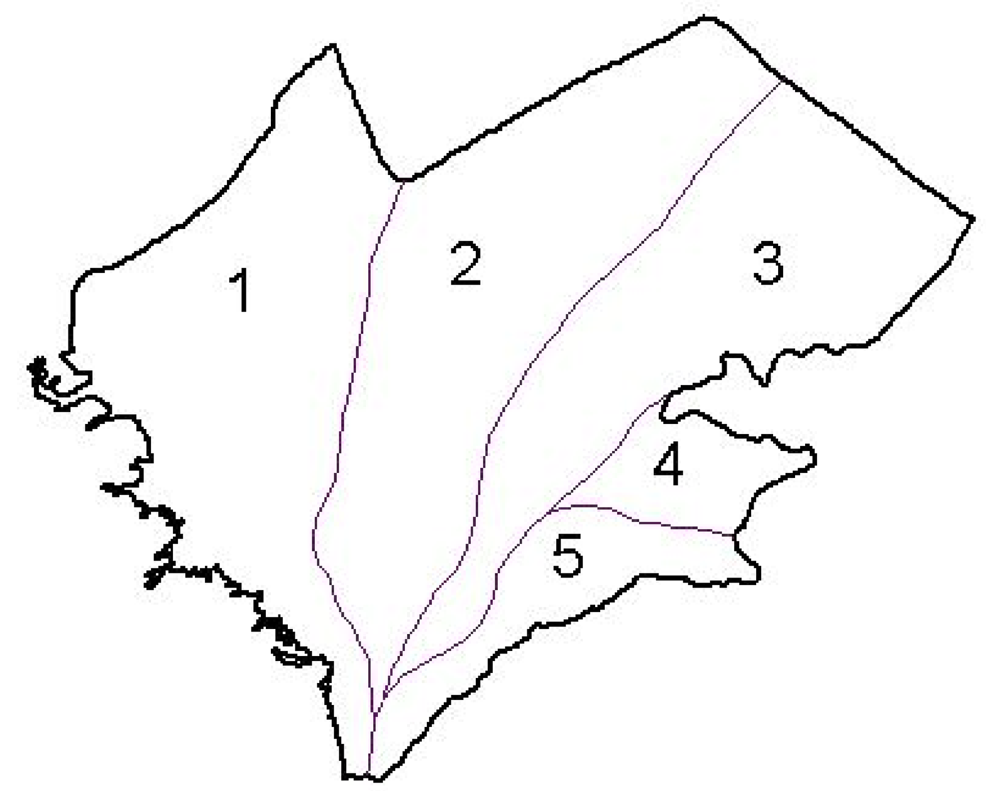


Figure 2-52
Wells with One or More Historical cis-1,2-Dichloroethene Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

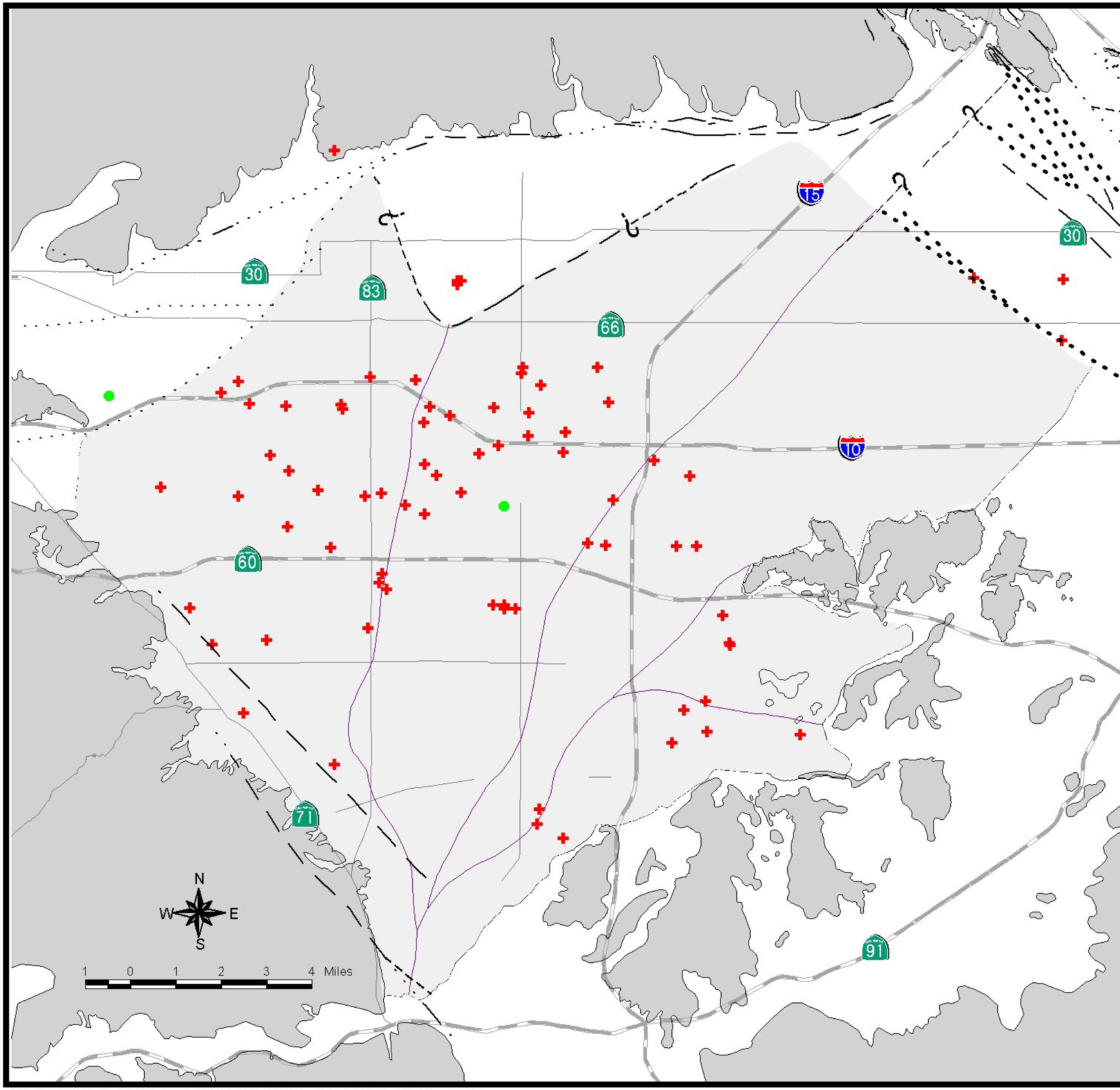
Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-52.apr

Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Over 1/2 MCL (0.25 ug/l)
- Over MCL (0.5 ug/l)



Management Zone Index Map

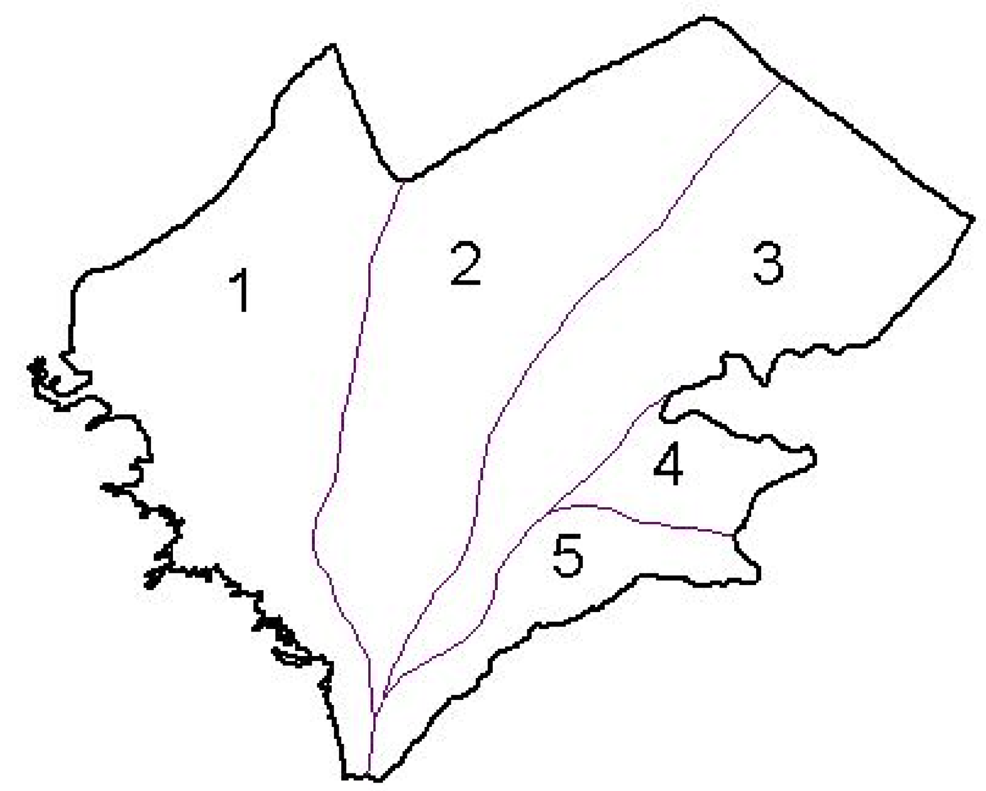
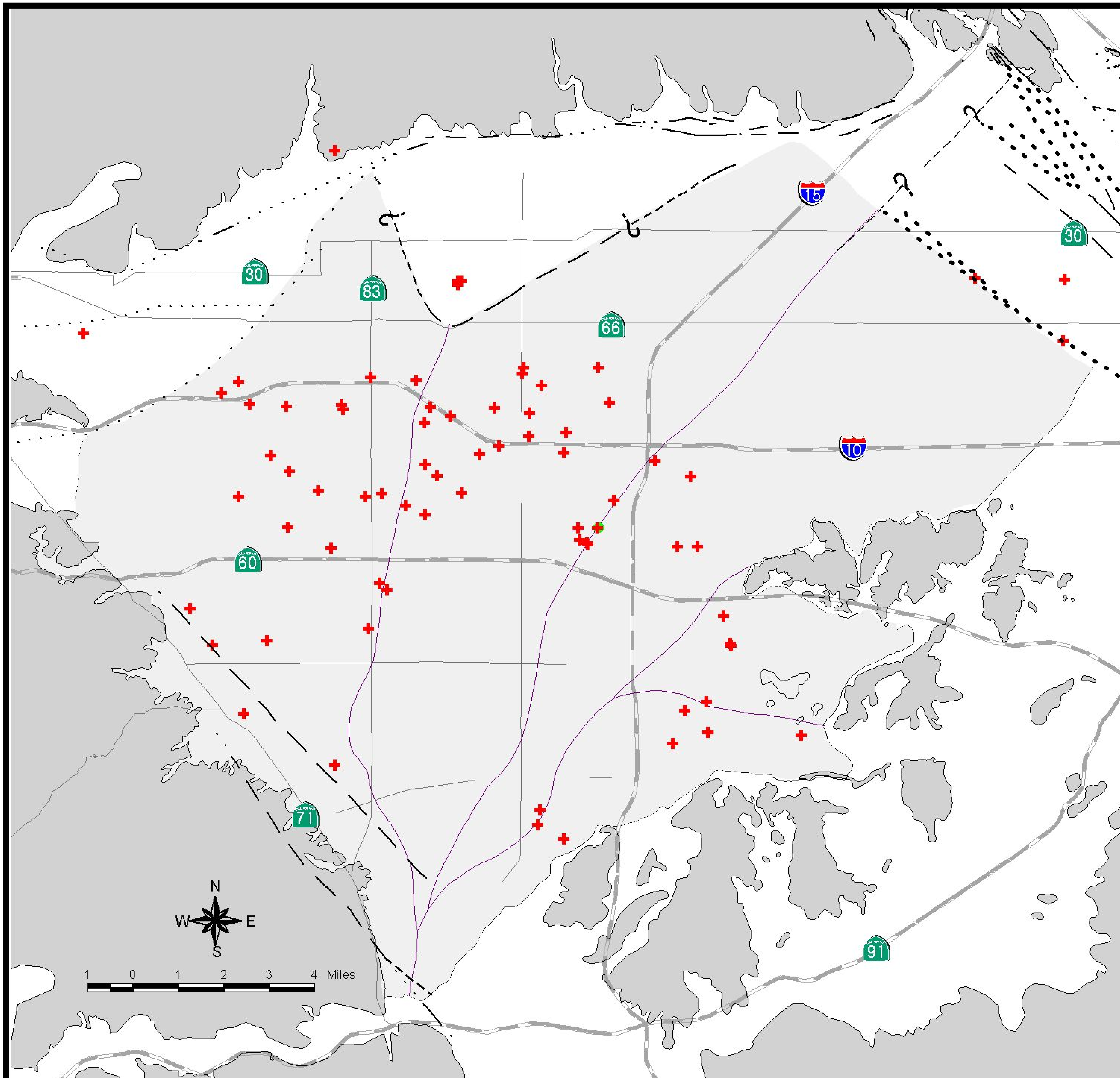


Figure 2-53
Wells with One or More Historical 1,2-Dichloroethane Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999



Optimum Basin Management Program
Chino Basin Watermaster

Legend

- Over 1/2 MCL (0.25 ug/l)
- Over MCL (0.5 ug/l)

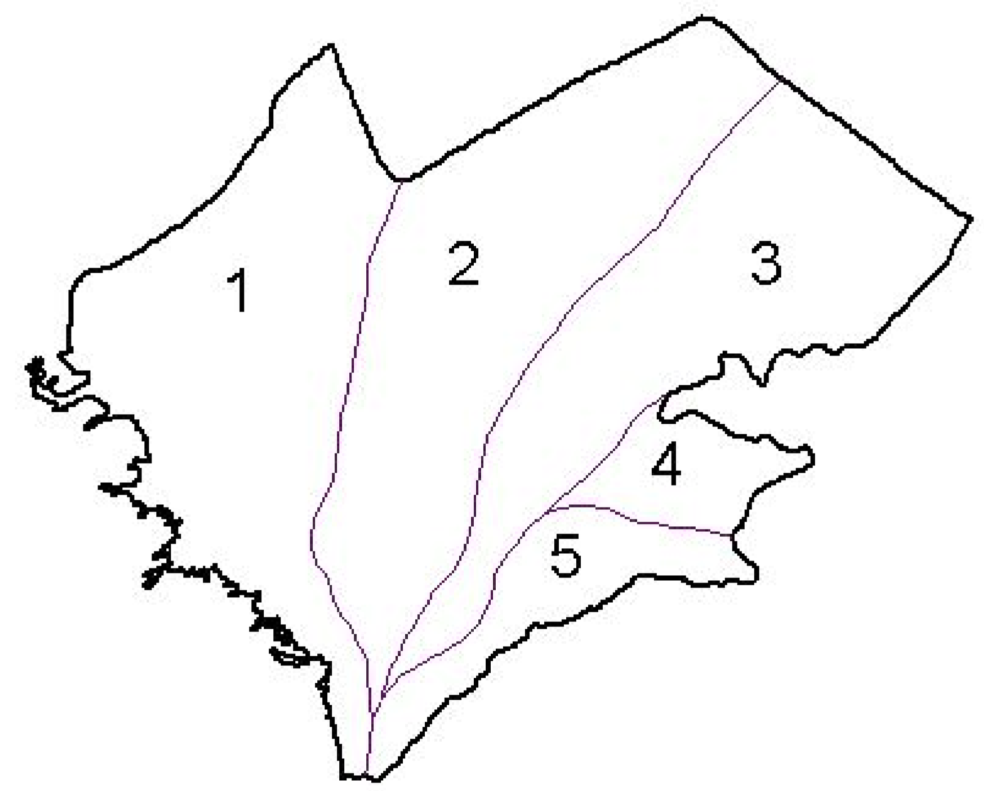


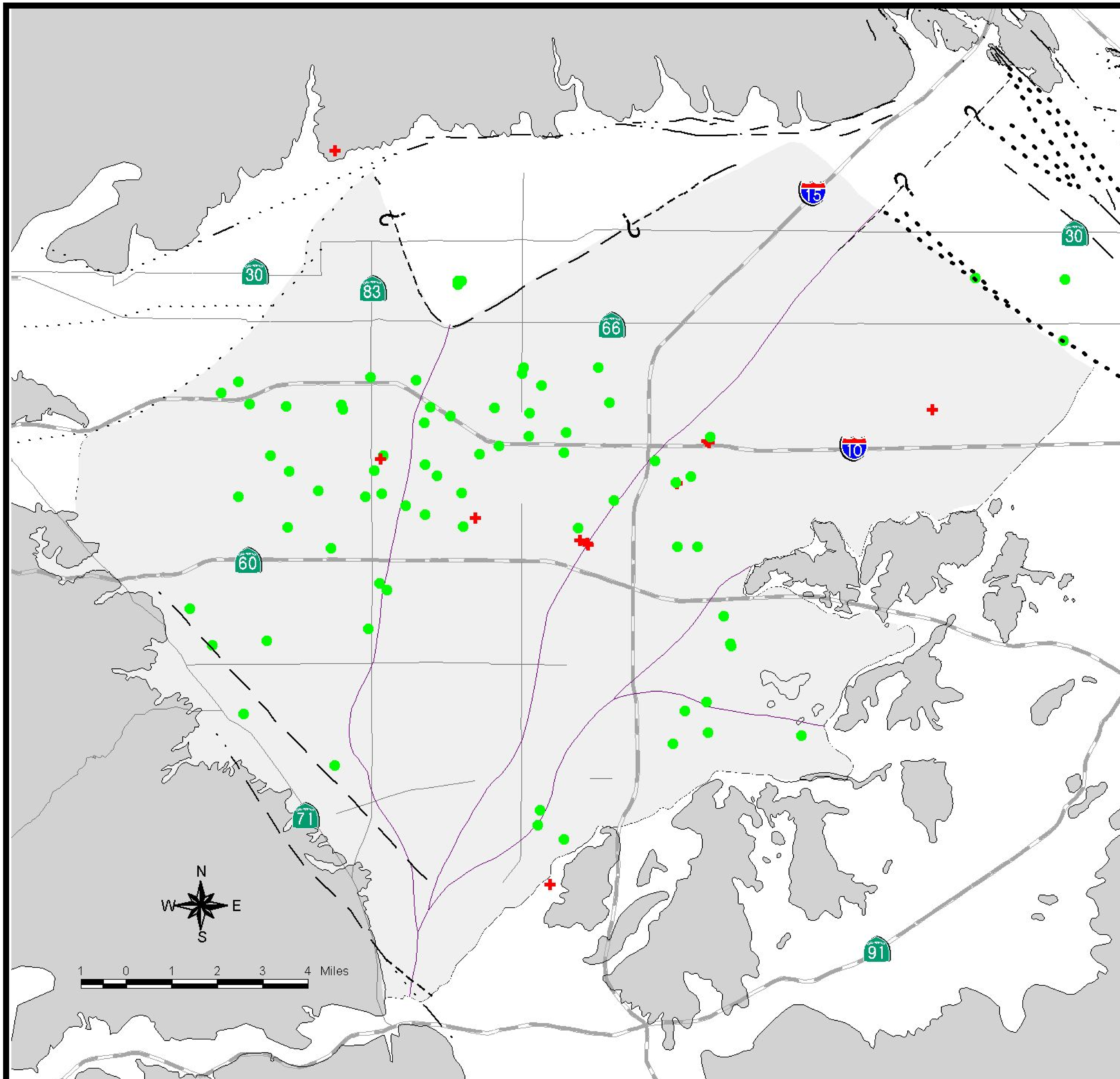
Figure 2-54
Wells with One or More Historical Vinyl Chloride Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-54.apr

Optimum Basin Management Program
Chino Basin Watermaster



Legend

- Over 1/2 MCL (0.5 ug/l)
- Over MCL (1.0 ug/l)

Management Zone Index Map

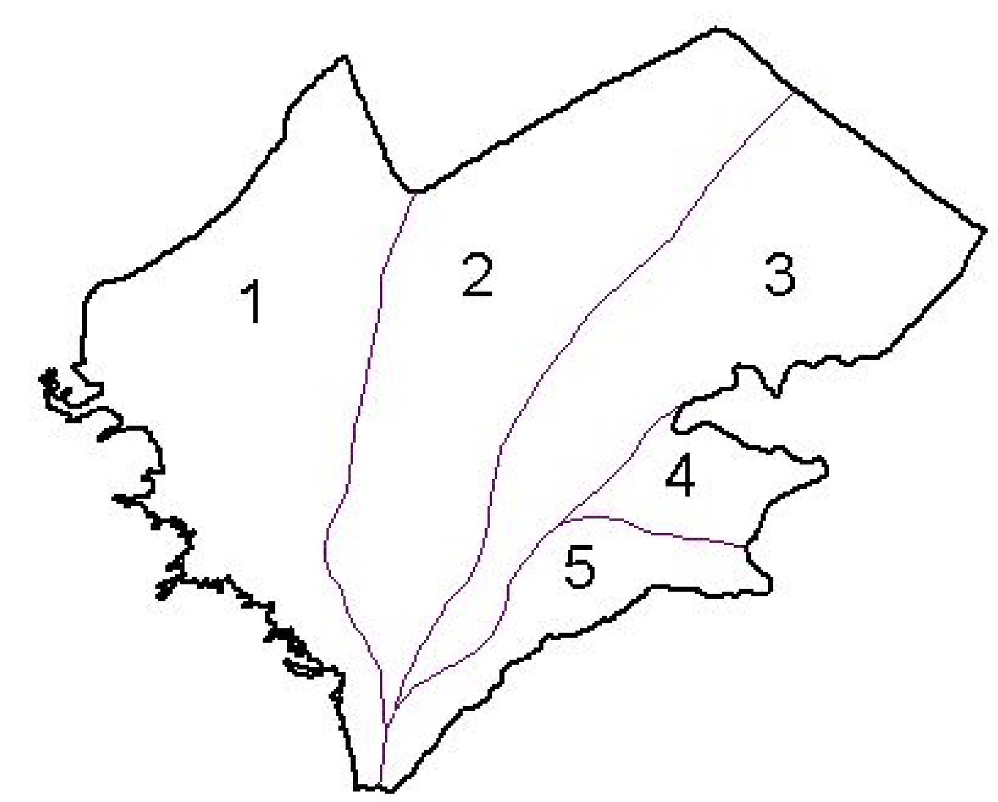


Figure 2-55
Wells with One or More Historical Benzene Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

s:\clients\cbwm\obmp\task order 2\obmp documents\section 2\figures\figure 2-55.apr

Optimum Basin Management Program
Chino Basin Watermaster

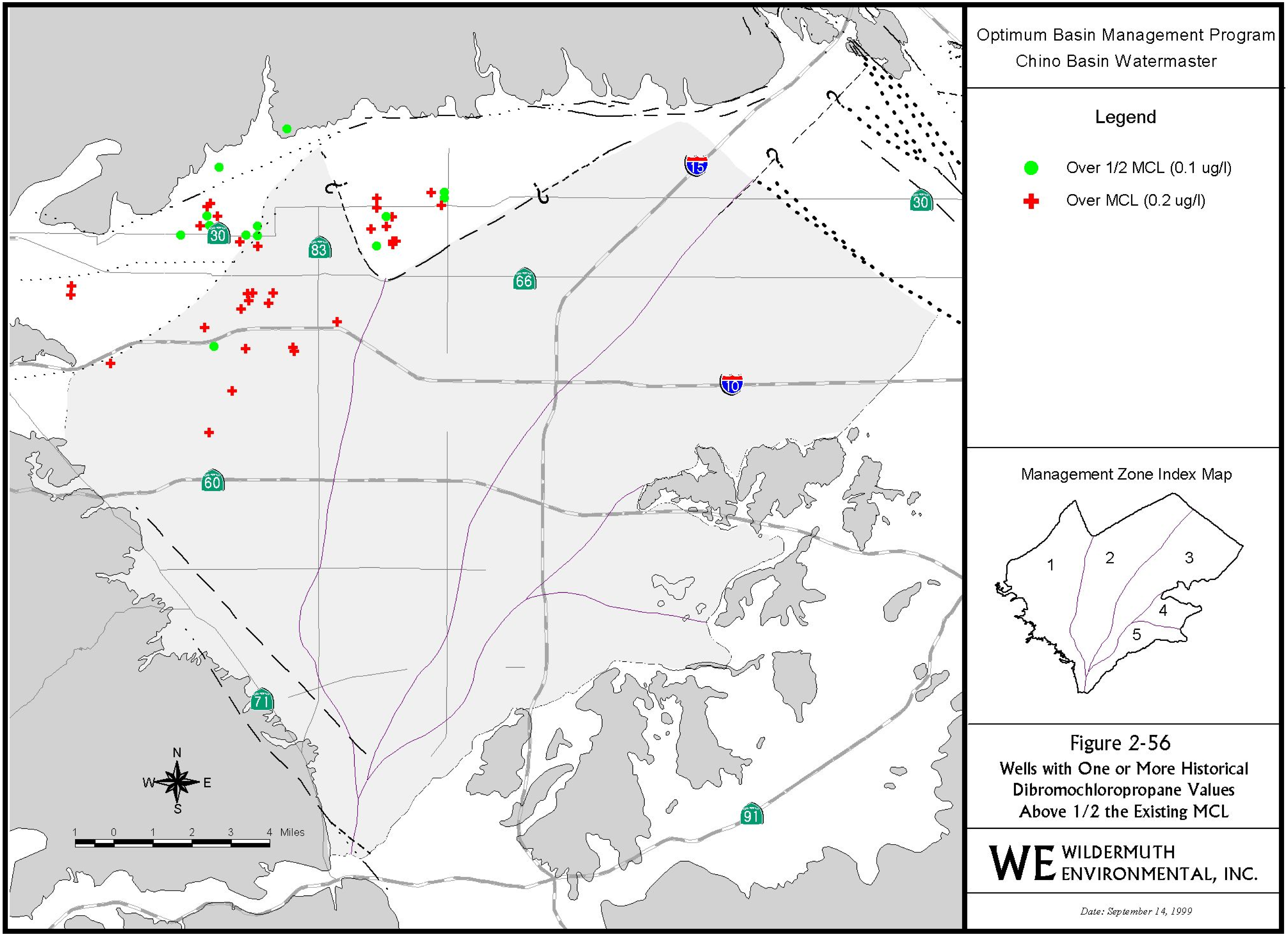


Figure 2-56
Wells with One or More Historical Dibromochloropropane Values Above 1/2 the Existing MCL

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: September 14, 1999

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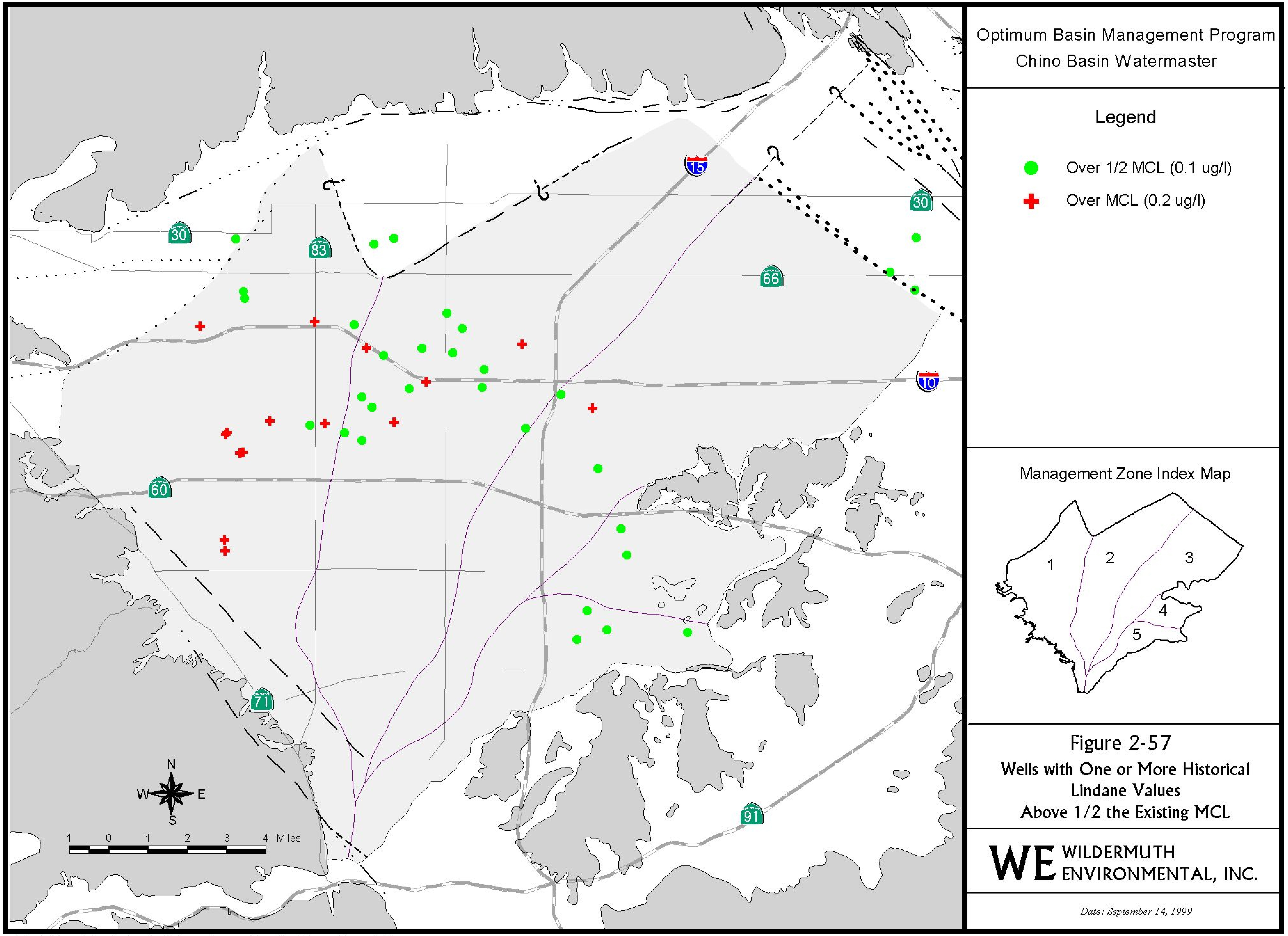

Figure 2-57
Wells with One or More Historical Lindane Values Above 1/2 the Existing MCL

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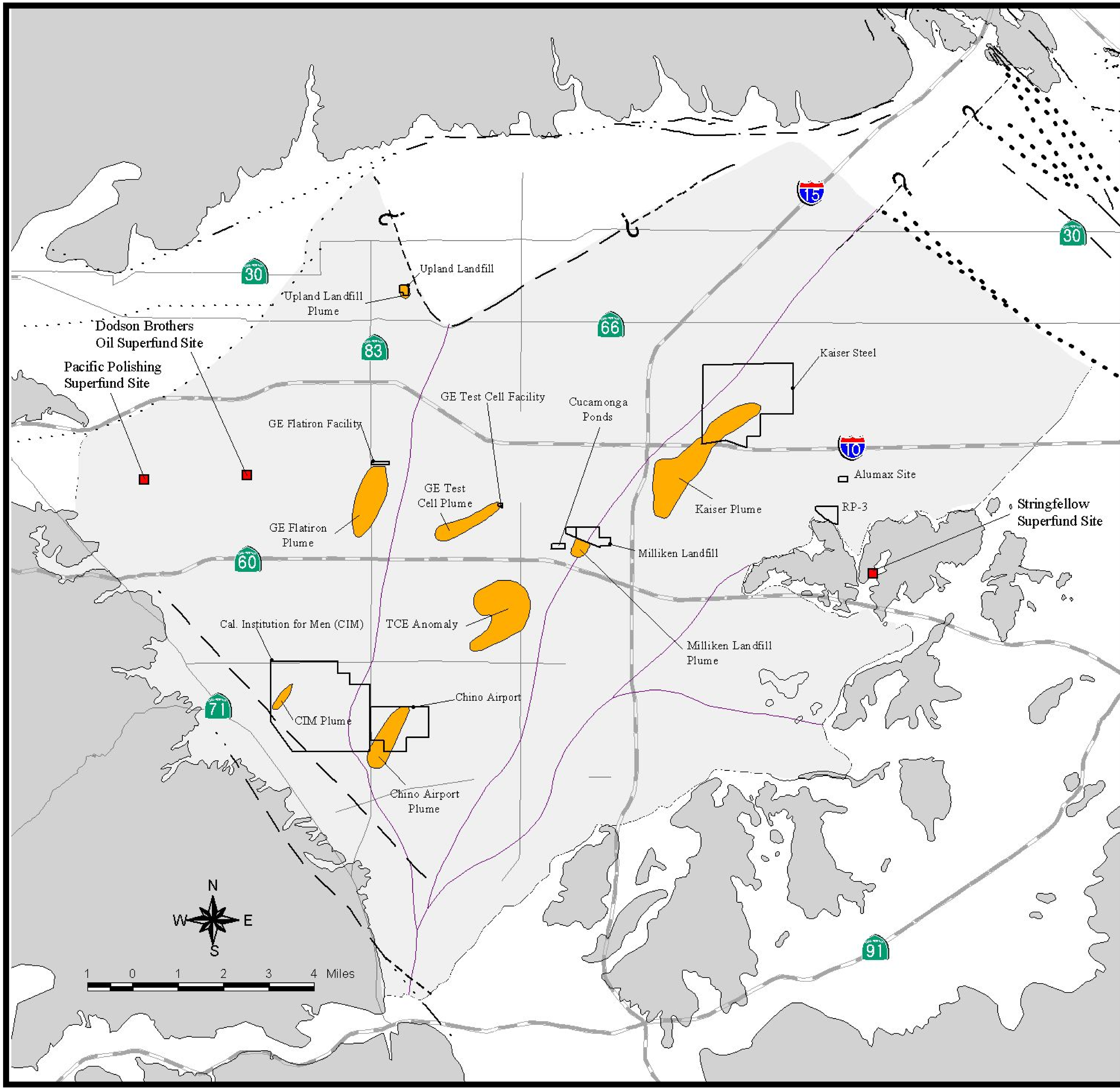
Optimum Basin Management Program
Chino Basin Watermaster



Legend

Point Source Locations

Approximate Extent of Groundwater Plume

Superfund Sites

Management Zone Boundary

Hydrologic Chino Basin

Management Zone Index Map

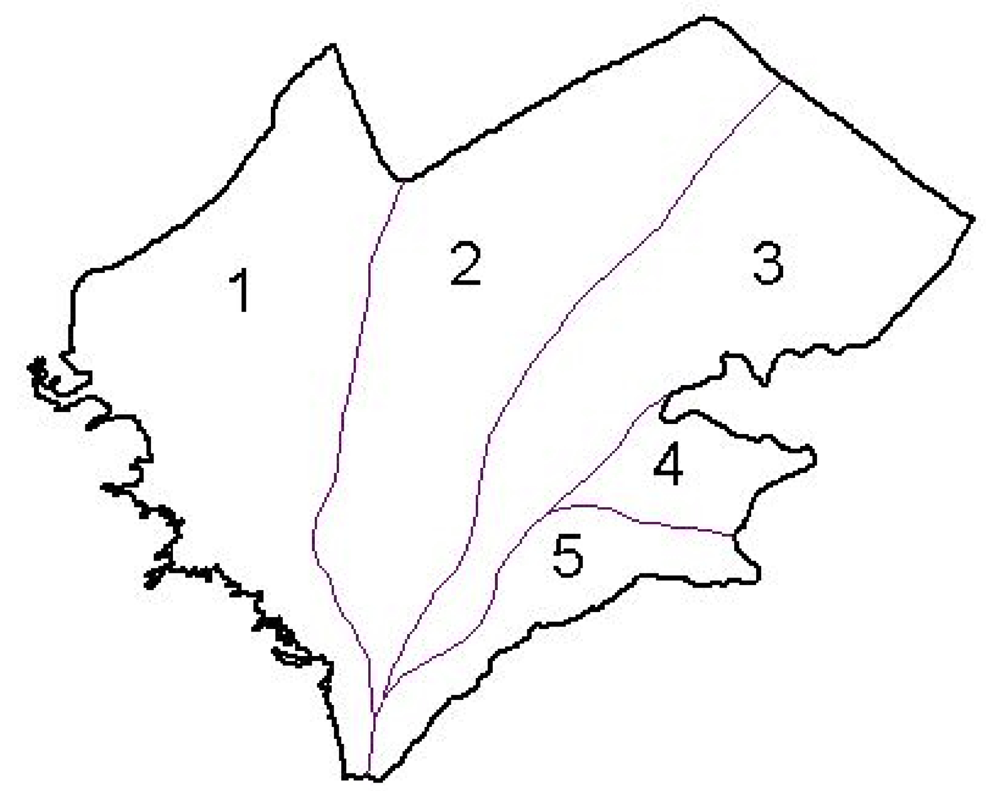


Figure 2-58

Locations of Known Point Sources in the Chino Basin

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

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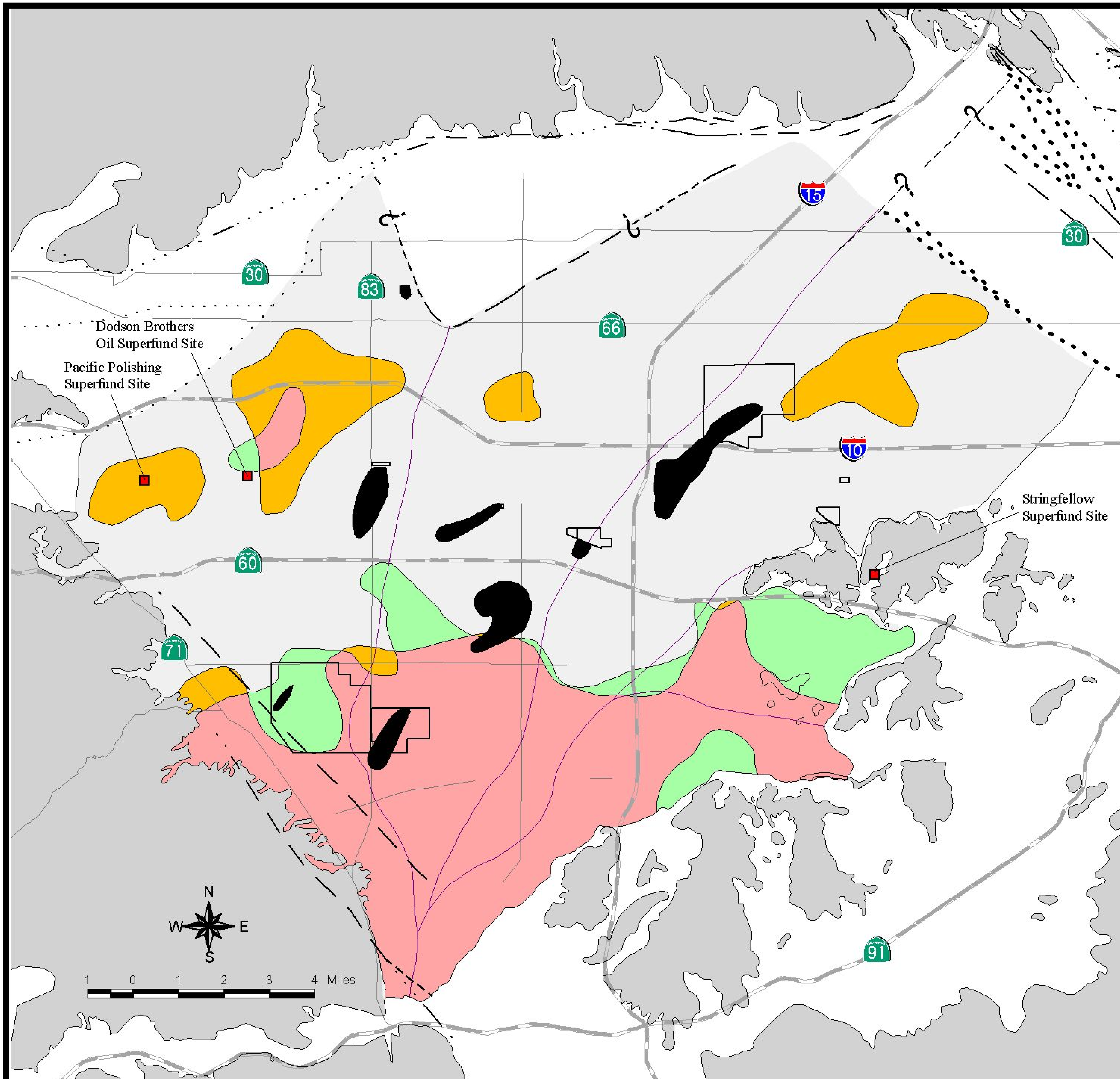

Optimum Basin Management Program

Chino Basin Watermaster

Legend

- Area with TDS > 500 mg/L and NO3-N > 8 mg/L
- Area with TDS > 500 mg/L and NO3-N < 8 mg/L
- Area with TDS < 500 mg/L and NO3-N > 8 mg/L
- Known Plumes
- Point Source Locations
- Superfund Sites

Management Zone Index Map

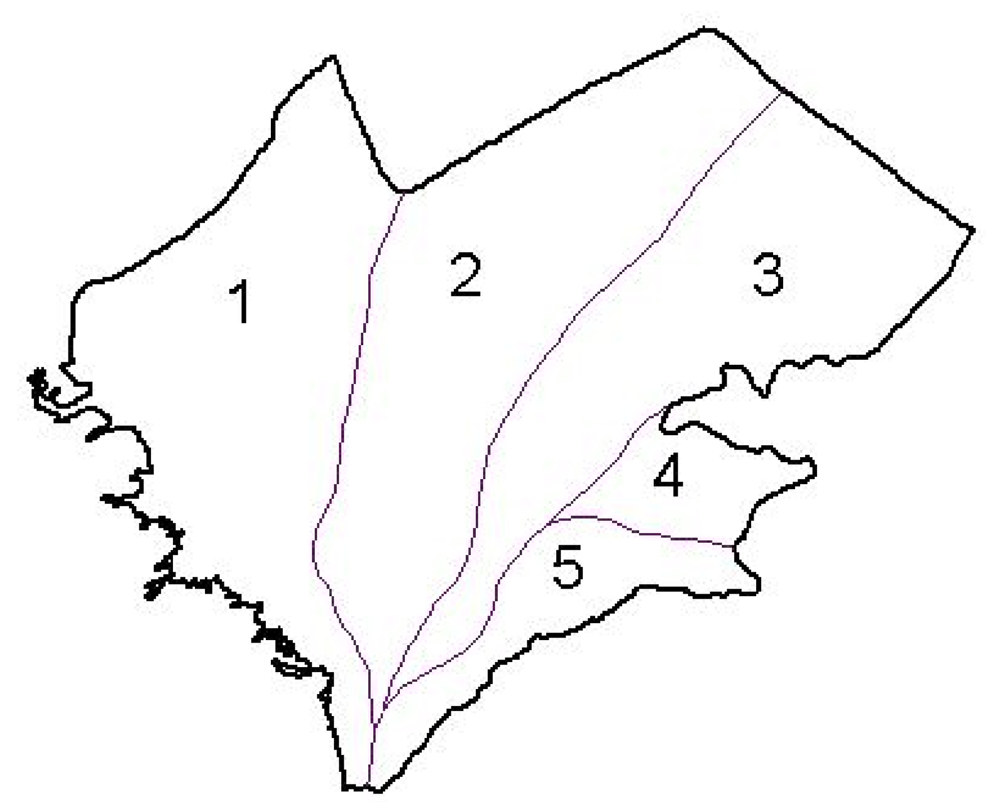

Figure 2-59

Locations of Known Point Sources and Areas with Impaired Water Quality in the Chino Basin

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

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SECTION 3
GOALS OF THE OBMP

This section presents the mission statement for the OBMP, the issues, needs and interests that were articulated by the stakeholders, and the goals of the OBMP. Each of these items was developed as part of the institutional process. These items were discussed in numerous public meetings and their final form is based on the consensus of those stakeholders that participated in the process.

MISSION STATEMENT

The stakeholders have met twice per month since the February 19, 1998 ruling by Judge Gunn, to develop the OBMP. As part of this process, the stakeholders defined a new paradigm from which they view their stewardship responsibilities, current and anticipated problems in the Basin, and the solution approaches to those problems. This new paradigm is described in the following mission statement and core values developed by the stakeholders:

> *The purpose of the Optimum Basin Management Program is to develop a groundwater management program that enhances the safe yield and the water quality of the Basin, enabling all groundwater users to produce water from the Basin in a cost-effective manner.*

The stakeholders have adopted the following core values associated with the mission statement.

Water Quality. All producers desire to produce water of a quality that is safe and suitable for the intended beneficial use.

Long View. All producers desire a long term, stable planning environment to develop local water resources management projects. The producers, independently and through Watermaster, will strive to take the long view in their planning assumptions and decisions to ensure a stable and robust management program.

Increased Local Supplies. All producers will, for an undetermined time into the future, be dependent on high quality imported water for direct uses and for groundwater replenishment. Because high quality imported supplies may not be available, the producers will strive to minimize their dependency on imported water and to increase their dependency on local supplies when economically justified.

Groundwater Storage. Unused groundwater storage capacity in the Chino Basin is a precious natural resource. The producers will manage the unused storage capacity to maximize the water quality and reliability and minimize the cost of water supply for all producers. The program will encourage the development of regional conjunctive use programs.

Storm Water Recharge. The producers will strive to increase storm water recharge and thereby maintain and enhance the safe yield and water quality.

Reclaimed Water Recharge. The safe yield of the Chino Basin will be enhanced through the recharge of reclaimed water. The producers will strive to maximize the recharge of reclaimed water to enhance the safe yield and water quality.

Cost of Groundwater Supplies. The producers are committed to finding ways to subsidize the cost of using poor quality groundwater in a cost-effective and efficient manner.

MANAGEMENT ISSUES, NEEDS, AND INTERESTS

As part of the OBMP scoping process, issues, needs and interest were solicited from the stakeholders in the Basin. These issues, needs and interests have been summarized in a tabular form in Tables 3-1 through 3-7, where each table refers to a class of issues, needs and interests that include:

- safe yield
- native and imported water recharge
- quality and quantity
- reclaimed water
- conjunctive-use storage
- costs
- human resources and administration

Attribution for the source of each issue, need, and interest is listed in these tables. In some cases, a specific issue, need and interest may show up in more than one class. These needs and interests were discussed at several scoping meetings and were used to focus problem identification, OBMP goals, and the resulting OBMP scope of work.

MANAGEMENT GOALS OF THE OBMP

In June 1998, the stakeholders began the process of developing management goals for the OBMP that address the issues, needs, and interests of the producers. The process involved the proposal of an initial set of goals followed by discussion and group editing at the bi-monthly meetings. The initial set of goals of the OBMP is listed below.

Goal No. 1 – Enhance Basin Water Supplies. This goal applies not only to local groundwater, but also to all sources of water available for the enhancement of the Chino Groundwater Basin. The following activities enhance basin water supplies:

- *Enhance recharge of storm water runoff*. Increasing the recharge of storm water in the Basin will increase the water supplies in the Chino Basin. The relatively low TDS and nitrate concentrations of storm flow will improve groundwater quality.
- *Increase the recharge of recycled water*. The recharge of recycled water above that required for replenishment obligations can be used for safe yield augmentation and/or conjunctive use.
- *Develop new sources of supplemental water*. New sources of supplemental water, including surface and groundwater from other basins, can be used to meet Chino Basin area demands, reduce dependency on Metropolitan supplies, and improve drought reliability.
- *Promote the direct use of recycled water*. Promoting the direct use of recycled water for non-potable uses will make more native groundwater available for higher-priority beneficial uses.
- *Promote the treatment and use of contaminated groundwater*. Groundwater in some parts of the Basin is not produced because of groundwater contamination problems and thus the yield of the Basin may be reduced. The yield of the Basin can be maintained and enhanced by the production and treatment of these contaminated waters.

- *Reduce groundwater outflow*. Increasing groundwater production near the Santa Ana River will increase the streambed percolation of the Santa Ana River into the groundwater basin, and reduce groundwater outflow from the Basin and thereby increase the supply of groundwater in the Basin.
- *Re-determine safe yield.* Recent studies suggest that the safe yield may be greater than the 140,000 acre-ft as stated in the Judgment. The activities listed above will cause the yield to increase further. Continuing to operate the Basin at 140,000 acre-ft/yr will cause groundwater in the Basin to be lost to the Santa Ana River. The safe yield will be re-determined on an as needed basis to maximize the current yield and to cause future increases in yield

Goal No. 2 – Protect and Enhance Water Quality. This goal will be accomplished by implementing activities that capture and dispose of contaminated groundwater, treat contaminated groundwater for direct high-priority beneficial uses, and encourage better management of waste discharges that impact groundwater. The following activities will protect and enhance water quality:

- *Treat contaminated groundwater to meet beneficial uses*. Groundwater in some parts of the basins is not produced because of groundwater contamination problems. Groundwater quality can be protected by intercepting contaminants before they spread. Intercepted groundwater could be treated and used directly for high priority beneficial uses or injected back to the aquifer.
- *Monitor and manage the Basin to reduce contaminants and to improve water quality*. Actively assisting and coordinating with the Regional Board, the EPA, and other regulatory agencies in water quality management activities would help improve water quality in the Basin.
- *Manage salt accumulation through dilution or blending, and the export of salt*.
- *Address problems posed by specific contaminants.*

Goal No. 3 – Enhance Management of the Basin. This goal will be accomplished by implementing activities that will lead to optimal management of the Chino Basin. The following activities will protect and enhance management of the Basin:

- *Develop policies and procedures that will encourage stable, creative and fair water resources management in the Basin*.
- *Optimize the use of local groundwater storage.* Policies and procedures for local storage, cyclic storage and other types of storage accounts will be created to maximize drought protection and improve water quality, and to create an efficient system to transfer water from producers with surplus water to producers that need water.
- *Develop and/or encourage production patterns, well fields, treatment and water transmission facilities and alternative water supply sources to ensure maximum and equitable availability of groundwater and to minimize land subsidence*.
- *Develop conjunctive-use programs with others to optimize the use of the Chino Basin for in-basin producers and the people of California*.

Goal No. 4 – Equitably Finance the OBMP. This goal is based on the following principles:

- *The primary source of revenue to finance the implementation will be the consumers of the Chino Basin groundwater.*

- *The consumers in the Chino Basin must be treated equitably by passing the cost of the OBMP on a per acre-foot basis or by other methods, based on formulas to be determined.*
- *Financial incentives and disincentives will be established to assure that existing groundwater is pumped out of the Basin and a higher quality of water is used to replenish the Basin.*
- *Opportunities for creativity will be provided to the producers so that they are motivated to use their assets and abilities in the implementation of the OBMP.*
- *Recover value from utilization of storage of supplemental water and from rising water outflow.*

The Special Referee and her engineer reviewed these goals and provided direction to the stakeholders. In particular, the Special Referee suggested that the goals and action items were too vague. The goals and action items were refined and produced in a tabular format. The goals setting process concluded on November 26, 1998. The final set of goals is listed in Table 3-8. Table 3-8 lists each goal, the impediments to each goal, action items to surmount each impediment and achieve the goal, and the implication of the individual action items. The stakeholders were asked to review the final set of goals and action items listed in Table 3-8 to make sure that their individual issues, needs, and interests were addressed by the management goals. The stakeholders concluded that the set of goals listed in Table 3-8 addressed their needs and interests.

Table 3-1
Safe Yield Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
Maintain Existing Supply/Transfer/Over-Production Methodology		■								■						■
Flexible Supply/Transfer/Over-Production Methodology			■						■			■	■			
Increase Safe Yield Based on Past Engineering Studies						■										
Promote Production in South to Protect And Enhance Safe Yield and Minimize Losses							■		■							
Coordinate/Reduce/Relocate Production to Ensure Safe Yield is Produced											■					
Dedicate Increases in Safe Yield to Agencies for Specific Basin Management Projects Examples: Reduce/Relocate Agency Pumping Production In Poor Quality Areas Treatment Of Poor Water Quality New Production In Areas Where Basin Losses Occur Other		■					■		■	■						■
Develop Knowledge to Ensure Water Production is Reliable									■							
Need to Continue to Rely on Stable Safe Yield, Including Reallocation in Accordance with Original Adjudication										■						
Accelerate Transfer of Un-Produced Ag and Overlying Non-Ag Water			■													
Do Not Include Original Safe Yield & Methods Of Reallocation in the OBMP										■						
Assure Complete and Accurate Reporting Of Water Use in Basin				■												
Maximize the Use of Reclaimed Water	■															

Respondent columns as above; ■ = filled cell.

Table 3-1 (Continued)
Safe Yield Needs and Interests

	Respondent															
Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
Monitor Fluctuations in Basin and Changes in Production Patterns to Identify Basin Issues				X												
Explore Impacts to Safe Yield From the Development of the Basin				X												
Allow Parties to Use Basin in Their Best Interest and Mitigate Impacts									X							X
Determine and Assess Storage Losses in the Basin				X					X			X				
Develop a Plan to Maximize Yield During MWD Shortages, Shutdowns, and Peak Use Periods								X								
Increase Safe Yield by Installing Desalters to: Examples: Capture Rising Groundwater Induce Recharge From Santa Ana River Increase Groundwater Gradient	X															
Coordinate/Reduce/Relocate Production to Reduce Subsidence			X												X	
Accelerate Land-Use Conversions			X													
Retain Production Rights to Satisfy Demands			X													
Evaluate Impacts from Increased Northern Production and Provide Credits for Increased Southern Production			X										X		X	
Increase Water Conservation Within the Basin	X		X												X	X
Increase Operating Safe Yield and Reallocation of Production Rights			X													
Evaluate Impacts of Desalter Operations on Safe Yield			X												X	

Table 3-2
Native and imported Water Recharge Needs and Interests

Ideas	Respondent															
	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
Support Sole and/or Cooperative Efforts to Develop Additional Economically Feasible Recharge Facilities for Both Native and Imported Water	■	■	■				■		■	■	■				■	
Develop Program to Increase Recharge of Native Runoff and Create a Mechanism to Pledge the Value of the Increase in Safe Yield from These "New Water" Sources to Help Pay for the Construction of These Facilities													■			
Develop Alternative and/or Less Expensive Imported Water Options	■		■			■										■
Establish Water Quality Subsidy to Encourage Replenishment Of High Quality Imported Water													■			
Maximize Use of Existing Recharge Facilities	■					■									■	
Recharge High Quality Runoff and Reclaimed Water as Hydrologically High as Possible in the Basin	■															

Table 3-3
Quality and Quantity Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona	Geomatrix
	Respondent																
Determine Responsibility and/or Accountability for Existing Water Quality and Quantity Issues			■			■			■								■
Support and/or Encourage the Construction of Treatment Processes to Clean-Up Non-Potable Groundwater for Use Examples: Well Head Treatment Wetlands To Denitrify Dairy Wastes In-Situ Technologies Desalters Dilution	■	■	■	■						■	■		■				■
Encourage Basin Activities to Protect Quality/Quantity Examples: Protect/Manage Watershed Removal Of Unused Manure And Contaminants Regulations To Eliminate Nitrate And Contaminant Usage Dairy Sewer Connections Accelerate On-Going Activities Dilute Basin With SWP Water	■		■			■	■		■								
Develop Sellable and/or Exportable Water Insurance Rights to Replenish Overproduction During Drought and/or Encourage Basin Clean-Up									■								■
Develop a Means to Export Water to Encourage Basin Clean-Up									■		■						■
Identify and Regulate Sources of Contamination			■														

Table 3-3 (Continued)
Quality and Quantity Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona	Geomatrix
Develop "Credit Type Program to Encourage Development and Implementation of Water Quality Improvement and Conservation Programs													X		X		
Assess the Impacts of Groundwater Production and Recharge on Water Quality of Down Gradient Producers			X														
Incorporate Existing Remediation Projects Into Basin Water Quality Management Program																	X
Increase Conservation and Develop New Sources of Water (e.g. Bunker Hill, Santa Ana River, Recycled, …)			X														
Pump Non-Potable Water for Irrigation Uses							X									X	
Manage Basin to Maintain/Improve Water Quality of Water Supply Sources to Meet Discharge Standards	X																
Assure Water Level and Quality in Aquifer is Maintained Examples: Reduce/Relocate Agency Pumping Production In Poor Quality Areas Poor Water Quality Treatment Increased Imported Water Other			X	X					X	X							
Re-Examine Basin Water Quality Objectives and Establish Naturally-Occurring Limits			X													X	
Map Areas with Active Septic Tanks to Identify Issues									X								
Produce Maps Showing Problem Areas and Projected Problem Areas									X						X	X	

Table 3-4
Reclaimed Water Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
Develop Reuse and Recharge Projects to Maximize Use	■	■	■	■		■				■	■				■	■
Develop Regional Transmission Systems for Reclaimed Projects	■									■						
Expand CIM WWTP to Allow Crop Irrigation				■												
Provide Incentives for the Development of Reclaimed Projects		■														
Expedite Nitrogen/TDS Study to Determine What are the True Assimilative Capacities													■			■
Establish Agreement with RWQCB on Mitigation Credits for Additional Water Pumped in the South to Allow Increased Use of Reclaimed Water for Recharge							■									
Allow Parties to Use Basin in Their Best Interest and Mitigate Impacts									■							■
Modify Basin Water Quality Objectives to Increase Levels of Water Recycling	■															
Coordinate Basin Water Quality Plans to Permit Increased Levels of Recycling	■															
Use Reclaimed Water to Flush Lower Basin	■															

Table 3-5
Conjunctive Use-Storage Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Kaiser	Pomona
Support Economical Programs That Mitigate Water Quality Issues		■	■					■			■						■
Develop Ability to Market Basin Losses			■														
Basis: Monitoring Groundwater Level																	
Amount In Storage																	
Allow Parties to Use Basin in Their Best Interest and Mitigate Impacts									■								■
Encourage Storage and Underproduction in North to Flush Out the South End of the Basin		■															
Determine and Allocate Storage Capacity Based on Technical Data and Basin Management Goals			■				■			■							
Provide Transfer Mechanisms Between Pools to Ensure Beneficial Use of Water		■	■							■							■
Develop a Means to Export Water (Rights and/or Storage)		■							■		■						■
Determine and Assess Storage Losses			■						■			■					
Develop Economical Programs to Store Additional MWD Water and Reduce Pumping Costs in the North								■									
Allow Transferability of Stored Overlying Non-Agricultural Water																■	
Develop Programs to Construct Facilities and Deliver Water Between Agencies During Periods of Shortage								■									
Retain Existing Cyclic Storage Program for Droughts										■							■
Allow Storage Accounts for Ag Pool				■													

Respondent columns: CBMWD through Pomona.

Table 3-6
Cost Needs and Interests

Ideas	Respondent: CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
All Assessments Borne by All Parties (Including Clean-Up Costs)		■	■				■					■				
Assessments Attributable to Benefiting/Responsible Parties (Including Clean-Up Costs)						■			■							■
Seek Financial Aid to Meet Management Goals (Includes Grants and Loans For Ag., Flood Control, etc.)			■			■	■		■				■			
Develop Incentives to Encourage Basin Management Objectives Examples: Reduce/Relocate Agency Pumping Provide Grant Funding Allocations for Treated Groundwater Waive Fees For Pumping in Poor Quality Areas Corrective Activities/Agreements Bonuses to Reduce Water Costs Back Down to MWD Rates Credit Ag Pool for Overproduction of Poor Water Others				■		■	■					■	■		■	■
Develop Equity and the Perception of Equity in the Operation of the Basin (Including Clean-Up Costs)									■	■						
Establish Funding Mechanisms to Improve Water Quality			■							■					■	■

Table 3-6 (Continued)
Costs Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
Sell Surplus Ag Water to Fund Clean-Up				■												
Establish Special Assessments/Taxes to Encourage Basin Management Objectives			■													
Basis: Historic Versus Current Production																
Historic Versus Current Land Uses																
Need																
Parcel Tax																
Other																
Phase Out 85/15 Rule			■									■				
Identify Realistic and Economically Feasible Long-Term Goals							■									■
Develop Reliable and Economic Sources to Stabilize Rates										■						
Credit Producers That Import Water to the Basin						■										■
Allow Parties to Use Basin in Their Best Interest and Mitigate Impacts									■							
Actively Seek to Partner with Other Parties Who Are Interested in Solving Our Problems													■			
Replenishment Via MWD and Unproduced Water Purchases															■	

(Column group heading: Respondent)

Table 3-7
Human Resources And Administration Needs and Interests

Ideas	CBMWD	CCWD	Chino	CIM	FUWC	FWC	JSCD	Metropolitan	MVWD	Ontario	TVMWD	Upland	Vanden Heuvel	MVIC	CBWCD	Pomona
Reduce Administrative Costs Examples: Synthesize Key Issues To Reduce Paper Waste Contract Data Management									■							■
Minimize Unproductive Meeting Time									■							
Assign Responsible Parties and Committees to Specific Basin Issues									■							
Establish Accountability Measures for Parties and Committees									■							■
Enhance And Maintain Ongoing Data Development for Basin Examples: Well and Production Data Monitoring Well System Basin Models and Backup Files Standardize Reporting Establish Data Exchange Process Establish Reporting and Update Schedules			■						■							
Actively Seek to Partner with Other Parties Who Are Interested in Solving Our Problems													■			
Coordinate with On-Going Efforts of Other Agencies in the Basin			■										■			■
Instill Regional Prosperity and Good Relations Via CBWM Programs			■													
Develop Rules Intended to Prevent Agency Impacts and Avoid Litigious Situations			■													■
Allow Parties to Act Without Developing Stifling Bureaucracies									■							

Respondent columns: CBMWD, CCWD, Chino, CIM, FUWC, FWC, JSCD, Metropolitan, MVWD, Ontario, TVMWD, Upland, Vanden Heuvel, MVIC, CBWCD, Pomona (■ = filled box)

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
Goal 1 -- Enhance Basin Water Supplies			
1 Unless certain actions are taken the safe yield of the basin will be reduced.			
1a Basin yield is lost due to groundwater outflow from the southern part of basin.	Maintain or increase groundwater production in southern part of the basin; treat and serve contaminated groundwater from southern third of the basin.	This action will maintain and possibly increase safe yield; reducing production to levels below 1965-74 will result in a loss of safe yield.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas
		This action will result in improved water quality in the Santa Ana River.	
	Locate new recharge facilities in the upper half of the basin.	Recharge in the upper half of the basin ensures that the water recharged can be recovered and put to beneficial use; recharge in the lower half of the basin may be lost to the Santa Ana River.	2 Develop and implement a comprehensive recharge program.
	Locate new recharge facilities in the lower half of the basin when recovery of recharged water can be ensured.	This action will result in localized water quality and supply improvements in the lower half of the basin.	2 Develop and implement a comprehensive recharge program.
	Develop and implement a comprehensive basin-wide ground level, groundwater level, quality, and production monitoring program.	This action will provide Watermaster with the information necessary to determine outflow to the river, actual production, and to design groundwater treatment facilities. This action is necessary to maintain yield.	1 Develop and implement a comprehensive basin-wide ground level, groundwater level, quality, and production monitoring program.
1b The basin is not using as much high quality stormwater as it could for recharge.	Develop and implement a comprehensive plan of stormwater recharge.	This action will result in a list of feasible recharge projects that when implemented will maintain/increase basin yield, improve surface water and groundwater quality, and reduce the cost of flood control projects.	2 Develop and implement a comprehensive recharge program.
	Develop a comprehensive stormwater flow and quality monitoring program in partnership with other agencies charged with flow and quality monitoring.	This action will provide data that can be used to quantify the increase in yield through stormwater recharge and will provide water quality benefits.	2 Develop and implement a comprehensive recharge program.
		This action will quantify offset credits for recycled water recharge.	
	Develop new stormwater recharge projects at existing and future flood control facilities.	This action will maintain/increase yield and improve groundwater quality.	2 Develop and implement a comprehensive recharge program.

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
	Maximize recharge capacity at existing recharge facilities through improved maintenance.	This action will maintain/increase yield and improve groundwater quality.	2 Develop and implement a comprehensive recharge program.
1c The current manner Watermaster manages cyclic and local storage accounts will cause overdraft.	Develop methods to account for losses from cyclic and local storage accounts; and set limits on storage.	This action will help maintain the safe yield and ensure that basin water is put to maximum beneficial use.	8 Develop and implement a storage management program.
2 Unless certain actions are taken, groundwater levels in Management Zone (MZ) 1 will continue to decline adding to the potential for additional subsidence and fissures, lost production capability, and water quality problems.	Develop comprehensive ground level, groundwater level and quality monitoring program in MZ 1.	This action will provide engineering and scientific information that can be used to accurately assess groundwater conditions and manage MZ 1.	4 Develop comprehensive ground level, groundwater level and quality monitoring program in MZ 1.
	Develop groundwater management program for MZ 1consisting of:	This action will result in a plan that will reduce potential future subsidence and occurrence of ground fissures, maintain minimum levels of production, and improve water quality.	4 Develop and implement a groundwater management program for MZ 1.
	Increase recharge of stormwater and supplemental water in MZ 1.	This action will help maintain or increase groundwater levels and reduce the potential for subsidence and ground fissures.	
	Manage groundwater production in MZ 1 to a sustainable level to minimize subsidence.	This action will help maintain or increase groundwater levels and reduce the potential for subsidence and ground fissures.	
	Increase direct use of supplemental water in MZ 1(including in lieu deliveries).	This action will help maintain or increase groundwater levels and reduce the potential for subsidence and ground fissures.	
3 Because there is limited assimilative capacity for total dissolved solids (TDS) and nitrogen in the basin, there are economic limitations on the recharge of recycled water.	Create new assimilative capacity through the development of offset programs and through other mitigation programs.	This action will result in increased use of reclaimed water and will decrease the dependence on expensive and less reliable imported sources.	5 Develop and Implement Regional Supplemental Water Master Plan
4 Because future demands are increasing and there are limitations on basin and traditional supplemental supplies, new sources of supplemental water need to be developed.	Maximize the direct use of recycled water.	This action will reduce the dependence on expensive and less reliable imported sources.	5 Develop and Implement Regional Supplemental Water Master Plan
	Develop new sources of supplemental water from the Bunker Hill Basin, the Santa Ana River and other outside basin sources.	This action will ensure that there will be adequate supplies of high quality water to meet future demands.	5 Develop and Implement Regional Supplemental Water Master Plan

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
Goal 2 -- Protect and Enhance Water Quality			
1 Watermaster lacks comprehensive, long term information on groundwater quality.	Develop and implement a comprehensive groundwater quality monitoring program.	This action will provide a comprehensive assessment of current and future water quality problems and solutions in the basin. This action will contribute to the the least-cost and most expedient plans to protect, enhance and use groundwater to the maximum extent possible.	1 Develop and implement a comprehensive basin-wide ground level, groundwater level, quality, and production monitoring program.
2 Watermaster does not have sufficient information to determine whether point and non-point sources are being adequately addressed in the basin.			
2a RWQCB may not have adequate resources to address all the water quality problems within its jurisdiction in the Chino Basin.	Coordinate with regulatory agencies to share monitoring and other information to detect and define water quality problems.	This action will result in more efficient use of Watermaster, producer and regulatory agency resources.	6 Develop a cooperative program with the regulatory agencies where Watermaster and producer resources can be used to improve regulatory agency effectiveness.
	Take coordinated action regarding Watermaster priorities of mutual interest.	This action will improve timeliness and success in preventing water quality degradation and in cleaning up existing degradation; may include Watermaster entering litigation to assist in clean up.	6 Develop cooperative programs where Watermaster and producer resources can be used to improve basin management.
	Participate in projects of mutual interest including the RWQCB Wastershed management efforts in the Chino Basin	This action will result in more efficient use of resources of Watermaster, producers, and dischargers.	6 Develop and implement programs to address problems as identified and determined beneficial.
2b A comprehensive approach to addressing point and non-point source problems does not exist.	Develop and implement programs to address problems posed by specific contaminants such as TDS, nitrate, methyl ter -butyl ether (MTBE), perchlorate and others.	This action will improve timeliness and success in preventing water quality degradation and in cleaning up existing degradation.	6 Develop and implement programs to address problems posed by specific contaminants.
2c There is ongoing salt and nitrogen loading from dairies. Source water quality available to the dairies is often too degraded to be discharged.	Export manure.	This action will reduce TDS and nitrogen degradation of surface water and groundwater at less cost than treatment of receiving waters.	7 Develop and implement programs that result in maximum animal waste export
	Treat dairy sewage and eliminate discharge to groundwater, or export dairy sewage.	This action will reduce TDS and nitrogen degradation of surface water and groundwater at less cost than treatment of receiving waters.	7 Develop and implement programs that result in maximum animal waste export

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
3 There is ongoing and legacy contamination in vadose zone with TDS and nitrogen from historic dairy and other irrigated agricultural practices.	Develop regional and local groundwater treatment systems to treat groundwater for direct beneficial use.	This action will improve groundwater quality, maintain/increase safe yield, and maximize beneficial use of basin water.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
4 Poor ambient groundwater quality limits direct use of groundwater and can lead to loss of basin yield.	Develop programs (regional treatment, incentives, etc) to pump and treat degraded groundwater and to put the treated water to direct use.	This action will speed up the cleanup of degraded water, stop the spreading of degradation and maintain/increase safe yield.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas
5 The basin is not using as much high quality stormwater as it could for recharge.	Develop and implement a comprehensive plan of recharge for stormwater.	This action will result in a list of feasible recharge projects that when implemented will maintain/increase basin yield, improve surface water and groundwater quality, and reduce the cost of flood control projects.	2 Develop and implement a comprehensive recharge program.
	Develop a comprehensive stormwater flow and quality monitoring program in partnership with other agencies charged with flow and quality monitoring.	This action will provide data that can be used to quantify the increase in yield through stormwater recharge and will provide water quality benefits. This action will quantify offset credits for recycled water recharge.	1 Develop a comprehensive stormwater flow and quality monitoring program in partnership with other agencies charged with flow and quality monitoring.
	Develop new stormwater recharge projects at existing and future flood control facilities.	This action will maintain/increase yield and improve groundwater quality.	2 Develop and implement a comprehensive recharge program.
	Maximize recharge capacity at existing recharge facilities through improved maintenance.	This action will maintain/increase yield and improve groundwater quality.	2 Develop and implement a comprehensive recharge program.
6 The basin is hydrologically closed.			
6a The southern part of the basin will accumulate TDS and nitrogen if yield is maintained or increased.	Periodically assess the salt balance of the basin.	This action will provide one of a group of metrics from which the success of the water quality component of the OBMP will be assessed. A declining salt balance will indicate an improvement in water quality.	1 Develop and implement a comprehensive basin-wide ground level, groundwater level, quality, and production monitoring program. 6 Develop new tools to compute salt balance
6b There is a lack of cost-effective groundwater salt export facilities.	Develop new TDS export facilities and/or find means of using Non Reclaimable Waste Line and the Santa Ana Regional Interceptor with less cost.	This action will result in TDS and and nitrogen removal, improvement in groundwater quality, will maintain/increase basin yield, and improve Santa Ana River quality.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas
	Establish financial incentives to ensure that existing groundwater is pumped and that high quality water is used to replenish the basin.	This action will result in more TDS and and nitrogen removal, improvement in groundwater quality, will maintain/increase basin yield, and improve Santa Ana River quality.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
6c Existing production patterns in the basin cause salt and nitrate to accumulate in the southern end of the basin.	Increase recharge without an increase in production to cause an increase in rising water	This action will result in a gradual improvement in groundwater quality in the southern part of the basin and an increase in TDS and nitrogen degradation in the Santa Ana River.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas
7 Pesticide and chemical use, and petroleum product disposal habits	Public education.	Members of the public will be encouraged to become individually involved in protecting both surface and groundwater quality	6 Develop and implement programs to address problems posed by specific contaminants.
Goal 3 -- Enhance Management of the Basin			
1 The way Watermaster manages cyclic and local storage accounts will cause overdraft.	Develop methods to account for losses from cyclic and local storage accounts; set limits on storage.	This action will help maintain the safe yield and ensure that basin water is put to maximum beneficial use.	8 Develop and implement a storage management program.
2 Existing production patterns are not balanced, cause losses, can cause local subsidence, and water quality problems.	Develop and implement a comprehensive basin-wide ground level, groundwater level, quality, and production monitoring program.	This action will provide information that can be used to understand the groundwater flow system and quality conditions.	1 Develop and implement a comprehensive basin-wide ground level, groundwater level, quality, and production monitoring program.
	Develop new production patterns that maximize yield and beneficial use; and develop incentive programs and policies that encourage (or rules that enforce) new production patterns.	This action will maximize yield and beneficial use of basin water; improve basin water quality, and improve Santa Ana River quality.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas 1 - 9 Develop basin-wide groundwater management program
	Develop programs (regional treatment, incentives, etc) to pump and treat degraded groundwater and to put the treated water to direct use.	This action will maximize yield and beneficial use of basin water; improve basin water quality, and improve Santa Ana River quality.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas
3 About 500,000 to 1,000,000 acre-ft of storage in the Chino Basin cannot be used due to water quality and institutional issues.	Develop conjunctive use programs that take into account water quantity and quality	This action will result in lower water supply costs to basin producers.	9 Develop conjunctive use programs that take into account water quantity and quality
4 Poor ambient groundwater quality limits direct use of groundwater and can lead to loss of basin yield.	Develop programs (regional treatment, incentives, etc) to pump and treat degraded groundwater and to put the treated water to direct use.	This action will speed up the cleanup of degraded water, stop the spreading of degradation and maintain/increase safe yield.	3 Develop and implement a comprehensive water supply plan for existing and future impaired areas

Table 3-8
Summary Matrix of OBMP Goals, Impediments, Action Items, Implications, and Implementation Elements

Impediments to the Goal	Action Items to Implement Goal	Implications	Program Elements to be Implemented in the OBMP El. No./ Element Description
Goal 4 -- Equitably Finance the OBMP			
1 The equitable distribution of cost associated with the OBMP is not defined.	Identify an equitable approach to spread the cost of OBMP implementation either on a per acre-ft basis or some other equitable means.	This action will improve the likelihood that the OBMP will be implemented.	Develop and implement a financial plan to implement the OBMP
	Identify ways to recover value from utilizing basin assets including storage and rising water leaving the basin.	This action will lower the cost of the OBMP to producers and improve the likelihood that OBMP will be implemented.	Develop and implement a financial plan to implement the OBMP
2 Limited resources restrict potential water resources improvements of the OBMP.	Evaluate project and management components and rank components with equal consideration given to water quantity, water quality and cost.	This action will result in the optimum set of project and management components of the OBMP being implemented.	

SECTION 4
MANAGEMENT PLAN

INTRODUCTION

The Optimum Basin Management Program (OBMP) goals, impediments to the goals, action items to remove the impediments, and implications of the action items are summarized in Table 3-8. This section of the OBMP report describes the actions that, when implemented, will achieve the goals of the OBMP. Table 3-8 includes a column that cross-references the action items listed for each goal with OBMP program elements. The program elements described herein include:

- Program Element 1 – Develop and Implement Comprehensive Monitoring Program
- Program Element 2 – Develop and Implement Comprehensive Recharge Program
- Program Element 3 – Develop and Implement Water Supply Plan for the Impaired Areas of the Basin
- Program Element 4 – Develop and Implement Comprehensive Groundwater Management Plan for Management Zone 1
- Program Element 5 – Develop and Implement Regional Supplemental Water Program
- Program Element 6 – Develop and Implement Cooperative Programs with the Regional Water Quality Control Board, Santa Ana Region (Regional Board) and Other Agencies to Improve Basin Management
- Program Element 7 – Develop and Implement Salt Management Program
- Program Element 8 – Develop and Implement Groundwater Storage Management Program
- Program Element 9 – Develop and Implement Conjunctive-Use Programs

The scope of the program elements was developed by the Chino Basin stakeholders. Each program element contains a series of comprehensive actions and plans to implement those actions. It is anticipated that a specific implementation program will be the result of Phase II of the OBMP development process. It will include the specific details of how the plan will be implemented and funded, and by whom. Implementation of all program elements is necessary to achieve the goals of the OBMP. Because of overlap and synergies, some of the program elements were combined as they were developed. The following program elements were combined: 3/5, 6/7, and 8/9. The program elements are summarized in this section. Task Memorandums were prepared for each program element during development of the OBMP Phase I Report and are available from the Watermaster offices. They describe each program element in detail and generally include:

- need and function
- description of program element actions
- cost
- implementation entities
- implementation schedule for the short-term (first three years), mid-term (4^{th} through 10^{th} years) and-long term (11^{th} through 50^{th} years)

The emphasis in this section is on a description of OBMP actions, schedule and cost. The program element descriptions provide Watermaster and the Court with a means of comparing actions taken in OBMP implementation with progress in achieving the goals of the OBMP.

PROGRAM ELEMENT 1 – DEVELOP AND IMPLEMENT COMPREHENSIVE MONITORING PROGRAM

Need and Function

Program Element 1 – Develop and Implement a Comprehensive Monitoring Program contains monitoring activities that are action items explicitly listed in Table 3-8 and provides information required by other program elements of the OBMP.

The first impediment to *Goal 1 – Enhance Basin Water Supplies* can be stated as: "Unless certain actions are taken, safe yield of the Basin will be reduced … due to groundwater outflow from the southern part of the Basin." This impediment speaks to the reduction in groundwater production in the southern part of the Basin as agricultural land is converted to urban uses, and to increase outflow as groundwater storage is increased due to other management activities. The amount of safe yield lost due to these activities needs to be computed and used in the administration of the Judgment – otherwise the Basin will be overdrafted. The re-determination of safe yield and estimation of losses from groundwater storage programs require comprehensive water level mapping across the Basin, analysis of water level time histories at wells, and accurate estimations of groundwater production. The current groundwater level monitoring is not adequate. The primary problems with the current groundwater level monitoring program include poor areal distribution of wells in the monitoring program, short time histories, questionable data quality, and insufficient resources to develop and conduct a comprehensive program. Groundwater production estimates from the agricultural pool rely on water duty methods for most of the producers and some producers do not provide the Chino Basin Watermaster (Watermaster) with information upon which production estimates can be made. Rigorous groundwater level and production monitoring programs are described below.

The first impediment to *Goal 2 – Protect and Enhance Water Quality* can be stated as: "Watermaster lacks comprehensive, long-term information on groundwater quality." The primary uses of water quality information include, but are not limited to:

- locate and characterize water quality challenges in the Basin and formulate corrective management plans;
- provide an understanding of how the Basin works;
- determine whether water quality produced by a well is suitable for the desired use (*e.g.*, potable quality for potable use); and
- design treatment systems to improve water quality to a level to meet a desired use.

Currently, Watermaster obtains water quality data from all the appropriators for their active wells and from the Regional Board for wells monitored under their supervision (*e.g.*, landfill monitoring and other special water quality investigations). Watermaster has a limited groundwater quality monitoring program in the southern part of the Basin measuring general minerals and physical properties at about 60 wells. There is little historical or current water quality information for most of the 600 agricultural wells in the southern half of the Basin, for wells in the overlying non-agricultural pool, and for inactive appropriative pool wells. The water quality being produced at a majority of the wells in the Basin is unknown.

A salt budget approach has been proposed as a management tool for the Basin. The salt management steps included in *Program Element 7 Develop and Implement Salt Management Program* will be used by the Watermaster and other stakeholders to reduce the rate of salt accumulation in the Basin. Groundwater quality monitoring will be used to help assess the state of salt in the Basin in the future after the salt management plans are implemented. The direction and cost of future water management activities in the Basin depends on the water quality. A comprehensive groundwater quality monitoring program is fundamental to management of the Basin. A rigorous groundwater quality monitoring program is described below.

The fifth impediment to *Goal 2 – Protect and Enhance Water Quality* can be stated as: "The Basin is not using as much high quality storm water as it could for recharge." The first step in determining how much storm water recharge is occurring is to monitor the volume of inflow and outflow that is occurring at existing facilities, the amount of storm water that is available for recharge in the absence of recharge facilities, and to estimate the associated water quality. Characterizing the water quality of local and imported waters used for recharge in the Basin is necessary to protect water quality for beneficial uses, assess salt balance, design treatment processes to produce water of a quality suitable for intended uses, and to minimize the cost of recycled water recharge. Engineering investigations can utilize these data to design new facilities, and modify/operate existing facilities.

Storage of water in the Basin for local or regional conjunctive use may cause outflow to the Santa Ana River and some of its tributaries in the Chino Basin to increase. The water quality of this outflow may cause water quality deterioration in the Santa Ana River and require mitigation. Watermaster needs to develop a long-term database to assess losses from storage, and surface water impacts in the Santa Ana River and its Chino Basin tributaries from groundwater management activities.

The second impediment to *Goal 3 – Enhance Management of the Basin* can be stated as: "Existing production patterns are not balanced, cause losses, can contribute to local subsidence, and water quality problems." The impediment speaks to a lack of local balance between groundwater recharge and production. The lack of information on how groundwater moves in the Basin can lead to production and replenishment patterns that cause loss of yield and other problems as stated in the impediment. Groundwater level, groundwater quality, and accurate production estimates are necessary to define the groundwater flow systems and to implement equitable and cost-effective management plans.

Monitoring Programs to Support Water Resources Management in the Chino Basin

Groundwater Level Monitoring Program. Watermaster began a process to develop a comprehensive groundwater level monitoring program in the spring of 1998. The process consists of two parts – an initial survey followed by long-term monitoring at a set of key wells. The initial survey was to consist of collecting groundwater level data at all wells in the Basin from which groundwater level measurements can be obtained for spring 1998, fall 1998, spring 1999, and fall 1999. Due to resource limitations at the Watermaster, the initial survey is partially complete and will not be completed until after fall 2001. The data from the initial survey will be mapped and reviewed. Based on this review and Watermaster management needs, a long-term monitoring program will be developed and implemented in the fall of 2001. Watermaster staff will conduct this program with minimal outside assistance. Watermaster staff expects that they will measure groundwater levels in the initial survey at about 400 wells in overlying agricultural pool and about 100 other wells from the other pools and unassigned monitoring wells. The long-term monitoring program will use about half of the wells used in the initial survey plus all wells in the other pools and unassigned wells monitored under the direction of the Regional Board and others. Keys well located in agricultural areas will be replaced as necessary if the original well must be destroyed when the agricultural land surrounding the well is converted to other use.

Groundwater Quality Monitoring Program. Watermaster will begin the development of a comprehensive water quality monitoring program in July 1999. As with the groundwater level monitoring program, the water quality monitoring program will consist of an initial survey and a long-term monitoring effort. The initial survey will consist of:

- collection of all water quality data from appropriators' wells that are tested by appropriators;
- collection of all water quality data from Regional Board for water quality monitoring efforts that are conducted under their supervision; and
- collection and analysis of at least one water quality sample at all (or a representative set of) other production wells in the Basin. Assumed maximum number of wells sampled by Watermaster staff in the initial survey is 600.

Re-sampling and analysis will be done at wells sampled by Watermaster if volatile organic compounds (VOCs) are detected. These data will be mapped and reviewed. Based on this review and Watermaster management goals in the OBMP, a long-term monitoring program will be developed and implemented in the fall of 2002. The long-term monitoring program will contain a minimum set of key wells that can be periodically monitored to assess water quality conditions in the Basin over time. Table 4-1 lists the analytes and the analytical costs for sampling 200 wells per year for three years (plus an estimated 10 more wells for verification re-sampling). The average annual analytical cost is about $185,000 per year and totals about $555,000 if all wells were sampled. Watermaster staff will be trained to obtain samples at these wells and will require a total of about 140 person-days per year. Outside services will cost about $60,000 per year. Water quality data for all operable wells in the other pools will be provided by the well owners in those pools.

Production Monitoring Program. All wells that produce more than 10 acre-ft/yr will have in-line totalizing flow meters. To accomplish this, about 600 agricultural wells will be equipped with in-line totalizing flow meters. Production records from wells owned by appropriators and overlying non-agricultural pool members will report quarterly as has been done in the past. Watermaster staff will read the meters of wells owned by agricultural pool members at least once a year during the period of mid-May through June. Watermaster staff will digitize all production records in Watermaster's database and use this information in the administration of the Judgment. The cost of the installing in-line flow meters in the overlying agricultural pool is summarized in Table 4-2 and totals about $810,000. It has been recommended by the overlying agricultural pool that Watermaster fund up to 50 percent of the cost, with the remaining funds coming from the individual producers.

In addition to the above, all producers will provide Watermaster on an annual basis a *water use and disposal survey* form that describes the sources of water used by each producer and how that water is disposed after use. The purpose of the form is to provide information to Watermaster that will enable accurate salt budget estimates as described in *Program Element 6 – Develop and Implement Cooperative Programs with the Regional Board and Other Agencies to Improve Basin Management*, and for other water resources management investigations that may be undertaken by Watermaster in the future as part of the OBMP.

Surface Water Discharge and Quality Monitoring. The current program of measuring water quality at recharge basins should be expanded to all recharge and retention basins that contribute significant recharge to the Basin. Water level sensors will be installed in all recharge and retention basins that contribute significant recharge to the Chino Basin. These facilities were listed in Table 3 of the *Program Element 2 – Develop and Implement a Comprehensive Recharge Program* draft memorandum and are reproduced here in Table 4-3. A total of 16 new water-level sensors will be required at a total cost of

$192,000. Water level data acquisition and water quality sampling will be done by Watermaster staff. The annual cost of laboratory analysis and interpretation of water level and water quality data is about $45,000.

Watermaster needs to assess the existing surface water discharge and associated water quality monitoring programs for the Santa Ana River and its Chino Basin tributaries to determine the adequacy of the existing monitoring programs for characterizing historical ambient conditions and their utility in detecting water quality impacts from future Chino Basin management activities. If necessary, Watermaster could contract with the agencies conducting these programs to modify their programs to accommodate Watermaster. Ideally, a cooperative program involving all the interested agencies could be developed at a reduced cost for all. The cost of the initial assessment of surface water data for the Santa Ana River is about $15,000.

Ground Level Monitoring Program. Ground level surveys are proposed herein as an offshoot of the subsidence issues in Management Zone 1. The stakeholders are interested in determining if and how much subsidence has occurred in the Basin. Watermaster will conduct an analysis of historical ground level survey and remote sensing data to make this determination. The analysis consists of the following tasks:

- Historical survey data collected and/or on file by federal, state, and local agencies will be compiled, mapped, and reviewed to estimate total subsidence for as long a period as possible. Estimated cost to complete this review is about $15,000.
- Synthetic aperture radar (SAR) imagery will be used to assess the time history of subsidence in the Basin for the period 1993 though 1999. Estimated cost to develop this time history is about $20,000. It should be noted that the City of Chino has already conducted a similar investigation for most of the Basin and that the effort described herein is to expand on the work already done by the City.
- Based on the above information, a network of ground elevation stations in subsidence-prone areas will be developed and periodic surveys of these stations will be done. The frequency of periodic surveys will be established for the Basin as a whole with more frequent surveys done for some areas of the Basin. The estimated cost of this effort is not certain. It should be noted that the City of Chino has already conducted a similar survey within the City of Chino and that the effort described herein is to expand on the surveys done by the City to the entire Basin.

These tasks can be accomplished in the first year.

Well Construction, Abandonment and Destruction Monitoring. Watermaster maintains a database on wells in the Basin and Watermaster staff makes frequent well inspections. Watermaster sometimes finds a new well during routine well inspections. The near-term frequency of inspection is expected to increase due to the groundwater level, quality and production monitoring programs. Watermaster needs to know when new wells are constructed as part of its administration of the Judgment. Valuable information for use in managing the Chino Basin is usually developed when wells are constructed including: well design, lithologic and geophysical logs, groundwater level and quality data, and aquifer stress test data. Producers generally notify Watermaster when they construct a new well but seldom, if ever, provide the information listed above. Watermaster has not generally asked for these data. Well owners must obtain permits from the appropriate county and state agencies to drill a well and to put the well in use. Watermaster will develop cooperative agreements with the counties of Los Angeles, Orange, Riverside, and San Bernardino, and the California Department of Health Services (DHS) to ensure that the appropriate entities know that a new well has been constructed. Watermaster staff will obtain well design, lithologic and geophysical logs, groundwater level and quality data, and aquifer stress test data.

The presence of abandoned wells is a threat to groundwater supply and a physical hazard. Watermaster staff will review its database, make appropriate inspections, consult with well owners, and compile a list of abandoned wells in the Chino Basin. The owners of the abandoned wells will be requested to properly destroy their wells following the ordinances developed by the county in which the abandoned well is located. Watermaster staff will update its list of abandoned wells annually and provide this list to the counties for follow-up and enforcement.

Cooperative Efforts with Appropriate Agencies to Implement Program

Groundwater Level Monitoring. Watermaster will develop a groundwater level measurement protocol for use by all cooperating entities. Groundwater levels will be obtained by the following entities:

- Overlying Agricultural Pool – Watermaster staff
- Overlying Non-agricultural Pool – pool member or Watermaster staff
- Appropriative Pool – pool member or Watermaster staff
- Other wells – Watermaster staff will obtain data from Regional Board or owners.

Groundwater Quality Monitoring. Watermaster will develop groundwater sampling and analysis protocols for use by all cooperating entities. Groundwater quality analyses will be obtained by the following entities:

- Overlying Agricultural Pool – Watermaster staff
- Overlying Non-agricultural Pool – pool member
- Appropriative Pool – pool member
- Other wells – Watermaster staff will obtain data from Regional Board or owners.

Proposed Production Monitoring Program. Watermaster will develop and implement an in-line meter installation program for the overlying agricultural pool. The installation program will take place over a three-year period starting in Watermaster fiscal year 1999/00. Groundwater production estimates and water use and disposal survey forms will be obtained by the following entities:

- Overlying Agricultural Pool – Watermaster will read meters and producers will prepare and submit water use and disposal survey forms
- Overlying Non-agricultural Pool – pool member will read the meters and prepare and submit the water use and disposal survey forms
- Appropriative Pool – pool member will read the meters and will prepare and submit the water use and disposal survey forms.

Surface Water Discharge and Water Quality Program. Watermaster will take the lead in completing the following activities:

- Chino Basin Water Conservation District (Conservation District) and Watermaster will jointly install water level sensors in all existing recharge and retention facilities that have potential for storm water recharge.
- Watermaster staff will obtain grab samples approximately every two weeks for all basins during the rainy season and have these samples analyzed.

- Watermaster will review the surface water discharge and associated water quality monitoring programs for the Santa Ana River and the lower Chino Basin tributaries, and compare what is available from these programs to what is needed for Watermaster investigations under the OBMP.

Ground Level Survey. Watermaster will conduct the analysis to estimate historical subsidence and to monitor future subsidence in the Chino Basin.

Monitoring of Well Construction, Abandonment and Destruction. Watermaster will take the lead in completing the following activities:

- Develop agreements with county and state agencies to notify each other regarding construction of new wells and to obtain construction related information.
- Watermaster staff will prepare a list of abandoned wells and request the owners of abandoned wells to properly destroy their wells.

The counties will follow-up to ensure that abandoned wells within their jurisdiction are properly destroyed.

Implementation Actions and Schedule

First Three Years (1999/00 to 2001/02). The following actions will be completed in the first three years commencing fiscal year 1999/00:

- Complete initial survey for the groundwater level program.
- Complete initial survey for groundwater quality program.
- Complete meter installation program for overlying agricultural pool.
- Complete ground level survey.
- Complete installation of water level sensors in recharge and retention facilities.
- Complete Santa Ana River surface water monitoring adequacy analysis.
- Start and continue surface water discharge and quality monitoring at recharge and retention facilities.
- Develop agreements with county and state agencies regarding notification of new well drilling.
- Well construction and related information will be requested as new wells are identified.
- A list of abandoned wells will be developed annually and the owners will be requested to properly destroy their abandoned wells.

Years Four to Ten (2002/03 to 2010/11). The following actions will be completed in years four through ten, commencing fiscal year 2002/03:

- Start and continue long-term groundwater level monitoring program, cause key wells to be relocated as necessary.
- Start and continue long-term groundwater quality monitoring program, cause key wells to be relocated as necessary.
- Continue production monitoring.

- Conduct remote sensing analysis using synthetic aperture radar or other techniques at least every ten years (2010/11) or sooner, if necessary.
- Participate, as necessary, in the Santa Ana River surface water monitoring.
- Continue surface water discharge and quality monitoring at recharge and retention facilities.
- Well construction and related information will be requested as new wells are identified.
- A list of abandoned wells will be developed annually and the owners will be requested to properly destroy their abandoned wells.

Years Eleven to Fifty (2011/12 to 2050/51). The following actions will be completed in years eleven to fifty, commencing fiscal year 2011/12:

- Continue long-term groundwater level monitoring program, cause key wells to be relocated as necessary.
- Continue long-term groundwater quality monitoring program, cause key wells to be relocated as necessary.
- Continue production monitoring.
- Conduct remote sensing analysis using synthetic aperture radar or other technique at least every ten years (2020/21, 2030/31, 2040/41, 2050/51) or sooner, if necessary.
- Participate as necessary in the Santa Ana River surface water monitoring.
- Continue surface water discharge and quality monitoring at recharge and retention facilities.
- Well construction related information will be requested as new wells are identified.
- A list of abandoned wells will be developed annually and the owners will be requested to properly destroy their abandoned wells.

PROGRAM ELEMENT 2 -- DEVELOP AND IMPLEMENT COMPREHENSIVE RECHARGE PROGRAM

Need and Function of the Program Element

The need for a comprehensive recharge program was described in the introduction to the Final Report for Phase 1 of the Chino Basin Recharge Master Plan (Wildermuth, 1998). Program Element 2 -- Develop and Implement Comprehensive Recharge Program contains action items explicitly listed in Table 3-8.

The first impediment to Goal 1 – Enhance Basin Water Supplies can be stated as: "Unless certain actions are taken, safe yield of the Basin will be reduced … due to groundwater outflow from the southern part of the Basin" speaks to poorly planned recharge where recharge of storm water and recycled water could be placed too low in the Basin to be recovered. Some recycled water projects that are currently being planned will increase recharge when groundwater production downgradient of these proposed recharge projects is decreasing. The result will be increased outflow to the Santa Ana River and no yield improvement. A comprehensive program must ensure that the locations of recharge and production are such that yield is maximized.

The second impediment to *Goal 1 – Enhance Basin Water Supplies* and the fifth impediment to *Goal 2 – Protect and Enhance Groundwater Quality* can be stated as: "The Basin is not using as much high quality storm water as it could for recharge." At the time the Chino Judgment was adopted (1978), about

41 percent of the safe yield was estimated to come from irrigation returns. Since that time, irrigated agriculture has declined and is projected to be almost completely converted to urban uses by 2020. This will result in a decline of irrigation returns to groundwater and a potential decrease in the safe yield. San Bernardino County, Riverside County, and the US Army Corps of Engineers (USACE) have constructed flood control projects that efficiently capture and convey storm flow to the Santa Ana River, effectively eliminating the groundwater recharge that formerly took place in the stream channels and flood plains in the Chino Basin. In most cases, no provisions were made to mitigate the loss of recharge from flood control projects. Also, there have been no mitigation efforts to preserve recharge when land use is converted from native and agricultural uses to urban uses. Thus, the safe yield may have decreased in the Chino Basin due to land use changes and flood control improvements. Water harvesting opportunities exist that can be used to offset the yield lost to urbanization and flood control improvements. Water harvesting consists of capturing and recharging new storm flow caused by urbanization. Most of the precipitation falling on undeveloped land or land in agricultural uses is lost to evapotranspiration. Storm flow increases dramatically with urbanization due to an increase in impervious land cover, decrease in evapotranspiration of rainfall, and construction of drainage improvements. The potential yield from this additional storm flow is numerically equal to the increase in storm flow that occurs when the land is converted to urban uses. The actual yield is equal to the additional rainfall-storm flow that is captured and put to beneficial use. In the Chino Basin, the best and least expensive way to put this new water to beneficial use is groundwater recharge.

Increasing the yield of the Chino Basin by increased capture of storm flow will improve ambient water quality and increase the assimilative capacity of the Chino Basin. Increasing the capture of storm flow will reduce the cost of mitigation requirements for recharge of recycled water. The Basin Plan assumes that a certain average annual quantity of storm flow will be recharged each year. The volume of recycled water that can be used in the Basin, without total dissolved solids (TDS) mitigation, is numerically-tied to the average annual quantity of storm flow that recharges the Basin. A decrease in the recharge of storm flow will result in a decrease in the volume of recycled water that will be permitted in the Basin without TDS mitigation. Likewise, an increase in the recharge of storm flow will result in an increase in the volume of recycled water that will be permitted in the Basin without TDS mitigation. Therefore, the volume of storm flow recharge from storm flow has a dramatic impact on the future and cost of recycled water recharge.

The annual replenishment obligation will grow from about 30,000 to 55,000 acre-feet per year (acre-ft/yr) over the next 20 to 30 years. Watermaster has access to spreading facilities with a current capacity of about 29,000 acre-ft/yr when imported water from Metropolitan is available. Assuming replenishment water is available seven out of ten years, the average annual recharge capacity of recharge facilities available to Watermaster is about 20,000 acre-ft year. The in-lieu recharge potential for the Chino Basin is about 57,000 acre-ft/yr and will remain constant over the next 20 to 30 years based on the water supply plan included in this OBMP. Assuming in-lieu replenishment water is available seven out of ten years, the average annual in-lieu recharge capacity available to Watermaster is about 40,000 acre-ft year. The replenishment obligation, available recharge capacity over the next 20 years is (acre-ft/yr):

Year	Replenishment Obligation	--------------Recharge Capacity--------------			Surplus Recharge Capacity
		Physical	In-Lieu	Total	
2000	31,000	20,000	40,000	60,000	29,000
2020	55,000	20,000	40,000	60,000	5,000

The surplus recharge capacity could be used up quickly by future replenishment needs and implementation of conjunctive-use programs. A modest conjunctive use program consisting of an annually occurring seasonal shift of imported demands and a dry year yield component that would use up 150,000 acre-ft of storage will require about 46,000 acre-ft of recharge capacity. New recharge capacity is needed immediately for even a modest conjunctive-use program. The availability of in-lieu recharge capacity listed above is not a certainty. In the present mode of basin management, in-lieu recharge capacity is available on an ad hoc basis and requires the cooperation of water supply agencies that have access to supplemental water. Watermaster needs to obtain enough recharge capacity to meet its replenishment obligations for ultimate demands on the Chino Basin. The safest and most conservative way to ensure that recharge capacity will be available is for Watermaster to develop new recharge capacity that will meet ultimate replenishment obligations. For an average annual recharge capacity of 55,000 acre-ft/yr, Watermaster will need an annual recharge capacity of about 80,000 acre-ft/yr (80,000~55,000/0.7). The new recharge capacity by management zone for the year 2020 is estimated to be about:

Management Zone 1	18,000 acre-ft/yr
Management Zone 2 and 3	34,000 acre-ft/yr
Total	52,000 acre-ft/yr

The allocation of recharge capacity to management zones is based on balancing recharge and production in each management zone with the year 2020 production pattern described in Program Elements 3 and 5. Figure 4-1 shows the existing spreading and storm water retention basins in the Chino Basin. Figure 4-1 also shows the preferred area, based on current knowledge, for new recharge basins in Management Zone 2 and 3. The preferred recharge area is rapidly developing. It is unlikely that Watermaster will be able to purchase lands already in urban use and construct new basins. Therefore, Watermaster needs to obtain new recharge sites in the preferred area immediately. Recharge capacity in Management Zone 1 can be obtained by expanding recharge capacity at the Montclair Basins, improving the Upland and Brooks Basins, and through groundwater injection. During Phase II of the OBMP, Watermaster will develop an implementation plan to secure a total physical recharge capacity of about 80,000 acre-ft/yr with recharge facilities sized and located that will balance the production and recharge.

Past Efforts by Watermaster and the Conservation District

The Conservation District and the Watermaster completed phase 1 of a three-phase work plan to improve recharge and establish a long-range recharge master plan for the Chino Basin. The three phases consist of:

> *Phase 1 - Initial Screening and Assessment.* Conduct an assessment of how much storm flow is currently recharged and how much additional recharge could occur at new and existing spreading basin sites. From this assessment a list of promising spreading basins will be developed. Research questions will be developed for the promising sites and a detailed scope of work will be developed for Phase 2. Phase 1 was completed in January 1998 and is summarized below.
>
> *Phase 2 - Engineering Assessments of Promising Sites.* Site-specific investigations, percolation rate monitoring and the preparation of cost estimates for developing and managing these basins will be developed in this phase. The institutional issues regarding ownership of facilities, management of non-Conservation District-owned facilities, disposition of water recharged, and Basin Plan modifications will be identified.

Principles of agreement will be developed that describe the institutional issues and means to resolve these issues through agreements. A list of recharge projects will be identified and prioritized based on need and cost effectiveness. A detailed scope of work will be developed for Phase 3.

Phase 3 - Develop an Implementation Plan. A plan to develop and manage spreading basins will be prepared. The plan will include existing and new basins and a schedule for spreading basin improvements based on developing recharge capacity to match need for increased groundwater yield at minimum cost.

The Phase 1 effort was completed in January 1998. The objective of the Phase 1 analysis of the Recharge Master Plan was to determine the potential for artificial recharge given the resources in the Chino Basin. This was accomplished through data collection, research, and a massive computational and engineering assessment. Existing storm water recharge in the Chino Basin was estimated to be about 12,000 acre-ft/yr. This 12,000 acre-ft is part of the existing safe yield. The potential storm water recharge was estimated to range from about 25,000 to 30,000 acre-ft/yr given proper routine maintenance at existing and then-current planned facilities. Subsequent investigations by the Conservation District suggest that the potential recharge is lower. Incorporating the Conservation District's recent work, the potential range is probably around 12,000 to 22,000 acre-ft/yr. Table 4-4 lists the existing flood control/spreading basins and annual average recharge estimates based on updated Phase 1 modeling results. Most basins are not maintained to optimize recharge and there is little quantitative information on basin conditions or current recharge performance. Recharge of storm flows at existing basins could reach about 28,000 acre-ft/yr under ultimate land use conditions. The investigation also showed that it was economical to construct recharge facilities in areas with low percolation rates (<0.25 ft/day) if the facilities were part of a flood retention project. The potential recharge capacity and cost for recharge of imported and recycled water were developed. Operational plans that specify the amount and scheduling of imported water and recycled water recharge were developed. About 17,000 acre-ft/yr of recycled water recharge capacity was developed. The potential for imported water recharge ranges from about 100,000 acre-ft/yr to 135,000 acre-ft/yr at existing basins and one new large facility. Based on the work done for Program Elements 3 and 5 of the OBMP, the imported water recharge capacity needs to be expanded from its current capacity of 29,000 acre-ft/yr to about 80,000 acre-ft/yr to accommodate Watermaster replenishment activities.

Phase 2 Scope of Work for Hydrogeologic and Engineering Investigations

The Phase 2 work, as recommended in the Phase 1 report, was not formally started. Phase 2 consists of eight tasks.

<u>Task 1 Conduct Reconnaissance Analysis to Identify Existing Recharge Basins and Potential New Recharge Sites.</u> The purpose of this task is to develop a list of existing basins that can be used to recharge storm water, recycled water and imported water; and to identify areas for new recharge facilities. Based on the results of this task, some existing basins and new sites with potential for recharge by spreading and injection will be studied in detail in subsequent tasks and others with little potential recharge will either be studied later or not considered as recharge sites. This task consists of the following subtasks:

1.1 Meeting(s) with San Bernardino County Flood Control District (SBCFCD), Riverside County Flood Control and Water Conservation District (RCFCWCD), Los Angeles County Public Works Department (LACPWD) (collectively, the flood control agencies), the USACE, the Conservation District and the Watermaster. The purpose of these meetings is to discuss the use of existing flood control/recharge basins, recharge potential of these basins, past investigations, future flood control plans that could in include recharge, and institutional impediments to storm water recharge.

1.2 Meetings with planning agencies and the flood control agencies to inform these agencies of the need to set aside open space for recharge and to locate suitable areas for future recharge sites; to seek their cooperation in obtaining such lands, and to develop incentive programs to set aside land for recharge. A permanent basin-wide water conservation planning committee chaired by the Watermaster will be formed to facilitate the process of building and maintaining recharge facilities.

1.3 Develop a financing concept to provide capital for the improvement of existing facilities, construction of new facilities, operations and maintenance, and to mitigate adverse impacts of new spreading basins.

1.4 Review new hydrogeologic and facilities information that became available after completion of the Phase 1 analysis.

1.5 Evaluate Phase 1 computer simulation results to determine the location and magnitude of storm flow that is not being captured at existing facilities and that could be captured and recharged in either new facilities or from improved operations at existing facilities.

1.6 Develop a list of existing and proposed recharge facilities that merit detailed investigation. The priority list should be based on management issues (*e.g.*, subsidence and water quality), cost effectiveness, and for existing facilities, the availability of the facilities for recharge.

1.7 Conduct reconnaissance level feasibility investigation of using injection wells for recharge in Management Zone 1. The purpose of this recharge will be to increase the piezometric levels, reduce future subsidence, and improve water quality.

Task 2 Preliminary Assessment of the Capture of New Recharge. The objective of this task is to estimate the fate of artificial recharge. That is, to estimate the recharge benefits, areas of potential high groundwater, and losses to the Santa Ana River. The scenarios to be tested include recharge scenarios developed in the Phase 1 analysis (modified based on the results of Conservation District investigations and the results of Task 1). The *Rapid Assessment Model (RAM) Tool,* currently under development by the Watermaster, or *Chino Integrated Groundwater Surface Water Model (CIGSM)* are two models that could be used to make this assessment. It is not likely that the CIGSM would be used due to the time and expense to make it ready for use (see Program Elements 6 and 7 later in this section).

Task 3 Conduct Field Program. The purpose of this task is to develop fundamental information that can be used to assess the recharge potential of some existing and proposed basins, and to develop design information for new basins. The field program recommended for Phase 2 includes:

- obtaining and interpreting continuous cores for the upper 50 feet of sediment in existing facilities and the upper 100 feet of sediments from areas adjacent to existing and proposed basins;
- trenching to observe and interpret the near surface soil profiles;
- gradation tests of materials obtained from the trenches; and

- the installation of water level sensors identical to what Conservation District has installed in some of their basins.

Water level data will be collected at basins that are equipped with water level sensors. These data will be interpreted to produce percolation rates at each basin. The percolation rates will be correlated to soil properties and subsurface conditions to determine what is controlling recharge at a specific facility and to develop general design guidelines for the Chino Basin area. The field program is summarized in Table 4-5 covers 16 existing basins and up to three new surface water recharge facilities. Table 4-5 includes a cost estimate for this field program. Field programs for injection tests in Management Zone 1 will be developed in the work done in Program Element 4 – Develop and Implement Comprehensive Groundwater Management Plan for Management Zone 1.

Task 4 Develop Principles of Agreement. This task involves developing principles of agreement between SBCFCD, RCFCWCD, USACE, the Conservation District, and the Watermaster regarding the operation of existing and proposed storm flow management facilities. The goals of the principles are to maintain flood protection and maximize recharge. This work will involve the preparation of draft principles and many meetings. New technical information will need to be developed on an *ad hoc* basis in response to technical issues that will be involved in the principles. A set of principles will be developed with the Regional Board regarding TDS and nitrogen offset credits for recharge of recycled water.

Task 5 Develop Preliminary Operating Plans and Designs. Preliminary operating plans and facility improvements will be developed for all (new and proposed) recharge basins in the Chino Basin based on the results of Tasks 1 through 4. Preliminary capital and operating cost estimates will be developed.

Task 6 Estimate the Average Annual Recharge for Each Basin. Given the results of Tasks 1 through 5, the input data for the computer simulation models used in Phase 1 will be updated. The simulation models will be used to estimate the average annual recharge in each recharge basin. Estimates of imported water and recycled water recharge capacity will be updated. The priority list developed in Task 1 will be updated based on the results of this task.

Task 7 Develop Early Action Plan and Scope of Work for Phase 3. Given the results of Tasks 1 through 6, an early action plan and scope of work for Phase 3 will be developed. The early action plan, will include a list of high priority recharge projects that can be implemented with minimal additional analyses, and a list of lower priority projects that will require longer lead times to implement. These projects may include operating existing facilities to increase recharge, other non-controversial modifications to existing facilities, and construction of new recharge facilities. The scope of work will contain engineering design, environmental assessment and processing, and financing tasks. The scope of work will contain parallel tracks for the early action plan and the lower priority projects.

Task 8 Prepare Report. Technical memoranda will be prepared for Tasks 1 through 7. A final summary report will be prepared incorporating the task memoranda and a scope of work for Phase 3.

Cooperative Efforts with Appropriate Agencies to Implement Program

There are two fundamental levels of implementation appropriate for the comprehensive recharge program: one to develop the program, and one to construct, manage and operate the program. For development of the program, the implementing agencies include:

- the Watermaster, representing the producers who will benefit from the recharge and who will pay the cost of the plan development and implementation;

- the Conservation District, the flood control agencies, and the USACE who own the existing facilities and who (for the flood control agencies) will benefit from reduced flood control costs and improved storm water quality in the Santa Ana River and its tributaries;
- the planning agencies whose cooperation will be necessary to site new recharge facilities within their service areas; Inland Empire Utilities Agency (IEUA), Three Valleys Municipal Water District (TVMWD), and Western Municipal Water District (WMWD) as the provider of imported and recycled water for recharge; and producers that will utilize their own facilities for groundwater injection.

Watermaster will develop the recharge program for the Basin in the first four years of OBMP implementation. Watermaster will enter in to agreements with cooperative entities to implement the recharge program. Potential cooperative entities include Conservation District, the flood control agencies, USACE, Metropolitan Water District of Southern California (MWDSC), IEUA, TVMWD, and WMWD. These contracts will include specific performance goals and schedule. Watermaster will monitor these contracts very closely. If the cooperative entities fail to perform according to the terms of their contract, then Watermaster will terminate the agreements and either enter into an agreement with another cooperative entity or implement the program itself.

Implementation Actions and Schedule

First Three Years (1999/00 to 2001/02). The following actions will be completed in the first three years commencing fiscal year 1999/00:

- The Phase 2 scope of work should be completed within the first three years.
- Based on the results of the Phase 2 work, a list of high priority and low priority recharge projects will be identified. An action plan will be developed to implement the high priority projects as soon as possible and to implement the low priority projects as resources will allow.
- Task 1.1 and 1.2 should begin immediately, prior to the OBMP being submitted to the Court for approval.
- Watermaster advisory committee should form an *ad hoc* committee to start the coordination process and formalize the permanent basin-wide water conservation planning committee. Task 1.5 should also begin immediately.
- In year three, all high priority projects that involve re-operation of existing recharge/flood control facilities should be implemented, and Phase 3 should be started.
- Watermaster should begin the process of acquiring new recharge sites and easements identified in the Phase 2 and 3.

Years Four to Ten (2002/03 to 2010/11). The following actions will be completed in years four through ten, commencing fiscal year 2002/03:

Years four and five

- Complete Phase 3.
- Implement all high priority projects that involve construction and re-operation at existing facilities.

- Watermaster should continue the process of acquiring new recharge sites and easements identified in the Phase 2 and 3. By year five, recharge sites should have acquired to recharge at least 55,000 acre-ft/yr.
- Update the comprehensive recharge program in year 5.

Years five to ten

- Implement all high priority projects that involve the construction of new recharge facilities.
- Update the comprehensive recharge program in year 10.

Years Eleven to Fifty (2011/12 to 2050/51). The following actions will be completed in years eleven to fifty, commencing fiscal year 2011/12:

- Implement all other recharge projects based on need and available resources.
- Update the comprehensive recharge program every five years.

PROGRAM ELEMENT 3 – DEVELOP AND IMPLEMENT WATER SUPPLY PLAN FOR THE IMPAIRED AREAS OF THE BASIN

PROGRAM ELEMENT 5 – DEVELOP AND IMPLEMENT REGIONAL SUPPLEMENTAL WATER PROGRAM

Need and Function of the Program Elements

These program elements serve the OBMP goals listed in Table 3-8. The specific goals, impediments and action items are described below.

The first impediment in *Goal 1 – Enhance Basin Water Supplies* can be stated as: "Unless certain actions are taken, safe yield of the Basin will be reduced due to outflow from the southern part of the Basin." The fourth impediment in *Goal 2 – Protect and Enhance Water Quality* can be stated as: "Poor ambient groundwater quality limits direct use of groundwater and can lead to loss of Basin yield." Most of the agricultural land use in the southern part of the Basin will convert to urban uses over the next 20 to 30 years. Groundwater from the southern part of the Basin will have to be treated prior to use for these new land uses. Groundwater outflow to the Santa Ana River will occur if the decrease in agricultural groundwater production in the southern part of the Basin is not matched by an increase in municipal groundwater production in the same area. The increase in outflow will result in a decrease in safe yield that will reduce the initial rights of the producers in appropriative pool by about 74 percent. The increase in groundwater outflow to the Santa Ana River will cause an increase in river discharge and a degradation of water quality in the river. Currently, agricultural production in the southern part of the Basin is estimated using primarily water duty methods to be about 40,000 acre-ft/yr. Annual estimates of agricultural production are expected to be larger after in-line meters are in place. If the current level of groundwater production in the southern part of the Basin were to cease, the rising water discharge to the Santa Ana River could increase by approximately the numerical equivalent of the current production – about 40,000 acre-ft/yr. This new discharge would have an associated TDS concentration of about 1,300 milligrams per liter (mg/L) (almost twice the basin plan objective of 740 mg/L and 2.5 times the secondary drinking water MCL of 500 mg/L) and a nitrogen concentration of 30 mg/L-N (three times the basin plan objective of 10 mg/L-N and primary drinking water MCL of 10 mg/L-N). The Santa Ana River downstream of the Chino Basin is the primary drinking water supply for most of Orange County. Therefore, Santa Ana River water quality impacts caused by not producing Chino Basin groundwater will adversely affect the municipal water supplies in Orange County. The Regional Board has indicated that any adverse impacts to the Santa Ana River water quality associated with increased outflows from Chino Basin groundwater will have to be completely mitigated – presumably by desalting recycled water discharges to the Santa Ana River.

The third impediment in Goal 1 – Enhance Basin Water Supplies can be stated as: "Because there is a lack of assimilative capacity for total dissolved solids and nitrogen in the Chino Basin, there are economic limitations on the recharge of recycled water." Most of the recycled water produced in the Basin is exported out of the Basin because of either lack of demand for direct use or economic limitations caused by the lack of assimilative capacity in the Chino Basin. The TDS and nitrogen objectives in the Santa Ana Watershed are under rigorous review and new water quality objectives and water recycling guidelines should be implemented in the next few years. Recharge of recycled water could be used to replenish over-production, supplement the yield of the Basin, and lower the demand for imported water from the Sacramento Delta. There are three treatment options that that can be used to enable the recharge of recycled water: desalting recycled water prior to recharge, desalting groundwater to offset the salt load in the recycled water, and blending recycled water with low TDS imported and/or storm waters.

The fourth impediment in *Goal 1 – Enhance Basin Water Supplies* can be stated as: "Because future demands are increasing and there are limitations on basin and traditional supplies, new sources of supplemental water need to be developed." Alternatives to the use of imported water from MWDSC need to be developed to meet future demands, improve reliability and minimize cost of supplies. The new supplies include recycled water, groundwater from adjacent basins, Santa Ana River water and other waters as can be identified and conveyed to the Chino Basin.

The third impediment in *Goal 2 – Protect and Enhance Water Quality* can be stated as: "There is ongoing legacy contamination in the vadose zone with TDS and nitrogen from agriculture." The vadose zone that underlies areas that were or are currently in agricultural use is likely to be degraded with TDS and nitrogen. The vadose zone will contribute to future TDS and nitrogen degradation of the saturated zone. The primary areas of concern are the areas that were formerly in citrus in the northern part of the Basin and the entire southern half of the Basin. There are two significant implications of legacy contamination in vadose zone: groundwater degradation from TDS and nitrogen will continue into the future long after the agriculture has left – even if extraordinary efforts are used to clean up degraded groundwater; and, groundwater treatment ranging from blending to desalting will be necessary far into the future to put the degraded groundwater to beneficial use.

There are other goals and impediments to goals that are listed for these program elements, but they are somewhat redundant with those listed above and are not described herein. Fundamentally, the goal of Program Elements 3 and 5 is to develop a regional, long range, cost-effective, equitable, water supply plan for producers in the Chino Basin that incorporates sound basin management. The water supply plan developed during Phase II of the OBMP process will include:

- a cost-effective plan to maximize the beneficial use of Chino Basin groundwater and the safe yield.
- a program to reliably meet the long-term water supply needs of area purveyors.
- an implementation program.

Water Demand Planning Assumptions

The planning assumptions and basic data used to develop and evaluate water supply plans are described below.

Available Water Supply from the Impaired Area. As urbanization of the agricultural areas of San Bernardino and Riverside counties in the southern half of the Basin occurs, the agricultural water demands will decrease and urban water demands will increase significantly. Future development in these areas is expected to be a combination of urban uses (residential, commercial, and industrial). The cities of Chino, Chino Hills, and Ontario, and the Jurupa Community Services District (JCSD) are expected to experience significant new demand as these purveyors begin serving urban customers in the former agricultural area. For planning purposes, the agricultural area is assumed to be fully developed by the year 2020.

Based on current estimates of overlying agricultural pool production, it is expected that at least 40,000 acre-ft/yr of groundwater will need to produced in the southern part of the Basin to maintain the safe yield. Actual replacement groundwater production required could be far greater than 40,000 acre-ft/yr if current agricultural production is greater than reported to Watermaster. Recall in the Section 2 discussion on Chino Basin production, that there was a difference in the agricultural production reported to Watermaster (based on water duty methods) and the production estimates developed in the CBWRMS based on water duty methods and water budget modeling, with Watermaster's estimates being about 26,000 acre-ft/yr lower for the period 1978 to 1989. Watermaster will install in-line meters on all wells over the next three years after which accurate estimates of agricultural production will be available. If these estimates show that agricultural production is higher than previously reported, then the groundwater production rates from the southern part of the Basin will have be increased to maintain yield.

Water Supply Plans. Water demands, supply projections for agencies that produce groundwater from the Chino Basin, and estimates of the safe operating yield of the Basin are the basis for evaluating the water supply plans presented in this analysis. Initial water supply plans were developed by Montgomery Watson in 1998 and modified by WE, Inc., based on information supplied by the municipal and industrial producers. The initial plans are shown in Table 2-17.

Based on the data presented in Section 2, the municipal and industrial demands are projected to increase 30 percent between 2000 and 2020. Several agencies will experience increases in demand exceeding 30 percent over the next 20 years, including the cities of Chino, Chino Hills, Norco, Ontario, Cucamonga County Water District (CCWD), Fontana Water Company (FWC), JCSD, and the West San Bernardino County Water District (WSBCWD). Forecasts from municipal and industrial entities indicate that water supply sources for the Chino Basin in 2020 will consist predominantly of Chino Basin wells through direct use or treatment and use, groundwater and treated surface water from other basins, and MWDSC supplies.

The demand data in Section 2 and individual water supply plans were used to quantify the future demand for each purveyor that will need to be satisfied from new water supply sources. Future sources for each purveyor were evaluated and classified into two categories: secure sources and non-secure sources. Secure sources are those with a high probability of being available throughout the planning period. These include existing and available supplies from Chino Basin wells, existing water and desalter plants (*i.e.*, WFA/JPA, CCWD, and TVMWD water treatment plants and Santa Ana Watershed Project Authority [SAWPA] Desalter), imported treated MWDSC water from the Weymouth treatment plant, and imported surface water from other basins. Non-secure sources are not currently available and must be developed to serve the Basin purveyors. These depend on a future event, such as the construction of a treatment plant or acquisition of a new water source.

Table 4-7 lists the 2020 demand projections, projected secure water supply sources including Chino Basin groundwater, production rights, over/under production, the water needed in the future, and the replenishment obligations. The quantity of water that will be required by each water purveyor was found by subtracting the secure water supply for each purveyor from the purveyor's 2020 demand.

As shown in Table 4-6 of the 404,000 acre-ft/yr of total demand predicted in 2020, approximately 364,000 acre-ft/yr will be met from secure water sources with the remaining 40,000 acre-feet of demand being met from projects described in this program element. The breakdown of the 40,000 acre-ft/yr by purveyor from largest to smallest user is as follows:

Jurupa CSD	10,720 acre-ft/yr
City of Chino	9,540 acre-ft/yr
City of Ontario	8,400 acre-ft/yr
City of Chino Hills	5,600 acre-ft/yr
City of Norco	3,260 acre-ft/yr
Santa Ana River WC	2,170 acre-ft/yr
Swan Lake	350 acre-ft/yr
Total in 2020	40,040 acre-ft/yr

The demand in years 2005, 2010, and 2015 was predicted assuming a uniform increase in annual demand for each of the above purveyors. Table 4-7 lists the demands for these intermediate planning years.

For the purpose of this analysis, it was assumed that there is approximately 48,000 acre-ft/yr of agricultural production in the southern part of the Chino Basin in the year 2000, and that this production will reduce to about 8,000 acre-ft/yr in the year 2020. This decline in agricultural production must be matched by new production in the southern part of the Basin or the safe yield in the Basin will be reduced. The remaining 8,000 acre-ft/yr of production in the southern part of the Basin will be used by the State of California.

Potential Supplemental Water Supply Sources. An evaluation of potential future supplemental water supply sources is given in Table 4-8. Of these sources, the most viable is supplied through existing basin conventional water treatment plants that treat imported State Water Project (SWP) water from MWDSC. For the purposes of this analysis, it is assumed that future supplemental water supplies will come from expansion of the CCWD Lloyd Michael water treatment plant (WTP) and the WFA/JPA Agua de Lejos WTP.

Alternative Water Supply Plan Descriptions

Four initial water supply plan alternatives and ten subalternatives were developed. The initial alternatives consisted of various combinations of wells, desalters, water treatment plants, water and brine pipelines, and pumping stations. Purveyors that will require new water supplies include the cities of Chino, Chino Hills, Ontario, Norco, JCSD, Santa Ana River Water Company (SARWC), and Swan Lake. A fifth alternative was also developed that included three subalternatives for various levels of recycled water use. The water supply plans are described in detail in the Task Memorandum on file with the Watermaster for this Program Element. The initial alternatives that were evaluated included:

Alternative 1: Supplemental Water Deliveries Only

- Subalternative 1A: Supplemental Water Delivery – Agricultural Converts to Urban Uses
- Subalternative 1B: Supplemental Water Delivery – Agricultural Use Stays

Alternative 2: Groundwater Pump, Treat, and Serve Only

- Subalternative 2A-1: Regional Groundwater Pump, Treat, and Serve – Agricultural Converts to Urban Uses
- Subalternative 2A-2: Ad Hoc Groundwater Pump, Treat, and Serve – Agricultural Converts to Urban Uses
- Subalternative 2B-1: Regional Groundwater Pump, Treat, and Serve – Agricultural Use Stays
- Subalternative 2B-2: Ad Hoc Groundwater Pump, Treat, and Serve – Agricultural Use Stays

Alternative 3 – Conjunctive Use

- Subalternative 3A: Conjunctive – Agricultural Converts to Urban Uses
- Subalternative 3B: Conjunctive – Agricultural Use Stays

Alternative 4: Supplemental Water Delivery and Regional Groundwater Pump, Treat, and Serve

- Subalternative 4A: Supplemental Water Delivery and Regional Pump, Treat, and Serve – Agricultural Converts to Urban Uses
- Subalternative 4B: Supplemental Water Delivery and Regional Pump, Treat, and Serve – Agricultural Use Stays

Alternative 5: Reclaimed Water Delivery

- Subalternative 5A: Direct Non-Potable Reuse Only
- Subalternative 5B: Reclaimed Water Delivery for Spreading Only
- Subalternative 5C: Direct Non-Potable Reuse and Recharge of Reclaimed Water

Recommended Water Supply Plan for the OBMP

Considerable discussion of the alternative water supply plans occurred at the OBMP workshops in February through May of 1999. The discussions focused, in part, on the assumption and details of each alternative and cost. Based on technical, environmental, and cost considerations, the stakeholders selected Alternative 4A for detailed review and refinement. Alternative 6A was developed based on Alternative 4A and 5C, includes an accelerated desalting schedule and has no future supplemental water deliveries to the southern part of the Basin. The Alternative 6A water supply plan consists of the following key elements.

Groundwater Production Pattern. Groundwater production for municipal use will be increased in the southern part of the Basin to: meet the emerging demand for municipal supplies in the Chino Basin, maintain safe yield, and to protect water quality in the Santa Ana River. All new southern Basin production will require desalting prior to use. The cities of Chino, Chino Hills, Ontario and Norco, and the JCSD will maximize their use of groundwater from the southern part of the Basin prior to using other supplies. The SAWPA desalter, currently under construction will have to be expanded from 8 million gallons per day (mgd) to 10 mgd by 2003. Two new desalters will be constructed – the *east* and *west* desalters. The east desalter will need to be on-line by late 2003 at a capacity of 14 mgd. The west desalter will need to be on-line by 2010 with a capacity of 7.5 mgd. Both these new desalters will be expanded in the future. The cost of the southern Basin desalting system will be shared by all Basin producers such that the agencies making direct use of this water above are not unfairly burdened with the cost of treating this water. It was demonstrated during discussions on this program element that equitable cost sharing could be achieved. It was also demonstrated that the groundwater production pattern in the Alternative 6A water supply plan was the least cost plan when lost safe yield and Santa Ana River water quality mitigation costs are avoided. The stakeholders came to an agreement on May 27, 1999 that the Alternative 6A water supply plan should be included in the OBMP.

The total replenishment obligation associated with this groundwater production pattern is 31,000 acre-ft/yr in the year 2000 and will increase to about 55,000 acre-ft/yr by the year 2020. The replenishment obligation can be satisfied using water in local storage, direct recharge of imported and recycled water, and by in-lieu exchange.

Imported Water. Imported water use will increase to meet emerging demands for municipal and industrial supplies in the Chino Basin area, Watermaster replenishment, and conjunctive use. Expanded use of imported water in the northern part of the Basin will have a lower priority than maintaining groundwater production in the southern part of the Basin.

Recycled Water. Recycled water use (direct use and recharge) will increase to meet emerging demands for non-potable water and artificial recharge. Under the current Basin Plan, all new recycled water use will require mitigation for TDS and nitrogen impacts. Recycled water use will be expanded as soon as practical. The two new desalters described above and the increase in storm water recharge will provide mitigation for the expanded use of recycled water.

Under Alternative 6A , two new desalters will be constructed and the SAWPA desalter currently under construction will be expanded immediately. The general location of these desalters, their respective well fields, product water pipelines, and delivery points are shown in Figure 4-2. Table 4-9 shows the timetable for the new desalters along with the salt removal capacity of these desalters. Table 4-10 contains the capital and annual costs for these facilities. An initial financing and cost sharing plan for this part of the OBMP will be developed during the Phase II OBMP process.

Implementation Requirements and Issues

Technical evaluation requirements and issues relating to facilities siting, facilities description and operations, and technical feasibility include:

- Basin exploration to assess ambient water quality and potential well field locations.
- Geotechnical and hydrogeological investigations.
- Siting investigations for desalters, wells, pipelines, and other facilities.
- Pump tests to determine viability of aquifer production.
- Modeling for safe yield impacts for alternatives identified in the OBMP.
- Preliminary engineering (reverse osmosis [RO] process design, facility layouts, pipeline alignments).
- Aquifer and groundwater quality monitoring.
- Santa Ana Regional Interceptor (SARI) capacity/availability.

- Analyses of the availability/capacity of existing infrastructure.
- Project phasing schedule.
- Construction delivery method (design-bid-build versus design-build).

Financial evaluation requirements and issues include:

- Economic feasibility analysis.
- Project financing plan.
- Interagency agreements/approvals/contracts.
- Potential impact on replenishment obligations.
- Cost/benefit analyses to evaluate incentives.
- Method of operation (agency operation versus contract operation).
- Future availability of MWDSC incentives.
- Sale of rising groundwater to Orange County.

California Environmental Quality Act (CEQA) and permitting requirements and issues include:

- Selection of implementing/lead agency.
- Preparation of necessary documents for CEQA/ National Environmental Policy Act (NEPA) compliance.
- Compliance with Basin Plan.
- Regulatory requirements/approvals from DHS and Regional Board Requirements.
- Interagency agreements/approvals/contracts.

Implementing Agencies

There are a number of specific responsibilities that must be defined when implementing any of the previously discussed alternatives. These responsibilities are listed in Table 4-11. One agency could assume all the responsibilities listed in Table 4-11; however, reality dictates that no single agency can typically meet all of these responsibilities. The following section provides a description of the agencies that could become the lead implementing agency for the construction, operation, and technical and financial support of the chosen water supply alternative.

Chino Basin Watermaster. Watermaster was created on January 27, 1978 by the San Bernardino County Superior Court after extensive negotiations between the municipal, industrial, and agricultural producers. The Chino Basin Watermaster is the entity charged with administering adjudicated water rights and managing groundwater resources within the Chino Basin. The Watermaster's primary responsibilities include: manage and control the replenishment of water supplies in the Basin, acquire and spread replenishment water as needed, approve and facilitate the storage of supplemental water in the Basin, and develop and implement an optimum basin management program to manage the Basin.

Inland Empire Utilities Agency. IEUA, formerly the Chino Basin Municipal Water District, serves 570,000 people and covers 242-square miles in the areas of Chino, Chino Hills, Fontana, Montclair, Ontario, Rancho Cucamonga, Upland and the Chino Agricultural Preserve. The Agency's major responsibilities are: wastewater treatment and disposal; supplemental water supply; industrial waste or non-reclaimable waste disposal; and water recycling. Under the *Regional Sewage Service Program*, the Agency operates three domestic wastewater treatment plants. The program enables local communities to take advantage of shared facilities and to further reduce costs by combining staffs and operations. Two additional water recycling facilities will be on-line in the next 10 years to accommodate the growth of the area's industrial and residential communities, as well as to meet increasingly stringent environmental regulations.

Three Valleys Municipal Water District. In recognition of the need for additional sources of water for the growing region, the Pomona Area Water Committee was organized in 1945 for securing annexation to the MWDSC. Through the efforts of the committee, the District was formed on January 26, 1950 by public election. The District is a local government agency with a board of directors elected by the registered voters residing within the District's boundaries. The District's boundary includes approximately 133 square miles with a current population of 475,000. Approximately 126,600 retail customers are served by the local agencies to whom the District provides supplemental water.

Western Municipal Water District. Western Municipal Water District of Riverside County was formed in 1954 to bring supplemental water to growing western Riverside County. Western's district consists of a 510-square mile area of western Riverside County, with a population of nearly one-half million people. Western is in the heart of the Santa Ana Basin and within its district lies the communities of Jurupa, Mira Loma, Rubidoux, Riverside, Norco, Corona, Elsinore Valley, and Rancho California. A member agency of the Metropolitan Water District of Southern California, Western serves imported water directly to more than 10,000 retail customers who are located in the unincorporated and non-water bearing areas around Lake Mathews and portions of the city of Riverside. The District also serves ten wholesale customers with Colorado River and SWP water. In addition to its retail water service, the District has committed to retail sewer service to 2600 customers in the Lake Hill/Home Gardens area.

Santa Ana Watershed Project Authority. SAWPA is a joint powers agency that was originally formed to develop water and wastewater management plans for the Santa Ana River watershed. The agency is now responsible for regional water quality planning and implements projects at the request of its member agencies. Members of SAWPA include: IEUA, Eastern Municipal Water District (Riverside County), San Bernardino Valley Municipal Water District (SBVMWD), WMWD (Riverside County), and the Orange County Water District (OCWD). SAWPA owns and operates the Santa Ana Regional Interceptor (SARI) sewer brine disposal system that offers a means of exporting non-reclaimable wastewater from the southern portion of the Chino Basin (CBMWD Reclaimed Water Master Plan, 1993). In addition to the SARI, SAWPA, in cooperation with a number of other agencies who provided support and financial resources, constructed the Arlington Desalter to begin reversing the Arlington Basin's salinity. The Arlington Desalter produces approximately 6 mgd of drinking quality water. SAWPA also owns and operates the SAWPA Chino Desalter that, upon construction by the year 2000, will supply approximately 8 mgd of potable drinking water to JCSD, Chino, Chino Hills, and Norco.

Cooperative Efforts with Appropriate Agencies to Implement Program

Watermaster will assume the leadership role for developing and implementing the OBMP regional water supply plan (Alternative 6 described above) including the development of new desalting plants and the expansion of the new SAWPA desalter. Watermaster will enter into agreements with cooperative entities to implement the OBMP regional water supply plan. Potential cooperative entities include CCWD, IEUA, TVMWD, WMWD, SAWPA, WFA/JPA, and private entities. These contracts will include specific performance goals and schedule. If a cooperative entity fails to perform according to the terms of their agreement, then Watermaster will terminate the agreements and either enter into an agreement with another cooperative entity or implement the program itself.

The new desalting projects could be designed, built, operated and owned by IEUA, WMWD, SAWPA, or by private entity under long-term contract to supply water from the desalters. A private entity may be the preferred way to construct the east desalter because of rapid implementation requirements of that desalter.

CCWD, IEUA, TVMWD, and WFA/JPA will be responsible for providing imported supplies.

IEUA and WMWD will be responsible for expanding the recycled water use in the Basin.

Implementation Actions and Schedule

First Three Years (1999/00 to 2001/02). The following actions will be completed in the first three years commencing fiscal year 1999/00:

<u>Preliminary Engineering – Year 1</u>

- Basin exploration to assess current water quality and identify well field locations.
- Geotechnical and hydrogeological investigations.
- Siting investigations for desalters, wells, pipelines, and other facilities.
- Re-evaluation of potential purveyor water supplies/demands.
- Analysis of availability & capacity of existing infrastructure.
- Analysis of SARI capacity & availability.
- Concept design for new treatment facilities.
- Preparation of necessary documents for CEQA/NEPA compliance.
- Regulatory requirements/approvals from DHS and Regional Board Requirements.
- Conditional use and other permits from local agencies.
- Economic feasibility analysis.
- Project financing plan.
- Selection of implementing/lead agency.
- Interagency agreements/approvals/contracts.
- Method of operation (agency operation versus contract operation).

<u>Design and Construction of East Desalter and</u>
<u>Design and Construction of Expansion of SAWPA Desalter – Years 2 and 3</u>

- Purchase land for ultimate facilities.
- Pre-design investigations.
- Pump tests to determine groundwater production.
- Re-evaluation of purveyor water supplies/demands.
- Preliminary engineering.
- RO process design.
- Facility site layouts.
- Pump station design.
- Final design.
- Bidding and contract award.
- Construction.

- Start-up by 2003.

Years Four to Ten (2002/03 to 2010/11). The following actions will be completed in years four through ten, commencing fiscal year 2002/03

Design and Construction of Western Desalter

- Purchase land for ultimate facilities.
- Pre-design investigations.
- Pump tests to determine groundwater production.
- Re-evaluation of potential purveyor water supplies/demands.
- Geotechnical and hydrogeological investigations.
- Preliminary engineering.
- RO process design.
- Facility site layouts.
- Pump station design.
- Final design.
- Bidding and contract award.
- Construction
- Start-up by 2010

East, West, and SAWPA desalters:

- Operate facilities through period.
- Upgrade facilities as necessary to maintain state-of-the-art and to meet regulatory requirements.

Years Eleven to Twenty (2010/11 to 2019/20). The following actions will be completed in years eleven to twenty, commencing fiscal year 2010/11

Expansion of Eastern Desalter, and
Expansion of Western Desalter

- Pre-design investigations.
- Pump tests to determine groundwater production.
- Re-evaluation of potential water supplies/demands.
- Geotechnical and hydrogeological investigations.
- Preliminary Engineering.
- RO process design.
- Facility site layouts.
- Pump station design.
- Final design.
- Bidding and contract award.
- Construction.
- Start-up by 2015.

East, West, and SAWPA desalters:

- Operate facilities through period.

- Upgrade facilities as necessary to maintain state-of-the-art and to meet regulatory requirements.

PROGRAM ELEMENT 4 – DEVELOP AND IMPLEMENT COMPREHENSIVE GROUNDWATER MANAGEMENT PLAN FOR MANAGEMENT ZONE 1 (MZ1)

Need and Function

Program Element 4 – Develop and Implement Comprehensive Groundwater Management Plan for Management Zone 1 contains action items explicitly listed in Table 3-8.

The second impediment to *Goal 1 – Enhance Basin Water Supplies* can be stated as: "Unless certain actions are taken, piezometric levels in the deep aquifers of Management Zone 1 will continue to decline adding to the potential for additional subsidence and fissures, lost production capability and water quality problems. This impediment speaks to a localized subsidence and fissuring problem within the City of Chino and to a potentially larger and similar problem in the southern end of Management Zone 1 in the former artesian area. This part of the Basin contains a higher fraction of fine-grained materials that originated from sedimentary deposits in the Chino and Puente Hills. This area also consists of a multiple aquifer system. The upper aquifer(s) are moderately high in TDS and are often very high in nitrate. The City of Chino Hills has drilled a series of wells into the deeper aquifer(s) to obtain better quality water. The storage and hydraulic properties of the deeper aquifers are quite limited relative to the upper aquifer. The correlation of the recent groundwater production in the deep aquifers and the timing of the subsidence and fissuring, and a review of the hydrogeologic data from the area very strongly suggest that deep aquifer production is the likely cause of the subsidence. Figure 4-2 illustrates the location and magnitude of subsidence and fissuring in the City of Chino and Figure 4-3 shows the location of the this subsidence anomaly relative to Management Zone 1 and the former artesian area. The *Program Element 4 – Develop and Implement Comprehensive Groundwater Management Plan for Management Zone 1* task memorandum is on file and available from the Watermaster offices. It describes the subsidence problem in the Management Zone 1 area as it is currently understood in more detail.

MZ 1 Management Plan

The continued occurrence of subsidence and fissuring in Management Zone 1 is not acceptable and must be reduced to tolerable levels or completely abated. However, there is some uncertainty as to the causes of subsidence and fissuring and more information is necessary to distinguish among potential causes. An interim management plan must be developed and implemented to:

- minimize subsidence and fissuring in the short-term;
- collect the information necessary to understand the extent and causes of subsidence and fissuring; and
- formulate an effective long-term management plan.

MZ 1 Interim Management Plan. The interim management plan would consist of the following activities:

- Voluntarily modify groundwater production patterns in Management Zone 1 for a five-year period. For example, there is some indication that deep aquifer production beneath the City of Chino contributed to recent subsidence and fissuring in the area. Reduction or elimination of deep aquifer production beneath the area of subsidence and fissuring is a logical short-term mitigation strategy.

- Balance recharge and production in Management Zone 1. Based on preliminary engineering investigations with RAM tool, it appears that current levels of pumping and recharge are balanced. However, increases in pumping should be balanced with increases in recharge.
- Determine gaps in existing knowledge. Primarily, there is a lack of understanding of Management Zone 1 hydrogeology, of the nature and extent of subsidence and fissuring, and of the exact causes of subsidence and fissuring.
- Implement a process to fill the gaps in existing knowledge. This would include hydrogeologic, geophysical, and remote sensing investigations of Management Zone 1, as well as certain monitoring programs, such as piezometric, production, water quality, ground level, and subsidence monitoring.
- Formulate a long-term management plan. The long-term management plan will include goals, activities to achieve those goals, and a means to evaluate the success of the plan.

MZ 1 Long-Term Management Plan. The long-term management plan will be formulated during the interim management plan based on investigations, monitoring programs and data assessment. It will likely include modifications to groundwater pumping rates and the locations of pumping, recharge, and monitoring. The long-term management plan will be adaptive in nature – meaning monitoring and periodic data assessment will be used to evaluate the success of the management plan and to modify the plan, if necessary.

Cooperative Efforts with Appropriate Agencies to Implement Plan

The subsidence and fissuring problem appears to be currently focused in the City of Chino and the California Institution for Men (CIM). However, it is reasonable given the current knowledge, to expand the minimum area of concern to the entire former artesian area shown in Figure 4-3 and slightly beyond that area. Changes in pumping and recharge patterns in Management Zone 1, and more generally the area of concern, will most likely be part of the management plan. The producers in the area include the cities of Chino, Chino Hills, Ontario, Pomona and Upland, the Monte Vista Water District (MVWD), San Antonio Water Company (SAWC), Southern California Water Company (SCWC), the State of California (CIM, California Institution for Women [CIW]), and SAWPA. Watermaster may need to have entities that increase their production to provide for the recharge of an equivalent amount of water to maintain the balance of pumping and recharge. Watermaster will take the leadership role in the development and implementation of the Management Zone 1 management plan.

Implementation Actions and Schedule for the First Five Years

Year 1

- Establish a Management Zone 1 committee and develop interim management plan.

Years 2 to 5

- Implement the interim management plan, including appropriate monitoring.

Years 3 to 5

- Annual assessment of data from monitoring programs, and modification of monitoring programs if necessary.

Year 5

- Develop long-term management plan.

Implementation Actions and Schedule for Years Six to Ten.

Year 6

- Implement the long-term management plan.

Years 6 to 10

- Annual assessment of data from monitoring programs, and modification of management plan if necessary.

Implementation Actions and Schedule for Years Eleven to Fifty.

Assessment of data from monitoring programs every three years and modification of management plan if necessary.

PROGRAM ELEMENT 6 – DEVELOP AND IMPLEMENT COOPERATIVE PROGRAMS WITH THE REGIONAL BOARD AND OTHER AGENCIES TO IMPROVE BASIN MANAGEMENT

PROGRAM ELEMENT 7 – DEVELOP AND IMPLEMENT SALT MANAGEMENT PROGRAM

Need and Function

These program elements are needed to address some of the water quality management problems that have occurred in the Basin. These water quality problems are described in Section 2 *Current Physical State of the Basin* and Table 3-8 in Section 3 *Goals of the OBMP*. The specific water quality issues addressed by these program elements are listed below:

- The Special Referee has indicated that Watermaster needs to routinely demonstrate that implementation of the OBMP will lead to groundwater quality improvements. Watermaster should develop and use a method to determine water quality trends and to verify whether the OBMP is improving water quality.
- There is legacy contamination in the vadose zone from past agricultural activities (TDS and nitrogen) that will continue to degrade groundwater long into the future.
- Watermaster does not have sufficient information to determine whether point and non-point sources of groundwater contamination are being adequately addressed.
- There is ongoing salt and nitrogen loading from agriculture.

Demonstration of Water Quality Improvement

The TDS and nitrogen challenges in the Chino Basin are caused by agriculture and safe yield management. The TDS and nitrogen impacts from agriculture were described in Section 2. Table 4-12 shows in summary format how the TDS concentration in source supplies and fertilizer affect the TDS concentration in irrigation return flows to groundwater. The TDS concentration in the irrigation return flow is about four times higher than the TDS concentration in the irrigation supply. The majority of the increase in TDS concentration is caused by consumptive use and a negligible contribution from the fertilizer. The table also shows the affect of the use of dairy manure for fertilizer and soil improvement. The TDS contribution from manure is much larger than from commercial fertilizer, however the concentration increase from consumptive use is more significant particularly for source water TDS concentrations typical in the southern part of the Basin (>500 mg/L). Similar TDS concentration increases in irrigation return flows occur for other crop types such as citrus and grapes, both of which were significant in the past. Table 4-12 shows TDS concentrations for urban irrigation return flows for a representative range in municipal source water TDS concentration. The range of TDS concentrations in urban irrigation returns is from about 1,200 to 1,800 mg/L with less than ten percent coming from fertilizers and the overwhelming majority of the TDS increase coming from consumptive use.

Figure 4-4 is a map that shows the general groundwater flow directions in the Chino Basin. The map contains velocity vectors that show direction and relative velocity of groundwater flow. One of the more interesting interpretations of this map is that groundwater generally flows away from the Santa Ana River. Small amounts of rising groundwater occur seasonally in Chino and Mill Creeks and are typically less than 11,000 acre-ft/yr. The only way significant amounts of groundwater can leave the Basin are through consumptive use, the discharge of recycled water to the Santa Ana River near Prado, and the discharge of brine to either the Santa Ana Regional Interceptor (SARI) or the Non-Reclaimable Waste Line (NRWL). The groundwater flow pattern shown in Figure 4-5 is largely influenced by production. If there were a significant reduction in groundwater production in the southern part of the Basin, then groundwater outflow to the Santa Ana River would increase and the safe yield would be reduced. The safe yield of the Basin depends on recharge of Santa Ana River water and minimal outflow of groundwater to the river. Without the recycled water discharges to the Santa Ana River near Prado dam and brine discharges to the SARI and the NRWL, the Chino Basin would almost be a completely closed system.

The vadose zone is the part of the aquifer that lies between the soil and the water table. The vadose zone is partially saturated and buffers the mineral salt loads entering from the soil. The buffering effect reduces the magnitude of the peak loads to the saturated zone and spreads out the loading of the saturated zone over a period of time that is longer than the soil loading. Salts in the vadose zone are being released to the saturated zone now and will continue to be released to the saturated zone for some time after the agricultural lands are converted to urban uses. The quantity of salt reaching groundwater should reduce in the future for two reasons:

- salt loading to the soil from agricultural will reduce over time
- less water will percolate through the vadose zone as the agricultural area becomes paved through urbanization (60 to 80 percent impervious).

If current rates of agricultural loading were to continue indefinitely, TDS and nitrate concentrations in groundwater could continue to rise. TDS projections for the Chino Basin that were made during the *Chino Basin Water Resources Management Study* (CBWRMS) suggested that the TDS concentrations would continue to rise in groundwater throughout most of the 50-year planning horizon of 1990 through 2040. These graphs are included in the Program Element 6 Task Memorandum on file and available from the Watermaster offices. In the CBWRMS, agricultural activities were assumed to decline to minimum levels by the year 2020. If and when the land use in the area is converted to urban uses, the source water TDS served to the new urban areas will be always less than 400 mg/L and the mineral salts from the source water will be mostly discharged in recycled water discharges to the Santa Ana River, brine line discharges (from new desalters) and increased rising groundwater flows to the Santa Ana River. The TDS concentration in groundwater will, after some period of time, decline slowly but should still remain significantly higher than be served as a municipal supply.

The Court will require Watermaster t develop and use a method to demonstrate that actions taken in the OBMP will improve groundwater quality. The question arises: how *do we assess progress towards improving groundwater quality if groundwater monitoring alone will continue to show degradation even after significant steps are taken to improve water quality?*

The alternatives available to the Watermaster range from groundwater quality monitoring alone to the application of numerical models in conjunction with monitoring. As mentioned above, if groundwater monitoring were the only metric for measuring improvement, then it will appear for many years that construction of desalters and the export of dairy waste will have no benefit. The use of numerical models to assess progress in improving water quality is extremely expensive if their only use were to assess such progress.

A method that combines monitoring and a salt budget is more practical and cost-effective than large-scale modeling. The salt budget approach consists of a salt mass accounting in each management zone and the Basin as a whole. The magnitude of each inflow and outflow component would be estimated. The TDS and nitrogen concentration of each inflow and outflow component would be estimated. Water quality will improve if the flow-weighted concentration in the inflow is less than the flow-weighted concentration in the outflow.

$$[S\ I_k{*}C_k] \ / \ [S\ I_k] \ - \ [S\ O_j{*}C_j] \ / \ [S\ O_j] < 0 \quad \text{water quality is improving}$$

$$[S\ I_k{*}C_k] \ / \ [S\ I_k] \ - \ [S\ O_j{*}C_j] \ / \ [S\ O_j] > 0 \quad \text{water quality is degrading}$$

$$[S\ I_k{*}C_k] \ / \ [S\ I_k] \ - \ [S\ O_j{*}C_j] \ / \ [S\ O_j] = 0 \quad \text{water quality is not changing}$$

where: I_k is volumetric recharge component *k*
C_k is the TDS or nitrogen concentration associated with recharge component *k*
O_j is volumetric discharge component *j*
C_j is the TDS or nitrogen concentration associated with discharge component *j*

The inflow components include: precipitation, artificial recharge of storm flows, artificial recharge of recycled water, and applied water. The outflow components include: evapotranspiration, surface water outflow, recycled water export, groundwater export and brine export. The TDS and nitrogen mass increments added to water as it is applied to irrigated lands or to disposal land needs to be estimated. The inflow and outflow components used in this approach will produce average recharge and discharge from the Basin, that is, there will be no change in groundwater storage.

The salt budget will be computed for existing conditions to assess the current balance, hereafter referred to as the baseline case. An assessment of future water quality improvements that will occur from the OBMP will be made by changing the water and waste management assumptions in the baseline case to reflect OBMP implementation. The changes in the inflow and outflow components and their associated TDS and nitrogen concentration will be made and the salt budget equations would be re-solved. The relative improvement of water quality will be assessed by comparing the salt budget of the OBMP to the baseline plan. Later, during periodic OBMP updates, the salt budget will be computed based on the then current water quality (from monitoring programs) and the then current water and waste management plans. These periodic assessments will allow Watermaster to determine if the OBMP is improving water quality.

There are some limitations to the salt budget method and the use of such a method should be considered in light of all anticipated water quality assessment needs in the Basin. Table 4-13 presents a tabular comparison of future water quality information requirements with alternative methods and approximate costs to use those methods over the next 20 years. The CBWRMS developed a comprehensive set of models for the Chino Basin that is capable of assessing the impact of past and future water resources management activities on groundwater level, streamflow, and water quality. The *Chino Integrated Groundwater and Surface Water Model* (CIGSM) is extremely complex and expensive to maintain and use.

The salt budget method will cost about $80,000 to $100,000 to develop and use the first time. Subsequent uses, in either OBMP updates or *ad hoc* investigations, will involve developing new water quality input data based on new monitoring data and revised water and waste management scenarios. Total cost over the next 20 years should range between $300,000 to $400,000. CIGSM is composed of series of models. In contrast to the salt budget method, CIGSM is very complex and difficult to use. The cost to re-calibrate CIGSM, to update the planning data, and to use the model to evaluate the initial OBMP is about $700,000 based on recent detailed estimates developed for the TIN/TDS Study (Wildermuth Environmental, 1999). The cost to use CIGSM over the next 20 years will run between $3,000,000 to $4,000,000.

Cooperative Efforts with the Regional Water Quality Control Board

Watermaster does not have sufficient information to determine whether point and non-point sources of groundwater contamination are being adequately addressed. Watermaster's past monitoring efforts have been largely confined to mineral constituents in the southern half of the Basin and to available monitoring data supplied by municipal and industrial producers. The Regional Water Quality Control Board (Regional Board) has limited resources to detect, monitor and cause the clean up of point and non-point water quality problems in the Chino Basin. The Regional Board commits its resources to enforce remedial actions when it has identified a potential responsible party. The Regional Board does not take action when the sources are not easily identified or when the sources are diffuse, such as non-point sources. Notable examples include the mercury problem in the east Ontario area and some solvent plumes in the lower Chino Basin. It is not a question of Regional Board willingness to in this area; it is the allocation of limited RWQCB resources. Watermaster can improve water quality management in the Basin by committing resources to:

- identify water quality anomalies through monitoring;
- assist the Regional Board in determining sources of the water quality anomalies;
- establish priorities for clean-up jointly with RWQCB; and
- remove organic contaminants through its regional groundwater treatment projects in the southern half of the Basin.

The last bulleted item requires some explanation. The well field for SAWPA desalter will eventually intercept a solvent plume of unknown origin that is emanating from the Chino airport area. There is a second solvent plume northeast of the Chino airport area that could be intercepted by the current desalter or another future desalter. This will require additional treatment for the water produced by the desalter. The desalter project can be used to clean up these plumes at some additional cost. The cost of cleaning up the solvent plumes at the desalters will be less than the cost of a dedicated solvent removal system. The additional cost should be paid for by the entity responsible for the solvent discharge. A similar process was used by the Regional Board and Kaiser Steel Corporation to mitigate a TDS plume in the north half of the Chino Basin.

TDS and Nitrogen (Salt) Management in the Chino Basin

TDS and nitrogen management will require minimizing TDS and nitrogen additions by fertilizers and dairy wastes, desalting of groundwater in the southern part of the Basin (for water supply purposes), and maximizing the artificial recharge of storm water. The latter two management components are included in Program Elements 3 and 2, respectively

The agricultural area in the southern part of the Chino Basin will gradually convert to urban uses over the next 20 to 30 years and, thus, in the long term, the TDS and nitrogen challenges from irrigated agriculture and dairy waste management will go away. The Regional Board will adopt new dairy waste discharge requirements in the summer of 1999. The requirements will include the following:

- Each dairy will develop and implement an engineered waste management plan that will contain dairy process water and on-dairy precipitation runoff for up to a 25-year, 24-hour storm
- Manure scraped from corrals must be exported from the dairy within 180 days
- All manure stockpiled in the Chino Basin as of December 1, 1999, will be exported from the Basin by December 1, 2001.
- No manure may be disposed of in the Chino Basin
- Some manure can be applied to land at agronomic rates if and only if in the opinion of the Executive Officer there is reasonable progress toward the construction of a new desalter in the Chino Basin.

The Santa Ana River Watershed Group (SARWG) is a stakeholder group made up of municipal, county, regional and federal agencies, and private individuals that are working through complex land use and environmental issues in the Santa Ana Watershed. One of their work products is a draft manure management strategy (MMS) for the Chino Basin. The primary component of MMS is the export of manure either as a raw or an improved material. The MMS describes the economics of manure management and the means to finance manure export.

The new dairy waste discharge requirements may have the unintended result of actually causing Santa Ana River quality to degrade. Some or all of the dairy farmers could move out of the Basin if they cannot afford to continue dairy operations as a result of the new waste discharge requirements. A rapid departure of the dairies will result in a rapid decline in groundwater production in the southern part of the Basin and a subsequent increase in poor quality rising water. The rising groundwater will degrade the river. As part of the OBMP, Watermaster will annually review the economics of dairy waste management in the Chino Basin and may contribute funds to subsidize the removal of manure from the Basin. In the first year of the OBMP implementation, Watermaster will contribute $150,000. Watermaster will closely monitor the activities of the Regional Board, SARWG and others whose actions will influence the amount of TDS and nitrogen entering the Basin.

The urban land use that will replace agriculture will require low TDS municipal supplies that in turn will produce lower TDS irrigation returns to groundwater than those generated by agriculture. The construction of desalters in the southern part of the Basin (as described in Program Elements 3 and 5) will extract and export huge quantities of salt from the Basin. Table 4-9 lists the salt removal capacity of desalters described in Program Elements 3 and 5. By 2020, the salt removal capacity of the desalters will reach over 80,000 tons per year. The dairy salt contribution is currently about 30,000 tons per year. It is premature to set salt reduction goals until the salt budget method described above is developed and the salt budget is assessed for the Basin. However, it seems reasonable to expect that the salt budget will be impacted favorably by the desalters and future land use conversions, and that Watermaster should expect a reduction in salt loading of about 80,000 to 100,000 tons of salt per year in the next 20 to 30 years.

Implementation Actions and Schedule

First Three Years (1999/00 to 2001/02). The following actions will be completed in the first three years commencing fiscal year 1999/00:

- Watermaster will form an ad hoc committee, hereafter *water quality committee*. The purposes of the *water quality committee* are to review water quality conditions in the Basin and to develop (with the Regional Board) cooperative strategies and plans to improve water quality in the Basin. The committee would meet regularly with

Regional Board staff to share information and to recommend cooperative efforts for monitoring groundwater quality and detecting water quality anomalies. The schedule and frequency of meetings will be developed with the Regional Board during the first year of the OBMP implementation.

- Watermaster will refine its monitoring efforts to support the detection and quantification of water quality anomalies. This may require additional budgeting for analytical work and staff/support.
- If necessary, Watermaster will conduct investigations to assist the Regional Board in accomplishing mutually beneficial objectives.
- Watermaster will seek funding from outside sources to accelerate detection and clean up efforts.
- Develop salt budget goals, develop the salt budget method described above and review all the OBMP actions.
- Watermaster will annually review the economics of dairy waste management in the Chino Basin and may contribute funds to subsidize the removal of manure from the Basin. In the first year of the OBMP implementation, Watermaster will contribute $150,000.

At the conclusion of the third year, the *water quality committee* will have met several times, developed and implemented a cooperative monitoring plan with the Regional Board, and developed a priority list and schedule for cleaning up all known water quality anomalies.

Years Four through Fifty (2002/03 to 2050/51). The following actions will be completed in years four through fifty, commencing fiscal year 2002/03:

- Continue monitoring and coordination efforts with the Regional Board.
- Annually update priority list and schedule for cleaning up all known water quality anomalies.
- Continue to seek funding from outside sources to accelerate clean up efforts.
- Implement projects of mutual interest.
- As part of periodic updates of the OBMP, re-compute the salt budget using the salt budget method. The salt budget method would be used to reassess future OBMP actions to ensure that salt management goals are attained.
- Annually review the economics of dairy waste management in the Chino Basin and consider contributing funds to subsidize the removal of manure from the Basin.

PROGRAM ELEMENT 8 – DEVELOP AND IMPLEMENT GROUNDWATER STORAGE MANAGEMENT PROGRAM

PROGRAM ELEMENT 9 – DEVELOP AND IMPLEMENT CONJUNCTIVE USE PROGRAMS

Need and Function

The first impediment to *Goal 1 – Enhance Basin Water Supplies* can be stated as: "Unless certain actions are taken, safe yield of the Basin will be reduced … (because) the current manner in which Watermaster manages cyclic and local storage accounts will cause overdraft." Watermaster is concerned about the magnitude of water lost from the Chino Basin from rising groundwater when groundwater is stored in the local storage, cyclic, conjunctive use and other storage accounts. Watermaster is interested in determining how much water can be stored without significant loss from local accounts and in developing a procedure to equitably distribute these losses among entities that have storage accounts. Watermaster may consider setting limits for individual storage accounts for members of the overlying non-agricultural and appropriative pools that ensure reasonable and beneficial use of Chino Basin water.

The third impediment to *Goal 3 – Enhance Management of the Basin* can be stated as: "About 500,000 acre-ft of storage in the Chino Basin cannot be used due to water quality and institutional issues." The impediment speaks to two issues. The first issue is a concern by the producers of adverse water quality impacts if groundwater storage is significantly (see Section 2) increased. The second issue is the past inability of Watermaster, producers, and MWDSC to be able to agree on a conjunctive use program for the Chino Basin.

Parties to the Judgment can store un-pumped groundwater rights for various reasons that include:

> **Future use during shortage of other less expensive water supplies.** Some parties to the Judgment have access to other sources of water that are less expensive than producing Chino Basin groundwater. The alternative water supplies available to these parties include imported water, local streamflow, and other groundwater basins. By not pumping their Chino Basin rights, they can then store water in the Chino Basin for later use when their other less expensive sources are scarce. This is conjunctive use.
>
> **Exchange or sell to other producers.** Some parties to the Judgment produce less than their rights resulting from decreased demand, groundwater quality problems, or because they have access to other less expensive supplies. The un-pumped water pursuant to the Judgment can be exchanged or sold to other parties to the Judgment.
>
> **Temporary shortfall in production capacity.** Some parties may not be able to use all their rights due to temporary shortfalls in production capacity caused by water quality or mechanical problems. The un-pumped water goes into local storage accounts until production capacity is recovered or increased.

As a means of efficiently managing their available water supply, each appropriative and overlying non-agricultural producer tries to minimize the cost of water from the sources of supply available to that producer. Some producers have multiple sources of supply and some have limited supplies. Some agencies are in a position, because of the sources of supply available to them, to accumulate water in local storage accounts in most years. Conversely, some agencies produce groundwater from the Chino Basin in excess of their rights and cannot make use of local storage accounts except through the purchase or lease of other water. There are two fundamental reasons why storage limits should be considered.

> **Ensure reasonable beneficial use.** The accumulation of water in local storage accounts in quantities that cannot be put to a reasonable beneficial use is in conflict with Section 2 of Article X of the California Constitution. Therefore, if a local storage account maximum storage limit needs to be set, the limit should be based on the producer's ability to put the stored water to reasonable beneficial use.
>
> **Reduce groundwater losses to the Santa Ana River.** The cumulative losses of water from local storage accounts can grow to be large and, thus, the ability to use the stored water to Chino Basin producers is lost. These losses could be minimized by storing water for shorter periods of time prior to use and by limiting the water put into storage accounts to an amount that can be put to reasonable beneficial use.

Estimate of the Water Lost from Storage

The accumulation of groundwater in storage without an increase in groundwater production will cause the baseflow to increase in the Santa Ana River and some of its tributaries (Chino Creek and Mill Creek). Investigations conducted by Watermaster in 1995 concluded that losses from water in local storage accounts and cyclic storage are about two percent per year of the water in storage. These losses could reach over four percent in the future if groundwater production patterns are not managed in the southern part of the Basin. Exhibit A in the Program Element 8 Task Memorandum (on file and available from the Watermaster offices) shows the estimated losses from each local storage account, the cyclic storage account, and the Basin as a whole for the 20-year post-Judgment period of 1978 to 1997. The total water lost from local storage accounts and cyclic storage for the 20-year period of 1978 through 1997 is about 50,500 acre-ft. If the water in these storage accounts is produced without accounting for the losses then the Basin will be overdrafted by an amount equal to the water lost from storage.

Storage Limit Concepts

Currently there is no existing aggregate limit for local storage accounts. Watermaster's Uniform Groundwater Rules and Regulations (UGRR) contains an aggregate threshold storage value of 100,000 acre-ft above which losses to rising water are to be computed and allocated to the storage parties on a pro rata basis. The UGRR does not specify whether the loss is to be computed for the increment of storage above 100,000 acre-ft or total storage. The 100,000 acre-ft threshold value is an arbitrary number. Some loss will occur when water is placed into local storage. Using 100,000 acre-ft as a threshold value ensures that up to 2,000 acre-ft/yr of unaccounted-for-losses from storage will occur every year. This water will not be in the Basin when the storage parties attempt to recover the stored water. If losses are not accounted for, then the Basin is not being operated in the safe yield mode as required by the Judgment. Therefore, regardless of how storage limits are set, Watermaster should deduct the rising water losses from planned storage for all local storage accounts and for the storage accounts of non-Judgment parties. There are several different ways to develop upper limits on the individual local storage accounts. Some of these are described below.

Limit based on the ability to use. In this concept, an upper limit is based on the storage party's ability to store and recover all the water in its account over a fixed period, say five years. The storage party would have to demonstrate that it has enough production capacity to recover all the water in storage over a five-year period. The fixed period would be the same for all storage parties. In this concept, each storage party would have to demonstrate to Watermaster that they have the ability to put a specific volume of water into storage and be able to recover that water, adjusted for losses, over a fixed period of time. Thus, the storage party will have the facilities in place for groundwater production. This type of limit ensures that the water is put to a reasonable beneficial use. For example, suppose an agency has Chino Basin production capacity of 25,000 acre-ft/year, an operating yield of 15,000 acre-ft/yr and the fixed period has been set at five years. Then they would be allowed to put 50,000 acre-ft into its local storage account. If an agency were to increase its Chino Basin production capacity then its local storage account limit could be increased by an amount equal to five times the increase in production capacity. The five-year period used above is arbitrary – Watermaster would need to determine the length of the fixed period.

Arbitrary limits. In discussions regarding storage limits in prior years, Watermaster considered setting storage limits based on a multiple of safe yield for overlying non-agricultural pool and a multiple of operating safe yield for the appropriative pool. Parties that have historically over-produced and that will continue to over-produce may not ever be able to use such a local storage account. Parties that under-produce will fill their accounts and may hold water in these accounts for long periods of time and incur large storage losses. This has been the trend with the past operation of the local storage accounts. Upper limits based on this concept are arbitrary and may not provide for reasonable beneficial use of Chino Basin water. Storage limits based on a multiple of prior years production, an arbitrary volume equal for all parties, or any other arbitrary volume suffer from the same limitations.

Limit based on time water is in storage. In this concept, no volume limit would be set. Water could not be kept in storage for more than some fixed period of time, say ten years, regardless of the amount of water in storage. Water transferred from the local storage account for use by the storage party would be taken from the earliest water put into the local storage account. The storage party would be required to recover a volume of groundwater from its local storage account, sell or transfer a similar volume to another party, or sell a similar volume to Watermaster in order to reduce the quantity in its storage account by an amount equal to the water stored prior to the fixed period less losses to rising water. Simply stated, unused water from the first year would either be used or sold to Watermaster or other producer in the eleventh year, unused water from the second year would either be used or sold in the twelfth year, and so on if a ten year time limit is used.

Upper limit based on total storage and time water is in storage. This is a composite of the *ability to use* and *time in storage* concepts. In this case a volumetric upper limit would be set for each storage party based on the storage party's ability to store and recover water over a fixed period of time. A time constraint would be added such that water would not be kept in storage more than some fixed period of time.

In all the above storage limit concepts, the storage parties would sell their current year under-production to Watermaster or other parties to the Judgment each year that their local storage accounts are full. Watermaster, or parties to the Judgment, would then use this water to meet current replenishment obligations.

Implementation of Local Storage Account Limits

Watermaster's UGRR presently require an *initial determination of local storage requirements to be made*. Watermaster then allocates this storage to members of the appropriative and overlying non-agricultural pools when specific parties make an application for a local storage agreement. Watermaster must periodically review the status of the local storage accounts and adjust the local storage requirement as described in the UGRR. While not explicitly described in the Judgment or UGRR, local storage account limits based on the *ability to use*, *time in storage,* or a composite of the two, are consistent with the Judgment and could be implemented with some changes in the UGRR.

Local storage account limits based on the *ability to use* require that each agency make a determination of their Chino Basin groundwater production capacity and submit that finding to Watermaster. Watermaster would determine the duration over which the volume in local storage accounts would be used. Storage account limits for each storage party would be computed as:

$$\text{Storage Limit} = \text{duration of storage period} * (\text{Chino Basin production capacity} - \text{average operating yield})$$

The average operating yield would equal the average of previous years operating yield entitlements (*e.g.*, five year average). Watermaster could periodically, or upon petition by a storage party, review and adjust the storage limits.

Local storage account limits based on the *time in storage* require that Watermaster determine the time-in-storage limit. Watermaster could then go through production and local storage account records to determine if water must be either used or sold to Watermaster. Local storage account limits based on the composite of the *ability to use* and *time in storage* require the implementation steps described for both concepts.

Some storage parties may currently have more water in their local storage accounts than would be allowed in the storage limit concepts listed above. In this case, the storage party would not be allowed to put water into their local storage accounts and under-production would be purchased by Watermaster.

If, as a result of these storage limits, Watermaster is required to purchase more water than is required for replenishment, then either the storage party will be allowed to temporarily store additional water in its local storage account or Watermaster payments for that water may have to be temporarily deferred.

Water in local storage accounts is used for replenishment of overdraft either by the producer's that hold a local storage account, or is sold to other producers with replenishment obligations. It is possible that Watermaster could fulfill all replenishment obligations exclusively from local storage accounts for several years. Watermaster should fulfill the need for replenishment from increased production with imported water for those areas that have a critical need for imported water and use the water stored in local storage accounts for the rest of the replenishment obligation.

Storage Management Program

Since 1995, the producers have developed numerous storage management proposals. This storage management program described here was developed in April and May of 1999 and differs from the previous proposals that sought to assign all the readily-useful storage in the Basin up among producers. If successfully implemented, storage limits on individual storage accounts may not need to be considered by Watermaster. The proposal described herein will allow:

- Watermaster to develop conjunctive use programs that will benefit all the producers in the Basin;
- ensure that Basin water and storage are put to maximum beneficial use; and
- maintain the integrity of the Judgment.

Definitions. *Operational Storage Requirement* – The operational storage requirement is the storage or volume in the Chino Basin that is necessary to maintain safe yield. In the context of this storage management program, the operational storage is estimated to be about 5,300,000 acre-ft. An engineering analysis will be done to assess the operational storage requirement of the Basin as part of the implementation of this program.

Safe Storage – Safe storage is an estimate of the maximum storage in the Basin that will not cause significant water quality and high groundwater-related problems. In the context of this storage management program, the safe storage is estimated to be about 5,800,000 acre-ft. An engineering analysis will be done to assess the safe storage requirement of the Basin as part of the implementation this plan.

Safe Storage Capacity – The safe storage capacity is the difference between safe storage and operational storage requirement and is the storage that could be safely used by producers and Watermaster for storage programs. Based on the above, the safe storage capacity is about 500,000 acre-ft. The allocation and use of storage in excess of safe storage will preemptively require mitigation, that is, mitigation must be defined and resources committed to mitigation prior to allocation and use.

Key Elements

- No maximum storage limit will be placed on local storage accounts for a period of five years ending on June 30, 2004, and water that becomes eligible for storage can be stored.
- The need for storage limits will be re-evaluated in five years based on the ability of the storing party to use the water in storage (ability to use concept) and on Watermaster's need for storage programs that provide regional benefits.
- Storage is not assignable.
- All water in local storage and other storage accounts will incur losses at a rate of 2 percent of water in storage each year starting in fiscal year 2002/03.
- The storage loss rate and safe yield will be estimated in the year 2012/13 and every ten years thereafter.
- Watermaster will develop regional conjunctive-use programs to store supplemental water for MWDSC and other entities that can cause supplemental water to be stored in the Basin.
- The regional conjunctive-use programs will provide benefits to all producers in the Basin, the people of California and the nation. Watermaster's conjunctive-use programs will take priority over conjunctive-use programs developed by others.
- Storage committed to conjunctive-use programs may consist of two parts, storage within the safe storage capacity and storage in excess of safe storage. Storage in excess of safe storage capacity will preemptively require mitigation.
- The initial target storage for Watermaster's conjunctive-use program will be 150,000 to 300,000 acre-ft within the safe storage capacity.
- Cyclic storage will be folded into conjunctive-use storage.
- Watermaster's conjunctive-use program tentatively consists of the following elements:
  - complete the existing short term conjunctive-use project;
  - seasonal peaking program for in Basin use and dry year program to reduce the demand on Metropolitan to 10 percent of normal summer demand (requiring 150,000 acre-ft of storage);
  - dry-year export program; and
  - seasonal peaking export program.

Re-determination of Safe Yield and Storage Loss Rates. The safe yield and storage loss rate will be assessed every ten years starting in the year 2012/13. The ten-year period of 2002/03 to 2011/12 will be used to compute the safe yield and to estimate the storage loss rate.

Safe yield and storage loss rate determinations require accurate groundwater level and production data. Watermaster does not have accurate production data from agricultural producers. Watermaster estimates most of the production in the agricultural pool using a water duty method that does not meet the requirements of the Judgment. Program Element 1 of the OBMP includes a program to install meters and obtain production measurements from all wells in the Basin. It will take three years to fully meter all agricultural wells. Watermaster will have accurate production monitoring at all wells starting in year

2002/03. Watermaster is in the process of developing a groundwater level monitoring program for the Basin. This plan should be implemented in the year 1999/00.

The safe yield in the Judgment was developed over the period 1965 to 1974 using the procedure described in Section 2 of the OBMP report. The safe yield will be re-determined in year 2012/13 using the ten-year period 2002/03 to 2011/12 because it will contain accurate production data and groundwater level data. A ten-year period is proposed to be consistent with the method used in the engineering work for the Judgment and is the minimum necessary to estimate a safe yield.

Re-determination of the storage loss rate will require the use of a numerical flow model. The *RAM Tool* developed by Watermaster will be modified and used for this purpose. The model would be used as follows:

- Calibrate the RAM tool for the safe yield period. In the calibration process, the hydrology for the period 2002/03 to 2011/12 will be developed including deep percolation of applied water and precipitation, unmeasured storm water recharge, subsurface inflow from adjacent basins, and uncontrolled discharges from the Basin (rising water).
- Once calibrated, the water supply plans of the producers and other storage entities will be modified to assume that no water would be put into storage accounts. The model will be rerun with this assumption and the results would be compared to the calibration run to determine losses from storage and the storage loss rate.
- The storage loss rate would be set based on the relationship of water in storage and associated losses.

Watermaster's new groundwater level and production monitoring are crucial to this effort.

Implementation Actions and Schedule

First Three Years (1999/00 to 2001/02). The following actions will be completed in the first three years commencing fiscal year 1999/00:

- Receive Court approval of OBMP.
- Evaluate need to modify Watermaster UGRR to reflect the storage management plan.
- Determine the operational storage requirement and safe storage.
- Begin formal implementation of comprehensive monitoring programs described in Program Element 1 (including groundwater level, groundwater quality, production, and surface water monitoring in the Santa Ana River).
- Complete the existing short-term conjunctive-use pilot project with MWDSC.
- Conduct engineering and environmental analyses, other feasibility efforts, and negotiate agreements to:
- implement a conjunctive-use program that includes seasonal peaking for in Basin use and dry year program to reduce the demand on MWDSC to 10 percent of normal summer in-Basin demand (requiring 150,000 acre-ft of storage);
- implement a conjunctive-use program for dry-year export; and
- implement a seasonal peaking program for export.

Years Four through Ten (2002/03 to 2008/09). The following actions will be completed in years four through ten, commencing fiscal year 2002/03:

- Continue monitoring as described in Program Element 1.
- Begin construction of facilities to implement the conjunctive-use projects listed in *years one through three*, in year 2003/04.
- Commence conjunctive-use operations.
- Start assessing losses in year 2002/03.

Years Eleven through Fifty (2009/10 to 2048/49). The following actions will be completed in years eleven through fifty, commencing fiscal year 2009/10:

- Continue monitoring as described in Program Element 1.
- Continue conjunctive-use operations.
- In year 2012/13, compute safe yield and storage loss rate for period 2002/03 through 2011/12, and reset safe yield and storage loss rates for the next the next ten-year period 2012/13 to 2021/22. Reassess storage management plan and modify Watermaster UGRR, if needed.
- In year 2022/23, compute safe yield and storage loss rate for period 2012/13 through 2021/22, and reset safe yield and storage loss rates for the next the next ten-year period 2022/23 to 2031/32. Reassess storage management plan and modify Watermaster UGRR, if needed.
- In year 2032/33, compute safe yield and storage loss rate for period 2022/23 through 2031/32, and reset safe yield and storage loss rates for the next the next ten-year period 2042/43 to 2041/42. Reassess storage management plan and modify Watermaster UGRR, if needed.
- In year 2042/43, compute safe yield and storage loss rate for period 2032/33 through 2041/42, and reset safe yield and storage loss rates for the next the next ten-year period 2052/53 to 2051/52. Reassess storage management plan and modify Watermaster UGRR, if needed.

PROGRAM COST AND EARLY IMPLEMENTATION PLAN

Table 4-14 contains a 20-year cost projection for implementation of the OBMP. The 20-year cost of OBMP implementation is about $400,000,000. The following program elements will be implemented entirely by Watermaster:

- Program Element 1 – Develop and Implement Comprehensive Monitoring Program
- Program Element 4 – Develop and Implement Comprehensive Groundwater Management Plan for Management Zone 1
- Program Element 6 – Develop and Implement Cooperative Programs with the Regional Water Quality Control Board, Santa Ana Region (Regional Board) and Other Agencies to Improve Basin Management
- Program Element 7 – Develop and Implement Salt Management Program
- Program Element 8 – Develop and Implement Groundwater Storage Management Program

Watermaster has committed to fund these program elements in their entirety through Watermaster assessments and through grants obtained directly by Watermaster. The Watermaster budget for fiscal 1999-2000 provides funding necessary to begin the efforts described in these program elements. The cost of the first three years is about $2,900,000 and average annual cost for the next 20 years is about $480,000.

The following program elements will be started by Watermaster in fiscal 1999-2000 and will be completed by others by agreement with Watermaster:

- Program Element 2 – Develop and Implement Comprehensive Recharge Program
- Program Element 3 – Develop and Implement Water Supply Plan for the Impaired Areas of the Basin
- Program Element 5 – Develop and Implement Regional Supplemental Water Program

The Watermaster budget for fiscal 1999-2000 provides funding necessary to begin the planning processes for these program elements. For Program Element 2, Watermaster's projected budget includes funds for completion of Phases 2 and 3 of the recharge master plan of $430,000 to be spent in the first three years of OBMP implementation. For Program Elements 3 and 5, the Watermaster budget contains funds to start the planning process and to define the scope of the facilities at enough detail so that agreements can be done for others to build and operate the facilities required in these program elements. Watermaster has budgeted about $650,000 for this process over the first three years of OBMP implementation. These agreements will be described in Part 2 of the OBMP report documents.

The Watermaster budget includes funds to begin the planning process for Program Element 9 – Develop and Implement Conjunctive-Use Programs. Watermaster has budgeted about $430,000 for this process over the first three years of OBMP implementation. The stakeholders envision that the cost of conjunctive use will be borne by outside interests that will store water in the Chino Basin.

OBMP PROGRESS REPORTS AND PROGRAM UPDATES

Watermaster will report progress on the OBMP in its annual report to the Court. Watermaster will formally review and update the OBMP at a frequency of five years or less.

LEGAL QUESTIONS AND ISSUES

The Judgment prescribes the process by which the Watermaster Board receives recommendations from the producers and is empowered to make decisions. To address the unresolved legal questions and issues identified below, the items will be brought to the individual pool committees for discussion and consideration. The pools in turn will develop their positions and recommendations for discussion and consideration by the Advisory Committee. The Advisory Committee will meet to discuss and consider the questions. The Advisory Committee's recommendations will be forwarded to the Watermaster Board for its consideration and implementation. Should the Watermaster Board disagree with the Advisory Committee recommendation, it has several options based on the Judgment and past practice. These options are:

If the Advisory Committee vote is equal to or greater than 80 percent:

1. Ask the Advisory Committee to reconsider the question based on a Board recommendation.

2. If the Advisory Committee does not wish to reconsider the matter, the Watermaster Board may ask the Court to consider the matter.

If the Advisory Committee vote is less than 80 percent:

1. Hold a hearing on the matter and develop written findings and conclusions.

During implementation of the OBMP, all unresolved legal questions and issues listed below will be addressed through the process described above. A schedule to address these items will be developed, and Watermaster will prepare written findings and conclusions to be submitted to the Court as part of the implementation process. This will be done regardless of the Advisory Committee vote or Watermaster findings and conclusions in an effort to more effectively keep the Court apprised of the OBMP implementation progress.

Watermaster recommends this manner of addressing legal questions and issues pursuant to the Judgment and in keeping with the Plaintiff's Post Trial Memorandum filed with the Court on July 12, 1978. At 4:13-20 in Paragraph B. 2. Watermaster Organization and Powers, of the Post Trial Memorandum it states:

> "At the same time, the Watermaster Advisory Committee was created and given broad powers to review, advise and consent to the actions of the Watermaster, subject to more detailed actions by the pool committees formed to advise, consent and administer the affairs of the several pools established under the Physical Solution. In these many provisions, there is a balance created to assure the protection of the private rights of the parties and the general public interest in the preservation of the resource. (emphasis added)."

The process described above will be used to address the legal questions and issues listed below.

- Transfers of water within and from the overlying non-agricultural pool
- Clarification and/or expansion of definitions of types of water in Judgment
- Evaluation of Judgment provisions and rules and regulations affected by the OBMP

These questions and issues will be resolved in the first three years of the OBMP implementation.

Table 4-1
Analytical Costs
Groundwater Quality Monitoring Program

Analyses	Cost Year 1	Year 2	Year 3
Inorganic Analyses			
General Mineral Analyses	$170	$179	$187
General Physical	$40	$42	$44
Inorganic Chemical Analysis	$185	$194	$204
Perchlorate	$65	$68	$72
MTBE	$40	$42	$44
Organic Analyses			
VOCs	$150	$158	$165
Pesticides			
Pesticides and PCBs	$150	$158	$165
DBCP/EDB	$65	$68	$72
Radionuclide Analyses			
Gross Alpha & Beta	$65	$68	$72
Totals per Sample	$930	$977	$1,025
Cost for 210 Wells	$195,300	$205,065	$215,318
Cost for 210 Wells Less than 10% Discount	$175,770	$184,559	$193,786

Table 4-2
Inline Meter Installation
Cost Estimates

Pipe Diameter	2"		3"		4"		6"		8"		10"		12"		Total Wells
Number of Wells	52		186		147		68		127		44		1		625
Meter type	ML-03(a)		ML-03		ML-03		LP-31(b)		LP-31		LP-31		LP-31		
Installation costs	unit	cost	unit	cost	unit	cost	unit	cost	unit	cost	unit	cost	unit	cost	Subtotals
Pre-installation inspection[1]	$50	$2,600	$50	$9,300	$50	$7,350	$50	$3,400	$50	$6,350	$50	$2,200	$50	$50	$31,250
Meter[2]	$700	$36,400	$750	$139,500	$800	$117,600	$500	$34,000	$535	$67,945	$545	$23,980	$580	$580	$420,005
Straightening Vane[3]	n/a	n/a	n/a	n/a	n/a	n/a	$35	$2,380	$35	$4,445	$50	$2,200	$50	$50	$9,075
Installation[4]	$200	$10,400	$200	$37,200	$200	$29,400	$275	$18,700	$300	$38,100	$300	$13,200	$300	$300	$147,300
Piping modifications[5]	$65	$3,400	$67	$12,400	$67	$9,800	$65	$4,400	$66	$8,400	$64	$2,800	$200	$200	$41,400
Installation Subtotal	$1,015	$52,800	$1,067	$198,400	$1,117	$164,150	$925	$62,880	$986	$125,240	$1,009	$44,380	$1,180	$1,180	$649,029
Installation Contingency (25%	$254	$13,200	$267	$49,600	$279	$41,038	$231	$15,720	$247	$31,310	$252	$11,095	$295	$295	$162,257
Totals[6]	$1,269	$66,000	$1,333	$248,000	$1,396	$205,188	$1,156	$78,600	$1,233	$156,550	$1,261	$55,475	$1,475	$1,475	$811,287

(a) 150 psi flanged tube meter; sealed meter mechanism; magnetic drive; sealed totalizer

(b) 150 psi strap-on saddle meter; sealed meter mechanism; magnetic drive; sealed totalizer

1 Mobilization costs

2 Meter costs from Water Specialties Corp.

3 Necessary to reduce turbulence. Pre-installed within the flange-type (ML-03) meters.

4 Labor cost only

5 Includes materials and labor costs. Estimate assumes that 35% of installations will require piping modifications at an average cost of $200 per well.

6 Does not include Watermaster administration costs.

Table 4-3
Cost of Installation of Water-Level Sensors and Annual Cost of Surface Water Monitoring

Basins	Install Water Level Sensors #	Install Water Level Sensors Cost	Water Quality Sampling and Analysis #/yr	Water Quality Sampling and Analysis Cost
Upland	1	$12,000	12	$1,620
Brooks			12	$1,620
Montclair 1			12	$1,620
Montclair 2			12	$1,620
Montclair 3			12	$1,620
Montclair 4			12	$1,620
7th Street	1	$12,000	12	$1,620
Ely 3	0	$0	12	$1,620
Turner Basins 1, 2, 3 and 4	3	$36,000	12	$1,620
Grove Street (new)	1	$12,000	12	$1,620
Lower Day	1	$12,000	12	$1,620
Wineville and Riverside	2	$24,000	24	$3,240
Etiwanda Debris Basin (new)	1	$12,000	12	$1,620
Victoria	1	$12,000	12	$1,620
Rich and San Sevaine 1 through 5	3	$36,000	36	$4,860
Jurupa (new)	1	$12,000	12	$1,620
Declez	1	$12,000	12	$1,620
Up to Three New Areas	0	$0		
Subtotal Field Program Costs	16	$192,000	240	$32,400
Review and Interpretation of Water level and Quality Data				$13,000
Total Estimated Cost		$192,000		$45,400

Table 4-4
Recharge Performance for
Spreading Basins

Facility	Owner	Perc Rate (ft/day)	Average Annual Recharge Existing Land Use (acre-ft/yr)	Ultimate Land Use (acre-ft/yr)
San Antonio Creek System				
Upland Basin	City of Upland	3.0	893	1,071
Montclair 1	CBWCD	2.0	807	1,190
Montclair 2	CBWCD	3.0	282	368
Montclair 3	CBWCD	1.5	359	315
Montclair 4	CBWCD	1.0	510	570
Brooks	CBWCD	1.5	807	823
West Cucamonga Creek System				
8th Street	SBCFCD	1.0	0	0
7th Street	SBCFCD	1.0	247	247
Ely Basin (1)	SBCFCD & CBWCD	1.0	2,749	2,898
Cucamonga Creek				
Lower Cucamonga West	SBCFCD(2)	0.1	1,894	1,894
Lower Cucamonga East plus Chris Basin	SBCFCD(2)	0.1	583	645
Deer Creek System (3)				
Turner No. 1	SBCFCD	0.5	2,100	2,200
Turner No. 2	SBCFCD			
Turner No.'s 3 and 4	SBCFCD			
Day Creek System				
Lower Day	SBCFCD	0.5	0	0
Wineville	SBCFCD	0.5	1,778	2,038
Riverside	SBCFCD	0.5	1,387	2,173
Etiwanda Creek System				
Etiwanda Spreading Grounds (4)	SBCFCD			
Etiwanda Basin	SBCFCD	4.0	2,527	3,317
Etiwanda Percolation Area (5)	SBCFCD			
San Sevaine Creek System (6)				
San Sevaine No. 1	SBCFCD	3.0	2,476	2,557
San Sevaine No. 2	SBCFCD	3.0	315	359
Rich Basin	SBCFCD	1.0	914	975
San Sevaine No. 3	SBCFCD	3.0	353	651
San Sevaine No. 4	SBCFCD	3.0	72	156
San Sevaine No. 5	SBCFCD	2.0	4	6
Victoria Basin	SBCFCD	2.0	183	295
Hickory Basin	SBCFCD	2.0	495	507
Jurupa Basin	SBCFCD	2.0	2,223	2,511
Declez	SBCFCD	0.5	0	0
CBWCD Facilities			6,147	6,760
Others Facilities			17,810	21,005
Total			23,957	27,765

Source -- Modified version of Table 3-8 from *Final Report, Phase 1, Chino Basin Recharge Master* Plan, 1998.

Notes (1) -- Ely basins 1 and 2 owned by SBCFCD; Ely basin 3 is owned by CBWCD. (2) Basin owned by SBCFCD; CBWCD manages recharge efforts and pays for basin maintenance. (3) SBCFCD has the ability to recharge storm flow in these basins but does not do so. (4) Has high percolation rates but very small percolation area and no conservation storage. (5) Currently not used. (6) Under construction. Recharge values reflect ultimate project conditions.

Table 4-5
Budget-Level Cost Estimate for Field Programs in Phase 2 Recharge Investigations

Basins/ Cost Summaries	Phase 2 Field Program Costs						Total Field Task Costs
	Cores		Trenching		Sieve Tests		
	#	Cost	#	Cost	#	Cost	
Upland	0	$0	0	$0	0	$0	$0
7th Street	4	$2,000	2	$500	6	$300	$2,800
Turner Basins 1, 2, 3 and 4		$0		$0		$0	$0
Grove Street							$0
Lower Day	0	$0	0	$0	0	$0	$0
Wineville and Riverside	10	$5,000	4	$1,000	12	$600	$6,600
Etiwanda Debris Basin	0	$0	0	$0	0	$0	$0
Etiwanda Percolation Basins	4	$2,000	4	$1,000	12	$600	$3,600
Victoria	0	$0	0	$0	0	$0	$0
Rich and San Sevaine 1 through 5	0	$0	0	$0	0	$0	$0
Jurupa	0	$0	0	$0	0	$0	$0
Declez	4	$2,000	4	$1,000	12	$600	$3,600
Up to Three New Areas	12	$6,000	9	$2,250	27	$1,350	$9,600
Subtotal Field Program Costs	34	$17,000	23	$5,750	69	$3,450	$26,200
Field Labor Costs		$5,100		$3,450			$8,550
Mobilization, Contracting and Supervision of Field Work							$15,000
Review and Interpretation of Data							$27,000
Total Estimated Cost							$76,750

Source -- Modified version of Table 5-2 from Final Report, Phase 1, Chino Basin Recharge Master Plan, 1998.

Notes -- NA means not applicable. (1) Water level sensors may be desirable for new basins at a later date.

Table 4-6
Estimated Demand for New Water Supply Sources in Chino Basin

(acre-ft/yr)

Purveyor	2020 Demand	Secure Sources Other	Secure Sources Chino Basin GW	Production Rights	Over/Under Production	Water Needed From OBMP
Ameron	9	0	9	98	-89	0
CA Institute for Men-- Agricultural (1)	2100	0	2100	0	2100	0
CA Institute for Men-- Potable (1)	1320	0	1320	0	1320	0
CA Institute for Women-- Frontera (1)	0	0	0	0	0	0
City of Chino	27900	5000	13360	18077	-4717	9540
City of Chino Hills	23240	11790	5850	4826	1024	5600
City of Norco	9000	4740	1000	331	669	3260
City of Ontario (2)	72040	26940	36700	31755	4945	8400
City of Pomona	35104	16084	19020	18367	653	0
City of Rialto	6100	6100	0	0	0	0
City of Upland (3)	24000	13800	9200	5860	3340	0
Cucamonga CWD (4)	68000	57840	10160	16930	-6770	0
Fontana WC	54300	31300	23000	542	22458	0
Jurupa CSD (5)	25820	4500	10600	13719	-3119	10720
Kaiser Ventures	0	0	0	1155	-1155	0
Marygold Mutual WC	1700	1700	0	1073	-1073	0
Mira Loma Space Center (6)	25	25	0	104	-104	0
MV Irrigation Co.	0	0	0	1109	-1109	0
MV Water District	14160	0	14160	7957	6203	0
San Antonio WC-- Domestic	1780	1520	260	260	0	0
San Antonio WC-- Non-Pot. (7)	2750	2750	0	1358	-1358	0
San Bernard. Co. Parks Department	75	0	75	0	75	0
San Bernard. Co. Div. of Airports-- Ag. (1)	370	0	370	0	0	0
San Bernard. Co Div. of Airports--Dom.	300	0	300	133	167	0
Santa Ana River Water Co.	2170	0	0	2131	-2131	2170
Southern California Edison	3300	2500	800	982	-182	0
Southern California Water Co. (8)	15680	13120	2560	1075	1485	0
Sunkist	1470	0	1470	1873	-403	0
Swan Lake	350	0	0	464	-464	350
W. San Bernard. Co. WD	10900	10540	360	1055	-695	0
Other (9)			2094	2516	-422	0
TOTAL	403963	210249	154768	133750	20648	40040

Notes:
(1) Agricultural Pool
(2) 850 AFY from SAWC
(3) 1190 AFY from WECWC
(4) CCWD + FUWC
(5) JCSD + MWCGAH
(6) From JCSD
(7) Total right is 2468 AFY-- 850 AFY to Upland
(8) 400 AFY from WECWC
(9) WECWC-Upland, Conrock, Angelica RS Speedway, Praxair, CSI, West Venture, GE

Table 4-7
New Unmet Demand in the Southern Part of Chino Basin

Purveyor	New Unmet Demands (acre-ft/yr)			
	2005	2010	2015	2020
City of Chino	2,200	2,200	5,540	9,540
City of Chino Hills	1,460	3,030	4,710	5,600
City of Norco	980	1,740	2,500	3,260
City of Ontario	2,740	4,630	6,510	8,400
Jurupa CSD	900	2,725	6,860	10,720
SARWC	590	1,120	1,640	2,170
Swan Lake	0	350	350	350
Totals	8,870	15,795	28,110	40,040

Table 4-8
Summary of Potential Supplemental Water Supply Sources

Source	Description	Reliability/Availability	Preliminary Evaluation
CCWD Lloyd Michael WTP	Current Capacity: 45 mgd Average Daily Production: 15 mgd Maximum Day Demand: 30 mgd Current Excess Capacity: 15 mgd Expandable to 90 mgd	Dependent on MWDSC supplies Fairly reliable low TDS supply source from State Water Project Supply available through planning period	Viable Source for purveyors on east side of basin
WFA/JPA Agua de Lejos WTP	Current Capacity: 77 mgd Average Daily Production: 31 mgd Maximum Day Demand: 52 mgd Current Excess Capacity: 25 mgd Expandable to 88 mgd	Dependent on MWDSC supplies Fairly reliable low TDS supply source from State Water Project Supply available through planning period	Viable Source for purveyors on west side of basin
Bunker Hill	Import water through new pipeline from Bunker Hill Basin to WFA/JPA WTP in the City of Upland	Water supply will diminish over planning period. Future availability uncertain. Increases dependence upon imported supplies.	Not Viable
Santa Ana River Water	Import water through new pipeline from Santa Ana River to MWD feeder?	Availability determined by price. Best used for recharge purposes because of good quality. High potential as future supply source.	Viable Source, but further study needed
Recycled Water	Use for groundwater recharge in lieu of imported MWDSC supplies	Availability directly related to variation in monthly average wastewater flows and capacity. Best used for groundwater recharge and direct non-potable reuse.	Viable for groundwater recharge. TDS may require mitigation.

Table 4-9
Production and Salt Removal Capacity of Chino Basin Desalters

Year	Product Water Capacity (mgd)				Salt Removal Capacity (tons)			
	SAWPA Desalter	Watermaster Desalters East	Watermaster Desalters West	Total	SAWPA Desalter	Watermaster Desalters East	Watermaster Desalters West	Total
2000	8.0	0.0	0.0	8.0	7,100	0	0	7,100
2001	8.0	0.0	0.0	8.0	7,100	0	0	7,100
2002	8.0	0.0	0.0	8.0	7,100	0	0	7,100
2003	10.0	14.0	0.0	24.0	8,875	24,984	0	33,859
2004	10.0	14.0	0.0	24.0	8,875	24,984	0	33,859
2005	10.0	14.0	0.0	24.0	8,875	24,984	0	33,859
2006	10.0	14.0	0.0	24.0	8,875	24,984	0	33,859
2007	10.0	14.0	0.0	24.0	8,875	24,984	0	33,859
2008	10.0	14.0	0.0	24.0	8,875	24,984	0	33,859
2009	10.0	24.0	0.0	34.0	8,875	42,830	0	51,705
2010	10.0	24.0	7.5	41.5	8,875	42,830	13,384	65,089
2011	10.0	24.0	7.5	41.5	8,875	42,830	13,384	65,089
2012	10.0	24.0	7.5	41.5	8,875	42,830	13,384	65,089
2013	10.0	24.0	7.5	41.5	8,875	42,830	13,384	65,089
2014	10.0	24.0	7.5	41.5	8,875	42,830	13,384	65,089
2015	10.0	28.5	9.5	48.0	8,875	50,861	16,954	76,689
2016	10.0	28.5	9.5	48.0	8,875	50,861	16,954	76,689
2017	10.0	28.5	9.5	48.0	8,875	50,861	16,954	76,689
2018	10.0	28.5	9.5	48.0	8,875	50,861	16,954	76,689
2019	10.0	28.5	9.5	48.0	8,875	50,861	16,954	76,689
2020	10.0	28.5	9.5	48.0	8,875	50,861	16,954	76,689
21-Year Totals								
Water Production (acre-ft/yr)				703,654				
Salt Removal (tons)								1,061,744

Table 4-10
Cost Summary for Subalternative 6A

GROUNDWATER DESALTING					
Cost Component	**Year 2003**	**Year 2010**	**Year 2015**	**Year 2020**	**TOTAL ($)**
Capital Costs					
Source Water System	21,592,000	22,875,000	8,846,000	0	53,313,000
RO Treatment System	34,463,000	36,431,000	14,085,000	0	84,979,000
Product Water Pipelines	6,603,000	6,638,000	0	0	13,241,000
Brine Pipelines	22,000	14,000	0	0	36,000
Pump Station	2,370,000	3,088,000	1,293,000	0	6,751,000
SARI/CSDOC Capacity Charges	23,720,000	25,162,000	9713000	0	58,595,000
Land Requirements	1,188,000	387,000	0	0	1,575,000
TOTAL	89,958,000	94,595,000	33,937,000	0	218,490,000
Annualized Capital Costs					
Source Water System	1,883,000	1,995,000	771,000	0	4,649,000
RO Treatment System	3,005,000	3,177,000	1,228,000	0	7,410,000
Product Water Pipelines	576,000	579,000	0	0	1,155,000
Brine Pipelines	2,000	1,000	0	0	3,000
Pump Station	207,000	269,000	113,000	0	589,000
SARI/CSDOC Capacity Charges	2,068,000	2,194,000	847,000	0	5,109,000
Land Requirements	104,000	34,000	0	0	138,000
TOTAL	7,845,000	8,249,000	2,959,000	0	19,053,000
Operations & Maintenance Costs					
RO Treatment/Source Water	2,544,000	2,603,000	504,000	1,239,000	6,890,000
Pipelines	18,000	31,000	11,000	16,000	76,000
Pump Station O&M & Energy	579,000	592,000	117,000	283,000	1,571,000
SARI/CSDOC O&M	719,000	741,000	149,000	356,000	1,965,000
TOTAL	3,860,000	3,967,000	781,000	1,894,000	10,502,000

	Year 2003	**Year 2010**	**Year 2015**	**Year 2020**
Annualized Capital Cost Breakdown				
Year 2003	7,845,000	7,845,000	7,845,000	7,845,000
Year 2010		8,249,000	8,249,000	8,249,000
Year 2015			2,959,000	2,959,000
Year 2020				0
Total Annualized Capital Cost	7,845,000	16,094,000	19,053,000	19,053,000
O&M Cost Breakdown				
Year 2003	3,860,000	3,860,000	3,860,000	3,860,000
Year 2010		3,967,000	3,967,000	3,967,000
Year 2015			781,000	781,000
Year 2020				1,894,000
Total O&M Cost	3,860,000	7,827,000	8,608,000	10,502,000
Cost Summary				
Year Annual Cost ($)	$11,705,000	$12,216,000	$3,740,000	$1,894,000
Total Annual Cost ($)	**$11,705,000**	**$23,921,000**	**$27,661,000**	**$29,555,000**
Incremental Product Water Delivered (AF)	16,075	14,895	2,375	6,695
Cumulative Product Water Delivered (AF)	16,075	30,970	33,345	40,040

Table 4-11
Definition of Agency Responsibilities

Responsibility	Description
Treat & Supply Water	Agency has the technical and legal ability to treat and/or supply water to customers. Includes the right of first purchase of water.
Design & Construct Facilities	Agency has the physical and legal ability to design and construct water treatment facilities including pipelines, pumping stations, reservoirs and associated facilities.
Operate & Maintain Facilities	Agency has the physical and legal ability to operate and maintain appurtenant facilities.
Interface with Water Users	Agency has the technical ability to provide service to water customers including meter reading, billing, and customer interface.
Finance Project Construction	Agency has the legal and financial ability to obtain funds for the construction of the appurtenant facilities.
Collect Funds for Water Purchases	Agency has the legal authority to collect fees and charges for water service.
Provide Stand-by Water Supply	Agency has the physical ability to provide standby water service to potential water customers

Table 4-12
Effect of Land Use and Water Use on Salt Loading

(1) Land Use	(2) Source Water Applied (ft)	(3) Source Water Conc (mg/L)	(4) Irrigation Efficiency	(5) Effective Precipitation Volume (ft)	(6) Effective Precipitation Conc (mg/L)	(7) Evapo-transpiration (ft)	(8) Mass Added Through Use (tons)	(9) Return Flow (ft)	(10) Return Flow Concentration Due to ET (mg/L)	(11) Return Flow Concentration Due to Mass Added (mg/L)	(12) Return Flow Concentration Total Conc (mg/L)	(13) Mass (tons)
Irrigated Alfalfa without Dairy Waste Application												
Alfalfa	3.3	250	75%	0.8	100	3.3	0.176	0.8	1,104	156	1,260	1.4
Alfalfa	3.3	500	75%	0.8	100	3.3	0.176	0.8	2,108	156	2,264	2.6
Alfalfa	3.3	750	75%	0.8	100	3.3	0.176	0.8	3,112	156	3,268	3.7
Alfalfa	3.3	1000	75%	0.8	100	3.3	0.176	0.8	4,116	156	4,272	4.8
Irrigated Alfalfa with Solid Dairy Waste Application at 12 tons per acre												
Alfalfa	3.3	250	75%	0.8	100	3.3	1.3	0.8	1,104	1,151	2,255	2.5
Alfalfa	3.3	500	75%	0.8	100	3.3	1.3	0.8	2,108	1,151	3,259	3.7
Alfalfa	3.3	750	75%	0.8	100	3.3	1.3	0.8	3,112	1,151	4,263	4.8
Alfalfa	3.3	1000	75%	0.8	100	3.3	1.3	0.8	4,116	1,151	5,267	5.9
Irrigated Alfalfa with Solid and Liquid Dairy Waste Application at 12 and 1.2 Tons, Respectively												
Alfalfa	3.3	250	75%	0.8	100	3.3	1.4	0.8	1,104	1,240	2,344	2.6
Alfalfa	3.3	500	75%	0.8	100	3.3	1.4	0.8	2,108	1,240	3,348	3.8
Alfalfa	3.3	750	75%	0.8	100	3.3	1.4	0.8	3,112	1,240	4,352	4.9
Alfalfa	3.3	1000	75%	0.8	100	3.3	1.4	0.8	4,116	1,240	5,356	6.0
Urban Residential with Municipal Supplies												
Residential	3.7	250	75%	0.6	100	3.4	0.147	0.9	1,068	116	1,184	0.5
Residential	3.7	300	75%	0.6	100	3.4	0.147	0.9	1,268	116	1,384	0.5
Residential	3.7	350	75%	0.6	100	3.4	0.147	0.9	1,468	116	1,584	0.6
Residential	3.7	400	75%	0.6	100	3.4	0.147	0.9	1,668	116	1,784	0.7

(2) = Alfalfa ET from Table 19 of DWR Bull 113-3 divided by irrigation eff in column (4)

(5) = Alfalfa ET from Table 18 of DWR Bull 113-3 minus alfalfa ET from Table 19 of DWR Bull 113-3

(7) = Alfalfa ET from Table 18 of DWR Bull 113-3

(8) = Table 7 from WRE *Unit Water Requirements and Waste Increments* , 1970; and Figure III-1a from the RWQCB *Dairies and Their Relationship to Water Quality Problems in the Chino Basin*, 1990

(13) urban mass adjusted to 30 percent due to 70 percent imperviousness

TABLE 4-13
COMPARISON OF FUTURE WATER QUALITY INFORMATION REQUIREMENTS WITH ALTERNATIVE METHODS

Capability/Requirement	Method			
	Groundwater Monitoring	Salt Budget	Numerical Modeling: CIGSM	Numerical Modeling: New Model(s)
Characterize Ambient Water Quality	X			
Assess Water Quality Impacts From Future Water Resources Management				
Basin-wide/Management Zone	X	X	X	
Time Projections at Wells			X	
Future Assessments of Water Quality Improvements of OBMP	X	X	X	
Basin Plan Compliance for Recharge of Recycled Water	X	X	X	
Title 22 Compliance for Recharge of Recycled Water	X			X
CEQA studies for Conjunctive Use	X	X	X	X
Cost to develop, use and update over the next 20 years (assumes 5 comprehensive uses over 20 years)	not applicable	$300,000 to $400,000	>$3,000,000	>$1,000,000

X -- indicates that method will meet requirements.

Table 4-14
Preliminary Budget for OBMP Implementation
Years 1 Through 20

Program Element/Tasks	Fiscal Year Ending June 30,																				Total
	2000 Year 1	2001 Year 2	2002 Year 3	2003 Year 4	2004 Year 5	2005 Year 6	2006 Year 7	2007 Year 8	2008 Year 9	2009 Year 10	2010 Year 11	2011 Year 12	2012 Year 13	2013 Year 14	2014 Year 15	2015 Year 16	2016 Year 17	2017 Year 18	2018 Year 19	2019 Year 20	
Non-capital Cost Components																					
Program Element 1 -- Comprehensive Monitoring Program	*$562,000*	*$866,500*	*$571,500*	*$175,000*	*$210,000*	*$175,000*	*$175,000*	*$175,000*	*$175,000*	*$210,000*	*$175,000*	*$175,000*	*$175,000*	*$175,000*	*$210,000*	*$175,000*	*$175,000*	*$175,000*	*$175,000*	*$210,000*	*$5,115,000*
Groundwater level monitoring	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$200,000
Groundwater quality monitoring	$245,000	$245,000	$245,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$2,435,000
Groundwater production monitoring	$202,500	$202,500	$202,500	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$1,117,500
Surface water monitoring	$69,500	$109,000	$109,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$797,500
Ground level monitoring																					
Study and survey[1]	$35,000				$35,000					$35,000					$35,000					$35,000	$175,000
Extensometer[2]		$300,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$390,000
Program Element 4 -- Subsidence Zone (Management Zone 1)	*$100,000*	*$100,000*	*$100,000*	*$100,000*	*$100,000*	*$10,000*	*$10,000*	*$10,000*	*$10,000*	*$10,000*	*$5,000*	*$5,000*	*$10,000*	*$5,000*	*$5,000*	*$10,000*	*$5,000*	*$5,000*	*$10,000*	*$5,000*	*$615,000*
Program Element 6 Cooperative Efforts	*$52,500*	*$55,000*	*$5,000*	*$10,000*	*$85,000*	*$10,000*	*$10,000*	*$10,000*	*$10,000*	*$85,000*	*$10,000*	*$10,000*	*$10,000*	*$10,000*	*$85,000*	*$10,000*	*$10,000*	*$10,000*	*$10,000*	*$85,000*	*$582,500*
Salt balance method development and initial uses	$50,000	$50,000	$0		$75,000					$75,000					$75,000					$75,000	$400,000
Cooperative efforts with RWQCB	$2,500	$5,000	$5,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$182,500
Program Element 7 -- Salt Management	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$150,000*	*$3,000,000*
Program Element 8 -- Storage Management	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$255,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$5,000*	*$350,000*
Compute change in storage	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$100,000
Compute safe yield and storage loss rate														$250,000							$250,000
Program Element 9 -- Conjunctive Use	*$12,500*	*$210,000*	*$210,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$20,000*	*$772,500*
Assist Watermaster with program formulation	$12,500	$55,000	$55,000																		$122,500
Engineering and reporting		$155,000	$155,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$650,000
90%Facilities[5]																					
Subtotal Annual Costs from Non-Capital Intensive Program Elements	***$882,000***	***$1,386,500***	***$1,041,500***	***$460,000***	***$570,000***	***$370,000***	***$370,000***	***$370,000***	***$370,000***	***$480,000***	***$365,000***	***$365,000***	***$370,000***	***$615,000***	***$475,000***	***$370,000***	***$365,000***	***$365,000***	***$370,000***	***$475,000***	***$10,435,000***
Capital-Intensive Program Elements																					
Program Element 2 -- Comprehensive Recharge Program	*$93,750*	*$187,500*	*$150,000*	*$650,000*	*$2,687,399*	*$2,187,399*	*$2,187,399*	*$2,187,399*	*$2,187,399*	*$2,287,399*	*$2,187,399*	*$2,187,399*	*$2,187,399*	*$2,187,399*	*$2,287,399*	*$2,187,399*	*$2,187,399*	*$2,187,399*	*$2,187,399*	*$2,287,399*	*$36,879,634*
Phase 2	$93,750	$187,500																			$281,250
Early implementation[3]				$500,000	$500,000																$1,000,000
Phase 3			$150,000	$150,000																	$300,000
New east side basin -- capital cost					$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$1,889,326	$30,229,222
New west side basin -- capital cost					$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$224,073	$3,585,162
New east side facilities -- O&M costs					$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$592,000
New west side facilities -- O&M costs					$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$37,000	$592,000
Plan Update										$100,000					$100,000					$100,000	$300,000
Program Elements 3 and 5	*$40,000*	*$300,000*	*$310,000*	*$310,000*	*$310,000*	*$11,741,000*	*$12,282,600*	*$12,824,200*	*$13,365,800*	*$13,907,400*	*$23,938,000*	*$24,308,800*	*$24,679,600*	*$25,050,400*	*$25,421,200*	*$28,734,000*	*$28,929,250*	*$29,124,500*	*$29,319,750*	*$29,515,000*	*$334,411,500*
Assist Watermaster with program formulation	$15,000	$40,000	$40,000	$40,000	$40,000																$175,000
Prelim engineering, environmental, and reporting	$15,000	$250,000	$250,000	$250,000	$250,000																$1,015,000
Legal	$10,000	$10,000	$20,000	$20,000	$20,000																$80,000
East desalter -- capital costs						$6,697,000	$6,697,000	$6,697,000	$6,697,000	$6,697,000	$11,105,000	$11,105,000	$11,105,000	$11,105,000	$11,105,000	$12,977,000	$12,977,000	$12,977,000	$12,977,000	$12,977,000	$153,895,000
West desalter capital -- costs											$3,823,000	$3,823,000	$3,823,000	$3,823,000	$3,823,000	$4,893,000	$4,893,000	$4,893,000	$4,893,000	$4,893,000	$43,580,000
Expanded SAWPA desalter -- capital cost						$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$1,184,000	$17,760,000
East desalter -- O&M costs						$3,643,000	$4,167,200	$4,691,400	$5,215,600	$5,739,800	$6,264,000	$6,478,600	$6,693,200	$6,907,800	$7,122,400	$7,337,000	$7,337,000	$7,337,000	$7,337,000	$7,337,000	$93,608,000
West desalter -- O&M costs											$1,258,000	$1,383,800	$1,509,600	$1,635,400	$1,761,200	$1,887,000	$2,044,250	$2,201,500	$2,358,750	$2,516,000	$18,555,500
Expanded SAWPA desalter -- O&M costs						$217,000	$234,400	$251,800	$269,200	$286,600	$304,000	$334,400	$364,800	$395,200	$425,600	$456,000	$494,000	$532,000	$570,000	$608,000	$5,743,000
Subtotal Capital-Intensive Program Elements	**$133,750**	**$487,500**	**$460,000**	**$960,000**	**$2,997,399**	**$13,928,399**	**$14,469,999**	**$15,011,599**	**$15,553,199**	**$16,194,799**	**$26,125,399**	**$26,496,199**	**$26,866,999**	**$27,237,799**	**$27,708,599**	**$30,921,399**	**$31,116,649**	**$31,311,899**	**$31,507,149**	**$31,802,399**	**$371,291,134**
Total All Program Elements	**$1,015,750**	**$1,874,000**	**$1,501,500**	**$1,420,000**	**$3,567,399**	**$14,298,399**	**$14,839,999**	**$15,381,599**	**$15,923,199**	**$16,674,799**	**$26,490,399**	**$26,861,199**	**$27,236,999**	**$27,852,799**	**$28,183,599**	**$31,291,399**	**$31,481,649**	**$31,676,899**	**$31,877,149**	**$32,277,399**	**$381,726,134**

Figure 4-1
Preferred Area for Location of New Recharge Basins

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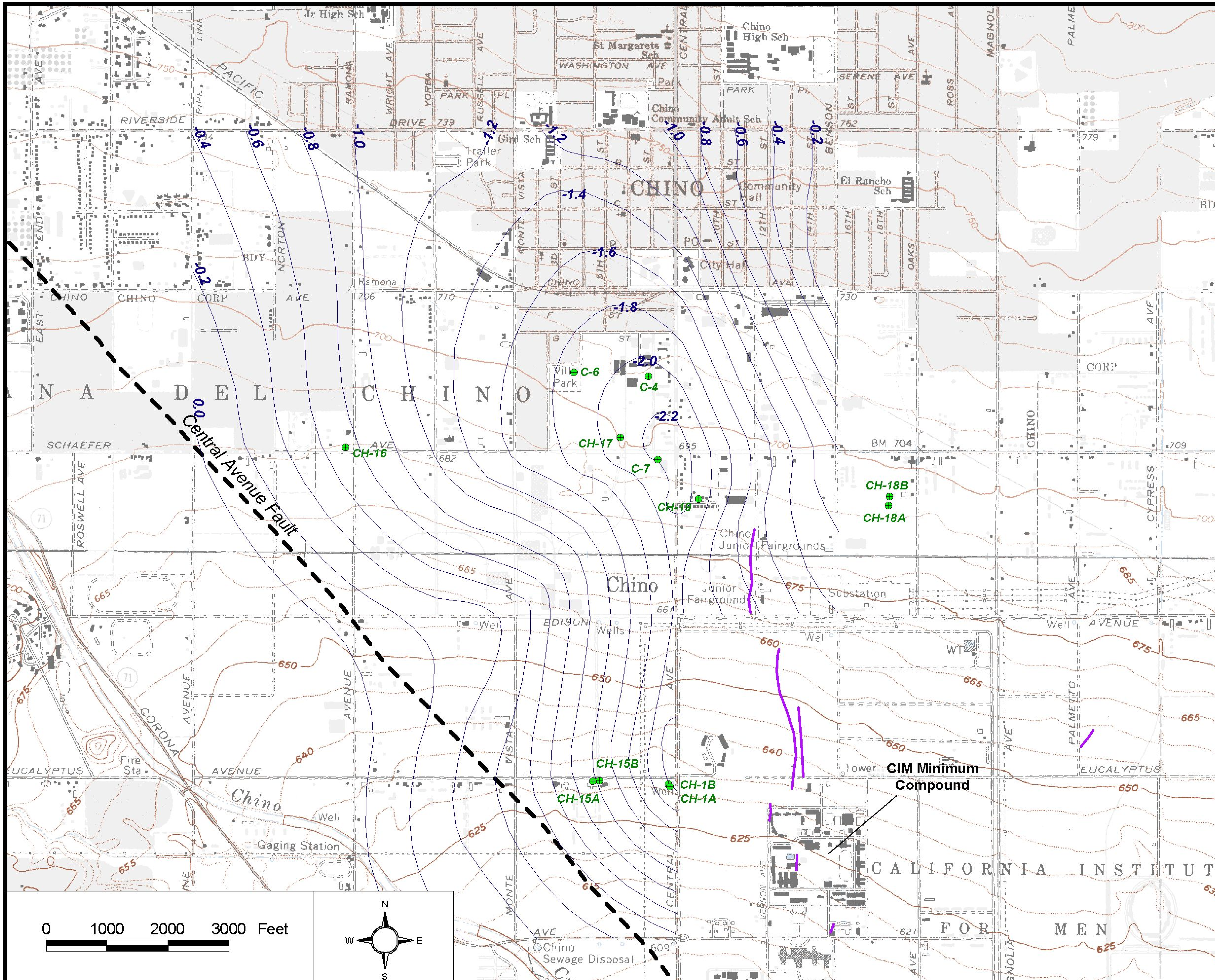
Optimum Basin Management Program
Chino Basin Watermaster



Legend

- C-7 Municipal Well
  - CH = City of Chino Hills
  - C = City of Chino
- -1.4 Subsidence Contour showing Settlement Depth in Feet (1987-99)
- Location of Ground Fissures (1994)
- Approximate Location of Known Fault

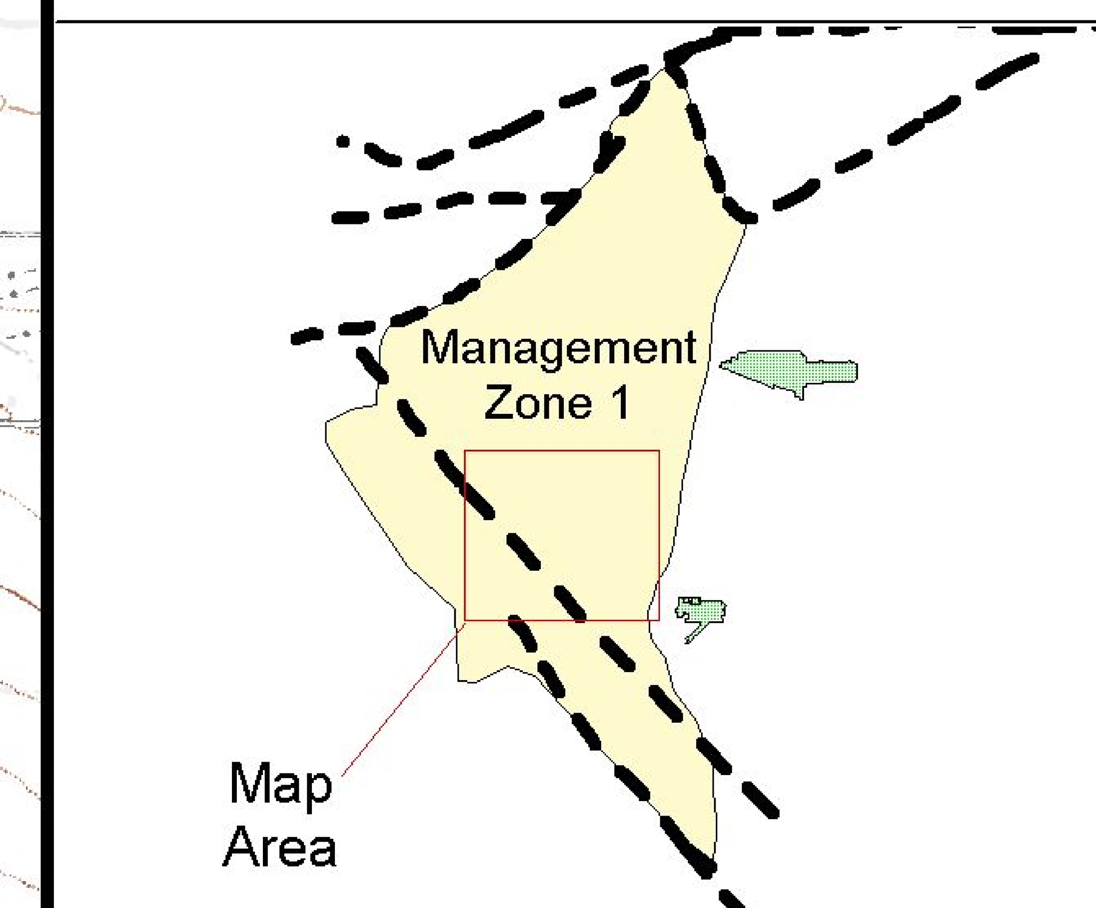


Figure 4-2

Subsidence Contours and Ground Fissures in the Chino Area

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

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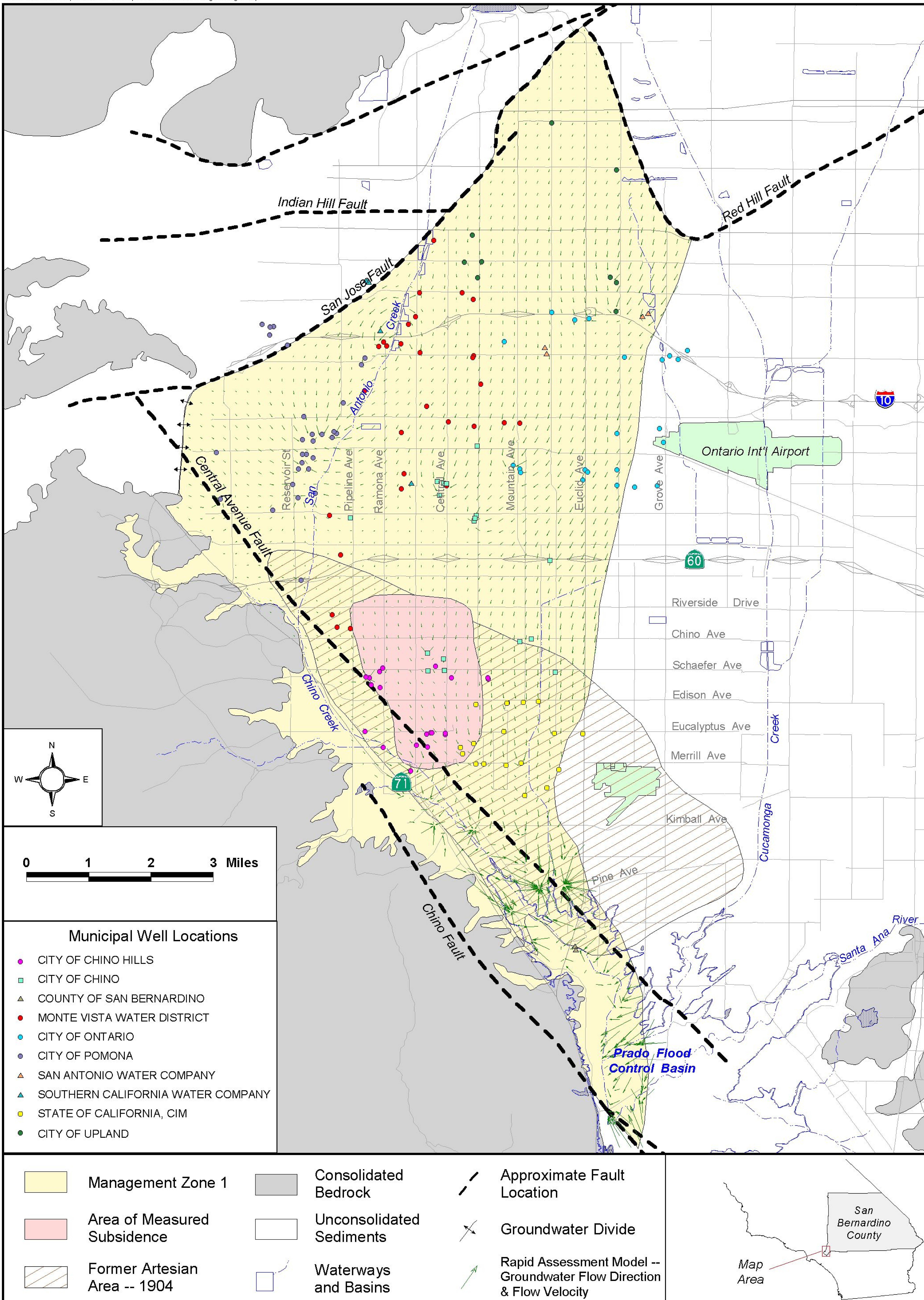
Source Data: USGS, Kleinfelder (1999), Geomatrix (1994) s:\clients\cbwm\obmp\task order 2\obmp document\section 4\figures\fig4-4.apr



Optimum Basin Management Program
Chino Basin Watermaster

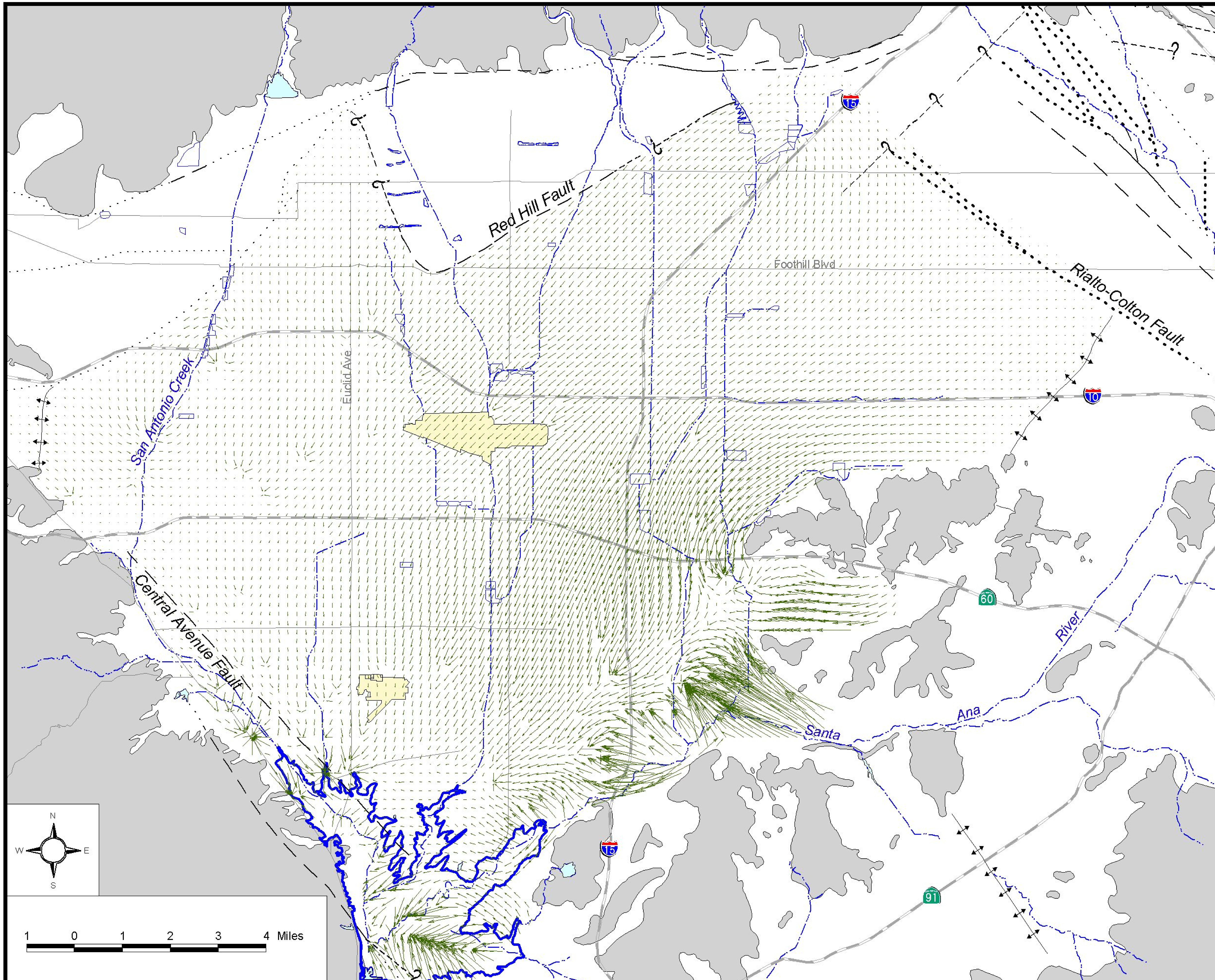
Source Data: USGS, Kleinfelder (1999), Mendenhall (1908)

Figure 4-3

Management Zone 1
Hydrogeology, Hydrology and Subsidence

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999



Optimum Basin Management Program
Chino Basin Watermaster

Legend

General Groundwater Flow Direction and Relative Flow Velocity

Bedrock Surface Exposure

Fault
Dashed where approximate
Dotted where concealed
Queried where uncertain

Groundwater Barrier (suspected fault)

Groundwater Divide

Waterways, Reservoirs, Spreading Basins and Flood Control Basins

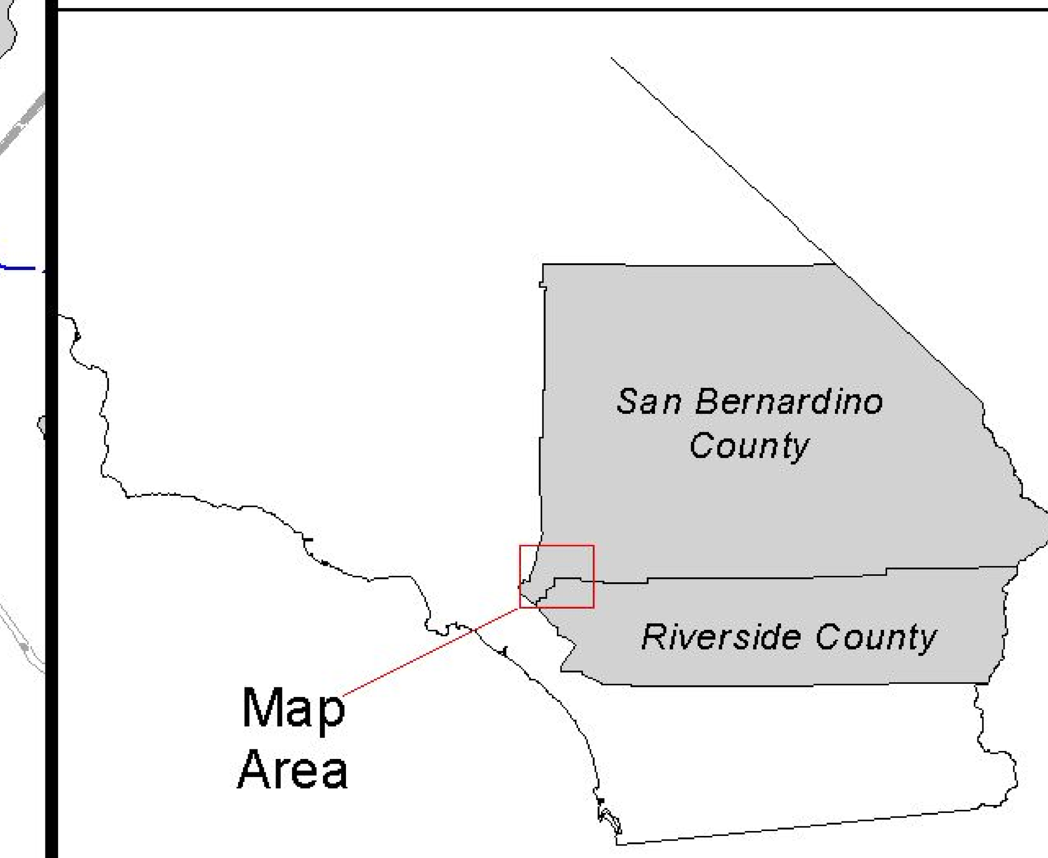


Figure 4-4

Groundwater Flow Direction and Relative Flow Velocity within Chino Basin

WE WILDERMUTH ENVIRONMENTAL, INC.

Date: August 19, 1999

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Appendix G
Reduced Delta Reliance

Inland Empire Utilities Agency Reduced Delta Reliance Reporting

G.1 Background

IEUA is an urban water supplier and a member agency of MWD. MWD provides IEUA with imported water supplies, which IEUA in turn distributes on a wholesale basis to its retail water purveyors. MWD is a contractor on the State Water Project (SWP) and, due to water quality considerations, all imported water supplies IEUA receives from MWD originate from the SWP system. The SWP system runs from Lake Oroville in Northern California to Southern California, crossing the Sacramento-San Joaquin Delta (Delta) along the way. MWD and its member agencies have made investments into water supply and demand management to regionally reduce impacts on the Delta. These investments bring regional reliability and reduced Delta reliance that make it infeasible for individual MWD member agencies to determine their individual Delta reliance.

As a recipient of imported water from the SWP delivered via MWD, IEUA may indirectly receive water through a proposed covered action, such as a multi-year water transfer, conveyance facility, or new diversion that involves transferring water through, exporting water from, or using water in the Delta. Through this appendix, IEUA is providing information in its 2015 and 2020 UWMPs that may be used in the covered action process, to demonstrate consistency with Delta Plan Policy WR P1, *Reduce Reliance on the Delta Through Improved Regional Water Self-Reliance* (WR P1) [California Code of Regulations (CCR), Title 23, § 5003].

The Delta Plan is a comprehensive, long-term resource management plan for the Sacramento-San Joaquin Delta (Delta) that was developed as part of the Delta Reform Act of 2009 (Water code section 85000 et seq) and includes both regulatory policies and recommendations, aimed at promoting a healthy Delta ecosystem. Delta Plan Policy WR P1 is one of 14 regulatory policies in the Delta Plan. WR P1 identifies UWMPs as the tool to demonstrate consistency with state policy to reduce reliance on the Delta for any Supplier that is participating in or carrying out a proposed covered action or receiving Delta water from a proposed covered action.

Within the supplier's UWMP, information should be provided that can be used to demonstrate consistency with this policy. Section (c)(1) of WR P1 states that suppliers that have (A) completed an urban water management plan, (B) implemented the efficiency measures in that plan, and (C) shown a measurable reduction in Delta reliance and improvement in regional self-reliance in the plan, are contributing to reduced reliance on the Delta and are therefore consistent with WR P1 [CCR, Title 23, § 5003(c)(1)].

The analysis and documentation provided below include all elements described in WR P1(c)(1) and are included in IEUA's 2015 and 2020 UWMP to support a certification of consistency in the case of a future covered action.

G.2 Demonstration of Reduced Reliance

The methodology used to determine IEUA's reduced Delta reliance and improved regional self-reliance is consistent with the approach detailed in DWR's UWMP Guidebook Appendix C, including the use of narrative justifications for the accounting of supplies and the documentation of specific data sources. Some of the key assumptions underlying IEUA's demonstration of reduced reliance includes:

- All data were obtained from the current 2020 UWMP or previously adopted UWMPs and represent average or normal water year conditions.

- All analyses were conducted at the IEUA service area level. Demands on IEUA are the total demands from all its retail agencies. Supplies are the total supplies IEUA manages, which are imported water from MWD and recycled water from its regional water recycling plants.

- No projects or programs that are described in the UWMPs as “Projects Under Development” were included in the accounting of supplies.

G.3 Summary of Expected Outcomes for Reduced Reliance on the Delta

As stated in WR P1(c)(1), the policy requires that, commencing in 2015, UWMPs include expected outcomes for measurable reduction in Delta reliance and improved regional self-reliance. WR P1 further states that those outcomes shall be reported in the UWMP as the reduction in the amount of water used, or in the percentage of water used, from the Delta.

It is important to note that MWD has prepared a detailed analysis that demonstrates the consistency with the Delta Plan Policy in its 2020 UWMP on a region-wide scale that includes its Member Agencies (MWD 2020 UWMP, Appendix 11). From its 2010 baseline, both long-term Regional Self-Reliance and Reduced Reliance on Supplies from the Delta are expected to increase over time. IEUA has adopted MWD’s calculation of Reduced Reliance on Supplies from the Delta due to the infeasibility of separating out the delta supplies that IEUA receives from MWD (see Section G.6 and G.7 for details).

IEUA will report its own expected outcomes for Regional Self-Reliance in the following sections (G.4 and G.5). These expected outcomes use the approach and guidance described in Appendix C of DWR’s Urban Water Management Plan Guidebook 2020 (Guidebook Appendix C), finalized on March 29, 2021.

The following provides a summary of the near-term (2025) and long-term (2045) expected outcomes for IEUA’s regional self-reliance and MWD’s regional reduction in reliance on Delta water supplies. The results show that IEUA is measurably improving regional self-reliance and MWD and its member agencies are reducing reliance on Delta supplies, both as an amount of water used and as a percentage of water used.

- Near-term (2025) – IEUA’s normal water regional self-reliance is expected to increase by 25 thousand acre-feet (TAF) from the 2010 baseline; this represents an increase of about 10 percent of 2025 normal water year demands (Table G-2).

- Long-term (2045) – IEUA’s normal water regional self-reliance is expected to increase by 50 TAF from the 2010 baseline; this represents an increase of about 17 percent of 2045 normal water year demands (Table G-2).

- Near-term (2025) – MWD’s normal reliance on water supplies from the Delta Watershed is expected to decrease by 300 thousand acre-feet (TAF) from the 2010 baseline; this represents a decrease of about 3 percent of 2025 normal water year demands (Table G-3).

- Long-term (2045) – MWD's normal reliance on water supplies from the Delta Watershed is expected to decrease by 314 thousand acre-feet (TAF) from the 2010 baseline; this represents a decrease of about 5 percent of 2045 normal water year demands (Table G-3).

G.4 Baseline and Calculation of Service Area Water Demands

In order to calculate the expected outcomes for measurable reduction in Delta reliance and improved regional self-reliance, a baseline is needed to compare against. This analysis uses a normal water year representation of 2010 as the baseline, which is consistent with the approach described in the Guidebook Appendix C.

Table G-1 shows the total service area water demands for IEUA for 2010 through 2045. These water demands include recycled water and imported water demand on IEUA from its retail agencies. The table also shows reported water use efficiency and calculates the total service area water demands without water use efficiency.

The data sources for the values in this table and calculations are explained below.

Service Area Demands with Water Use Efficiency Accounted For:

- Baseline (2010) value: The sum of the imported water and recycled water demands, as reported in IEUA's 2010 UWMP, Tables 3-10 and 3-15.

- 2015 value: The sum of the imported water and recycled water demands on IEUA, as reported in IEUA's 2015 UWMP, Table 2-8: IEUA Total Water Demands.

- 2020-2045 values: The sum of imported water and recycled water demands, from IEUA's 2020 UWMP, Table 2-4: Total Water Use (Potable and Non-Potable).

Reported Water Use Efficiency:

- Baseline (2010) value: No water use efficiency value is estimated to establish a conservative baseline.

- 2015 value: From IEUA's 2015 UWMP, Table 3-1. Only the 2015 value for WUE was selected.

- 2020 value: The volume of savings over the lifetime of water use efficiency measures implemented during FY 19/20, as reported in IEUA's Annual UWE FY19/20 report and detailed in Section 8.8 of IEUA's 2020 UWMP.

- 2025-2045 values: Projected water use efficiency savings, from IEUA's 2020 UWMP, Table 7-2.

The Service Area Water Demands without Water Use Efficiency Accounted For is the sum of the two volumes above for each year.

G.5 Calculation of Supplies Contributing to Regional Self-Reliance

For a covered action to demonstrate consistency with the Delta Plan, WR P1(c)(1) states that water suppliers must report the expected outcomes for measurable improvement in regional self-reliance. Table G-2 shows expected outcomes for supplies contributing to regional self-reliance both in amount and as a percentage. The numbers shown in Table G-2 represent efforts to improve regional self-reliance for the IEUA service area, focused only on the supplies IEUA manages, which are water use efficiency and water recycling. Supporting narratives and documentation for the all the data shown in the table are provided below:

Water Use Efficiency

The water use efficiency information shown in Table G-2 is taken directly from Table G-1. It is now reflected as a supply contributing to regional self-reliance.

Water Recycling

The water recycling values shown in Table G-2 are the recycled water supplies to meet the recycled water portion of the projected “service area water demands with water use efficiency accounted for” shown in Table G-1. These values come from IEUA’s 2010 UWMP Table 3-15, IEUA’s 2015 UWMP Table 2-8, and IEUA’s 2020 UWMP Table 2-4. A description on these water supplies can be found in Section 5.4 – Current Recycled Water Uses in IEUA’s 2020 UWMP.

The results shown in Table G-2 demonstrate that IEUA is improving its regional self-reliance, since the volume of water supplies contributing to regional self-reliance are projected to increase over time. In the near term (2025), the expected outcome for normal water year regional self-reliance increases by over 25,000 AF from the 2010 baseline; this represents an increase of about 10 percent of 2025 normal water year demands. In the long term (2045), normal water year regional self-reliance is expected to increase by more than 50,000 AF from the 2010 baseline.

G.6 Calculation of Reliance on Water Supplies from the Delta Watershed

WR P1(c)(1) requires that water suppliers report the expected outcomes for measurable reductions in supplies from the Delta watershed either as an amount or as a percentage. This analysis provides both calculations.

Although IEUA is currently a SWP-exclusive MWD member agency, it is infeasible to individually account for the independent impact on the Delta. IEUA participates, through MWD, in various water supply investment and demand management programs that reduce reliance on the Delta. Reliance on water supplies from the Delta are taken from MWD’s Reduced Delta Reliance assessment (MWD 2020 UWMP, Appendix 11).

Regional reliance on supplies from the Delta watershed are expected to decrease by 314 TAF over the 2010 baseline, a decrease of about 5.2% of 2045 demands. Increased regional self-reliance primarily comes from water use efficiency, conjunctive use projects, water recycling, and local/regional water supply and storage projects. The water supply accounting completed by MWD does not include any supplies from potential future covered actions.

G.7 Infeasibility of Accounting Supplies from the Delta Watershed for Metropolitan's Member Agencies and their Customers

Metropolitan's service area, as a whole, reduces reliance on the Delta through investments in non-Delta water supplies, local water supplies, and regional and local demand management measures. Metropolitan's member agencies coordinate reliance on the Delta through their membership in Metropolitan, a regional cooperative providing wholesale water service to its 26 member agencies. Accordingly, regional reliance on the Delta can only be measured regionally—not by individual Metropolitan member agencies and not by the customers of those member agencies.

Metropolitan's member agencies, and those agencies' customers, indirectly reduce reliance on the Delta through their collective efforts as a cooperative. Metropolitan's member agencies do not control the amount of Delta water they receive from Metropolitan. Metropolitan manages a statewide integrated conveyance system consisting of its participation in the State Water Project (SWP), its Colorado River Aqueduct (CRA) including Colorado River water resources, programs and water exchanges, and its regional storage portfolio. Along with the SWP, CRA, storage programs, and Metropolitan's conveyance and distribution facilities, demand management programs increase the future reliability of water resources for the region. In addition, demand management programs provide system-wide benefits by decreasing the demand for imported water, which helps to decrease the burden on Metropolitan's infrastructure and reduce system costs, and free up conveyance capacity to the benefit of all member agencies.

Metropolitan's costs are funded almost entirely from its service area, with the exception of grants and other assistance from government programs. Most of Metropolitan's revenues are collected directly from its member agencies. Properties within Metropolitan's service area pay a property tax that currently provides approximately 8 percent of the fiscal year 2021 annual budgeted revenues. The rest of Metropolitan's costs are funded through rates and charges paid by Metropolitan's member agencies for the wholesale services it provides to them. Thus, Metropolitan's member agencies fund nearly all operations Metropolitan undertakes to reduce reliance on the Delta, including Colorado River Programs, storage facilities, Local Resources Programs and Conservation Programs within Metropolitan's service area.

Because of the integrated nature of Metropolitan's systems and operations, and the collective nature of Metropolitan's regional efforts, it is infeasible to quantify each of Metropolitan member agencies' individual reliance on the Delta. It is infeasible to attempt to segregate an entity and a system that were designed to work as an integrated regional cooperative.

In addition to the member agencies funding Metropolitan's regional efforts, they also invest in their own local programs to reduce their reliance on any imported water. Moreover, the customers of those member agencies may also invest in their own local programs to reduce water demand. However, to the extent those efforts result in reduction of demands on Metropolitan, that reduction may not equate to a like reduction of reliance on the Delta. Demands on Metropolitan are not commensurate with demands on the Delta because most of Metropolitan member agencies receive blended resources from Metropolitan as determined by Metropolitan—not the individual member agency—and for most member agencies, the blend varies from month-to-month and year-to-year due to hydrology, operational constraints, use of storage and other factors.

The accounting of regional investments that contribute to reduced reliance on supplies from the Delta watershed is straightforward to calculate and report at the regional aggregate level. However, any similar accounting is infeasible for the individual member agencies or their customers. As described above, the region (through Metropolitan) makes significant investments in projects, programs and other resources that reduce reliance on the Delta. In fact, all of Metropolitan's investments in Colorado River supplies, groundwater and surface storage, local resources development and demand management measures that reduce reliance on the Delta are collectively funded by revenues generated from the member agencies through rates and charges.

Metropolitan's revenues cannot be matched to the demands or supply production history of an individual agency, or consistently across the agencies within the service area. Each project or program funded by the region has a different online date, useful life, incentive rate and structure, and production schedule. It is infeasible to account for all these things over the life of each project or program and provide a nexus to each member agency's contributions to Metropolitan's revenue stream over time. Accounting at the regional level allows for the incorporation of the local supplies and water use efficiency programs done by member agencies and their customers through both the regional programs and through their own specific local programs. As shown above, despite the infeasibility of accounting reduced Delta reliance below the regional level, Metropolitan's member agencies and their customers have together made substantial contributions to the region's reduced reliance.

Colorado River Programs

As a regional cooperative of member agencies, Metropolitan invests in programs to ensure the continued reliability and sustainability of Colorado River supplies. Metropolitan was established to obtain an allotment of Colorado River water, and its first mission was to construct and operate the CRA. The CRA consists of five pumping plants, 450 miles of high voltage power lines, one electric substation, four regulating reservoirs, and 242 miles of aqueducts, siphons, canals, conduits and pipelines terminating at Lake Mathews in Riverside County. Metropolitan owns, operates, and manages the CRA. Metropolitan is responsible for operating, maintaining, rehabilitating, and repairing the CRA, and is responsible for obtaining and scheduling energy resources adequate to power pumps at the CRA's five pumping stations.

Colorado River supplies include Metropolitan's basic Colorado River apportionment, along with supplies that result from existing and committed programs, including supplies from the Imperial Irrigation District (IID)-Metropolitan Conservation Program, the implementation of the Quantification Settlement Agreement (QSA) and related agreements, and the exchange agreement with San Diego County Water Authority (SDCWA). The QSA established the baseline water use for each of the agreement parties and facilitates the transfer of water from agricultural agencies to urban uses. Since the QSA, additional programs have been implemented to increase Metropolitan's CRA supplies. These include the PVID Land Management, Crop Rotation, and Water Supply Program, as well as the Lower Colorado River Water Supply Project. The 2007 Interim Guidelines provided for the coordinated operation of Lake Powell and Lake Mead, as well as the Intentionally Created Surplus (ICS) program that allows Metropolitan to store water in Lake Mead.

IEUA has emergency service connections to the MWD's Upper Feeder, which includes CRA supplies. However, these connections are not currently utilized due to water quality concerns.

Storage Investments/Facilities

Surface and groundwater storage are critical elements of Southern California's water resources strategy and help Metropolitan reduce its reliance on the Delta. Because California experiences dramatic swings in weather and hydrology, storage is important to regulate those swings and mitigate possible supply shortages. Surface and groundwater storage provide a means of storing water during normal and wet years for later use during dry years, when imported supplies are limited. The Metropolitan system, for purposes of meeting demands during times of shortage, regulating system flows, and ensuring system reliability in the event of a system outage, provides over 1,000,000 acre-feet of system storage capacity. Diamond Valley Lake provides 810,000 acre-feet of that storage capacity, effectively doubling Southern California's previous surface water storage capacity. Other existing imported water storage available to the region consists of Metropolitan's raw water reservoirs, a share of the SWP's raw water reservoirs in and near the service area, and the portion of the groundwater basins used for conjunctive-use storage.

Since the early twentieth century, DWR and Metropolitan have constructed surface water reservoirs to meet emergency, drought/seasonal, and regulatory water needs for Southern California. These reservoirs include Pyramid Lake, Castaic Lake, Elderberry Forebay, Silverwood Lake, Lake Perris, Lake Skinner, Lake Mathews, Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, Orange County Reservoir, and Metropolitan's Diamond Valley Lake (DVL). Some reservoirs such as Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, and Orange County Reservoir, which have a total combined capacity of about 3,500 AF, are used solely for regulating purposes. The total gross storage capacity for the larger remaining reservoirs is 1,757,600 AF. However, not all of the gross storage capacity is available to Metropolitan; dead storage and storage allocated to others reduce the amount of storage that is available to Metropolitan to 1,665,200 AF.

Conjunctive use of the aquifers offers another important source of dry year supplies. Unused storage in Southern California groundwater basins can be used to optimize imported water supplies, and the development of groundwater storage projects allows effective management and regulation of the region's major imported supplies from the Colorado River and SWP. Over the years, Metropolitan has implemented conjunctive use through various programs in the service area; the following table lists the groundwater conjunctive use programs that have been developed in the region.

Program	Metropolitan Agreement Partners	Program Term	Max Storage AF	Dry-Year Yield AF/Yr
Long Beach Conjunctive Use Storage Project (Central Basin)	Long Beach	June 2002-2027	13,000	4,300
Foothill Area Groundwater Storage Program (Monkhill/ Raymond Basin)	Foothill MWD	February 2003-2028	9,000	3,000
Orange County Groundwater Conjunctive Use Program	MWDOC OCWD	June 2003-2028	66,000+	22,000
Chino Basin Conjunctive Use Programs	IEUA TVMWD Watermaster	June 2003-2028	100,000	33,000
Live Oak Basin Conjunctive Use Project (Six Basins)	TVMWD City of La Verne	October 2002-2027	3,000	1,000
City of Compton Conjunctive Use Project (Central Basin)	Compton	February 2005-2030	2,289	763
Long Beach Conjunctive Use Program Expansion in Lakewood (Central Basin)	Long Beach	July 2005-2030	3,600	1,200
Upper Claremont Basin Groundwater Storage Program (Six Basins)	TVMWD	Sept. 2005- 2030	3,000	1,000
Elsinore Basin Conjunctive Use Storage Program	Western MWD Elsinore Valley MWD	May 2008- 2033	12,000	4,000
TOTAL			**211,889**	**70,263**

Metropolitan Demand Management Programs

Demand management costs are Metropolitan's expenditures for funding local water resource development programs and water conservation programs. These Demand Management Programs incentivize the development of local water supplies and the conservation of water to reduce the need to import water to deliver to Metropolitan's member agencies. These programs are implemented below the delivery points between Metropolitan's and its member agencies' distribution systems and, as such, do not add any water to Metropolitan's supplies. Rather, the effect of these downstream programs is to produce a local supply of water for the local agencies and to reduce demands by member agencies for water imported through Metropolitan's system. The following discussions outline how Metropolitan funds local resources and conservation programs for the benefit of all of its member agencies and the entire Metropolitan service area. Notably, the history of demand management by Metropolitan's member agencies and the local agencies that purchase water from Metropolitan's members has spanned more than four decades. The significant history of the programs is another reason it would be difficult to attempt to assign a portion of such funding to any one individual member agency.

Section 1: <u>Local Resources Programs</u>

In 1982, Metropolitan began providing financial incentives to its member agencies to develop new local supplies to assist in meeting the region's water needs. Because of Metropolitan's regional distribution system, these programs benefit all member agencies regardless of project location because they help to increase regional water supply reliability, reduce demands for imported water supplies, decrease the burden on Metropolitan's infrastructure, reduce system costs and free up conveyance capacity to the benefit of all the agencies that rely on water from Metropolitan.

For example, the Groundwater Replenishment System (GWRS) operated by the Orange County Water District is the world's largest water purification system for indirect potable reuse. It was funded, in part, by Metropolitan's member agencies through the Local Resources Program. Annually, the GWRS produces approximately 103,000 acre-feet of reliable, locally controlled, drought-proof supply of high-quality water to recharge the Orange County Groundwater Basin and protect it from seawater intrusion. The GWRS is a premier example of a regional project that significantly reduced the need to utilize imported water for groundwater replenishment in Metropolitan's service area, increasing regional and local supply reliability and reducing the region's reliance on imported supplies, including supplies from the State Water Project.

Metropolitan's local resource programs have evolved through the years to better assist Metropolitan's member agencies in increasing local supply production. The following is a description and history of the local supply incentive programs.

Local Projects Program

In 1982, Metropolitan initiated the Local Projects Program (LPP), which provided funding to member agencies to facilitate the development of recycled water projects. Under this approach, Metropolitan contributed a negotiated up-front funding amount to help finance project capital costs. Participating member agencies were obligated to reimburse Metropolitan over time. In 1986, the LPP was revised, changing the up-front funding approach to an incentive-based approach. Metropolitan contributed an amount equal to the avoided State Water Project pumping costs for each acre-foot of recycled water delivered to end-use consumers. This funding incentive was based on the premise that local projects resulted in the reduction of water imported from the Delta and the associated pumping cost. The incentive amount varied from year to year depending on the actual variable power cost paid for State Water Project imports. In 1990, Metropolitan's Board increased the LPP contribution to a fixed rate of $154 per acre-foot, which was calculated based on Metropolitan's avoided capital and operational costs to convey, treat, and distribute water, and included considerations of reliability and service area demands.

Groundwater Recovery Program

The drought of the early 1990s sparked the need to develop additional local water resources, aside from recycled water, to meet regional demand and increase regional water supply reliability. In 1991, Metropolitan conducted the Brackish Groundwater Reclamation Study which determined that large amounts of degraded groundwater in the region were not being utilized. Subsequently, the Groundwater Recovery Program (GRP) was established to assist the recovery of otherwise unusable groundwater degraded by minerals and other contaminants, provide access to the storage assets of the degraded groundwater, and maintain the quality of groundwater resources by reducing the spread of degraded plumes.

Local Resources Program

In 1995, Metropolitan's Board adopted the Local Resources Program (LRP), which combined the LPP and GRP into one program. The Board allowed for existing LPP agreements with a fixed incentive rate to convert to the sliding scale up to $250 per acre-foot, similar to GRP incentive terms. Those agreements that were converted to LRP are known as "LRP Conversions."

Competitive Local Projects Program

In 1998, the Competitive Local Resources Program (Competitive Program) was established. The Competitive Program encouraged the development of recycled water and recovered groundwater through a process that emphasized cost-efficiency to Metropolitan, timing new production according to regional need while minimizing program administration cost. Under the Competitive Program, agencies requested an incentive rate up to $250 per acre-foot of production over 25 years under a Request for Proposals (RFP) for the development of up to 53,000 acre-feet per year of new water recycling and groundwater recovery projects. In 2003, a second RFP was issued for the development of an additional 65,000 acre-feet of new recycled water and recovered groundwater projects through the LRP.

Seawater Desalination Program

Metropolitan established the Seawater Desalination Program (SDP) in 2001 to provide financial incentives to member agencies for the development of seawater desalination projects. In 2014, seawater desalination projects became eligible for funding under the LRP, and the SDP was ended.

2007 Local Resources Program

In 2006, a task force comprised of member agency representatives was formed to identify and recommend program improvements to the LRP. As a result of the task force process, the 2007 LRP was established with a goal of 174,000 acre-feet per year of additional local water resource development. The new program allowed for an open application process and eliminated the previous competitive process. This program offered sliding scale incentives of up to $250 per acre-foot, calculated annually based on a member agency's actual local resource project costs exceeding Metropolitan's prevailing water rate.

2014 Local Resources Program

A series of workgroup meetings with member agencies was held to identify the reasons why there was a lack of new LRP applications coming into the program. The main constraint identified by the member agencies was that the $250 per acre-foot was not providing enough of an incentive for developing new projects due to higher construction costs to meet water quality requirements and to develop the infrastructure to reach end-use consumers located further from treatment plants. As a result, in 2014, the Board authorized an increase in the maximum incentive amount, provided alternative payment structures, included onsite retrofit costs and reimbursable services as part of the LRP, and added eligibility for seawater desalination projects. The current LRP incentive payment options are structured as follows:

- Option 1 – Sliding scale incentive up to $340/AF for a 25-year agreement term
- Option 2 – Sliding scale incentive up to $475/AF for a 15-year agreement term

- Option 3 – Fixed incentive up to $305/AF for a 25-year agreement term

On-site Retrofit Programs

In 2014, Metropolitan's Board also approved the On-site Retrofit Pilot Program which provided financial incentives to public or private entities toward the cost of small-scale improvements to their existing irrigation and industrial systems to allow connection to existing recycled water pipelines. The On-site Retrofit Pilot Program helped reduce recycled water retrofit costs to the end-use consumer which is a key constraint that limited recycled water LRP projects from reaching full production capacity. The program incentive was equal to the actual eligible costs of the on-site retrofit, or $975 per acre-foot of up-front cost, which equates to $195 per acre-foot for an estimated five years of water savings ($195/AF x 5 years) multiplied by the average annual water use in previous three years, whichever is less. The Pilot Program lasted two years and was successful in meeting its goal of accelerating the use of recycled water.

In 2016, Metropolitan's Board authorized the On-site Retrofit Program (ORP), with an additional budget of $10 million. This program encompassed lessons learned from the Pilot Program and feedback from member agencies to make the program more streamlined and improve its efficiency. As of fiscal year 2019/20, the ORP has successfully converted 440 sites, increasing the use of recycled water by 12,691 acre-feet per year.

Stormwater Pilot Programs

In 2019, Metropolitan's Board authorized both the Stormwater for Direct Use Pilot Program and a Stormwater for Recharge Pilot Program to study the feasibility of reusing stormwater to help meet regional demands in Southern California. These pilot programs are intended to encourage the development, monitoring, and study of new and existing stormwater projects by providing financial incentives for their construction/retrofit and monitoring/reporting costs. These pilot programs will help evaluate the potential benefits delivered by stormwater capture projects and provide a basis for potential future funding approaches. Metropolitan's Board authorized a total of $12.5 million for the stormwater pilot programs ($5 million for the District Use Pilot and $7.5 million for the Recharge Pilot).

Current Status and Results of Metropolitan's Local Resource Programs

Today, nearly one-half of the total recycled water and groundwater recovery production in the region has been developed with an incentive from one or more of Metropolitan's local resource programs. During fiscal year 2020, Metropolitan provided about $13 million for production of 71,000 acre-feet of recycled water for non-potable and indirect potable uses. Metropolitan provided about $4 million to support projects that produced about 50,000 acre-feet of recovered groundwater for municipal use. Since 1982, Metropolitan has invested $680 million to fund 85 recycled water projects and 27 groundwater recovery projects that have produced a cumulative total of about 4 million acre-feet.

<u>Conservation Programs</u>

Metropolitan's regional conservation programs and approaches have a long history. Decades ago, Metropolitan recognized that demand management at the consumer level would be an important part of balancing regional supplies and demands. Water conservation efforts were seen as a way to reduce the need for imported supplies and offset the need to transport or store additional water into or within the Metropolitan service area. The actual conservation of water takes place at the retail consumer level. Regional conservation approaches have proven to be effective at reaching retail consumers throughout Metropolitan’s service area and successfully implementing water saving devices, programs and practices. Through the pooling of funding by Metropolitan’s member agencies, Metropolitan is able to engage in regional campaigns with wide-reaching impact. Regional investments in demand management programs, of which conservation is a key part along with local supply programs, benefit all member agencies regardless of project location. These programs help to increase regional water supply reliability, reduce demands for imported water supplies, decrease the burden on Metropolitan’s infrastructure, reduce system costs, and free up conveyance capacity to the benefit of all member agencies.

Incentive-Based Conservation Programs

Conservation Credits Program

In 1988, Metropolitan’s Board approved the Water Conservation Credits Program (Credits Program). The Credits Program is similar in concept to the Local Projects Program (LPP). The purpose of the Credits Program is to encourage local water agencies to implement effective water conservation projects through the use of financial incentives. The Credits Program provides financial assistance for water conservation projects that reduce demands on Metropolitan’s imported water supplies and require Metropolitan’s assistance to be financially feasible.

Initially, the Credits Program provided 50 percent of a member agency’s program cost, up to a maximum of $75 per acre-foot of estimated water savings. The $75 Base Conservation Rate was established based Metropolitan’s avoided cost of pumping SWP supplies. The Base Conservation Rate has been revisited by Metropolitan’s Board and revised twice since 1988, from $75 to $154 per acre-foot in 1990 and from $154 to $195 per acre-foot in 2005.

In fiscal year 2020 Metropolitan processed more than 30,400 rebate applications totaling $18.9 million.

Member Agency Administered Program

Some member agencies also have unique programs within their service areas that provide local rebates that may differ from Metropolitan’s regional program. Metropolitan continues to support these local efforts through a member agency administered funding program that adheres to the same funding guidelines as the Credits Program. The Member Agency Administered Program allows member agencies to receive funding for local conservation efforts that supplement, but do not duplicate, the rebates offered through Metropolitan’s regional rebate program.

Water Savings Incentive Program

There are numerous commercial entities and industries within Metropolitan’s service area that pursue unique savings opportunities that do not fall within the general rebate programs that Metropolitan provides. In 2012, Metropolitan designed the Water Savings Incentive Program (WSIP) to target these unique commercial and industrial projects. In addition to rebates for devices, under this program, Metropolitan provides financial incentives to businesses and industries that created their own custom water efficiency projects. Qualifying custom projects can receive funding for permanent water efficiency changes that result in reduced potable demand.

Non-Incentive Conservation Programs

In addition to its incentive-based conservation programs, Metropolitan also undertakes additional efforts throughout its service area that help achieve water savings without the use of rebates. Metropolitan's non-incentive conservation efforts include:

- residential and professional water efficient landscape training classes
- water audits for large landscapes
- research, development and studies of new water saving technologies
- advertising and outreach campaigns
- community outreach and education programs
- advocacy for legislation, codes, and standards that lead to increased water savings

Current Status and Results of Metropolitan's Conservation Programs

Since 1990, Metropolitan has invested $824 million in conservation rebates that have resulted in a cumulative savings of 3.27 million acre-feet of water. These investments include $450 million in turf removal and other rebates during the last drought which resulted in 175 million square feet of lawn turf removed. During fiscal year 2020, 1.06 million acre-feet of water is estimated to have been conserved. This annual total includes Metropolitan's Conservation Credits Program; code-based conservation achieved through Metropolitan-sponsored legislation; building plumbing codes and ordinances; reduced consumption resulting from changes in water pricing; and pre-1990 device retrofits.

Infeasibility of Accounting Regional Investments in Reduced Reliance Below the Regional Level

The accounting of regional investments that contribute to reduced reliance on supplies from the Delta watershed is straightforward to calculate and report at the regional aggregate level. However, any similar accounting is infeasible for the individual member agencies or their customers. As described above, the region (through Metropolitan) makes significant investments in projects, programs and other resources that reduce reliance on the Delta. In fact, all of Metropolitan's investments in Colorado River supplies, groundwater and surface storage, local resources development and demand management measures that reduce reliance on the Delta are collectively funded by revenues generated from the member agencies through rates and charges.

Metropolitan's revenues cannot be matched to the demands or supply production history of an individual agency, or consistently across the agencies within the service area. Each project or program funded by the region has a different online date, useful life, incentive rate and structure, and production schedule. It is infeasible to account for all these things over the life of each project or program and provide a nexus to each member agency's contributions to Metropolitan's revenue stream over time. Accounting at the regional level allows for the incorporation of the local supplies and water use efficiency programs done by member agencies and their customers through both the regional programs and through their own specific local programs. As shown above, despite the infeasibility of accounting reduced Delta reliance below the regional level, Metropolitan's member agencies and their customers have together made substantial contributions to the region's reduced reliance.

G.8 2015 UWMP Appendix P

The information contained in this Appendix G is also intended to be a new Appendix P attached to IEUA's 2015 UWMP consistent with WR P1 subsection (c)(1)(C) (Cal. Code Regs. tit. 23, § 5003). IEUA provided notice of the availability of the draft 2020 UWMP (including this Appendix G which will also be a new Appendix P to its 2015 UWMP) and WSCP and the public hearing to consider adoption of both plans and Appendix xx to the 2015 UWMP in accordance with CWC Sections 10621(b) and 10642, and Government Code Section 6066, and Chapter 17.5 (starting with Section 7290) of Division 7 of Title 1 of the Government Code. The notice of availability of the documents was sent to IEUA's member agencies, as well as cities and counties in IEUA service area. In addition, a public notice advertising the public hearing in English and Spanish was published in XX Southern California newspapers. The notification in English language newspapers was published on DATE and DATE, 2021. The notification was published on DATES in Spanish language newspapers, satisfying the requirement for non-English language notification. Copies of: (1) the notification letter sent to the member agencies, cities and counties in IEUA service area, and (2) the notice published in the newspapers are included in the 2020 UWMP Appendix E.

Thus, this Appendix G to IEUA's 2020 UWMP, which was adopted with IEUA's 2020 UWMP, will also be recognized and treated as Appendix P to IEUA's 2015 UWMP. IEUA held the public hearing for the draft 2020 UWMP, draft Appendix P to the 2015 UWMP, and draft WSCP on June 16, 2021, at the Board of Directors meeting, held online due to COVID-19 concerns. On June 16, IEUA's Board determined that the 2020 UWMP and the WSCP accurately represent the water resources plan for IEUA's service area. IEUA's Board determined that Appendix G to the 2020 UWMP and Appendix P to the 2015 UWMP includes all of the elements described in Delta Plan Policy WR P1, Reduce Reliance on the Delta Through Improved Regional Water Self-Reliance (Cal. Code Regs. tit. 23, § 5003), which need to be included in a water supplier's UWMP to support a certification of consistency for a future covered action. As stated in Resolution XXXX, the Board adopted the 2020 UWMP, Appendix P to the 2015 UWMP, and the WSCP and authorized their submittal to the State of California. Copies of Resolution XXXX is included in the 2020 UWMP Appendix D.

Table G-1: Calculation of IEUA Service Area Water Demands Without Water Use Efficiency

Total Service Area Water Demands (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands with Water Use Efficiency Accounted For*	79,440	92,325	96,934	113,280	117,752	121,438	126,072	126,664
Reported Water Use Efficiency or Estimated Water Use Efficiency Since Baseline	-	1,975	3,292	9,788	11,984	17,257	22,570	27,802
Service Area Water Demands without Water Use Efficiency Accounted For	79,440	94,300	100,226	123,068	129,736	138,695	148,642	154,466

*Demands include imported and recycled water, as found in 2020 UWMP Table 4-3W

Table G-2: Calculation of IEUA Supplies Contributing to Regional Self-Reliance

Water Supplies Contributing to Regional Self-Reliance (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Water Use Efficiency	-	1,975	3,292	9,788	11,984	17,257	22,570	27,802
Water Recycling	24,506	33,419	30,495	40,495	42,697	44,122	46,504	46,844
Stormwater Capture and Use	-	-	-	-	-	-	-	-
Advanced Water Technologies	-	-	-	-	-	-	-	-
Conjunctive Use Projects	-	-	-	-	-	-	-	-
Local and Regional Water Supply and Storage Projects	-	-	-	-	-	-	-	-
Other Programs and Projects the Contribute to Regional Self-Reliance	-	-	-	-	-	-	-	-
Water Supplies Contributing to Regional Self-Reliance	24,506	35,394	33,787	50,283	54,681	61,379	69,074	74,646

Service Area Water Demands without Water Use Efficiency (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands without Water Use Efficiency Accounted For	79,440	94,300	100,226	123,068	129,736	138,695	148,642	154,466

Change in Regional Self Reliance (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Water Supplies Contributing to Regional Self-Reliance	24,506	35,394	33,787	50,283	54,681	61,379	69,074	74,646
Change in Water Supplies Contributing to Regional Self-Reliance		10,888	9,281	25,777	30,175	36,873	44,568	50,140

Percent Change in Regional Self Reliance (As Percent of Demand w/out WUE)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Percent of Water Supplies Contributing to Regional Self-Reliance	30.8%	37.5%	33.7%	40.9%	42.1%	44.3%	46.5%	48.3%
Change in Percent of Water Supplies Contributing to Regional Self-Reliance		6.7%	2.9%	10.0%	11.3%	13.4%	15.6%	17.5%

Table G-3: Calculation of MWD Reliance on Water Supplies from the Delta Watershed

Water Supplies from the Delta Watershed (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
CVP/SWP Contract Supplies	1,472,000	1,029,000	984,000	1,133,000	1,130,000	1,128,000	1,126,000	1,126,000
Delta/Delta Tributary Diversions								
Transfers and Exchanges	20,000	44,000	91,000	58,000	52,000	52,000	52,000	52,000
Other Water Supplies from the Delta Watershed								
Total Water Supplies from the Delta Watershed	1,492,000	1,073,000	1,075,000	1,191,000	1,182,000	1,180,000	1,178,000	1,178,000

Service Area Water Demands without Water Use Efficiency (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands without Water Use Efficiency Accounted For	5,493,000	5,499,000	5,219,000	4,925,000	5,032,000	5,156,000	5,261,000	5,374,000

Change in Supplies from the Delta Watershed (Acre-Feet)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Water Supplies from the Delta Watershed	1,492,000	1,073,000	1,075,000	1,191,000	1,182,000	1,180,000	1,178,000	1,178,000
Change in Water Supplies from the Delta Watershed		(419,000)	(417,000)	(301,000)	(310,000)	(312,000)	(314,000)	(314,000)

Percent Change in Supplies from the Delta Watershed (As a Percent of Demand w/out WUE)	Baseline (2010)	2015	2020	2025	2030	2035	2040	2045 (Optional)
Percent of Water Supplies from the Delta Watershed	27.2%	19.5%	20.6%	24.2%	23.5%	22.9%	22.4%	21.9%
Change in Percent of Water Supplies from the Delta Watershed		-7.6%	-6.6%	-3.0%	-3.7%	-4.3%	-4.8%	-5.2%

Appendix H
2020 Hazard Mitigation Plan - Seismic

4.0 RISK ASSESSMENT

The risk assessment is the process of measuring the potential impact to life, property and economic impacts resulting from natural hazards. The intent of the Risk Assessment is to identify, as much as practicable given existing/available data, the qualitative and quantitative vulnerabilities of a community. The results of the risk assessment allow, for a better understanding of the impacts of natural hazards to the community. It provides a foundation in which to develop and prioritize mitigation actions to reduce damage from natural disasters through increased preparedness and response times and, the better allocation of resources to areas of greatest vulnerability.

This Risk Assessment Section evaluates the potential loss from a hazard event by assessing the vulnerability of buildings, infrastructure, and people. It identifies the characteristics and potential consequences of hazards, how much of the unincorporated areas of the County could be affected by a hazard, and the impact on unincorporated County area assets. The Risk Assessment approach consists of three (3) components:

- Hazard Identification – Identification and screening of hazards
- Hazard Profiles – Review of historic occurrences and assessment of the potential for future events
- Vulnerability Assessment – Determination of potential losses or impacts to buildings, infrastructure

4.1 HAZARD IDENTIFICATION

In order to identify potential vulnerability to all hazards that could impact the City, a risk assessment was performed. It focused on the following parameters:

- Hazard Identification
- The Impact of Hazards on Physical, Social, and Economic Assets
- Vulnerability Identification
- Estimates of the Cost of Damage or Costs that can be Avoided Through Mitigation

4.1.1 HAZARD SCREENING CRITERIA

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The City's HMP Planning Team reviewed the previous hazard mitigation plans and other relevant documents to determine screened hazards creating the greatest concern for the community. Figure 4-1.1 provides a crosswalk of hazards identified in the 2011 City of Chino Hills Local Hazard Mitigation Plan Update, the 2010 San Bernardino County Multi-jurisdictional Hazard Mitigation Plan Update, the 2015 City of Chino Hills General Plan Safety Element, and the 2013 California State Hazard Mitigation Plan. There were 18 different hazards identified based on document review. The crosswalk was used to develop a preliminary hazards list providing a framework for City HMP Planning Team members to evaluate which hazards were truly relevant to the City and the community and which ones are not. For example, volcanic activity was considered to be of little relevance to the City while earthquake, wildfire, and drought were indicated in almost all hazard documentation.

4.1.1A Document Review Crosswalk

Hazards	*2011 City of Chino Hills Local Hazard Mitigation Plan*	*2015 City of Chino Hills General Plan Safety Element*	*2010 County of San Bernardino Multijurisdictional Hazard Mitigation Plan Update*	*2013 CA State Hazard Mitigation Plan*
Climate Change				■
Dam Inundation		■	■	■
Drought and Water Shortage	■		■	■
Earthquake/Geologic Hazards	■	■	■	■
Extreme Heat	■		■	■
Extreme Cold			■	■
Flood	■	■	■	■
Hazardous Waste		■	■	■
High Winds/Straight Line Winds	■		■	
Hail			■	
Infestation			■	
Lightning			■	
Terrorism				■
Tornado			■	
Volcanic Activity			■	■
Wildfire Activity	■	■	■	■
Winter Storm (Heavy Snowfall)			■	■
Landslides/slope failure		■		

In addition to a document review, previous hazard occurrences were used to identify hazards for this HMP. Previous hazard occurrences provide a historical view of hazards that have affected the City in the past, and thus provide a window into the potential hazards that can affect the City in the future. Information about federal and state disaster declarations in San Bernardino County was compiled from FEMA and Cal OES's databases, as shown in Figure 4.1.1. Though not a complete snapshot of hazard incidences in the City (since not all hazard events are locally, federally or state declared), Figure 4-1.1. provided the City HMP Planning Team with solidified accounts of the types and extent of disasters that have affected the City. Dating back to 1812 when earthquakes with magnitudes greater than approximately 5.0 have resulted in moderate to strong damaging earthquake ground motions in the vicinity of the City.

As indicated in Figure 4.1.1.A large regional incidents have affected San Bernardino County, including the California Wildfires of 1999. Most recently, disasters for terrorist attacks (2015), flood (2011) and severe storms (2010) were declared in San Bernardino County.

The hazard data was analyzed based on the impacts to public safety, health, buildings, transportation, infrastructure, critical facilities, and cost effectiveness. The initial threat assessment of each hazard is based upon the following sources:

1. Historic occurrence of the hazard – Assessment is based on frequency, magnitude, and potential impact of the hazard.
2. Mitigation potential of the hazard – This criterion considers if there are mitigation or counter measures possible to prevent or alleviate the risk.
3. Expert opinion – Evaluation of threats includes a literature review and the expertise of the Planning Team.

4. Published data and information – Assessment is based on data and/or information from credible publications or websites, i.e. U.S. Geological Survey, California Geological Survey, National Weather Service

4.1.2 Hazard Prioritization

The Planning Team also reviewed and utilized the results of the community survey provided to residents via the City website, public meetings and City facilities' counters to see which hazards are creating the greatest concern for the community.

Answer Choices	Responses	
Act of Terrorism	68.75%	22
Dam Failure	53.13%	17
Drought	59.38%	19
Earthquake	68.75%	22
Energy Shortage	46.88%	15
Epidemic or Pandemic	53.13%	17
Extreme Heat	46.88%	15
Flood	53.13%	17
Freeze	31.25%	10
Gas Explosion	43.75%	14
Hazardous Materials Release	46.88%	15
Severe Weather	34.38%	11
Sink hole	34.38%	11
Structural Fire	46.88%	15
Train Derailment	34.38%	11
Tsunami	34.38%	11
Wildfire	65.63%	21

It was the consensus of the Planning Team to focus on three natural hazards that scored the highest percentage of responses and one man-made hazard that scored high: earthquake, wildfire, drought, and act of terrorism (we chose cyber-attack/terrorism).

In the 2011 HMP flooding was listed as a low probability, low impact hazard due to significant improvements in the City as well as the region to mitigate the flooding threat to the City. However, Chino Hills does have the potential impact that failure of a dam or other water retention structure may pose to the community. As required by the California Government Code §65302(g) our General Plan Safety Element assesses the impact of flooding from storm activity, such as 1% annual chance and 0.2% annual chance floods. The potential damage posed by more frequent, smaller-scale floods that occur when storm drain systems become overburdened during strong winter storms is also addressed. These floods can damage property and hinder emergency response activities, such as evacuation and fire department access to fire hydrants. Because of that potential, the Planning Team has included flooding as part our HMP update.

4.1.2.1 Hazard Prioritization - Method

The Planning Team utilized a non-numerical ranking system for the update process. This process consisted of generating a non-numerical ranking (High, Medium, or Low) rating for the: 1) probability and 2) impact from each screened hazard. The hazards were then placed in the appropriate/corresponding box/cell.

The table below is an example of how the hazards were ranked. In this example the red boxes represent the higher priority hazards, and the orange and yellow boxes represent additional levels of priority.

The probability indicators are based on the likelihood of the event occurring based on history and trends. Events categorized as "highly likely" have either occurred in Chino Hills in the past and will inevitably happen again. Those events categorized as "Possible," are events that are becoming a greater and a more common threat locally and nationally. These "Possible" events are unpredictable and may or may not ever occur in Chino Hills. These events can have a high impact on the City and warrant a proactive approach to preparation and mitigation. Events that are categorized as "Low" do not have a strong historical record of occurrence in Chino Hills and would result in having low impact to the City if they were to happen.

The definition of "High," "Medium," and "Low" probability and impacts are as follows:

Probability	**Impact**
High – Highly Likely/Likely	High – Catastrophic/Critical
Medium – Possible	Medium – Limited
Low – Unlikely	Low – Negligible

CHINO HILLS HAZARD ASSESSMENT MATRIX

		Impact		
		High	**Medium**	**Low**
Probability	**High**	Earthquake Wildfire Drought		
	Medium	Cyber-attack Active shooter		
	Low			Extreme Heat Flooding

Red boxes represent the higher priority hazards; orange represents the medium level and yellow boxes represent lowest level of priority.

- **Active shooter/Terrorism - Medium**
- **Cyber-attack - Medium/High**
- **Drought and Water Shortage - High/High**
- **Earthquake - High/High**
- **Extreme Heat - Low**

- **Flood - Low**
- **Wildfire - High/High**

4.2 Hazard Profiles

Hazard profiles are designed to assist communities in evaluating and comparing the hazards that can impact their community by comparing a number of hazard factors. Each type of hazard has unique characteristics, and the impact associated with a specific hazard can vary depending on the magnitude and location of each event. The probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

The various maps within this Plan help to describe the causes and characteristics of each hazard and identify which part of the City's population, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in each hazard section. For a full description of the history of hazard specific events, please see the appropriate hazard section. This section presents additional information regarding the hazards of concern (detailed below) as hazard profiles.

4.2.1 Earthquake/Geologic Hazard Profile

Earthquakes occur when tectonic plates, called faults, in the Earth's crust move past one another. Southern California is located on a boundary of two tectonic plates, the North American Plate and the Pacific Plate, causing the area to be considered seismically active. Numerous faults considered active or potentially active have been mapped in Southern California, including in the vicinity of and within the City. Earthquakes on faults can trigger several geologic phenomena that can cause severe property damage and loss of life. These hazards include: ground shaking, fault rupture, liquefaction and associated hazards, subsidence, and seiches (waves in enclosed bodies of water). Earthquakes can also cause a variety of localized, but not less destructive, hazards such as: urban fires, dam failures and release of toxic chemicals. The City could be impacted by any or all of these hazards.

Earthquakes are normally classified by the severity of their magnitude or their seismic intensity. "Magnitude" is defined as a measure of the amount of energy released when a fault ruptures. The intensity of seismic ground shaking at any given site is a function of several factors. Primarily the magnitude of the earthquake is determined by, the distance from the epicenter to the area of concern, the type of geologic material between the epicenter and the site, and the topographic conditions of the site. The amount of damage is also controlled to a certain extent by the size, shape, age, and engineering characteristics of the affected structures. Most buildings in the City are of wood-frame construction, which, while not immune to structural damage, is notably resilient to earthquake shaking, particularly when designed per current building codes.

4.2.2 Regulatory Environment

Numerous building and zoning codes exist at a state and local level to decrease the impact of an earthquake event and resulting liquefaction on residents and infrastructure. Building and zoning codes include the Alquist-Priolo Earthquake Fault Zoning Act of 1972, Seismic Hazards Mapping Act of 1990, 2013 California Standards Building Code (CSBC), and the 2015 City's General Plan. To protect lives and infrastructure in the City the following building and zoning codes are used.

State

The 1971 San Fernando earthquake resulted in the destruction of numerous structures built across its path. This led to passage of the Alquist-Priolo Earthquake Fault Zoning Act. This Act prohibits the construction of buildings for human occupancy across active faults in the State of California. Similarly, extensive damage caused by ground failures during the 1989 Loma Prieta earthquake focused attention on decreasing the impacts of landslides and liquefaction. This led to the creation of the Seismic Hazards Mapping Act. This Act increases construction standards at locations where ground failures are probable during earthquakes. Active faults in San Bernardino County have been included under the Alquist-Priolo Geologic Hazards Zones Act and Seismic Hazards Mapping Act.

Local

The 2013 California Building Standards Code (also known as Title 24) became effective for the County on January 1, 2014. Title 24 includes CBC Section 3417: Earthquake Evaluation and Design for Retrofit of Existing Buildings.

The 2013 CSBC is based on the International Building Codes (IBC), which is widely used throughout the United States. CSBC was modified for California's conditions to include more detailed and stringent building requirements. The City's Community Development department utilizes the 2013 CSBC and the American Society of Civil Engineers Standard (ASCE) No.7 to regulate the infrastructure in the City. This includes unreinforced masonry (URM) buildings. For new buildings, the City includes earthquake safety provisions, with enhancements for essential services buildings, hospitals, and public schools.

4.2.3 General Plan Geologic Hazard Reduction Policies

The following goals, policies, and actions support the City of Chino Hills Safety Plan and its vision to protect the community from unreasonable risks caused by natural and man-made hazards:

Goal S-1: Protect the Community from Geologic Hazards:

- Policy S-1.1: Regulate development in high-risk seismic, landslide and liquefaction hazard areas to avoid exposure to hazards.
- Action S-1.1.1: Observe prudent land use planning in the Fault Hazard Zone delineated for the Chino Fault, restricting high occupancy and emergency operation facilities and limiting residential development.
- City of Chino Hills – General Plan pages 5-28

- Action S-1.1.2: Conduct site-specific studies on soils, seismicity, and groundwater conditions to evaluate the potential for liquefaction and related ground failure phenomena in canyon floors and the alluvial flatlands.

- Action S-1.1.3: Regulate development of utility structures over 100 feet in height in geologic hazard areas when adjacent to existing or planned sensitive land uses.
- Action S-1.1.4: Continue to regularly update Building and Fire Codes to provide for seismic safety design.
- Action S-1.1.5: Support and encourage the seismic retrofitting and strengthening of existing facilities to minimize damage in the event of seismic or geologic hazards.
- Action S-1.1.6: Discourage any grading beyond that necessary to create adequate and stable building pads.
- Action S-1.1.7: Require all development to conform to the grading guidelines contained in the City Development Code.
- Action S-1.1.8: Require fault zones to be clearly identified on tract and parcel maps to increase public awareness of fault rupture hazards.
- Action S-1.1.9: Within geologic hazard overlay areas, require developments to minimize landscape irrigation.
- Action S-1.1.10: Require new development to minimize peak runoff as required by the Municipal Code.

4.2.4 EARTHQUAKES – HISTORICAL OCCURRENCES

The Planning Team noted the following regional and local events for the seismic activity in Chino Hills.

SOUTHERN CALIFORNIA EARTHQUAKES MAGNITUDE 5.0 OR GREATER		
Date	*Magnitude*	*Location*
12/8/1812	*6.9*	*Southwest of San Bernardino County - 40 Fatalities*
12/21/1812	*7.1*	*West of Ventura – 1 fatality*
1/9/1857	*7.9*	*Fort Tejon – 1 fatality*
2/24/1892	*7.8*	*Imperial Valley*
12/25/1899	*6.7*	*San Jacinto – 6 fatalities*
6/23/1915	*6.3*	*Imperial Valley – 6 fatalities*
4/21/1918	*6.8*	*Imperial Valley – 1 fatality*
3/11/1933	*6.4*	*Long Beach – 115 fatalities*
5/19/1940	*7.1*	*Imperial Valley – 9 fatalities*
2/9/1971	*6.6*	*San Fernando – 65 fatalities*
10/15/1979	*6.4*	*Imperial Valley – California Border*
7/8/1986	*6.1*	*North Palm Springs*
10/1/1987	*5.9*	*Whittier Narrows – 8 fatalities*
11/24/1987	*6.5*	*Superstition Hills – 2 fatalities*
11/24/1987	*6.7*	*Superstition Hills*
1/17/1994	*6.7*	*Northridge – 60 fatalities*
7/4/2019	*6.4*	*Ridgecrest*
7/5/2019	*5.4*	*Ridgecrest*
7/5/2019	*7.1*	*Ridgecrest*

SOUTHERN CALIFORNIA EARTHQUAKES MAGNITUDE 5.0 OR GREATER		
Date	*Magnitude*	*Location*
6/28/1991	*5.6*	*Sierra Madre – 2 fatalities*
4/23/1992	*6.2*	*Joshua Tree*
6/28/1992	*7.3*	*Landers – 3 fatalities*
6/28/1992	*6.5*	*Big Bear*
1/17/1994	*6.7*	*Northridge – 60 fatalities*
10/16/1999	*7.1*	*Hector Mine*
2/22/2003	*5.2*	*Big Bear City*
6/12/2005	*5.2*	*Southern California*
7/29/2008	*5.5*	*Chino Hills*
4/5/2010	*7.2*	*Sierra El Mayor – Northern Baja California*
3/29/2014	*5.1*	*Brea, Fullerton, La Habra California (Brea borders Chino Hills in Carbon Canyon)*

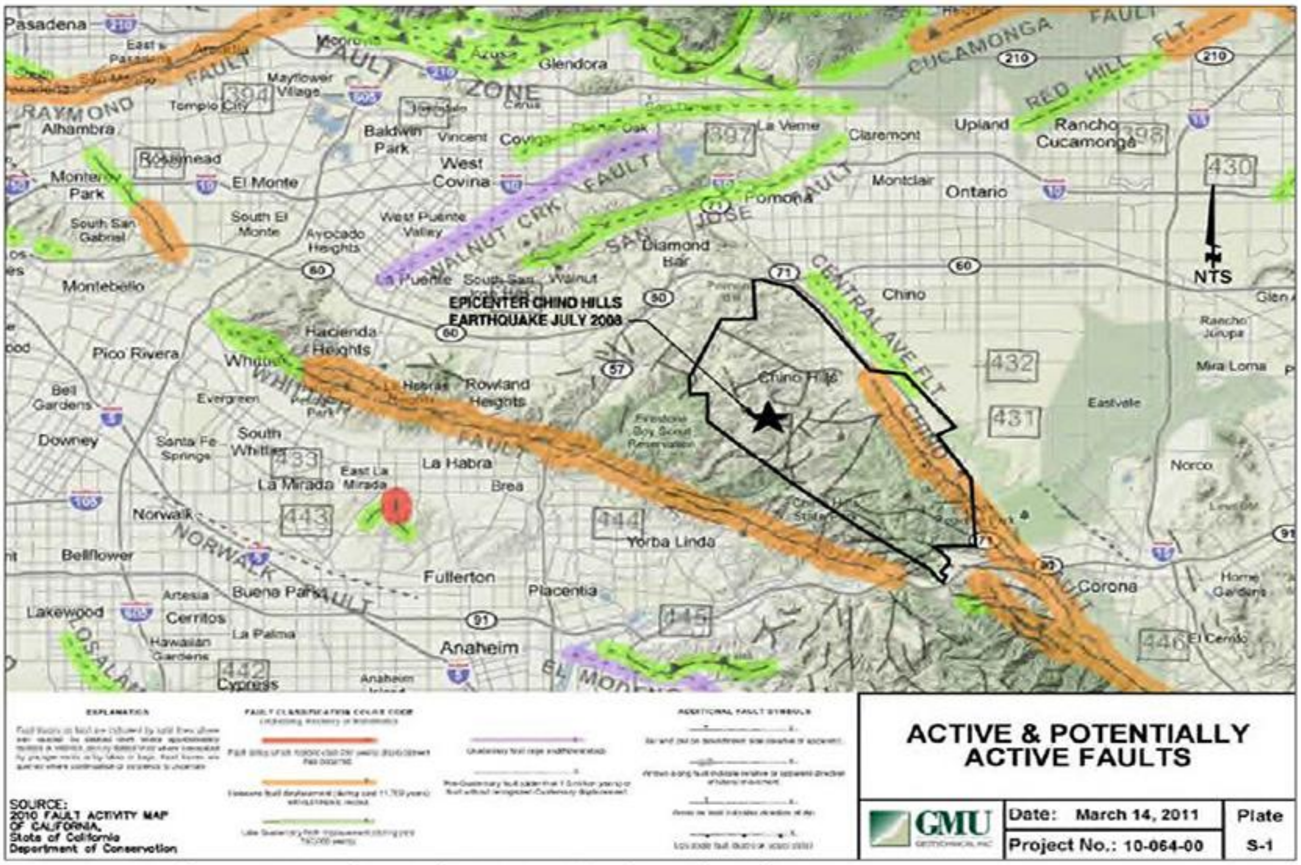
4.2.5 LOCATION/GEOGRAPHIC EXTENT

The Chino Hills is located in the eastern Puente Hills, in the northern portion of the Peninsular Ranges geomorphic province. The Peninsular Ranges province is characterized by a series of northwest to southeast-oriented valleys, hills, and mountains separated by faults associated with, and parallel to the San Andreas Fault System. Two of these faults, the Chino and the Whittier, are located in and near the City, respectively. These faults, and the bedrock and sediment types that occur in the area, control to a large extent the potential geologic impacts discussed below.

The hilly portions of the City are underlain by bedrock of the Puente Formation. The sea that originally covered the area receded westward as the land rose, and a complex process of faulting and folding formed the following hills that we know today as the Puente (Chino) Hills. The rocks of the Puente Formation, originally deposited in horizontal layers on the ocean floor, are now folded, and dip between 10 and 20 degrees from the horizontal. Locally, beds of the Puente Formation dip as steep as 45 to 60 degrees. The folded nature of these rocks, especially where thinly bedded or laminated, combined with the steepness of the terrain in the central and western portions of the City, makes this one of the most landslide-prone areas in Southern California.

The location of active and potentially active earthquake faults within or proximate to Chino Hills is illustrated in Figure 4.2.5.1 – Active and Potentially Active Faults. The geologic and seismologic characteristics of these faults are discussed below.

Figure 4.2.5.1 Below is a map showing where the major faults in Southern California are in relation to the City of



Active and Potentially Active Faults Affecting Chino Hills

These faults are:

a. Chino Fault
The Chino Fault is considered a northern splay of the Elsinore Fault Zone.29 The Chino Fault extends approximately 13 miles southeast through the City toward the City of Corona where it joins the Elsinore Fault Zone near the southern terminus of Main Street in Corona.

b. Elsinore Fault Zone
The Elsinore Fault extends approximately 124 miles from near the border with Mexico to its northern terminus near Whittier Narrows. The Uniform California Earthquake Rupture Forecast (UCERF2) and the Working Group on California Earthquake Probability (WGCEP 95) identify five fault segments within the Elsinore Fault Zone - Whittier, Glen Ivy, Temecula, Julian, and Coyote Mountains segments, from north to south.

c. San Jose Fault

The San Jose Fault is located north of the City and extends approximately 12 miles from the south side of the San Jose Hills northeast to near Claremont.

d. Puente Hills Blind Thrust

The Puente Hills Blind Thrust is a north-dipping thrust that extends approximately 24 miles east across the Los Angeles basin from downtown Los Angeles to Brea. A blind thrust fault is a buried fault, the surface of which does not break the surface. The fault is manifested at the surface by series of folds above the fault surface, including the Montebello Hills, and west and east Coyote Hills. The fault is subdivided into three segments: Los Angeles, Santa Fe Springs, and Coyote Hills. At least four large earthquakes (i.e., magnitude 7.2 to 7.5) are believed to have occurred on the fault in the past 11,000 years. The 1987 Whittier Narrows earthquake occurred on the Puente Hills Blind Thrust.

e. Sierra Madre-Cucamonga Fault Zone

The Sierra Madre-Cucamonga Fault Zone is located along the boundary between the southern margin of the San Gabriel Mountains and the northern portions of the San Fernando and San Gabriel valleys. The Sierra Madre-Cucamonga Fault Zone extends approximately 59 miles from near Interstate 405 in the San Fernando Valley to Lytle Creek.

f. San Jacinto Fault Zone

The San Jacinto Fault Zone is located east of the City and is one of the most seismically active faults in California. The fault zone extends approximately 155 miles from the area near Cajon Pass where the San Jacinto fault joins the San Andreas Fault south to the Imperial Valley. The San Jacinto fault zone is divided into eight segments based on fault geometry, historical seismicity, and slip rate data. The segments of the San Jacinto Fault Zone are San Bernardino Valley, San Jacinto Valley, Anza/Clark, Coyote Creek, Borrego Mountain, and the subparallel Superstition Mountain and Superstition Hills segments.

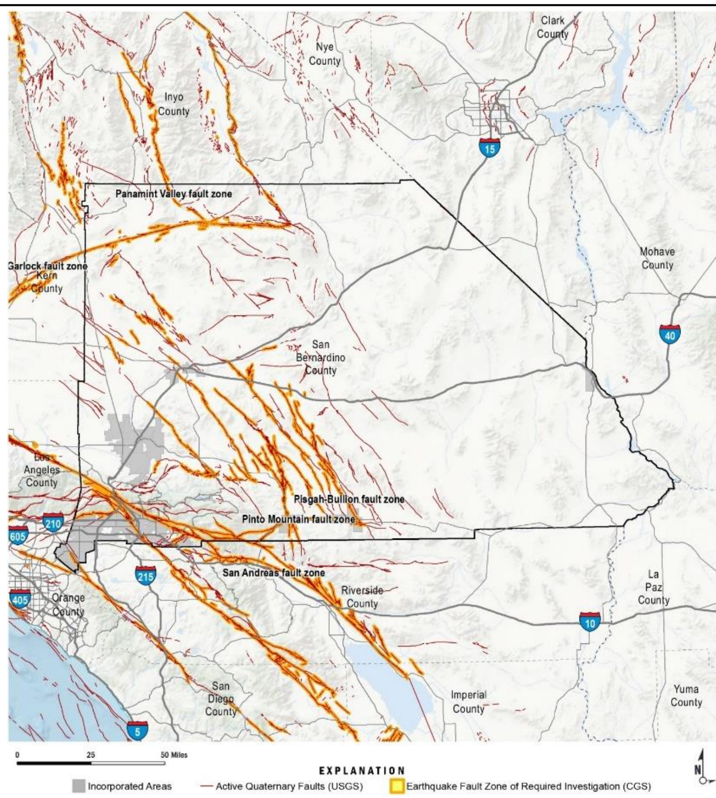
g. San Andreas Fault Zone

The San Andreas Fault extends southeast from where the fault joins the Kings Range Thrust and Mendocino Fault Zone approximately 807 miles to the Gulf of California. The San Andreas Fault is one on the most active faults and has the highest measured slip rate in California. The San Andreas Fault is the only known source of Magnitude 8.0 earthquakes in southern California.

4.2.5.2 Additional San Bernardino County Faults

There are many smaller faults within San Bernardino County capable of a major earthquake. Other geologic hazards include liquefaction and landslides, both occur during and after earthquakes. Figure 4.2.4 shows earthquakes greater than Magnitude 4.0 that have been felt within the San Bernardino County area.

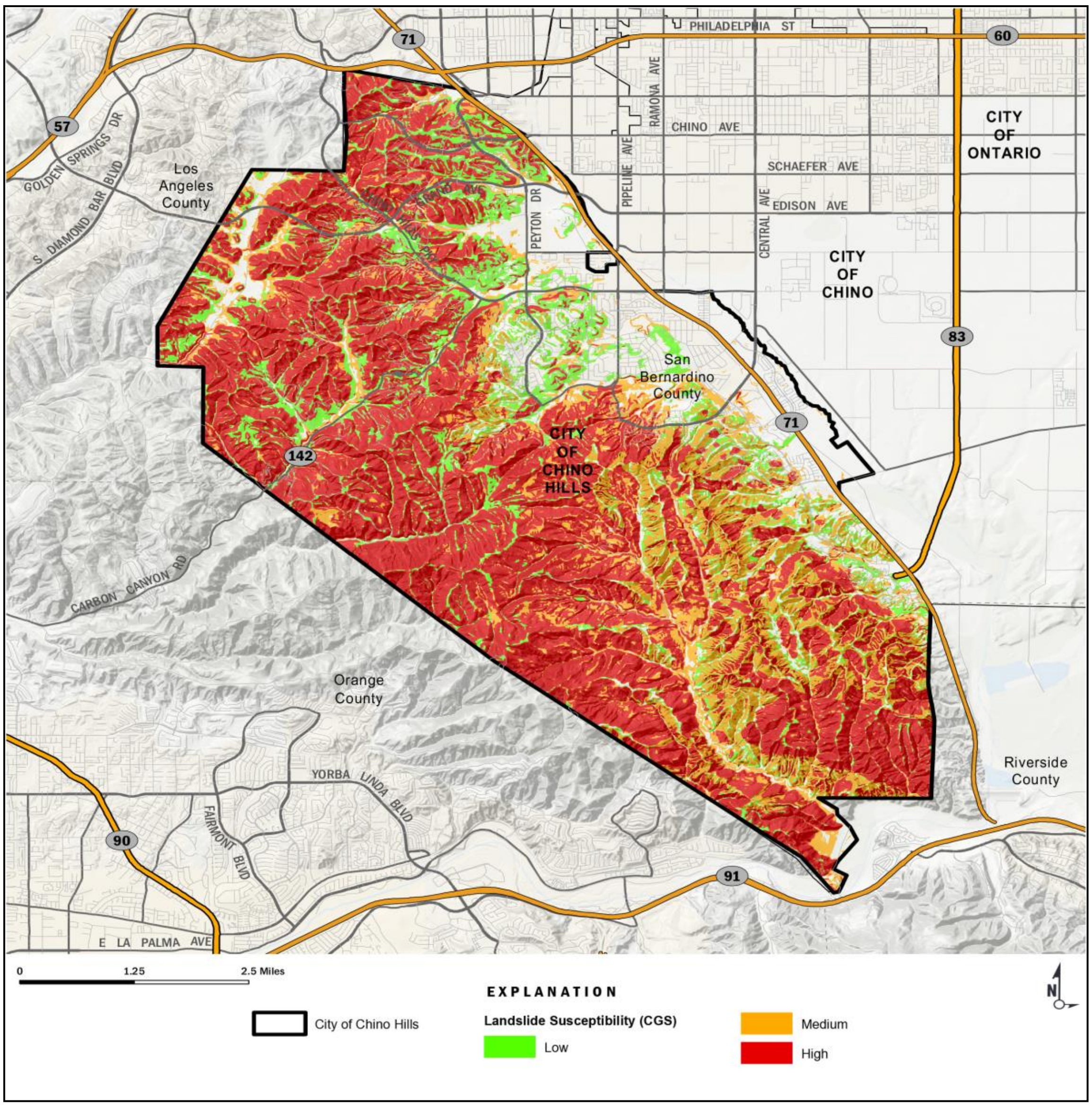
Date	Name
9/14/2011	Calimesa 4.1
1/15/2014	Fontana 4.4
7/5/2014	Running Springs 4.6
3/29/2014	Brea 5.1 (Chino Fault)
7/25/2015	Fontana 4.2
9/16/2015	Big Bear Lake 4.0
12/30/2015	Muscoy 4.4
1/6/2016	Banning 4.4



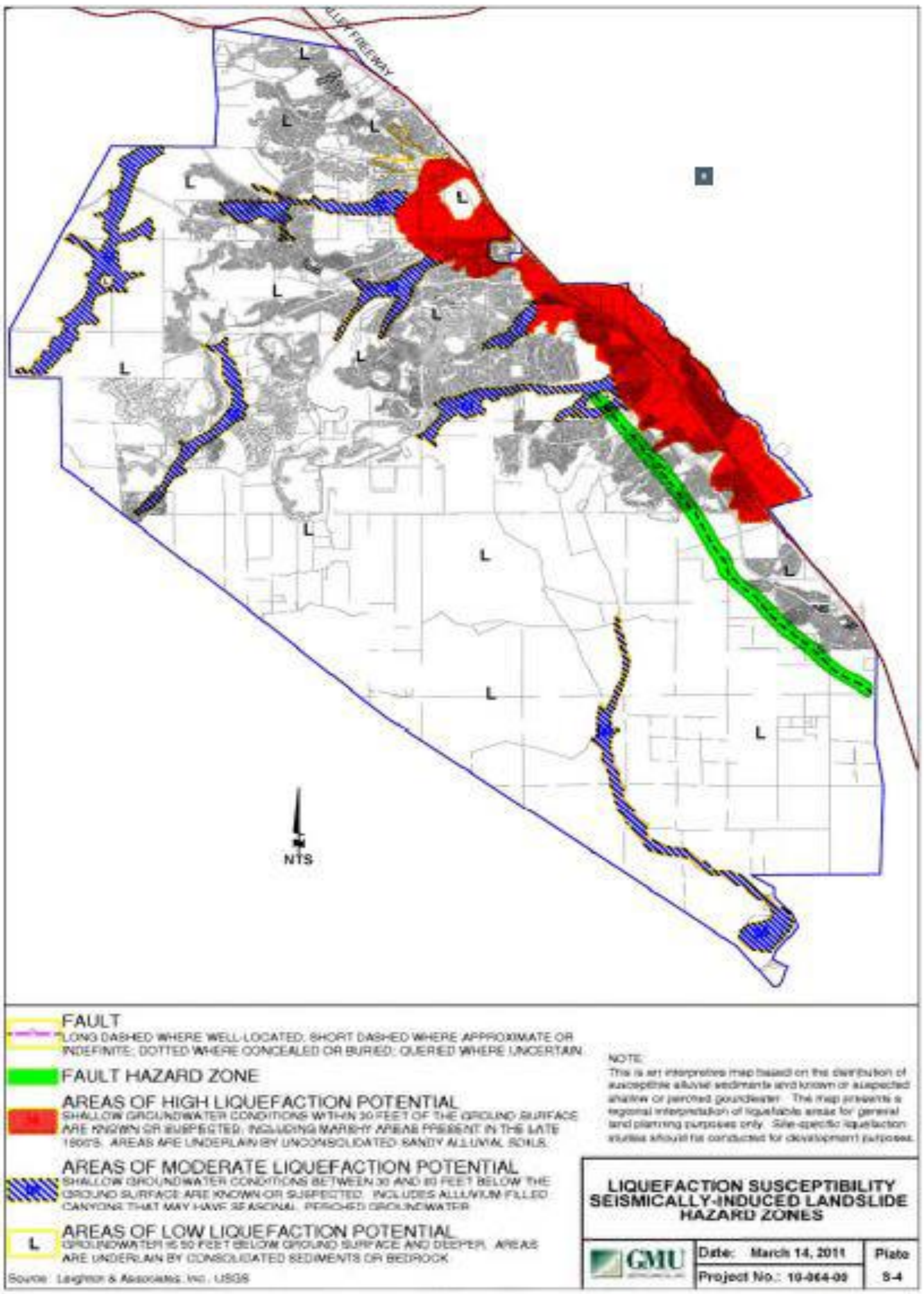
4.2.6 EARTHQUAKE – INDUCED LANDSLIDES

Earthquake-generated strong ground motions can worsen existing unstable slope conditions. Typical earthquake-induced landslides in the terrain of the Chino Hills area could include rotational slumps, rock falls, shallow slumps, and slides commonly associated with moderate to steep road cuts and natural slopes. If the slope materials become saturated, strong ground motions could also trigger mudslides and mudflows. Properly designed and constructed engineered slopes will generally perform well during an earthquake.

4.2.6.1 Landslide Susceptibility Map



4.2.6.2 Liquefaction Susceptibility Map



4.2.7 MAGNITUDE/SEVERITY

The most common method for measuring earthquakes is magnitude, which measures the strength of earthquake. Although the Richter scale is known as the measurement for magnitude, the majority of scientists currently use either the Mw Scale or Modified Mercalli Intensity (MMI) Scale. The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake.

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Figure 4.2.7.1 there are seven earthquake magnitude classes, ranging from great to micro. A magnitude class of great can cause tremendous damage to infrastructure in Chino Hills, compared to a micro class, which results in minor damage to infrastructure.

Table 4.2.7.1

Earthquake Magnitude Classes		
Magnitude Class	**Magnitude Range (M = Magnitude)**	**Description**
Great	M > 8	Tremendous damage
Major	7 <= M < 7.9	Widespread heavy damage
Strong	6 <= M < 6.9	Severe damage
Moderate	5 <= M < 5.9	Considerable damage
Light	4 <= M < 4.9	Moderate damage
Minor	3 <= M < 3.9	Rarely causes damage
Micro	M < 3	Minor damage

The MMI Scale measures earthquake intensity as shown in Figure 4.2.7.2. The MMI Scale has 12 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through XII describe damage to infrastructure during a moderate to catastrophic earthquake.

4.2.7.2 Modified Mercalli Intensity Scale

Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
1.0 – 3.0	I	I. Not felt except by very few people under especially favorable conditions.
3.0 – 3.9	II – III	II. Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
		III. Felt quite noticeably indoors. Many do not recognize it as an earthquake. Standing motorcars may rock slightly.
4.0 – 4.9	IV – V	IV. Felt by many who are indoors; felt by a few outdoors. At night, some awakened. Dishes, windows, and doors rattle.
		V. Felt by nearly everyone; many awakened. Some dishes and windows broken; some cracked plaster; unstable objects overturned.
5.0 – 5.9	VI – VII	VI. Felt by everyone; many frightened and run outdoors. Some heavy furniture moved; some fallen plaster or damaged chimneys.
		VII. Most people alarmed and run outside. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.
6.0 – 6.9	VII – IX	VIII. Damage slight in special designed structures; considerable in ordinary buildings; great in poorly built structures. Heavy furniture overturned. Chimneys, monuments, etc. may topple.
		IX. Damage considerable in specially designed structures. Buildings shift from foundations and collapse. Ground cracked. Underground pipes broken.

4.2.8 Frequency/Probability

While earthquakes occur less frequently than other primary natural hazard events, they have accounted for the greatest combined losses (deaths, injuries, and damage costs) in disasters since 1950 in California and have the greatest catastrophic disaster potential (Cal EMA 2010).

The United States Geological Survey (USGS) estimates that the probability of an earthquake occurring over the next 30 years in Southern California with a magnitude of 6.7 or greater, is 93 percent. Table 4.2.8.1 from the USGS lists the average time between earthquakes in the Southern California region, together with the likelihood of having one or more such earthquakes within the next 30 years (starting from 2014). "Readiness" indicates the factor by which likelihoods are currently elevated, or lower, because of the length of time since the most recent large earthquakes. The values from the USGS include aftershocks. It is important to note that actual repeat times will exhibit a high degree of variability, and will almost never exactly equal the average listed in the table.

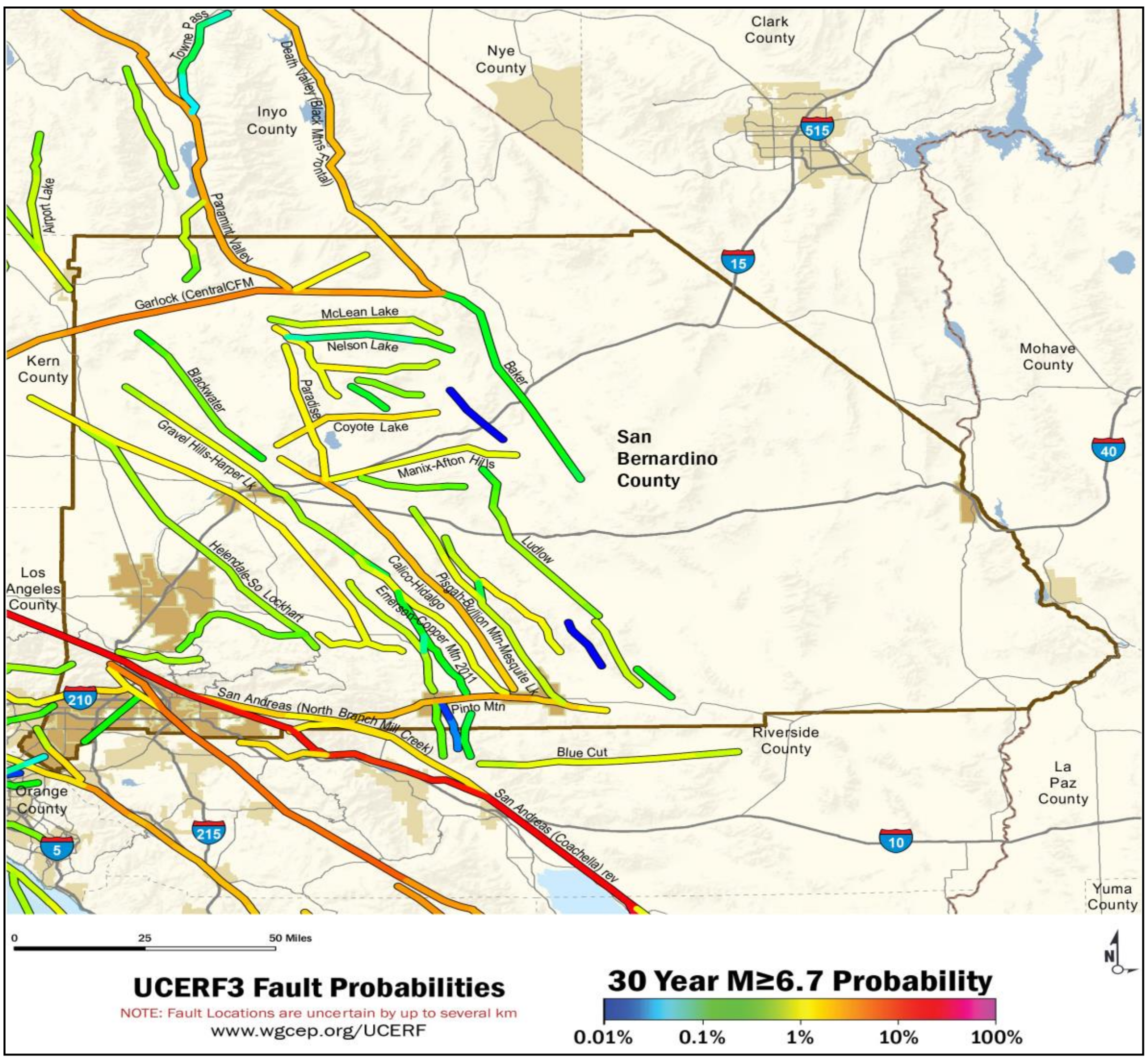
Table 4.2.8.1 Southern California Region Earthquake Probability

Magnitude (greater than or equal to)	Average repeat time (years)	30-year likelihood of one or more events	Readiness
5	.7	100%	1.0
6	2.3	100%	1.0
6.7	12	93%	1.0
7	25	75%	1.1
7.5	87	36%	1.2
8	522	7%	1.3

Source: USGS UCERF3: A New Earthquake Forecast for California's Complex Fault System FS 2015-3309

4.2.8.2 Fault Probabilities

Figure 4.2.8.2 shows the locations of major faults in California, including the four (4) major faults in Southern California in relation to San Bernardino County region. These faults are the Southern San Andreas, the San Jacinto, the Elsinore, and the Garlock Faults. There are also many smaller faults within San Bernardino County capable of producing significant earthquakes. However, these four faults are considered by the USGS and the California Geological Survey (CGS) to be the most dangerous in the County. (California Geological Survey Special Publication 42, Interim Revision 2007, "Fault-Rupture Hazard Zones in California" - Alquist-Priolo Earthquake Fault Zoning Act).



Appendix I
Emergency Operations Plan

Appendix 6

Chino Hills Community Water System

Emergency Response Plan

December 2020

Addresses U.S. Environmental Protection Agency America's Water Infrastructure Act of 2018 Mandate

City of Chino Hills

Emergency Response Plan

CWS and ERP Information

Please fill in the information below as indicated.

PWSID	CA3610036
Street Address	14000 City Center Drive
City, State Zip Code	Chino Hills, CA 91709
Phone number	909-364-2854
Population Served	84,364
Prepared by	Mark Wiley
Reviewed by	Christopher Eddy
Date completed	

PLAN DISTRIBUTION

Please fill in the recipient's name and title, the person who gave them the plan and on what date.

RECIPIENT/TITLE	DISTRIBUTED BY	DATE
Utility Operations Manager	Mark Wiley	

CHANGE HISTORY

Please describe the changes made to this plan since its original development, who made the changes and on what date the changes were incorporated into this plan.

DESCRIPTION OF CHANGE	NAME/TITLE	DATE

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UTILITY INFORMATION

During an incident, you need to have system information about your water utility readily available for your personnel, first responders, repair contractors/vendors, the media, and other response partner agencies.

i Utility Overview

Provide basic information about your utility.

Utility Information	
PWSID	CA3610036
Utility name and address	City of Chino Hills
Owner	City of Chino Hills
Directions to utility from major roadway, include lat./long. coordinates	Exit 71 Freeway at Grand Avenue, proceed east to Boy's Republic Drive, proceed south on Boy's Republic Drive, continue on Boy's Republic Drive as it turns west, proceed south on City Center Drive to 14000.
Total population served and total service connections	Population: 84,364 Connections:
Name, title, phone number of primary contact (e.g., ERP Lead)	Mark Wiley, Utility Operations Manager
Alternate contact	Steve Setlak, Production Supervisor
Location of treatment, distribution, collection schematics and operation manuals	15091 La Palma Drove, Chino, CA 91710

Use this checklist to ensure the following additional utility information (as applicable) is included as a part of your ERP.

- ☐ Map of distribution systems
- ☐ Pressure boundary map
- ☐ Process flow diagram
- ☐ Site plans and “as built” drawings for the following components of your system (as applicable):
  - Pumping and storage facilities
  - Reservoir facilities
  - Water treatment facilities
  - Chemical storage locations
  - Booster pump stations
  - Pressure-regulating valve (PRV) sites
- ☐ Distribution system diagrams and instrumentation information
- ☐ Equipment specifications and operation instructions
- ☐ Emergency power and light generation operation specifications
- ☐ Supervisory Control and Data Acquisition (SCADA) system operation instructions
- ☐ Communications systems operation instructions

ii Personnel Information

Attach your personnel roster here or fill out the table below.

Personnel			
Name and Title	**Job Duties and Responsibilities**	**Contact Information**	**Emergency Information**
Mark Wiley	Utility Operations Manger		909-573-4375
Rene Mendoza	Distribution Supervisor		909-573-4381
Brandon Weir	Senior Maintenance Worker		909-287-6698
Jose Delgadillo	Maintenance Worker II		909-573-4363
Matt Garduno	Maintenance Worker II		909-573-4337
Joe Gastelum	Maintenance Worker II		909-573-3039
Gabriel Martinez	Maintenance Worker II		909-573-6198
Albert Herrera	Maintenance Worker I		909-573-4358
Josh Franks	Senior Maintenance Worker		909-573-4392
Mike Almazon	Maintenance Worker II		909-573-4188
Jordan Andrade	Maintenance Worker I		909-573-4371
Tony Kapp	Maintenance Worker II		909-573-4353
John Rivera	Maintenance Worker II		909-573-4386
Manolo Sarmiento	Maintenance Worker I		909-614-9867
Amanda Wilbur	Maintenance Worker I		909-573-4377
Steve Setlak	Water Production Supervisor		909-573-4387
Paul Fonseca	Water Quality Technician II		909-573-4367
Dan Jockers	Water Quality Technician II		909-573-4395
Andrew Perez	Senior Maintenance Worker		909-573-4368
Frank Topete	Maintenance Worker II		909-993-3392
Daniel Bobadilla	Public Works Director		909-3642801

iii Primary Utility Components

List all the components necessary to maintain effective operation of your utility. Simply add more rows to the tables below if you have additional components. Text in italics represents examples – be sure to delete italicized text as necessary as you fill out the tables below and throughout this template.

Wells			
Well Name	**Depth/Location**	**Available Yield**	**Treatment Requirements/Associated Treatment Plant**
All City Wells inactivated due to groundwater contamination.			

Treatment Plants			
Plant name	**Location**	**Capacity**	**Treatment Train**
All plants off line due to groundwater contamination.			

Storage and Distribution System – Tanks, Primary Mains and Pumping Stations

Location	Area Served	Comments
Reservoir 1 APN: 103101145 North end of Live Oak Road	Intermediate Zone	Potable, HGL 1,047', 1MG
Reservoir 2 APN :103101155 2050 Carbon Canyon Road	Intermediate Zone	Potable, HGL 1,288', 1MG
Reservoir 4 APN: 101726105 Vellano Club Drive	H2 Zone	Potable, HGL 1,502', 1MG
Reservoir 5 APN: 102538210 Aquaduct Ln./Glen Ridge Dr.	Low Zone	Potable, HGL 828', 2MG
Reservoir 7 APN: 100007618 Canon Lane	H1 Zone	Potable, HGL1,305', .25MG, P-3 Booster Station
Reservoir 8 APN: 100008101 Hillside Road, Sleepy Hollow	H1 Zone	Potable, HGL 1,130', .25MG
Reservoir 9 APN: 102330101 Setting Sun Court	Intermediate Zone	Potable, HGL 1,056, 2MG
Reservoir 11 APN: 103101142 Sleepy Oak Road	H1 Zone	Potable, HGL 1,288', 2MG
Reservoir 12 APN: 102368117 Miramonte Court	HP1 Zone	Potable, P-1 Booster Station 1,288 HGL 2.5MG
Reservoir 13 APN: 103318136 Mystic Canyon	Low Zone	Potable, HGL 828', 2MG
Reservoir 14 APN: 101724117 State Park	Intermediate Zone	Potable, HGL 1,034', 5MG
Reservoir 15 APN: 102441104 Grand Avenue	Intermediate Zone	Potable, HGL 1,055' 5MG
Reservoir 16 APN: 100037144 Rancho Hills Drive	H1 Zone	Potable, HGL 1,055' 2MG
Reservoir 17 APN: 101726128 Vellano Club Drive	H2 Zone	Potable, HGL 1,502', 4MG
Reservoir 19 APN: 101724171 Morning Glory	Low Zone	Potable, HGL 828, 3MG
Reservoir 40 APN: 101724171 Morning Glory	Recycled Water System	Recycled, HGL 828, 3MG
Reservoir 42 APN: 101726132 Vellano Club Drive	Recycled Water System	Recycled, HGL 1,502', 4MG
Reservoir 46 APN: 101725114 3300 Woodview Road	Recycled Water System	Recycled, HGL 1,034', 1MG

Treatment Chemical Storage Facilities

Location	Chemical(s)	Comments
Booster Station 9 Eucalyptus W/O Peyton	Calcium Hypochlorite Tablets	Outside Containment
Booster Station 15 Soquel Canyon Parkway & Elinvar	Diesel Fuel	100 Gallon Permitted

Other Key Facilities

Location	Function	Comments
Booster Station 1 APN: 101726207 Vellano Club Drive	Booster Station	• AQMD Permit No.: G2274 (issued 4/10/2009) • AQMD Facility ID: 157375 • Model: SR4B • Make: Caterpillar • Engine Serial No.: CMB00221 • Engine Model: G3406 • Generator Serviced by Quinn Co. • Quinn Serial No.: 0CTS00542
Booster Station 2 APN: 101726107 Woodview Road, Overlook Park	Booster Station	• AQMD Permit No.: G2277 (issued 4/10/2009) • AQMD Facility ID: 157378 • Model: SR4 • Make: Caterpillar • Engine Serial No.: CBP00453 • Engine Model: G3406 • Generator Serviced by Quinn Co. • Quinn Serial No.: 0CTS00559
Booster Station 4 APN: 102361124 13523 Calle San Marcos	Booster Station	No Comment
Booster Station 5 APN: 103132162 Oakcrest Drive	Booster Station	No Comment
Booster Station 6 APN: 103112136 Topaz Street & Feldspar Drive	Booster Station	• AQMD Permit No.: G49969 (issued 1/3/2018) • AQMD Facility ID: 186443 • Model: 3306B • Make: Caterpillar • Engine Serial No.: SWF00329 • Engine Model: 250 • Generator Serviced by Quinn Co. • Quinn Serial No.: 02AJ00288
Booster Station 7 APN: 100051139 Valley Springs	Booster Station	No Comment
Booster Station 8 16380 Canon Lane	Booster Station	No Comment
Booster Station 9 APN: 102258202 Eucalyptus W/O Peyton	Booster Station	No Comment
Booster Station 10 APN: 100037144 1548 Rancho Hills Drive	Booster Station	No Comment
Booster Station 14 3900 Soquel Canyon Parkway	Booster Station	No Comment
Booster Station 15 APN: 1017241544 Soquel Canyon Parkway & Elinvar	Booster Station	• Make: Detroit Diesel MTU400 • Engine Serial No.: GM13280-GA1S • Generator Serviced by Cummins
Hydropneumatic Station 1 APN: 102368117 At Reservoir 12, Miramonte Court	Booster Station	No Comment
Hydropneumatic Station 2 APN: 103101115 15223 Turquoise Circle	Booster Station	No Comment
Hydropneumatic Station 3 APN: 100007618 Canon Lane	Booster Station	No Comment

Other Key Facilities		
Location	**Function**	**Comments**
Hydropneumatic Station 4 APN: 101714359 5013 Glenview Street	Booster Station	• Model: DGDK-5640903 • Manufacturer: Cummins • Make: ONAN • Engine Serial No.: L030576691 SPEC-B • Engine Model: 125 0DGDK • Generator Serviced by Cummins
Hydropneumatic Station 5 APN: 101742462 Soquel Canyon Parkway & Golden Terrace	Booster Station	• AQMD Permit No.: • AQMD Facility ID: • Model: GGLB-5789786 • Manufacturer: Cummins (GM Engine) • Make: ONAN • Engine Serial No.: B070023783 SPEC-D • Engine Model: 150 0GGLB • Generator Serviced by Cummins
Hydropneumatic Station 6 APN:101726214 2318 Vellano Club Drive	Booster Station	No Comment
Hydropneumatic Station 7 16400 Canyon Hills Road	Booster Station	• AQMD Permit No.: G49969 (issued 1/3/2018) • AQMD Facility ID: 186443 • Model: 250REZXB • Specification No.: GM78690 – GA1 • Make: Kohler Power Systems • Generator Serial No.: SGM32D532 • Date of Mfg: • Generator Serviced by Quinn Co. • Quinn Serial No.: SGM32D532 • Quinn Unit No.: LS-8

iv Industry Chemical Handling and Storage Facilities

List surrounding chemical production, handling or storage industries that could impact your utility during incidents such as accidental releases, hurricanes or earthquakes.

Industry Chemical Handling Facilities			
Facility Name	**Location**	**Distance**	**Chemical and Exposure Pathway**
No Chemical Handling Facilities Within the City			

Chemical Storage Tanks			
Facility Name	**Location**	**Distance**	**Chemical and Exposure Pathway**
There are no fuel stations within 2,000’ of any wells. All fuel stations have secondary containment.			

v Safety

List safety materials and important safety information to help protect utility personnel during an incident. You may also reference your utility Health and Safety Plan, if available.

Safety Materials

Type	Location
Toxic material detection and testing supplies	San Bernardino County Haz-Mat handles any releases.
Emergency food and water supplies	All personnel are assigned emergency food supplies.
Emergency PPE (note what PPE are present at each location)	All personnel have assigned PPE.
Other equipment (note what is present at each location)	Public Works yard houses all safety equipment and personnel are familiar with storage and usage.

Safety Information

Topic	Description
Wind speed	*No Issues with wind, rain or heat.*

vi Response Resources

Provide an inventory of available resources (e.g., equipment, supplies) either maintained on site or readily available off site (e.g., neighboring water system) in the table below, or insert an existing inventory sheet.

Resources
Public Works has full inventory of resources and equipment, mutual aid agreements are in place with neighboring agencies.

vii Key Local Services

Note the closest locations of key logistical and medical services that you or mutual aid and assistance providers may need during an incident. Include a map if available.

Essential Services

Facility	Location/Description
Hospital	*Pomona Valley Hospital,* 1798 N Garey Ave, Pomona, CA 91767 Kaiser Medical Center, 2295 S Vineyard Ave, Ontario, CA 91761
Gas station	SC Fuels, 5415 Schaefer Avenue, Chino, CA 91710

1 RESILIENCE STRATEGIES

This section contains strategies and resources to improve the resilience of the system, including the physical security and cybersecurity of the system.

1.1 Emergency Response Roles

Describe the roles and responsibilities for key utility and external response partner personnel in the table below. You can add, edit or delete rows as necessary.

Water Utility and Partner Roles
This data is found in Section 7 of Emergency Operations Plan (page 40)

External Response Partner Roles
Local Partners
Located In Appendix 3 Of Emergency Operations Plan
State Partners & Federal Partners
Located in Appendix 1 of Emergency Operations Plan

1.2 Incident Command System (ICS) Roles

Located in Section 5 of Emergency Operations Plan.

1.3 Communication

Located in Section 5 of Emergency Operations Plan.

1.3.1 Internal Communication

See Utility Information Section ii.

Contact List
Located in Section 12 of Emergency Operations Plan

1.3.2 External Response Partner Communication

Appendix 3 of the City of Chino Hills Emergency Operations Plan contains the External Response Partner Communication contact information (*pages 102-103*).

1.3.3 Critical Customer Communication

Appendix 3 of the City of Chino Hills Emergency Operations Plan contains the Critical Customer Communication contact information (*pages 102-103*).

1.3.4 Communication Equipment Inventory

Inventory your utility's communication equipment below.

Communication Equipment
All personnel are equipped with City issued mobile phones. The City participates in the Government Emergency Telecommunications Service (GETS) provided by the Federal Government.

1.4 Media Outreach

During regular working hours the City Public Information Officer can issue a press release to contact the news media at the Major L.A. Market Area television stations; KCBS (Channel 2), KNBC (Channel 4), KTLA (Channel 5), KABC (Channel 7), KCAL (Channel 9), and KKTV (Channel 11) to broadcast the necessary warning during newscasts. The various local radio stations will also be contacted. Both television and radio personnel are available at all hours. News is also immediately disseminated via the City Website E-notify System to subscribers, and can be placed on a City wide Emergency Alert viewable from all pages of the City website. Community Relations Staff can distribute information very quickly via Social Media using both Twitter and Facebook. Community Bulletin Board messages can be displayed on the two local government Cable TV channels under the City of Chino Hills' control; Channel 3 on Spectrum Cable TV, and 41 on Frontier Cable TV. As a follow-up measure, an Emergency Conditions Hotline (909) 364-2828 can be used with recorded information, and can provide updates to the community and water customers. We will also contact the Chino Champion, a local weekly newspaper that serves both Chino Hills and Chino.

The warnings can be issued in English, Spanish, and Mandarin Chinese to cover all members of the community. Outlying areas of the water service area (such as Carbon Canyon) or smaller directly impacted areas can be notified by Police Department Patrol Cars and/or Citizens on Patrol vehicles with PA systems and/or flyers/notices delivered directly to homes. This would be for smaller effected areas and can be accomplished very quickly.

A special telephone answering service can also be quickly set up at our Utility/Finance Department (using the regular company numbers) to answer questions that will come in from consumers.

It is anticipated that the time for notification to the television and radio audiences, social media, government cable TV stations, via City website tools will be very short. The areas served by flyers/notices delivered directly to homes and patrol vehicles with a PA system can be accomplished within 2 hours. For notification to be issued in other than normal hours, the same media will be contacted and an announcement will be scheduled for as long as is necessary. Patrol vehicles with a PA system will be used in the early morning hours to quickly alert the people not listening to their radio or television.

1.5 Public Notification Templates

Insert your templates for public notifications here, or reference where they may be found. Ensure that your templates are consistent with the regulatory requirements for public notification contained in the Public Notification Rule (see 40 CFR 141, Subpart Q) and all relevant state regulations.

2 EMERGENCY PLANS AND PROCEDURES

This section contains plans and procedures that can be implemented in the event of a malevolent act or natural hazard that threatens your utility's ability to deliver safe drinking water.

2.1 Core Response Procedures

Core procedures are the "building blocks" for incident specific response procedures, as they are typically implemented across a broad variety of incidents (e.g., hurricane, earthquake, flood). List all your core procedures here.

Access

Item	Description
Debris clearing	*Public Works has staff and equipment to address any debris cleanup.*
Alternate routes	*There are many access points into the City.*
Identification badges	*Personnel are provided with security badges and access codes depending clearances.*

Physical Security

Item	Description
Access control procedures	*Work Identification cards have electronic access codes built into them that restrict or allow access depending on the specific employee's clearance authorization.*
Restricted areas	*Work Identification cards have electronic access codes built into them that restrict or allow access depending on the specific employee's clearance authorization. Maintained by HR.*
Evidence protection measures	*All law enforcement issues are handled by the Chino Hills Police.*
Security culture	*City employees participate in "See Something, Say Something" campaign.*

Cybersecurity

Cybersecurity Plan is in development, nothing to post at this time.

Power Loss

Kind	Type	Fuel	Location
Emergency Generator • AQMD Permit No.: G28918 (issued 12/11/2013) • AQMD Facility ID: 175030 • Model: C9 PKGG • Make: Caterpillar • Vin No./Generator Serial No: C9E02934/4AG5U2133CC043132 • Generator Serviced by Quinn Co. • Quinn Serial No.: 0C9E02934 • Quinn Unit No.: PORT 8120	Trailer #8120	Diesel	15091 La Palma Drive
Emergency Generator • AQMD Permit No.: G34800 (issued 2/25/2015) • AQMD Facility ID: 175030 • Model: C9 PKGG • Make: 2015 Caterpillar • Vin No./Generator Serial No.: 4AG5U2234EC043481 • Generator Serviced by Quinn Co. • Quinn Serial No.: NPR00117 • Quinn Unit No.: PORT 8150	Trailer #8150	Diesel	15091 La Palma Drive
Emergency Generator • AQMD Permit No.: G34799 (issued 2/25/2015) • AQMD Facility ID: 175030 • Model: C9 PKGG • Make: 2015 Caterpillar • Vin No./Generator Serial No.: 4AG5U2232EC043480 • Generator Serviced by Quinn Co. • Quinn Serial No.: NGP00116 • Quinn Unit No.: PORT 8151	Trailer #8151	Diesel	15091 La Palma Drive

Sampling Site Plan

CITY OF CHINO HILLS
BACTERIOLOGICAL SAMPLE SITE PLAN

Date: June 12, 2020
System name: City of Chino Hills
System Number: 3610036
Active Service Connections: 24,428
Estimated Population Served: 84,364
Minimum Number of Routine Samples per week: 20
Number of Samples collected per week: 20
Rotation of Sample Location: No
Minimum Number of General Physical Samples per month: 20
Number of Samples Collected per month:87
Rotation of Sample Location: No

ROUTINE SAMPLE LOCATION

LOCATION	UP STREAM	DOWN STREAM	ZONE
1. PIPELINE AVE. SAMPLER	14698 PIPELINE AVE.	14700 PIPELINE AVE.	LOW
2. SEVEN OAKS ST. SAMPLER	6139 SEVEN OAKS ST.	6133 SEVEN OAKS ST.	LOW
3. COTTONWOOD TRL. SAMPLER	2580 COTTONWOOD TRL.	2612 COTTONWOOD TRL.	INTERMEDIATE
4. EAGLE CANYON DR. SAMPLER	13312 EAGLE CANYON DR.	13330 EAGLE CANYON DR.	H-1
5. ROYAL RIDGE DR. SAMPLER	3271 ROYAL RIDGE DR.	13707 PEYTON AVE.	INTERMEDIATE
6. WINDMILL CREEK RD. SAMPLER	14506 TERRACE HILL LN.	2305 DESPERADO DR.	INTERMEDIATE
7. RANCHO HILLS DR. SAMPLER	1471 RANCHO HILLS DR.	1465 RANCHO HILLS DR.	H-2
8. ROSEMARY LN. SAMPLER	16808 ROSEMARY LN.	16793 ROSEMARY LN.	H-1
9. HIGHLAND PASS RD. SAMPLER	1568 GREENS DR.	16231 CANON LN.	H-1
10. CANON LN. SAMPLER	16410 CANON LN.	16380 CANON LN.	H-1
11. PINNACLE CT. SAMPLER	16199 HIGH VISTA LN.	16132 PINNACLE CT.	H-2
12. PEYTON AVE. SAMPLER	15170 FROST AVE.	3298 CARRIAGE HOUSE DR.	INTERMEDIATE
13. OAKCREEK RD. SAMPLER	3263 OAKCREEK RD.	3211 ARMSLEY DR.	INTERMEDIATE
14. ROLLING RIDGE DR. SAMPLER	15636 ROLLING RIDGE DR.	15598 ROLLING RIDGE DR.	INTERMEDIATE
15. MURRAY AVE. SAMPLER	15376 MURRAY AVE.	15370 MURRAY AVE.	LOW
16. ACORN ST. SAMPLER	3445 TUPELO ST.	3424 BUCKINGHAM RD.	LOW
17. BUTTERFIELD RANCH RD. SAMPLER	5090 SUNDANCE HILL DR.	16158 VERMEER DR.	LOW
18. SAGEBRUSH ST. SAMPLER	5551 SAGEBRUSH ST.	5653 SAGEBRUSH ST.	LOW
19.GOLDEN GLEN DR. SAMPLER	4354 GOLDEN GLEN DR.	4342 GOLDEN GLEN DR.	INTERMEDIATE
20. AVENIDA CABRILLO SAMPLER	2254 AVENIDA CABRILLO	2191 CALLE BIENVENIDA	H-1

The sample locations listed above represent water quality from all Chino Hills' distribution zones, pressure zones, water sources, reservoirs, and additional disinfection zones.

The following is a list of experienced water quality samplers:

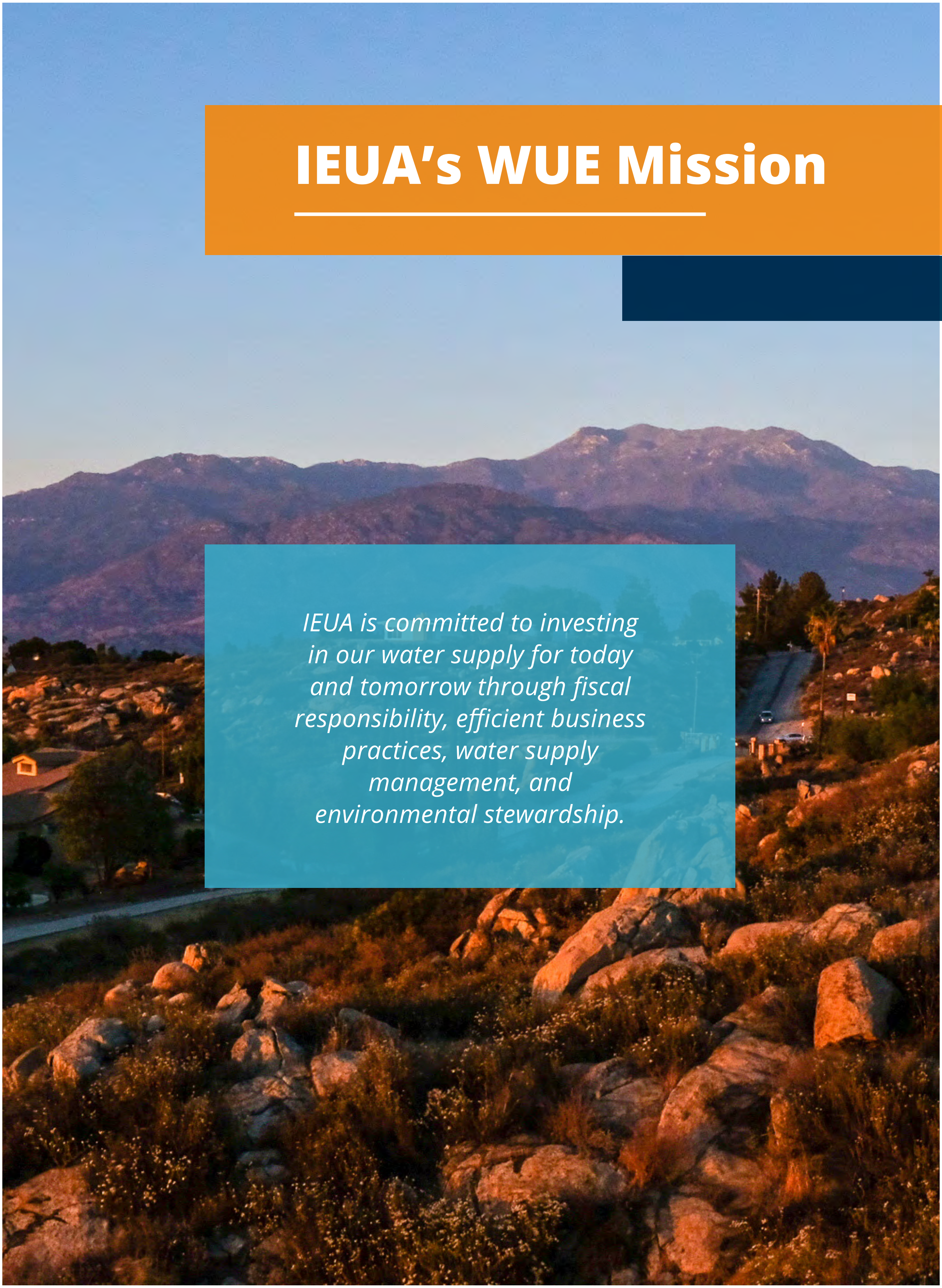
1. Paul Fonseca / T 3 Operator **2**.Steve Setlak / T2 Operator
3. Dan Jockers / T 2 Operator **4**.Andrew Perez / T2 Operator

Appendix J
IEUA Annual Regional Water Use Efficiency Report

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT

Regional Water Use Efficiency Programs Report

Fiscal Year 2019–2020



IEUA's WUE Mission

IEUA is committed to investing in our water supply for today and tomorrow through fiscal responsibility, efficient business practices, water supply management, and environmental stewardship.

Member Agencies

of Inland Empire Utilities Agency

CHINO
Where Everything Grows
Incorporated 1910

City of Chino Hills

City of Upland California

Cucamonga Valley® Water District
Service Beyond Expectation

FONTANA "AT YOUR SERVICE" WATER COMPANY

Monte Vista Water District

ONTARIO MUNICIPAL UTILITIES COMPANY

San Antonio Water Company
Since 1882

Letter from Shivaji Deshmukh, General Manager

As this year comes to a close, we recognize that 2020 was marked by significant and unforeseen challenges. We never could have predicted that the year would introduce a global COVID-19 health pandemic, devastating families and shuttering the doors of so many valued businesses.

This year has taught us that changes can happen suddenly and without warning. Yet for every glass half empty, there is a glass half full. Despite the trials this year has brought, there has been achievement.

First, IEUA and partner member agencies exceeded the volume of water savings projected in our 2015 WUE Business Plan. This herculean accomplishment came about because of the sound design and, more importantly, the superior day-to-day management by IEUA and member agency staff, as well as our program vendors.

Secondly, these savings were achieved through the delivery of highly cost-effective programs. IEUA spent just $1.15 million for programs that delivered lifetime savings of 3,292 acre-feet, at a low IEUA cost of $310 per acre-foot with a total cost of $849 to all parties.

This Regional Water Use Efficiency Programs Report highlights these achievements. The results stand as testimony to the excellent performance delivered against the many obstacles put in the pathway.

While celebrating 2020 accomplishments, we must also recognize the heightened challenges ahead for us. It is essential that we continue to meet SBx7-7 20x2020 requirements while we prepare for the future California's State Framework Legislation, SB606 and AB1668. The new water use objectives will require adaptation, collaboration, and innovation by IEUA and its partner member agencies. IEUA and the regional partners have decades of experience working collaboratively and we possess all the skills necessary to meet these new standards.

Sustained reduction in water use will be met through the implementation of innovative WUE programs that help grow markets for water-efficient products, services, and practices. Securing outside funding for this work will remain a focus for IEUA.

IEUA is committed to continued success, working alongside our member agencies to overcome the challenges that lie ahead.

Shivaji Deshmukh

Shivaji Deshmukh, P.E.
General Manager

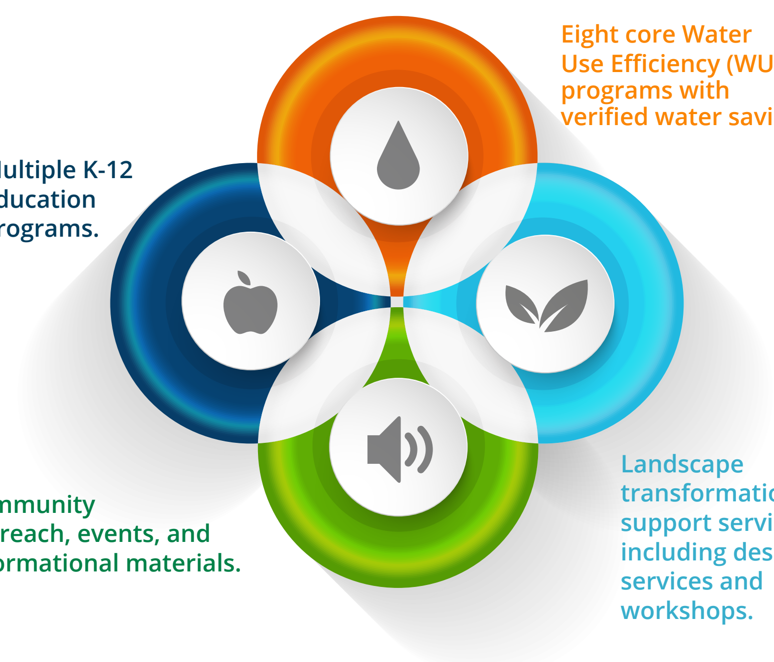
Together in FY2020, we deployed more than **7,400** water-saving technologies and services in our service area, *resulting in annual water savings of* 408 **acre-feet (AF).**

Highlights of the Year

July 1, 2019 to June 30, 2020

Fiscal year 2020 began with high expectations for the region's conservation efforts. As summer got into full swing, activity in all of IEUA's water use efficiency programs increased. The Sprinkler Tune-up Program launched with strong demand and it felt as though we would be on track to significantly increase customer participation from the low activity of post-drought years.

But as cases of COVID-19 multiplied in California, health precautions and economic uncertainty changed the upward trajectory of participation in these programs. Staff at the member agencies and IEUA had to rethink delivery of each program in order to keep customers, staff and contractors safe. Out of the disruption of those early days of the pandemic came the relaunch of programs with an emphasis on contactless and virtual delivery whenever possible. It is a testament to the resiliency and creativity of IEUA's member agencies and contractors that the programs were up and running again with minimal downtime. On behalf of and alongside its member agencies and despite the challenges posed by the global health pandemic, IEUA continued to implement a range of programs as well as educational and support services in FY 2020, including:



IEUA WUE staff provides a range of services to support regional WUE activities, including:

Program planning, performance tracking and evaluation.

Cost efficient centralized administration.

Procurement economies of scale for devices and vendor services.

Grant writing and procurement.

Vendor solicitation and contract management.

Budget management.

Legislative and regulatory compliance / support.

Key Accomplishments

Increased activity year-over-year, despite COVID-19 pandemic.

Annual savings of 408 acre-feet, lifetime savings of 3,292 acre-feet.

Cost-effective IEUA investment: 3-year payback at $310 per acre-foot cost.

Leveraged $1.6 million in outside funding.

Expanded budget and re-engineered the Sprinkler Tune-up Program to be the foundational program.

Launched innovative Leak Detection Program pilot.

A Special Consideration for COVID-19

COVID-19 has impacted everyone. In light of concern over basic needs such as public health and the economy, it's not a surprise that environmental issues including water conservation would take a back seat. Water conservation program activity throughout California has seen a steep decrease in participation.

The future remains uncertain, but most agree that the impacts of COVID-19 will be felt for some time. As IEUA and the member agencies look toward implementation of WUE programs in this new environment, we remain committed to ensuring the health and safety of our personnel, our contractors and our customers.

While conservation program participation is down, it's important to note that home improvement and eCommerce sales have increased. WUE programs need to leverage this new paradigm. A fresh look at the ways we have traditionally implemented our outreach, programs, and services will be required in this post-COVID-19 world. Among the accommodations and new practices, we foresee a continued shift to virtual or video-based workshops and services, a greater emphasis of bill savings in promotional materials, and evaluation of alternative program formats such as online stores and direct delivery of free and discounted products.

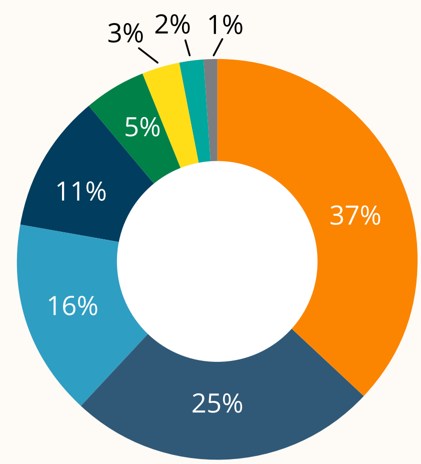
FY 2020 WUE Program Water Savings

There are eight IEUA WUE programs with verifiable water savings. These core programs saved 408 acre-feet annually and 3,292 acre-feet over the life of the measures.

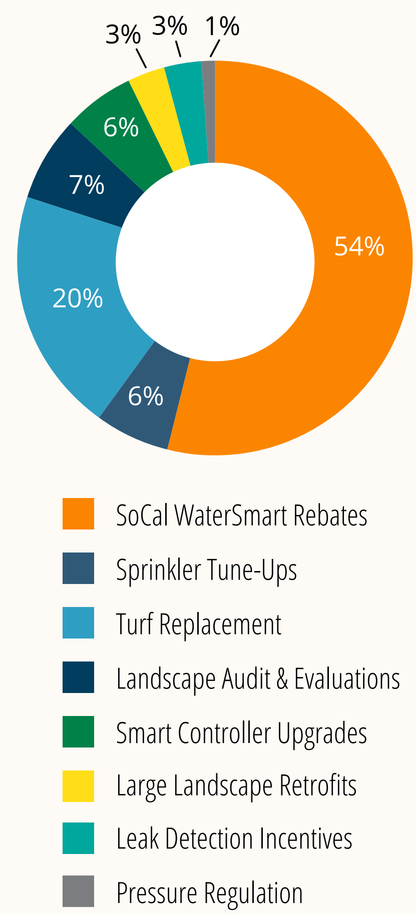
With the most savings, SoCal WaterSmart rebates represented 37% of the annual savings and 54% of the lifetime savings. Below are the annual and lifetime water savings for each program.

Program	Annual Savings (AF)	Lifetime Savings (AF)
SoCal WaterSmart Rebates	151	1,773
Sprinkler Tune-Ups	104	209
Turf Replacement	66	664
Landscape Audit & Evaluations	43	213
Smart Controller Upgrades	20	196
Large Landscape Retrofits	12	109
Leak Detection Incentives	8	83
Pressure Regulation	4	45
Total	**408**	**3,292**

Percent Annual Water Savings by Program



Percent Lifetime Water Savings by Program

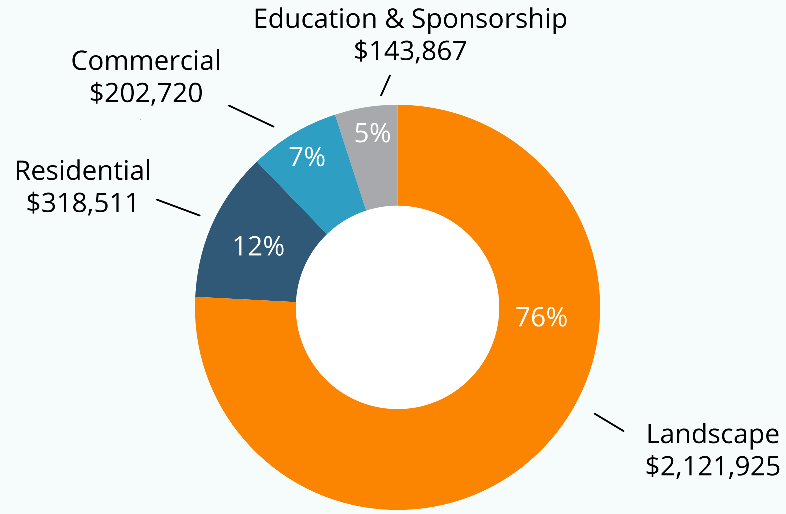


FY 2020 WUE Program Cost and Cost Effectiveness

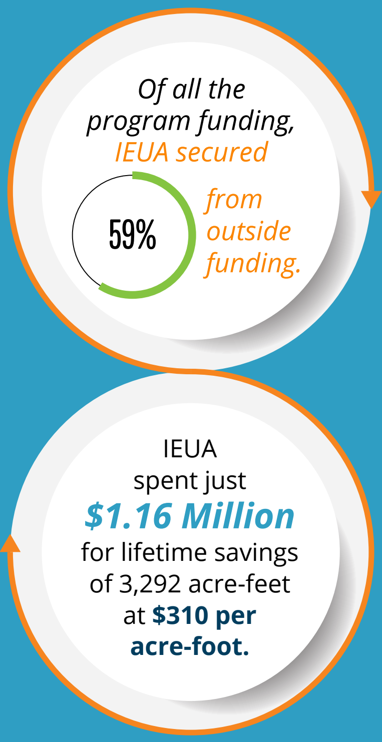
The total cost for FY 2020 WUE programs was $2.8 Million.

76%, or $2.1 Million, of the funds went to landscape and irrigation programs and services. $318,511 was spent on residential programs, $202,720 on commercial programs and $143,867 on education and support services.

Program Funding by Sector



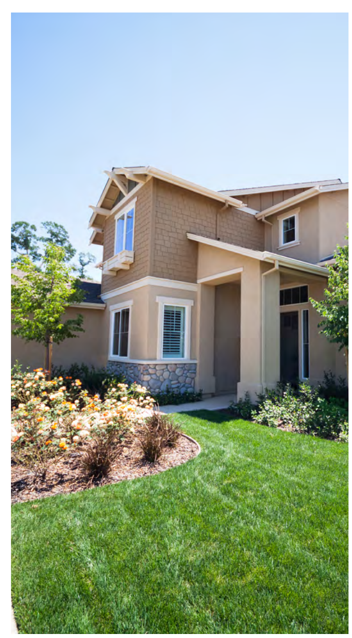
As shown in the chart below, IEUA continues to deliver highly cost-effective programs. IEUA spent just $1.16 million for programs that delivered lifetime savings of 3,292 acre-feet, at a low cost of $310 per acre-foot. Another way to view this is for every $1.00 IEUA spent, IEUA and the member agencies received $1.40 in benefits.



Below is a comparison of each core WUE program by funding source, total cost, IEUA payback and IEUA cost per acre-foot.

Program	Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
SoCal WaterSmart Rebates	$1,580	$231,570	$195,460	$428,610	1.86	$130
Landscape Audit & Evaluations	$15,937	$9,697	$9,810	$35,444	0.3	$226
Leak Detection Incentives	$0	$19,017	$0	$19,017	2.75	$228
Turf Replacement	$108,089	$309,638	$972,200	$1,389,927	5.62	$466
Sprinkler Tune-Ups	$0.00	$94,602	$69,786	$164,389	1.15	$476
Large Landscape Retrofits	$2,976	$71,143	$72,210	$146,329	7.37	$650
Smart Controller Upgrades	$0	$186,171	$96,096	$282,267	11.43	$949
Pressure Regulation	$0	$99,932	$77,242	$177,174	27.01	$2,242
Total	**$128,582**	**$1,021,770**	**$1,492,804**	**$2,643,157**	3.02	$310

Topping the list for cost-effectiveness is SoCal WaterSmart Rebates (not including Turf Replacement), which costs just $130 per acre-foot and has a payback of 1.86 years. The second most cost-effective program is the Landscape Audit and Evaluation Program (LEAP), administered by Chino Basin Water Conservation District (CBWCD), which costs $226 per acre-foot and earns a payback in just over three months. The Leak Detection Incentive Program is the third most cost-effective, at $228 per acre-foot with a payback of 2.75 years. In FY 2020, IEUA funded the Leak Detection Incentive pilot entirely out of its own budget. Going forward Metropolitan will provide funding thus increasing the cost-effectiveness of leak detection programs.



The Pressure Regulation Program is the highest cost at $2,242 per acre-foot, however the program is considered a highly valued customer service program. The program is now provided on a case-by-case for customers experiencing issues with indoor water pressure. Regardless of the high cost per acre-foot for the Pressure Regulation Program, the combined cost per acre-foot total for all programs, is a very low dollar amount of $310 per acre-foot.

In addition to the core efficiency programs with active water savings, IEUA funds educational and local agency support programs. These programs and services provide an educational foundation for all WUE efforts. To the right is a list of the programs and their associated funding for FY 2020.

Service	Outside Funding	IEUA Funding	MWD Funding	Total
Landscape Transformation Customer Education				
Landscape Design	$4,080	$240	$1,920	$6,240
Landscape Classes	--	$725	$700	$1,425
School Education				
National Theatre for Children	--	$49,920	--	$49,920
Garden in Every School	--	$1,951	--	$1,951
Shows That Teach	--	$11,450	--	$11,450
Member Agency Local Support & Funding				
WUE Support Tools	--	$19,065	--	$19,065
BMP Support	--	$10,000	--	$10,000
WUE Business Plan	--	$1,330	--	$1,330
CIMIS Station	--	$3,960	--	$3,960
CALWEP/ AWE Dues	--	$15,418	$15,418	$30,836
Plumbing Handbooks	--	$2,801	--	$2,801
Pressure Gauges	--	$3,389	--	$3,389
Water Festival	--	$1,500	--	$1,500
Total	**$4,080**	**$121,749**	**$18,038**	**$143,867**

FY 2020 Member Agency Program Activity

The chart below shows the program activity and water savings for each member agency. Although there are a range of devices that can be installed, the chart provides an illustrative comparison of performance for each overarching program.

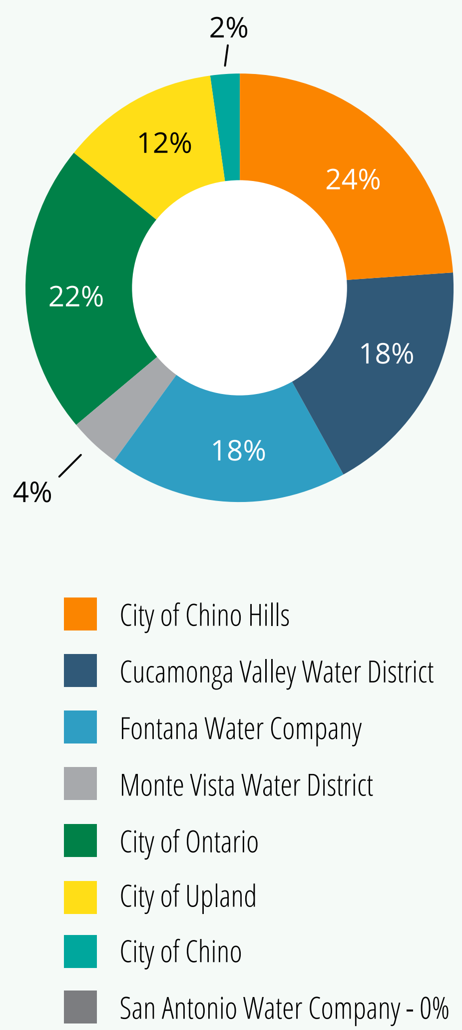
Interestingly Chino Hills, one of the smaller utilities, had the highest volume of annual water savings. This is due to their high customer participation in the Sprinkler Tune-Up Program. Ontario and Fontana achieved the largest lifetime savings due to installation of laminar flow restrictors at medical facilities and toilets in multi-family facilities.

Details on all program activity for each member agency can be found here.

FY 2020 Member Agency Program Activity and Water Savings

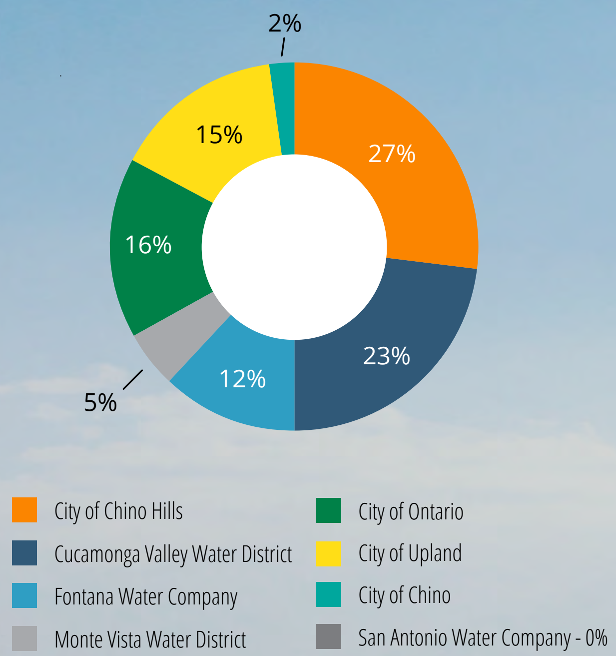
Member Agency	Number of Devices	Gallons Saved per Year	AF Saved per Year	Lifetime AF Saved
Chino, City of	175	2,190,587	7	67
Chino Hills, City of	788	28,741,926	88	483
Cucamonga Valley Water District	852	20,701,040	64	554
Fontana Water Company	2,211	21,413,895	66	679
Monte Vista Water District	172	5,260,859	16	122
Ontario, City of	2,613	26,510,242	81	790
Upland, City of	640	13,876,653	43	383
San Antonio Water Company	8	92,490	0	4

Percent Annual Water Savings by Member Agency



The chart below illustrates the program funding for the eight core water savings programs for each member agency.

IEUA Funding per Member Agency



Chino Hills and CVWD leveraged the most IEUA funding at $277,262 and $230,685 respectively. This is because Chino Hills actively promoted the Sprinkler Tune-up Program as well as the Leak Detection Program.

CVWD had the largest total funding at $701,745 ($421,033 from Metropolitan) because of their higher customer participation in the SoCal WaterSmart Program.

Details on program funding, activity and water savings for each member agency can be found here.

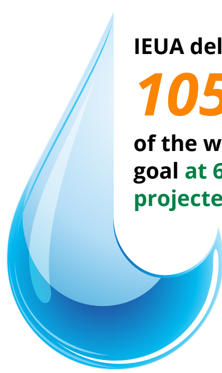
FY 2020 Funding Benefits per Member Agency

Member Agency	Outside Funding	IEUA Funding	MWD Funding	Total
Chino, City of	$0	$18,185	$25,492	$43,677
Chino Hills, City of	$10,808	$277,262	$304,082	$592,153
Cucamonga Valley Water District	$50,048	$230,665	$421,033	$701,745
Fontana Water Company	$2,000	$119,920	$200,381	$322,300
Monte Vista Water District	$11,725	$53,716	$77,446	$142,887
Ontario, City of	$16,722	$163,134	$204,216	$384,073
Upland, City of	$21,341	$148,600	$249,774	$419,715
San Antonio Water Company	$0	$590	$570	$1,160

FY 2020 Performance to WUE Business Plan Goals

Every five years, IEUA and its member agencies develop a Regional Water Use Efficiency Business Plan. The Business Plan documents regional water use efficiency targets, goals and methodologies to achieve water savings, meet current statutes, and comply with evolving State Standards.

To the right is a snapshot of the FY 2020 projected costs and savings from the 2015 WUE Business Plan compared against the actual costs and savings. As shown in the chart, IEUA delivered 105% of the water savings goal at 65% of the projected costs; in other words, more water saved for less dollars spent. It should be noted that it was projected that two water agencies would implement budget-based water rates. This did in fact, occur with both Chino and Chino Hills implementing budget-based rates. The actual water savings from the new rate structure will be evaluated in the future.



IEUA delivered
105%
of the water savings goal at 65% of the projected costs;

in other words, more water saved for fewer dollars spent.

FY 2020 Performance Against 2015 WUE Business Plan

IEUA Projected Costs	$1,094,335
"IEUA Actual Costs (Active Programs Only)"	$790,773
"Difference in Spending Project vs Actual Costs"	**($303,563)**
"Projected Annual Water Savings without Budget Based Rates (AF)"	3,127
"Actual Annual Water Savings without Budget Based Rates (AF)"	3,292
Percent Achievement	105%

Looking Forward

The member agencies and IEUA have been effectively implementing water use efficiency strategies and programs over the last decade.

There are a number of challenges ahead. The most important will be to meet the imminent legislative mandates for tightened water usage standards. These looming regulations will require water agencies at the retail and wholesale level to work together in new and innovative ways and at a faster pace of adaptation and coordination.

As a result, IEUA will support the regional efforts that will help the member agencies achieve compliance.

Specifically, IEUA is committed to the following objectives for the upcoming year:

- **Continue to focus on maximizing water savings and related programs** within the constraints of the COVID-19 pandemic.
- **Generate a WUE Business Plan** that provides the blueprint for the methodologies and strategies to be utilized to achieve water savings, meet current statutes, and comply with evolving State Standards.
- **Support retailers in calculating compliance with California's new Framework legislation** and meeting expected standards and requirements imposed by the Framework.
- **Offer a range of water use efficiency programs, ideally providing integrated, multi-resource benefits** including community and economic development.
- **Continue to leverage outside funding** and allocate IEUA WUE funding for local and regional programs to offset member agency financial burden.
- **Provide meaningful programs with high value for customers** to motivate customers to participate.
- **Provide valuable marketing, data, and support resources** to strengthen and augment programs and processes.

SoCal Water$mart Turf Replacement

The Turf Replacement Program encourages customers to remove high water-consuming turf and replace it with low water-using, regionally appropriate plants and surfaces that allow for ground water infiltration and elimination of runoff. Qualifying applicants are eligible to receive $3 per square foot of turf grass removed. Additional funding may be available to participants depending on member agency incentives.

Turf Replacement Program Savings FY 2020

	Annual Savings (AF)	Lifetime Savings (AF)
Residential	24	243
Commercial	42	421
Total	**66**	**664**

Long-term market transformation program

66% *of funding from MWD*

Why IEUA Implements the Turf Replacement Program

Hundreds of thousands of square feet of irrigated turf in the IEUA territory represent a significant opportunity for water savings.

Replacing turf with regionally appropriate plants also aids in transforming the irrigation and landscaping market.

Removing turf provides long-term savings that persist over 10 years.

Turf Replacement Program FY 2020 Accomplishments | Increased activity over FY 2019 despite COVID-19 pandemic.

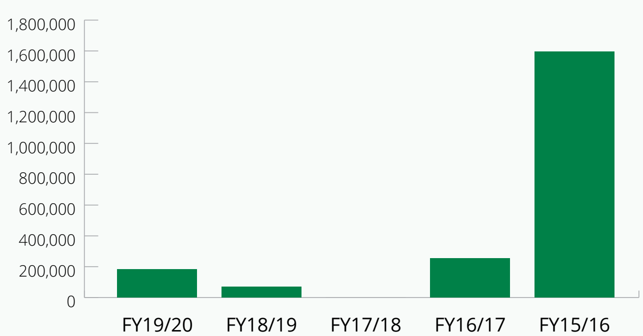
Turf Replacement Program Activity

Turf removal reached peak popularity during FY 2016 when severe drought limited outdoor irrigation and rebates for turf removal were at their highest. As drought conditions ended, turf removal activity declined steeply, dropping 82% from the peak. In FY 2018, Metropolitan suspended the program due to lack of budget.

Turf Removal began to rebound in FY 2020 with a 61% increase in residential and 94% increase in commercial square footage replaced. However, the COVID-19 pandemic has slowed activity. Program activity over the past five years in the IEUA service area has mirrored that in Metropolitan's service area and the entire region. Below is a chart displaying residential and commercial activity in the Turf Replacement Program over the last five years.

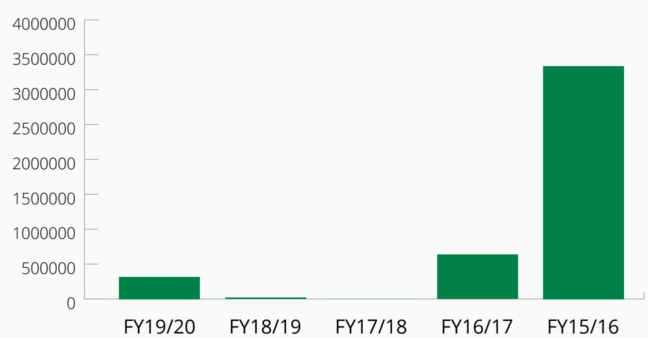
	Residential SF Replaced	Commercial SF Replaced	Total SF Replaced
FY 2020	184,286	318,778	503,064
FY 2019	71,257	19,801	91,058
FY 2018	0	0	0
FY 2017	255,091	637,916	893,007
FY 2016	1,596,789	3,337,120	4,933,909

Annual Activity | Residential SQ FT



% Change Year over Year	% Change from 5 Years Ago
61%	-766%

Annual Activity | Commercial SQ FT



% Change Year over Year	% Change from 5 Years Ago
94%	-947%

Turf Replacement Program FY 2020 Water Savings

	Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
Residential	7,924,298	24	243
Commercial	13,707,454	42	421
Total	**21,631,752**	**66**	**664**

Turf Replacement Program FY 2020 Cost and Cost Effectiveness

This program is cost effective at $466 per acre-foot.

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$108,089	$309,638	$972,200	$1,389,927	**5.62**	**$466**

Turf Replacement Potential Program Enhancements

During non-drought years, participation in the Turf Replacement Program significantly decreases. Among the barriers to customer acceptance are costs, aesthetic concerns, and lack of ability to execute projects. Recommendations for addressing these barriers include:

- Targeting of customers likely to replace their turf, consistent and appealing outreach, and education to address customer reluctance for change.
- Linking customers to support services to help them make the change successfully. This may include connections to plant suppliers and contractors, design services, and customer consultations.
- Building and promoting an easy-to-use and content-rich microsite that serves as a centralized hub bringing together the latest information, guidance, and examples on climate appropriate landscaping, including how-to videos, inspirational design ideas and homeowner stories, plant databases, and links to resources such as nurseries and qualified contractors.

SoCal Water$mart Rebates

SoCal WaterSmart (SCWS) is Metropolitan's regional rebate program offering incentives for a menu of indoor and outdoor water saving measures for both residential and commercial customers.

The program is administered by Metropolitan's regional vendor, EGIA. Metropolitan pays for the base incentive as well the administration.

SCWS Program Savings FY 2020

	Annual Savings (AF)	Lifetime Savings (AF)
Residential	57	731
Commercial	93	1,043
Total	**151**	**1,773**

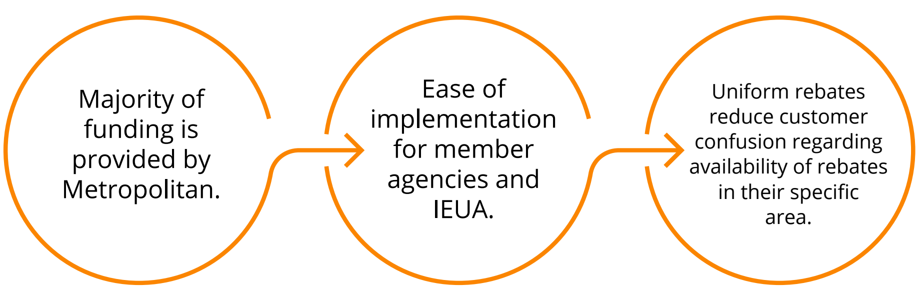
Highest water savings program

Lowest per acre-foot costs

IEUA adds supplemental funding for each device as shown in the chart below.

Residential Measures	Base Incentive	IEUA Added Incentive	Total Incentive
High Efficiency Clothes Washer	$85	$75	$160
Premium High Efficiency Toilet	$40	$60	$100
Landscape Measures			
High Efficiency Sprinkler Nozzles	$2	$3	$5
Smart Controllers (Less than one irrigated acre)	$80	$80	$160
Smart Controllers Per Station (One irrigated acre or larger)	$35	$10	$45
Commercial Measures			
Plumbing Flow Control Valve	$5	$5	$10
Laminar Flow Restrictor	$10	$10	$20
Commercial Premium High Efficiency Toilet	$40	$60	$100
Ultra-Low Water Urinal	$200	$200	$400
Large Rotary Nozzles (Per Set)	$13	$5	$18
In-Steam Flow Regulator	$1	$3	$4
pH- Cooling Tower Controller	$1,750	$1,000	$2,750
Cooling Tower Conductivity	$625	$375	$1,000
Dry Vacuum Pump (Per 0.5 HP)	$125	$200	$325
Connectionless Food Steamers (Per Compartment)	$485	$315	$800
Ice-Making Machines	$1,000	$1,000	$2,000

Why IEUA Implements the SoCal WaterSmart Program



SoCal WaterSmart Program FY 2020 Accomplishments

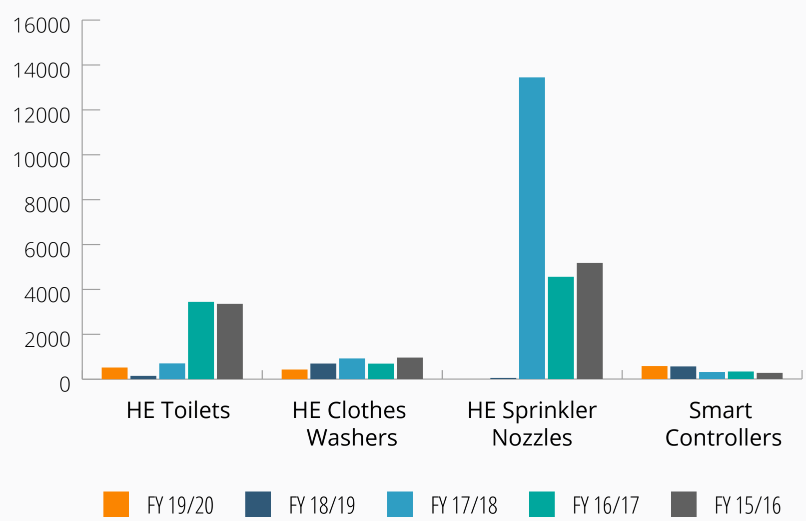
7,051 devices rebated.

Over **1,500** customers participated in the program.

Residential Device Activity

Activity has gone from a high in FY 2018 of 15,381 devices to a low of 1,456 devices in FY 2019 and now up 52% in FY 2020 with 2,803 devices rebated. High efficiency sprinkler nozzles represent the highest volume of devices rebated. High efficiency toilets represent the second highest volume.

Residential Annual Activity by Device - 5 Year Comparison



Residential Annual Activity by Device

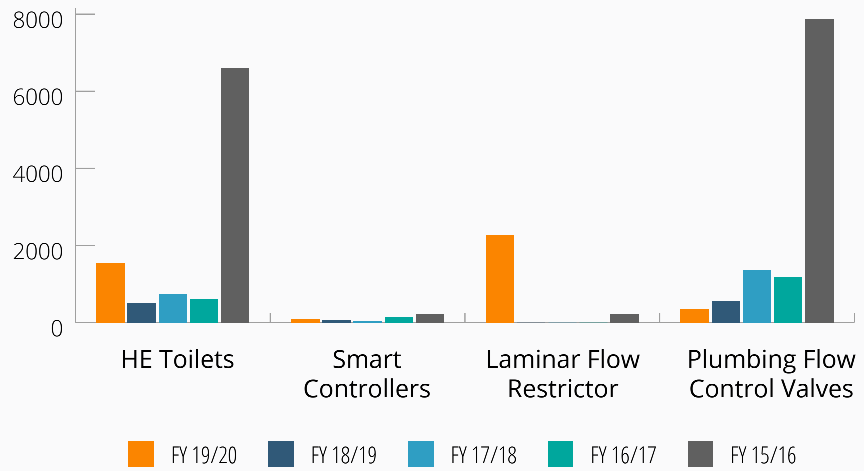
Device	FY 2020	FY 2019	FY 2018	FY 2017	FY 2016
HE Toilets	521	148	705	3,444	**3,355**
HE Clothes Washers	429	695	923	690	**959**
HE Sprinkler Nozzles	1,275	51	13,442	4,555	**5,173**
Smart Controllers	578	562	311	334	**271**
Total	**2,803**	**1,456**	**15,381**	**9,023**	**9,758**

Commercial Device Activity

Activity has gone from a high of 34,426 devices in FY 2016 to a low of 1,120 devices in FY 2019, increasing 122% to 4,248 devices in FY 2020. Laminar flow restrictors represent the largest number of rebated devices. Toilets represent the second largest volume.

In FY 2020, there was zero activity for urinals, cooling tower controllers, high efficiency sprinkler nozzles, and air-cooled ice machines.

Commercial Annual Activity by Device - 5 Year Comparison



	% Change Year Over Year	% Change from 5 Years Ago
High Efficiency Toilets	132.88%	-328.72%
Smart Controllers	167.05%	-140.91%
HE Sprinkler Nozzles	0.00%	0.00%
Laminar Flow Restrictors	100.00%	90.71%
Plumbing Flow Control Valves	251.94%	-2087.22%
Commercial	93	1,043

Commercial Annual Activity by Device

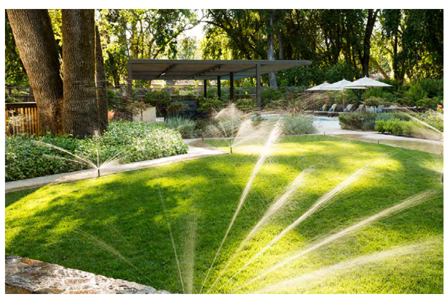
Device	FY 2020	FY 2019	FY 2018	FY 2017	FY 2016
High Efficiency Toilets	1,539	506	747	611	6,598
Smart Controllers	88	59	47	139	212
Laminar Flow Restrictor	2,261	0	0	0	210
Plumbing Flow Control Valves	360	547	1,363	1,191	7,874
Total	**4,248**	**1,120**	**17,028**	**7,141**	34,426

SoCal WaterSmart Program FY 2020 Water Savings

Residential Device Savings

The majority of annual residential device savings came from smart controllers at 24 acre-feet per year. However, high efficiency toilets represent the largest lifetime savings at 256 acre-feet due to their long life.

	Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
High Efficiency Toilets	4,176,930	13	256
High Efficiency Clothes Washers	4,823,483	15	207
High Efficiency Sprinkler Nozzles	1,828,299	6	28
Smart Controllers	7,798,526	24	15
Rain Barrels	5,573	0	0
Total	**26,557,109**	**57**	**731**



Commercial Device Savings

The majority of annual savings for commercial devices came from laminar flow restrictors at 52 acre-feet, followed by high efficiency toilets at 38 acre-feet. Due to its 20-year product life, toilets provide the largest lifetime savings at 757 acre-feet or 71% of total savings. Although toilets provide the longest lifetime savings, the multi-family market is saturated with few higher flow toilets available in the market.

	Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
High Efficiency Toilets	12,338,378	38	757
Smart Controllers	369,962	1	11
Laminar Flow Restrictor	16,947,778	52	260
Plumbing Flow Control	492,761	2	15
Total	**30,148,879**	**93**	**1,043**

SoCal WaterSmart Program FY 2020 Cost and Cost Effectiveness

Both the residential and commercial SoCal WaterSmart programs are the most cost-effective programs for IEUA. The commercial program comes in at $89 per acre-foot and the residential is at $155 per acre-foot with a combined cost of $130 per acre-foot, well below IEUA's avoided costs.

Residential Device Cost and Cost Effectiveness

	Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
High Efficiency Toilets	$0	$31,260	$20,840	$52,100	**2.94**	**$122**
High Efficiency Clothes Washers	$1,580	$32,175	$36,465	$70,220	**2.62**	**$155**
High Efficiency Sprinkler Nozzles	$0	$3,825	$2,550	$6,375	**0.82**	**$136**
Smart Controllers	$0	$46,240	$46,240	$92,480	**2.33**	**$193**
Rain Barrels	$0	$0	$315	$315	**0.00**	**$0**
Total	**$1,580**	**$113,500**	**$106,410**	**$221,490**	2.39	$155

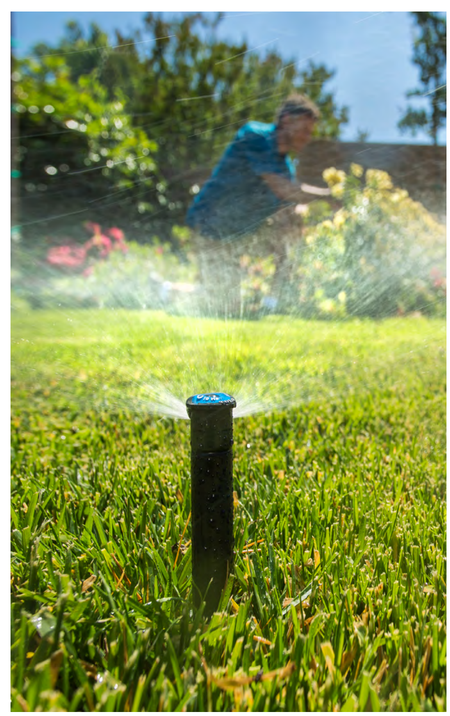
Commercial Device Cost and Cost Effectiveness

	Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
High Efficiency Toilets	$0	$92,340	$61,560	$153,900	**2.94**	**$122**
Smart Controllers	$0	$1,320	$3,080	$4,400	**1.40**	**$116**
Laminar Flow Restrictors	$0	$22,610	$22,610	$45,220	**0.52**	**$87**
Plumbing Flow Controls	$0	$1,800	$1,800	$3,600	**1.43**	**$119**
Total	**$0**	**$24,410**	**$24,410**	**$48,820**	0.55	$89

SoCal WaterSmart Potential Program Enhancements

Ease of participation, knowledge about rebates and motivation to install new projects all pose barriers to program implementation. Recommendations for addressing these barriers include:

- Continue to add funding to priority measures, specifically irrigation measures including smart controllers and high efficiency sprinkler nozzles.
- Conduct more aggressive outreach and marketing, specifically targeting large landscape properties and top users. Utilize the communication avenue most appropriate for targeted populations.
- Address the barriers to participation in standard rebate programs. The two main barriers to participation are complex rebate paperwork and the requirement to pay for the purchase up front before receiving the rebate.



Sprinkler Tune-up Program

The Sprinkler Tune-Up Program provides customers with a free landscape irrigation tune-up that includes:

- General landscape and irrigation audit.
- Recommendations for repairs and upgrades.
- Replacing and adjusting sprinkler heads and nozzles.
- Repairing valves and bad wiring.
- Controller programming and scheduling.
- Minor lateral irrigation line repairs.

Begun as a pilot in FY 2019, the Sprinkler Tune-up Program was operated by Conserv Inc, IEUA's existing vendor for the smart controller installation programs. Customers responded to the program so well that funding was exhausted within a few weeks. In FY 2020, IEUA and its member agencies expanded the program to meet higher demand and following a competitive bidding process, Conserv was awarded the new contract.

Tune-up Program Savings FY 2020

Annual Savings (AF)	Lifetime Savings (AF)
104	209

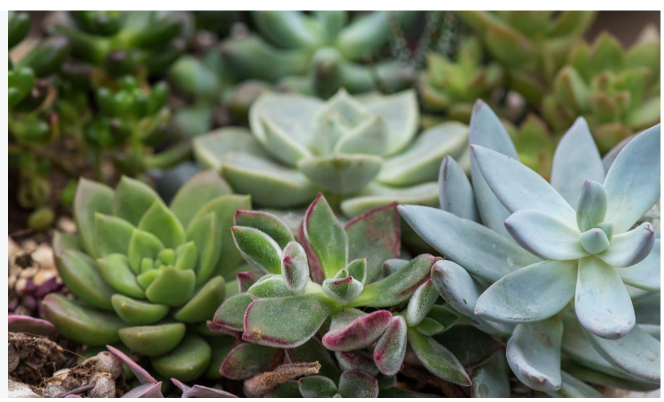
Why IEUA implements the Sprinkler Tune-up Program

1. Nearly all irrigation systems need repairs.
2. Repairs are necessary before efficiency upgrades are made to ensure new products will work as designed.
3. Measures are professionally installed by professional contractors ensuring quality installations and maximizing water savings.
4. Program participation increases customer interest in smart controllers and high efficiency nozzle installations, as well as additional repairs.
5. Customers become more connected with their landscape and irrigation systems and bring more mindfulness to their irrigation practices.

Sprinkler Tune-up Program FY 2020 Accomplishments

Increase activity **275%** year-over-year

Unprecedented customer demand



Sprinkler Tune-up Program Activity

Extremely high demand for the Sprinkler Tune-up Program has resulted in an increase in activity year-over-year. In fact, participation in this program is limited only by budget. If the budget were to increase, participation would increase.

	Tune-up Services
FY 2020	450
FY 2019	163

Sprinkler Tune-up Program FY 2020 Water Savings

Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
34,023,960	104	209

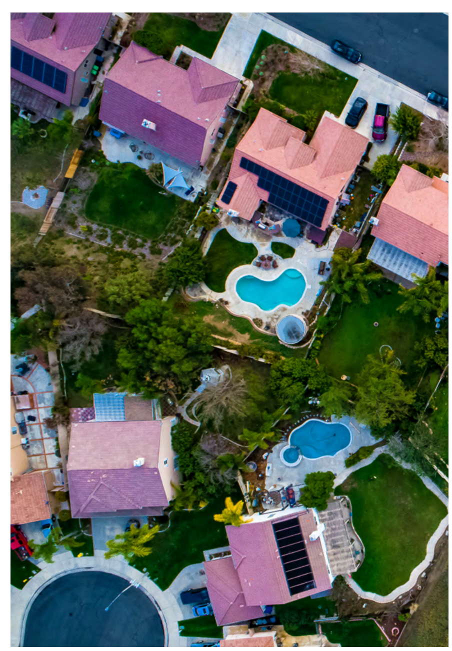
Sprinkler Tune-up Program FY 2020 Cost and Cost Effectiveness

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$0.00	$94,602.90	$69,786	$164,389	**1.15**	**$475**

Sprinkler Tune-up Program Potential Enhancements

Landscape irrigation systems are often neglected by consumers until they have a problem. By encouraging preventative maintenance, the Sprinkler Tune-up Program fills a void with expert help and often empowers customers to pay more attention to their systems. Recommendations to improve this program are:

- Consider targeting out-of-budget customers to improve cost effectiveness.
- Continue to participate in the Metropolitan-sponsored study to analyze the savings per repair and duration of those savings and modify program services based upon findings.



Small Controller Upgrade Program

The Small Controller Upgrade Program offers customers the free installation of smart controllers that use real-time weather data to adjust the frequency of watering. To participate, customers must attend an educational workshop prior to the installation to ensure they can program and maintain the controller.

Small Controller Program Savings FY 2020

Annual Savings (AF)	Lifetime Savings (AF)
20	196

Customers value smart controllers with remote access.

Strong synergy with tune-up services.

Why IEUA Implements the Small Controller Upgrade Program

Single family properties with irrigated landscapes typically have sprinkler controllers and spray heads, but most do not have the latest smart irrigation technologies that prevent overwatering.

Customers want to upgrade their sprinkler systems with the proven technology of smart controllers.

Professional contractors install the units, ensuring the quality of the work and initial programming.

There are a significant number of smaller lots that need upgrades in the service area.

Small Controller Upgrade Program FY 2020 Accomplishments

Almost **100%** increase in activity year-over-year

Shifted the educational workshop to an online video and transitioned the Program to contactless operation due to the COVID-19 pandemic.

Synergy **with Tune-up Program** allowed for increasing savings per site.

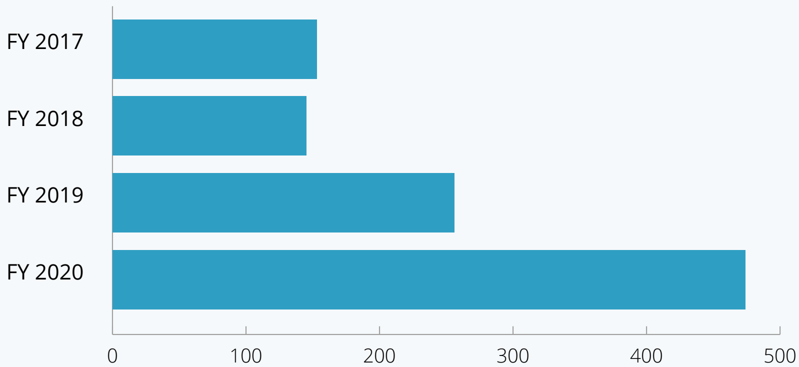
Conserv

Program vendor Conserv generated the video for free.

Small Controller Upgrade Program Activity

Despite the impacts of the COVID-19 health pandemic, activity in this program has continued to rise over the last year. This is due to how this program and Sprinkler Tune-up Program frequently work in concert to drive participation and water savings, as smart controllers were installed nearly 100% of the time an irrigation tune-up was done.

Smart Controller Installations
5 Year Comparison



Small Controller Upgrade Program FY 2020 Water Savings

Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
6,395,331	20	196

Small Controller Upgrade Program FY 2020 Cost and Cost Effectiveness

The Small Controller Upgrade Program is one of IEUA's more expensive programs. The per unit water savings for controllers at smaller properties is much lower than larger landscapes, thus driving the cost effectiveness down.

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$0.00	$186,171	$96,096	$282,267	**11.43**	**$949**

Small Controller Upgrade Potential Program Enhancements

The Small Controller Upgrade Program draws customers who are motivated to save water through technology and upgrade their irrigation systems. However, the program for smaller properties is not as cost effective as other programs. Following are some recommendations for consideration:

- Consider adding a co-payment to increase overall program cost effectiveness. However, cost-sharing may drive down participation, especially in times of economic uncertainty.
- Pair the program with the Sprinkler Tune-up program for increased convenience to the customer and improved savings.
- Target customers who exceed their water budgets for participation in this program. This is one way to increase cost effectiveness, rather than reaching out to the service area more broadly.

Large Landscape Retrofit Program

With its goal of reducing outdoor water use among top water users and properties with extensive landscapes, the Large Landscape Program provides the free installation of smart irrigation devices such as smart controllers and high efficiency sprinkler nozzles to eligible customers. The program targets customers who have a quarter of an acre or more of irrigated area or water usage of over 450,000 gallons per year per household.

Large Landscape Program Savings FY 2020

Annual Savings (AF)	Lifetime Savings (AF)
12	109

Why IEUA Implements the Large Landscape Retrofit Program

Properties with large irrigated areas typically have sprinkler controllers and spray heads, but most do not have the latest smart irrigation technologies.

Effective installations and programming are assured by professional installation by contractors.

Large landscape properties with very high outdoor water use present the best opportunities for greatest water savings due to their expansive acreage of irrigated lawns and gardens. In addition, upgrades to sites larger than a quarter of an acre are eligible for additional Metropolitan funding. This allows IEUA to leverage additional outside funding which increases overall program cost effectiveness.

The smart cloud-based irrigation controller appeals to customers.

Large Landscape Retrofit Program FY 2020 Accomplishments

Activity increased **100%** year-over-year

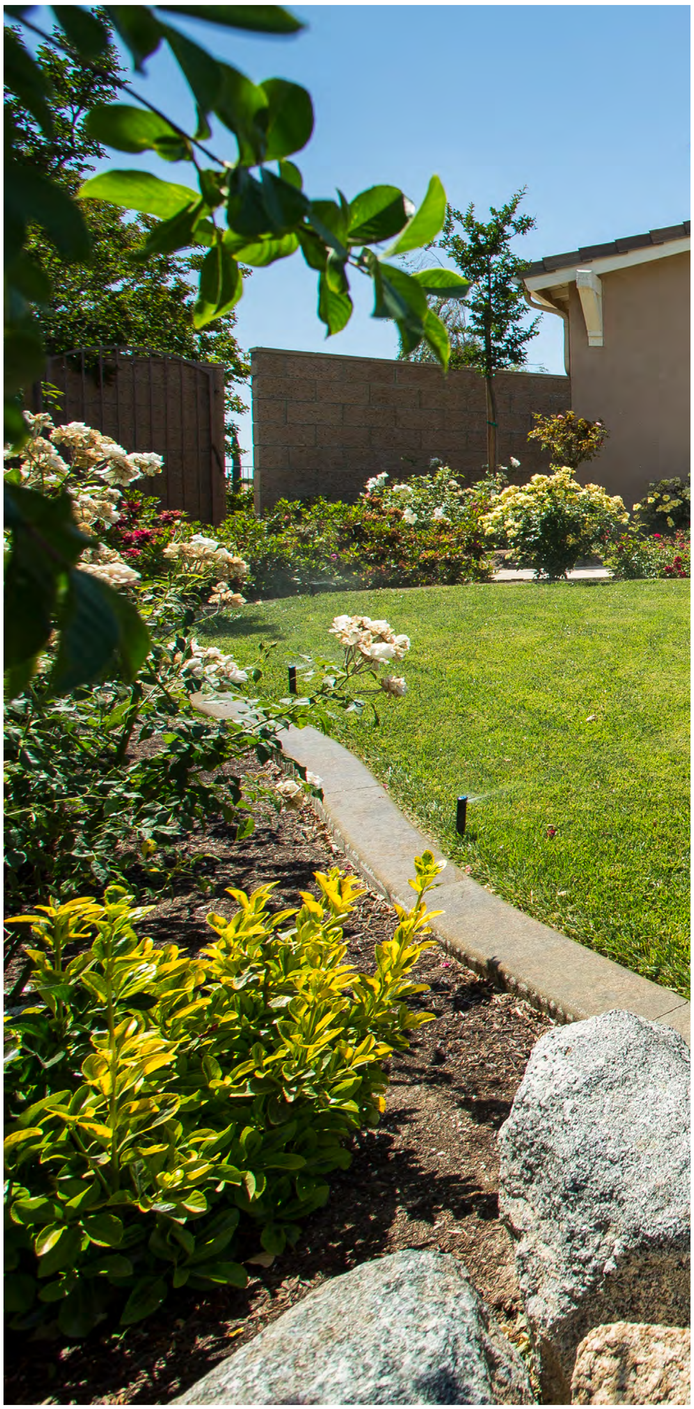
Synergy **with Tune-up Program** allowed for increasing savings per site.

Program closed and then re-opened successfully with contactless operations amid the COVID-19 pandemic.

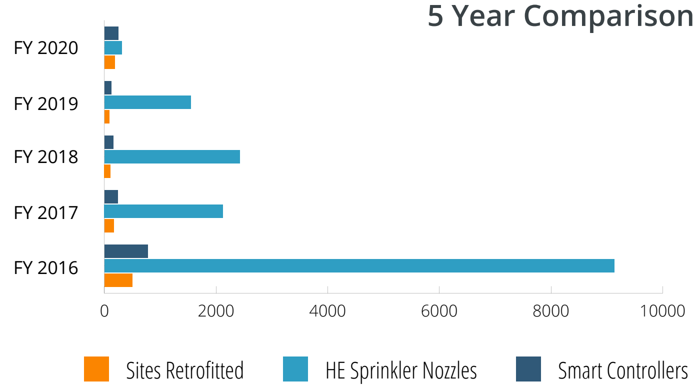
Large Landscape Retrofit Program Activity

Activity has decreased over the last five years and crept up a bit in FY 2020. This is probably due to the lack of extremely large properties in the IEUA service area as well as the general decline in all efficiency programs post drought.

The number of nozzles installed per site has gone down significantly over the last five years. The first iterations of the program allowed for replacement of nozzles with standard, non-high efficiency nozzles. This new requirement has likely lowered the number of nozzles replaced.



Large Landscape Retrofits
5 Year Comparison



	Smart Controllers	HE Sprinkler Nozzles	Sites Retrofitted
FY 2020	248	309	183
FY 2019	125	1,544	89
FY 2018	159	2,421	108
FY 2017	239	2,124	163
FY 2016	778	9,135	501

Large Landscape Retrofit Program FY 2020 Water Savings

Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
3,789,174	12	109

Large Landscape Retrofit Program FY 2020 Cost and Cost Effectiveness

The Large Landscape Program has a higher per acre-foot price than many other IEUA programs, however it is still below IEUA's avoided cost.

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$2,976	$71,143	$72,210	$146,329	**7.37**	**$650**

Large Landscape Retrofit Potential Program Enhancements

While the Large Landscape Program continues to be a cost effective and worthwhile program, it does present some opportunities for improvement. Some suggestions for future changes are:

- Offset the program's higher cost with a customer co-pay. This will boost the overall cost effectiveness of the program while increasing customer commitment to water savings.
- Offer virtual checkups to review programming of controllers and overall performance of the irrigation system to ensure the savings are sustained over time.
- Merge the Large Landscape and Sprinkler Tune-up programs to reduce costs and improve savings. Customers can receive all the necessary repairs and upgrades during one visit instead of two. In addition, the IEUA vendor provides a discount when both visits are done together.
- Market program as a Smart Timer Program to capitalize on customer interest in cloud-based controllers.

Pressure Regulating Valve Program

Launched as a pilot in June 2016, this program addresses problems caused by excessive water pressure on the customer side of the meter.

Pressure Regulating Valves (PRV) are installed at the meter, house, and/or at the point-of-connection for the irrigation system. These valves automatically reduce the high incoming water pressure from water mains to provide a lower, more functional pressure distribution. PRVs ensure that end-use plumbing fixtures and appliances operate at the intended flow rate and reduce the incidence of leaks.

EcoTechServices, Inc.℠

IEUA's program vendor, EcoTech Services, measures the property's water pressure and installs a PRV or adjusts the pressure if it exceeds a baseline of 80 pounds per square inch.

Pressure Regulation Program Savings FY 2020

Annual Savings (AF)	Lifetime Savings (AF)
4	45

Why IEUA Implements the Pressure Regulating Valve Program

Initial engineering savings assumptions showed significant savings of 163,000 per year per household.

Preliminary research indicated many customers' home plumbing systems had leaks and operated above the intended flow rate due to high pressure.

Pressure Regulating Valve Program FY 2020 Accomplishments

In FY 2020, Metropolitan completed a study of the water savings following the installation of PRVs at properties within the IEUA service area. This analysis of 484 installations found that 48% of properties saw an annual increase in water use or no change after household pressure was reduced. Below are data from this study. Based on the study findings, Metropolitan reduced its payment per PRV to $25 from an average of $240.

	# of Applicable Records	Avg Pre-Install Water Use (Units/yr.)	Avg Post-Install Water Use (Units/yr.)	Savings (%)	Avg Pressure Reduction (psi)	Avg Water Savings per Avg Pressure Reduction (Units/psi)
Total	484	238	232	2.50%	45	0.14

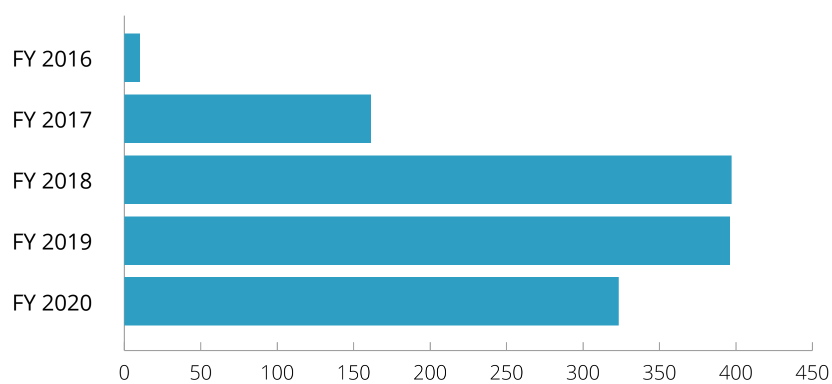
The savings found were unexpectedly low; however, the member agencies have elected to continue with the program because of its highly valued customer service. The program is now provided on a case-by-case basis for customer experiencing issues with pressure.

Pressure Regulating Valve Program Activity

Activity for the program remained stable through FY 2020. Due to limited outreach and the COVID-19 pandemic, activity will be significantly lower in FY 2021.

	Pressure Regulators installed
FY 2020	323
FY 2019	396
FY 2018	397
FY 2017	161
FY 2016	10

Pressure Regulating Valve Annual Activity
5 Year Comparison



Pressure Regulating Valve Program FY 2020 Water Savings

Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
1,452,667	4	45

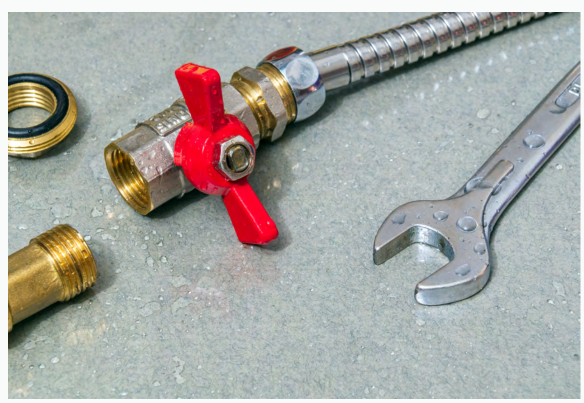
Pressure Regulating Valve Program FY 2020 Cost and Cost Effectiveness

At cost of $2,242 per acre-foot and a payback of 27.01 years, the Pressure Regulation Program is not cost effective.

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$0	$99,932	$77,242	$177,174	**27.01**	**$2,242**

Pressure Regulating Valve Potential Program Enhancements

While a study has shown the Pressure Regulation Program to be less cost-effective than other WUE programs, it still serves a useful customer service purpose for member agencies. Recommendations for the program are as follows:



- Continue to employ the program with the acknowledgement that its key value is as a customer service and educational opportunity.
- Leverage customer complaints about high water pressure leading to high water bills as a means for promoting other conservation measures.
- Target customers in those service areas known to be prone to high water pressure.

Leak Detection Incentive Program

Growing technology with strong customer interest

Smart leak detection devices can now monitor use, detect anomalies and alert homeowners of potential leaks. Some devices can even shut off water when abnormal use is detected, preventing or minimizing water damage in properties. A key benefit to water agencies is the water savings that accrues from these proactive programs. Recent studies of leak detection device programs by numerous water agencies show a reduction in water use of 9% to 18%. In those studies, approximately 70% of customers find leaks.

IEUA's program provides a point of purchase discount for the Flume Smart Water System. Customers install the Flume device themselves with set up taking less than 15 minutes. The technology works through a sensor that straps around the existing water meter and reads the magnetic signal coming from the meter's mechanical register. The system translates this signal to a flow rate in real-time and provides that data to customers via the Flume app on their smartphone.

Leak Detection Incentive Program Savings FY 2020

Annual Savings (AF)	Lifetime Savings (AF)
8	83

The Flume app provides real time alerts notifying customers of excessively high volume or long duration water usage. In addition, it allows customers to understand and manage their water usage through user-friendly visuals. Customers can track daily water usage and manage their use against a budget. A new version separates indoor and outdoor water usage, which could be extremely valuable in complying with the State Framework Legislation.

To purchase a Flume device, customers login into their respective member agency's branded portal, order the device and it is sent directly to their home. Customers receive an instant discount and pay the amount due directly to Flume. Currently, IEUA pays $160 and the customer pays $40 plus shipping and tax. The total retail cost is $200.

Why IEUA Implements the Leak Detection Incentive Program

The U.S. Environmental Protection Agency states that the average household's leaks can account for nearly 10,000 gallons of water wasted every year and that 10% of homes have leaks that waste 90 gallons or more per day.

Most leaks go undetected and customers are not aware they are wasting water for months until they receive an unexpectedly high water bill. Often, even the higher water bill goes unnoticed.

Leak Detection Incentive Program FY 2020 Accomplishments

Customer demand for this pilot program beginning in FY 2020 has been unprecedented and the program will be expanded in FY 2021. During the pilot program, Chino Hills expended their full allocation the same day their program went live. Currently three participating member agencies (Chino Hills, Monte Vista Water District, and Fontana Water company) offer devices on a first come first serve basis.

Leak Detection Incentive Program Activity

	Leak Detection Devices
FY 2020	111

Leak Detection Incentive Program FY 2020 Water Savings

Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
2,713,118	8	83

Leak Detection Incentive Program FY 2020 Cost and Cost Effectiveness

The Leak Detection Program is highly cost effective at $228 per acre-foot.

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$0	$19,017	$0	$19,017	**2.75**	**$228**

Leak Detection Incentive Potential Program Enhancements

With more attention being paid to leak detection by water agencies and customers, the Leak Detection Incentive Program offers a smart solution for member agencies seeking to achieve water savings and comply with new state regulations. Recommendations for this program are:

- Engage additional agencies to implement the program as a means to comply with new State Framework legislation.
- Educate agencies and meter departments on the safety and ease of installation/removal of Flume devices.
- Discuss with agencies how Flume can complement their current AMI systems providing additional customer benefits.
- Market utilizing vendor proven email format.
- Recommend the program for high bill complaints and target large users.

Landscape Evaluation and Audit Program

Program with the best payback at 0.3 months

Administered by the Chino Basin Water Conservation District, the Landscape Evaluation and Audit Program offers customers a free evaluation of their landscape and irrigation system. The program is offered to residential, commercial, institutional, and industrial customers.

LEAP Program Savings FY 2020

	Annual Savings (AF)	Lifetime Savings (AF)
Residential	9	47
Commercial	33	166
Total	**43**	**213**

The audit includes:

- A complete evaluation of the customer's irrigation system.
- Determination of the landscape's water needs.
- Generation of a water budget based on the local evapotranspiration and irrigated landscape area.

Customers also receive:

- Water-saving tips.
- Recommendations on how to improve overall efficiency of their irrigation system.
- Information on rebate opportunities.

Why IEUA Implements LEAP

Provides cost effective water savings.

Establishes a relationship with the customer.

Identifies site-specific water-saving opportunities.

Links customer with the most appropriate programs and services.

LEAP Accomplishments

- Despite a program hiatus from March to June due to health precautions related to the COVID-19 pandemic, the program saw increased activity in FY 2020.
- During the hiatus, CBWCD shifted LEAP's focus to CII customers to increase program cost effectiveness.

LEAP Activity

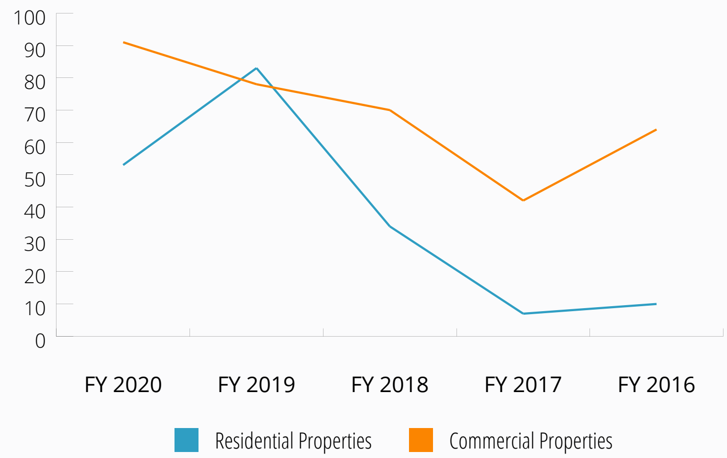
	Residential		Commercial	
	Properties	Acreage	Properties	Acreage
FY 2020	91	9.31	53	33.23

5 Year Comparison

	Residential Properties	Commercial Properties
FY 2020	91	53
FY 2019	78	83
FY 2018	70	34
FY 2017	42	7
FY 2016	64	10

LEAP Residential & Commercial Annual Activity

5 Year Comparison



LEAP FY 2020 Water Savings

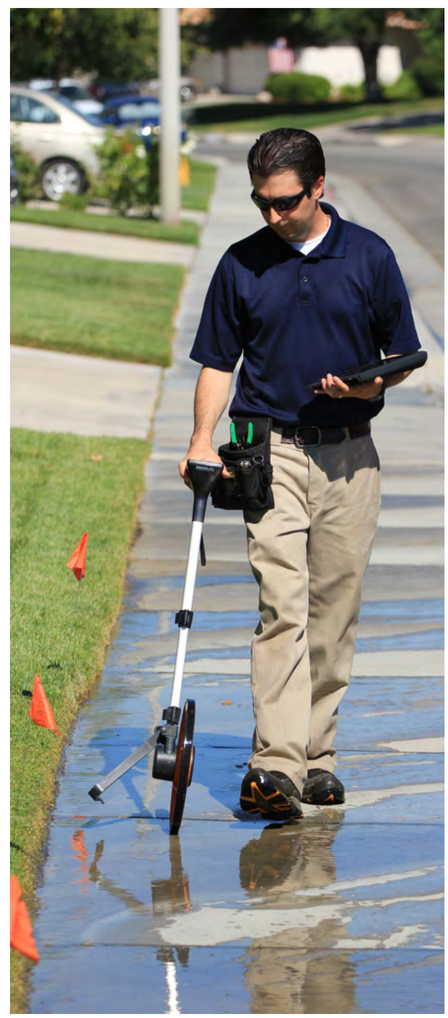
	Annual Savings (GPY)	Annual Savings (AF)	Lifetime Savings (AF)
Residential	3,033,673	9.31	18.62
Commercial	10,828,029	33.23	66.46

LEAP FY 2020 Cost and Cost Effectiveness

CBWCD administers the LEAP program at a minimal cost to IEUA. This is because CBWCD receives independent funding through a property tax collected from customers in its service area or "sphere of influence." Because CBWCD's service area overlaps with IEUA's, CBWCD provides LEAP without cost to program participants in the CBWCD service area. CBWCD only bills IEUA for customers who fall outside the CBWCD service area.

Outside Funding	IEUA Funding	MWD Funding	Total	IEUA Payback (Years)	IEUA Cost per Acre-foot
$15,937	$9,697	$9,810	$35,444	**0.30**	**$226**

LEAP Potential Program Enhancements



LEAP provides valuable information and expertise to homeowners, property managers, homeowner associations, institutional managers and others about ways they can use water more efficiently. Recommendations for this program include:

- Conduct personalized follow-up to verify recommendations have been implemented and to assist customers in making upgrades and receiving incentives will help ensure water savings.
- Continue focus on CII and HOA customers to improve cost effectiveness and increased savings.
- Work with retail member agencies to identify target list of top users.
- Offer single-family evaluations to high bill and large landscape out-of-budget customers.
- Provide comprehensive concierge-type customer service for CII and HOA customers to improve project completion rates. Examples include helping customers present projects to HOA Boards, receive bids, apply for incentives, etc.
- Consider new DIY online irrigation resources for homeowners.

Landscape Design Assistance Program

Through a collaboration between CBWCD, IEUA and its member agencies, customers can receive landscape design services free of charge. This service has a market value of approximately $500.

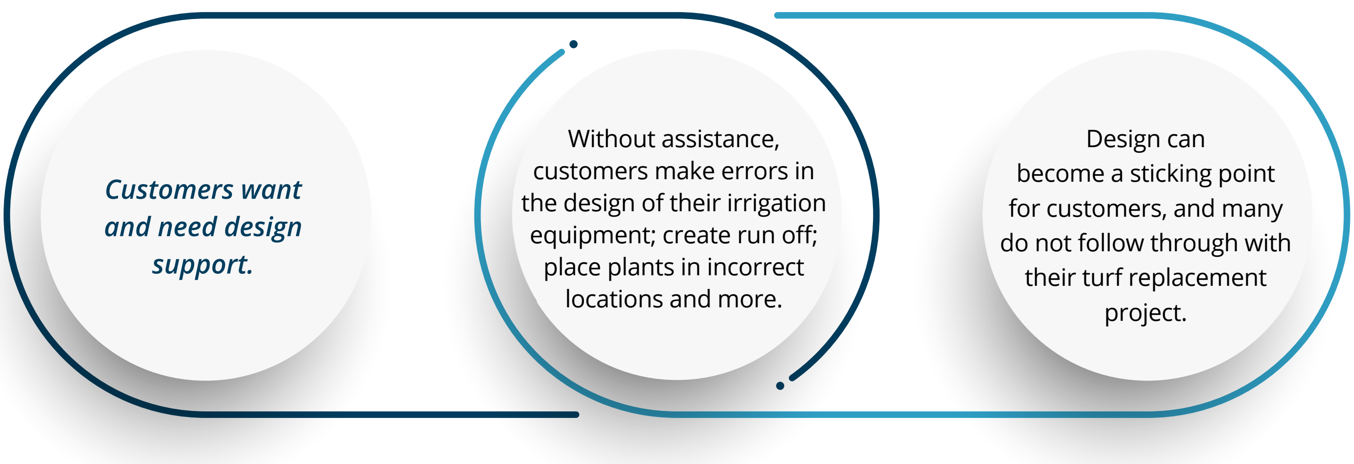
Participants are required to attend a two-hour "What You Need to Know Before Your Landscape Transformation" class before they become eligible to register for the Landscape Design Assistance Program. The class provides an overview of information people need to be successful with a turf replacement project, whether they are doing the work themselves or hiring a contractor.

After attending the class, a CBWCD staff member provides one-on-one consultations with participants. Customers discuss goals for their landscape area and then work with staff to create a computer-generated design for the landscape project.

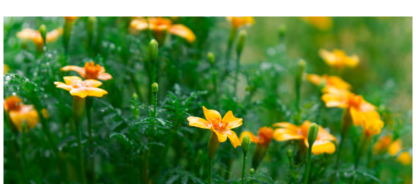
Following the consultation, CBWCD staff complete the design and create a custom plant list with the names and information about each plant selected for the designed landscape. Customers also receive a list of resources including sources for plants and other landscape materials.

Completed Designs	32
In Progress Projects	19
Completed Turf Replacement Projects	8
Percent Complete	25%

Why IEUA Implements the Landscape Design Assistance Program



Landscape Design Assistance Program Accomplishments



Turf replacement project completion rates increased to 25% in FY 2020. Two changes led to this success. First, commitment increased when customers were asked to provide a $100 refundable deposit for participation instead of $50. Second, CBWCD now requires attendance at one of its monthly Landscape Transformation Basics class. Not only did completion rates increase, but the program also drew 127 customers who had never participated in WUE programs before.

Landscape Design Assistance Program Activity and Costs

Like LEAP, CBWCD administers the Landscape Design Assistance Program at a minimal cost to IEUA. CBWCD receives independent funding for those customers in its service area. CBWCD only bills IEUA for customers who fall within the IEUA service area but outside the CBWCD service area.

Member Agency	Sites	Square Feet	Cost
City of Chino	4	7,535	$0
City of Chino Hills	6	7,115	$960
Cucamonga Valley Water District	4	7,818	$960
Fontana Water Company	1	2,307	$240
Monte Vista Water District	1	1,093	$0
City of Ontario	7	9,141	$0
San Antonio Water Company	0	0	$0
City of Upland	3	11,829	$0
Total	**26**	**46,838**	**$2,160**

Landscape Design Assistance Potential Program Enhancements

This popular program takes time and expertise to implement. Suggestions for streamlining it include:

- Create a template-based design system that allows participants to look at multiple design options online. Staff could then adapt the selected template to the customer's property dimensions and site conditions. Using a template base will dramatically increase efficiency in creating site-specific designs. This will allow expansion without hiring additional design staff.
- Develop a do-it-yourself option based on online resources that anyone can access at no costs. This resource would reach more customers and also reduce the number who need a customized design.

Landscape Workshops

In this series of courses residential landscapers learn the latest ways to reduce their property's landscape water usage. The courses cover information on the basics of efficient irrigation systems, the benefits of properly watering and fertilizing landscaping, landscape design techniques and plant selections. Workshop topics include:

- Drought Tolerant Plants
- Landscape Design
- Water Efficient Irrigation Systems
- Turf Removal
- Composting, Fertilizer, & Maintenance
- How the Drought Affects Your Water Timer
- Composting, Water Management & Pest Control

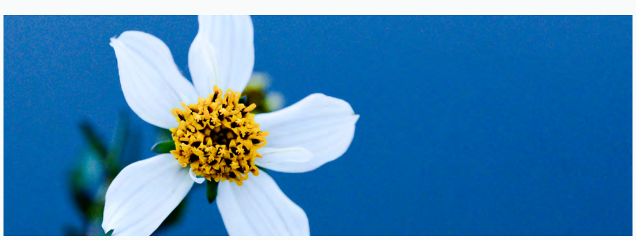
Landscape Workshop Results

Only four in-person workshops were held in FY 2020. This was due in part to the health precautions related to the COVID-19 pandemic, but also because of decline in customer demand.

Member Agency	Class Description	# of Classes
Cucamonga Valley Water District	Turf Removal and Plant Selection	2
City of Upland	Soil & Compost Native and Edible Gardens	2
	Total	4

Landscape Workshop Potential Enhancements

Free workshops bring value to customers and create opportunities to introduce people to a wide-range of water efficiencies they may not have considered before. Recommendations for improving these workshops include:



- Work with CBWCD to create a full range of remote learning webinars.
- Conduct personalized follow up with participants to understand customer needs and assist customers in making upgrades.
- More actively promote workshops among customers throughout the service area.

Locally Funded Programs

In addition to regionally administered programs, IEUA provides funding for local programs, activities and support tools. These programs include:

IEUA's Member Agency Administered Program

Initially launched in FY 2018, the Member Agency Administered Program provides funding for locally implemented WUE projects that can demonstrate water savings. Member agencies submit proposals that include a project scope of work, estimated water savings, and cost. Proposed projects may not be duplicative of existing regional programs. Over fiscal year 2020, there were no proposed projects to report.

IEUA's Best Management Practice Support Grant

Each year IEUA allocates funding to financially support member agency specific WUE activities. Each member is eligible to receive a $2,000 grant that supports a variety of activities and items such as special events, customer surveying, purchasing of outreach materials, conservation devices, and vehicle magnets. Over the last fiscal year, IEUA awarded four grants to member retail agencies representing a total of $8,000. Below is a list of the four member agency grants.

Retail Agency	Funding Description	Amount
City of Chino	Reusable Water Bottles	$2,000.00
City of Chino Hills	iPad Pro Tablet	$2,000.00
Cucamonga Valley Water District	Earth Day Event	$2,000.00
City of Ontario	WUE Bill Insert	$2,000.00
Total		$8,000.00

School and Education Programs

IEUA also provides regional education and outreach programs. Current regional education and outreach programs include the following:

National Theatre for Children

National Theatre for Children (NTC) delivers a behavior-driven, multiplatform, in-school water education curriculum for students and teachers in grade levels K-6. Through live theatre, a student curriculum and teacher guides, the custom-designed program teaches students about the uses of water, importance or water, ways to conserve, and ways water gets polluted. Over FY19/20, NTC visited 40 elementary schools throughout the IEUA service area and conducted 74 shows reaching 17,705 students.

Shows that Teach

Educational service provider Shows That Teach offers two fun, theatrical-style productions aimed at teaching K-6 students about water science, the value of water and the importance of conservation. The productions called "H2O, Where Did You Go?" and "Waterology" use skits, songs, visual aids, and audience participation to engage students and maximize retention. Over the last year, Shows That Teach conducted 23 performances, reaching 6,635 students at elementary schools throughout the service area and within the cities of Chino, Rancho Cucamonga, Fontana, and Ontario.

Below is the number of schools that participated in the NTC and Shows that Teach in FY 2020:

Program	# Schools	# Students	Funding
National Theatre for Children	40	17,705	$49,920
Shows That Teach	12	6,635	$11,450

Moving forward, the member agencies would like to focus efforts on only one school education program. They have chosen National Theatre for Children and eliminated Shows that Teach.

Garden in Every School® Program

Each year, the Garden in Every School® Program awards either a $4,500 grant per school for up to four schools for the establishment of a new water-wise garden or a $1,000 mini-grant to participating schools to support the sustainability of existing gardens. Due to the COVID-19 pandemic, the installation of schools gardens were placed on hold. Activity will resume in FY 2022.

Water Discovery Field Trip Program

Prior to the COVID-19 pandemic, IEUA provided free educational field trips to schools at the Chino Creek Wetlands and Educational Park to promote public understanding of the value of natural treatment wetlands, the creation of habitat for endangered/ sensitive species and environmental stewardship. During FY 2020, 1,734 Girl Scouts, Boy Scouts, elementary and high school students took part in the Water Discovery Field Trip Program prior to March when field trips were put on hold due to the pandemic.

Health precautions following the onset of the pandemic required that IEUA shift all education programs from in-person to virtual. In April 2020, IEUA launched Owlie's Virtual Adventures. The new virtual program features Wally's Water Conservation Camp, virtual tours, a series of At-Home Activities from the Water Discovery Field Trip Program, how-to videos on YouTube, and more.

The new virtual program, developed in-house by IEUA's External Affairs Department staff, demonstrates commitment to the goal of educating children about the importance of water and water conservation despite evolving conditions.

IEUA's Regional "*Water is Life*" Student Art/Poster Contest

Each year IEUA hosts its annual "Water is Life" Student Art/Poster Contest for grades K-12. The theme "Water is Life" has been used to help students express their creativity while focusing on the importance of water. In FY 2020, IEUA received over 600 entries. The top five winners from each category (K-5; 6-8; 9-12) were entered into Metropolitan's regional contest. Three winners were chosen from IEUA's service area: Cathy Zhang (1st grade-Allegiance STEAM Academy—Chino), Amy Esparza (10th grade-Chino Hills High School—Chino Hills), Armando Mora (11th grade-Chino Hills High School—Chino Hills). The winners were recognized at Metropolitan's awards ceremony in December 2020, and their artwork will be featured in the 2021 "Water is Life" calendar.

The Solar Cup™ Competition

Originally slated for May 2020 at Metropolitan's Lake Skinner reservoir in Temecula Valley, this year's Solar Cup™ competition had to transition to a virtual platform to meet health precautions related to the COVID-19 pandemic. The retooled Solar Cup™ 2.0 consisted of 12 virtual challenges designed to be completed as teams or individually.

Typically, the program lasts seven months and provides high school students with the opportunity to build, design and race solar-powered boats. The competition includes writing technical reports, creating social media campaigns and developing and implementing a strategy to build a boat powered by solar panels, traditionally concluding with a boat racing competition at Lake Skinner.

Solar Cup™ 2.0 challenges focused on virtual design and development, report writing, webinars, video scripting and development, and more. Teams also produced videos with uplifting messages for the public service message portion of the challenge.

The Chino Hills High School team co-sponsored by IEUA and the city of Chino Hills finished first with an overall score of 1332 out of 1300 by completing extra credit questions on some challenges.

IEUA co-sponsored three other teams for the original program prior to the program shift to a digital platform: Chino High School, co-sponsored with the city of Chino; Los Osos High School located in Rancho Cucamonga, co-sponsored with the Cucamonga Valley Water District; and Upland High School, co-sponsored with the city of Upland.

Community Outreach

IEUA participated in the following community outreach activities in coordination with member agencies:

- San Bernardino County Water Conference
- Landscape and Water Conservation Festival
- Chino Hills State of the Community Fair
- Smart Irrigation Month Hose Nozzle Giveaway

San Bernardino County Water Conference

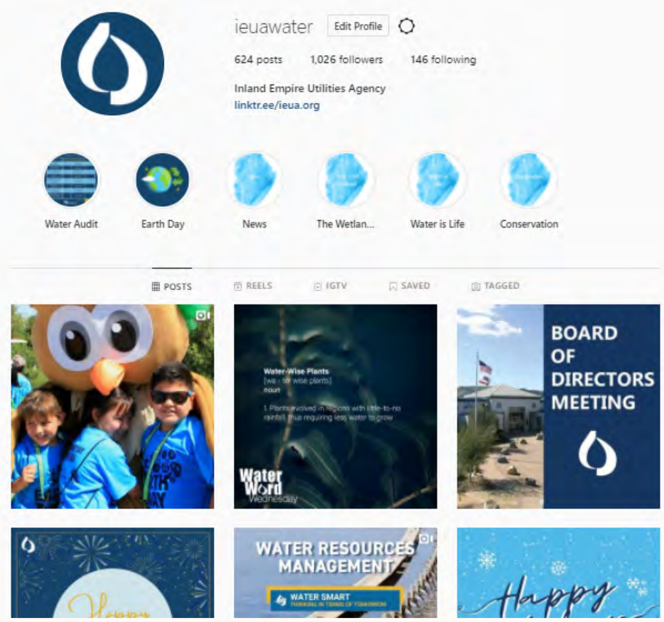
The annual San Bernardino County Water Conference was held on August 9, 2019, at the Ontario DoubleTree Hotel, where government officials, water experts, business leaders and the community discussed opportunities to overcome California's water challenges. The event was hosted by the Southern California Building Industry Association.

Landscape and Water Conservation Festival

The annual Landscape and Water Conservation Festival hosted by Chino Basin Water Conservation District, in partnership with IEUA and local water providers, was held on October 12, 2019 at the Waterwise Community Center in Montclair. The festival educates the public through free, hands-on activities, shows and workshops about the importance of using water wisely. They learn about where our water comes from and how it is used in everything including growing and cooking food, and the making of clothes and automobiles.

IEUA's Social Media Outreach

Communicating with our customers and the community means meeting them where they are. IEUA continues to offer updates via Facebook, YouTube, Twitter, Instagram, LinkedIn, and two educational blogs. IEUA hosts two Instagram pages, one for IEUA @IEUAWater and one for the Chino Creek Wetlands and Educational Park @chinocreekwetlands. The social media platforms allow IEUA to provide up-to-the-minute information on events, news, education programs, drought updates, water-wise tips, park updates and wildlife facts. Blog content is promoted via IEUA's social media channels and website.



Water Education - Water Awareness Committee

IEUA is a member of the Water Education Water Awareness Committee (WEWAC), which promotes the importance of water conservation in Southern California through coordination and participation in community outreach projects and providing grant funded opportunities for local educators. Projects include hosting booths at local resource and educational fairs, conducting water education workshops at local primary and secondary schools, offering grant and scholarship opportunities for educators and students, sponsoring an annual water conservation video contest, and sponsoring a broadcast media and digital art contest.

IEUA Water Softener Rebate Program

IEUA Water Softener Rebate Program aims to remove residential self-regenerating water softeners within the service area. Customers are incentivized through a rebate. During FY 2020, 17 water softeners have been removed and customers have received $7,325.10 in incentives. Over the course of the program, 901 water softeners have been removed and $523,249.95 in incentives has been paid to program participants. The removal of these devices will save approximately 17.12 acre-feet of water per year in addition to the removal of more than 208.13 tons of salt.

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT

6075 Kimball Ave, Chino CA 91708
909-993-1600 | www.ieua.org

Appendix K
Notice of Publication and Adoption Hearing

City of Chino Hills

14000 City Center Drive
Chino Hills, CA 91709
(909) 364-2600
www.chinohills.org

DATE: APRIL 8, 2021

TO: INTERESTED PARTIES

RE: NOTICE OF PREPARATION AND PUBLIC HEARING FOR THE CITY OF CHINO HILLS 2020 URBAN WATER MANAGEMENT PLAN (UWMP)

In compliance with the California Urban Water Management Planning Act, the City of Chino Hills is currently preparing an update to its Urban Water Management Plan (UWMP). The City encourages participation from your agency and the public in the process of updating this plan.

The UWMP is updated every five years and documents the City's planning efforts to ensure water supply sustainability over a wide range of conditions. The plan also contains system description, demand management measures, and water shortage contingency planning. The Final Draft of the 2020 UWMP can be reviewed Monday thru Thursday from 7:30 am to 4:30 pm at the City Clerk's office beginning on Tuesday, June 1, 2021. An electronic copy of the plan can be obtained from Mark Wiley, Utility Operations Manager, by email (mwiley@chinohills.org).

The City Council is scheduled to conduct a public hearing at the following time and location to receive comments on the Draft UWMP prior to final adoption.

Public Hearing Location:

Date:	Tuesday, June 22, 2021
Time:	7:00 pm
Location:	City of Chino Hills City Hall, Council Chambers 14000 City Center Drive Chino Hills, CA 91709

The City is interested in reviewing any comments subsequent to the release of the Draft. Please provide written comments to my attention no later than Friday, June 11, 2021. Oral comments are also encouraged at the hearing. Further information about submitting oral comments and attending the City Council meeting via Zoom or other approved manner will be posted on June 17, 2021 on the City website at: https://www.chinohills.org/60/Agendas-Minutes.

For more information or specific questions regarding the 2020 UWMP, please contact Mark Wiley at (909) 364-2854.

Sincerely,

Daniel Bobadilla, P.E.
Director of Public Works/ City Engineer

PROOF OF PUBLICATION

STATE OF CALIFORNIA
County of San Bernardino

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the publisher of the CHINO CHAMPION, a newspaper of general circulation, printed and published weekly in the City of Chino, County of San Bernardino, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of San Bernardino, State of California, under the date of August 5, 1952, Case Number 73453; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

April 3,17, all in the year **2021**

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Chino, California, this **17th day** of **April 2021**

(Signature)

Suzanne Rojas

RECEIVED
APR 22 2021
ACCOUNTS PAYABLE

Champion

Serving the Chino Valley and Chino Hills

RECEIVED
APR 28 2021
ACCOUNTS PAYABLE

9th & D Streets • P.O. Box 607
Chino, California 91708
Phone: (909) 628-5501

Adjudicated August 5, 1952
Case No. 73453

This space is for the County Clerk's Filing Stamp

NOTICE OF PUBLIC HEARING TO ADOPT A RESOLUTION RELATED TO THE CITY OF CHINO HILLS URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the City Council of the City of Chino Hills will hold a Public Hearing on June 22, 2021, 7:00 p.m. telephonically through Zoom and broadcast live on the City's website, pursuant to Section 3 of Executive Order N-29-20, issued by Governor Newsom on March 17, 2020, to receive public comments and to consider adopting a resolution related to the proposed 2020 Urban Water Management Plan (UWMP).

In compliance with the California Urban Water Management Planning Act, the City of Chino Hills is currently preparing an updated UWMP. The Final Draft of the 2020 UWMP can be reviewed beginning Tuesday, June 1, 2021. An electronic copy of the plan can be obtained from Mark Wiley, Utility Operations Manager, by email (mwiley@chinohills.org).

ALL INTERESTED PARTIES are invited and encourage to submit comments in writing beforehand or may give oral testimony at the public hearing regarding the proposed UWMP. Please direct any correspondence and all written comments to the City Clerk, City of Chino Hills, 14000 City Center Drive, Chino Hills, CA 91709.

NOTICE IS FURTHER GIVEN that the City Council meeting and public hearing will be held telephonically through Zoom and broadcast live on the City's website. To ensure the health and safety of the public, the Council Chambers will not be open to the public for the meeting. Further information and instructions about joining the meeting and submitting comments via Zoom, will be posted on June 17, 2021 on the City website at: https://www.chinohills.org/60/Agendas-Minutes.

NOTICE IS HEREBY FURTHER GIVEN that if you challenge the above described action in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

ADDITIONAL INFORMATION regarding the proposed 2020 Urban Water Management Plan is available by contacting Mark Wiley at (909) 364-2800, Monday through Thursday 7:30 a.m. to 4:30 p.m.

Dated: April 7, 2021
s/Cheryl Balz, City Clerk
Publish: Chino Hills Champion
Saturday, April 10, 2021
Saturday, April 17, 2021
Chino Valley Champion 175-21

LOOK WHAT CHAMPION READERS NOTICE:

- Trustee Sales • Petitions
- Public Notice • Bulk Sale
- Fictitious Business Names

City of Chino Hills

NOTICE OF PUBLIC HEARING TO ADOPT A RESOLUTION RELATED TO THE CITY OF CHINO HILLS URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the City Council of the City of Chino Hills will hold a Public Hearing on June 22, 2021, 7:00 p.m. telephonically through Zoom and broadcast live on the City's website, pursuant to Section 3 of Executive Order N-29-20, issued by Governor Newsom on March 17, 2020, to receive public comments and to consider adopting a resolution related to the proposed 2020 Urban Water Management Plan (UWMP).

In compliance with the California Urban Water Management Planning Act, the City of Chino Hills is currently preparing an updated UWMP. The Final Draft of the 2020 UWMP can be reviewed beginning Tuesday, June 1, 2021. An electronic copy of the plan can be obtained from Mark Wiley, Utility Operations Manager, by email (mwiley@chinohills.org).

ALL INTERESTED PARTIES are invited and encourage to submit comments in writing beforehand or may give oral testimony at the public hearing regarding the proposed UWMP. Please direct any correspondence and all written comments to the City Clerk, City of Chino Hills, 14000 City Center Drive, Chino Hills, CA 91709.

NOTICE IS FURTHER GIVEN that the City Council meeting and public hearing will be held telephonically through Zoom and broadcast live on the City's website. To ensure the health and safety of the public, the Council Chambers will not be open to the public for the meeting. Further information and instructions about joining the meeting and submitting comments via Zoom, will be posted on June 17, 2021 on the City website at: https://www.chinohills.org/60/Agendas-Minutes.

NOTICE IS HEREBY FURTHER GIVEN that if you challenge the above described action in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

ADDITIONAL INFORMATION regarding the proposed 2020 Urban Water Management Plan is available by contacting Mark Wiley at (909) 364-2800, Monday through Thursday 7:30 a.m. to 4:30 p.m.

Dated: April 7, 2021
s/Cheryl Balz, City Clerk
Publish: Chino Hills Champion
Saturday, April 10, 2021
Saturday, April 17, 2021
Chino Valley Champion 175-21

Name Change

ORDER TO SHOW CAUSE FOR CHANGE OF NAME CASE NUMBER: CIVSB2104354

TO ALL INTERESTED PERSONS:

City of Chino Hills

NOTICE OF PUBLIC HEARING MASTER SCHEDULE OF FEES, FINES AND PENALTIES

NOTICE IS HEREBY GIVEN that the City Council of the City of Chino Hills will hold a public hearing on April 27, 2021, 7:00 p.m., telephonically through Zoom and broadcast live on the City's website, pursuant to Section 3 of Executive Order N-29-20, issued by Governor Newsom on March 17, 2020, to consider adopting a resolution modifying the City's Master Schedule of Fees, Fines and Penalties.

The purpose of the meeting will be to receive public comment relative to the proposed resolution amending the City of Chino Hills Master Schedule of Fees, Fines and Penalties establishing new and revised fees charged for City services.

A copy of the proposed fee schedule and the data indicating the amount of cost, or estimated cost, required to provide the services for which the fees are levied and the revenue sources anticipated to provide the service, including General Fund revenues, will be made available for public review on Monday, April 12, 2021, electronically via this link https://www.chinohills.org/DocumentCenter/View/23556/Master-Schedule-of-Fees-Fines-and-Penalties-Effective-July-1-2021 or by appointment at the Office of the City Clerk, 14000 City Center Drive, Chino Hills, and thereafter Monday through Thursday from 7:30 a.m. to 5:30 p.m. by calling (909) 364-2620 to schedule an appointment.

NOTICE IS HEREBY FURTHER GIVEN that if you challenge the above described action in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

ALL PERSONS INTERESTED are invited to comment remotely as follows:

Join from a PC, Mac, iPad, iPhone, or Android device:

Please use this URL https://zoom.us/j/2685759176

PLEASE NOTE: If joining the meeting via Zoom, your phone number will appear on the screen.

Or join by phone: *67 1-669-900-6833
Enter Meeting ID: 268 575 9176

If you want to comment during the public comment portion of the agenda, Press *9 and we will select you from the meeting cue.

Please be advised that joining the meeting may display your telephone number or computer name. Options are available to anonymize this information. Contact the City Clerk's office if you need help with this option.

To give the City Clerk adequate time to print out your comments for consideration at the meeting, please submit your written comments prior to 5:30 p.m.; or if you are unable to email, please call the City Clerk's Office at

City of Chino Hills

NOTICE OF PUBLIC HEARING

DATE: Tuesday, April 20, 2021
TIME: 7:00 p.m.
PLACE: This hearing will NOT be held in the City Council Chambers but rather telephonically and electronically through Zoom to ensure the public health and safety by limiting human contact that could spread the COVID-19 virus, pursuant to Section 3 of Executive Order N-29-20, issued by Governor Newsom on March 17, 2020. See instructions below.

NOTICE IS HEREBY GIVEN that the Planning Commission of the City of Chino Hills will hold a public hearing at the time and place indicated above to consider approval of Tentative Parcel Map No. 20181.

PROJECT DESCRIPTION: The applicant is proposing to vacate Vravis Circle and a portion of Old Carbon Canyon Road, both of which are public road easements. The application will also include a reconfiguration of two parcels.

PROJECT LOCATION: The project is located at Old Carbon Canyon Road and Vravis Circle.

NOTICE IS HEREBY FURTHER GIVEN that Staff has determined that the proposed project is exempt from the California Environmental Quality Act (CEQA) pursuant to Section 15305 Minor Alterations in Land Use Limitations Subsection (a) of the CEQA Guidelines. The proposed project consists of vacating public road easements and reconfiguring two lots. No subdivision is proposed. Further, staff has determined with certainty that the project does not have the potential to cause a negative impact on the environment pursuant to CEQA Guidelines Section 15061(b)(3), the "common sense" exemption.

NOTICE IS HEREBY FURTHER GIVEN that if you challenge the above described project in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the Planning Commission at, or prior to, the public hearing.

ALL PERSONS INTERESTED are invited to comment remotely as follows:

Join from a PC, Mac, iPad, iPhone, or Android device:

Please use this URL https://us02web.zoom.us/j/87939548952.

PLEASE NOTE: If joining the meeting via Zoom, your phone number will appear on the screen. If you do not wish for your name to appear on the screen, then use the drop-down menu and click on "rename" to rename yourself to be anonymous. Contact the Planning Commission Secretary if you need help with this option.

Or join by phone:
*67 1-669-900-6833
Enter Meeting ID: 879 3954 8952

If you want to comment during the public comment portion of the agenda, Press *9 and we will select you from the meeting cue.

To give the Planning Commission

City of Chino

SUMMARY FOR PUBLICATION - ORDINANCE NOS. 2021-001 AND 2021-002

Ordinance No. 2021-001:
AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF CHINO, CALIFORNIA, AMENDING SELECTED PROVISIONS OF THE ZONING CODE (TITLE 20 OF THE MUNICIPAL CODE) OF THE CITY OF CHINO. PL20-0045 (ZONE ORDINANCE AMENDMENT).

Ordinance No. 2021-002:
AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF CHINO, CALIFORNIA, REPEALING AND REPLACING CHAPTER 20.22 OF THE CHINO ZONING CODE REGARDING THE REGULATION OF WIRELESS TELECOMMUNICATIONS FACILITIES ON PRIVATE PROPERTY. PL20-0045 (ZONE ORDINANCE AMENDMENT).

Ordinance Nos. 2021-001 and 2021-002 consist of an amendment to Title 20 (Zoning) of the Chino Municipal Code consisting of modifications and additions to Chapter 20.02 (Interpretation of the Zoning Code), Chapter 20.04 (Residential Zoning Districts), Chapter 20.05 (Mixed Use Zoning Districts), Chapter 20.06 (Commercial Zoning Districts), Chapter 20.07 (Industrial Zoning Districts), Chapter 20.08 (Agriculture, Open Space, and Public Zoning Districts), Chapter 20.11 (Accessory Structures), Chapter 20.12 (Temporary Uses and Structures), Chapter 20.18 (Parking), Chapter 20.21 (Standards for Specific Land Uses), Chapter 20.22 (Telecommunications Facilities), Chapter 20.23 (Administration), and Chapter 20.24 (Glossary).

Ordinance Nos. 2021 001 and 2021-002 were adopted by the Chino City Council on April 6, 2021 by the following votes:

AYES: Ulloa, Lucio, Comstock, Flores
NOES: None
ABSENT: None

A copy of the full text of the Ordinance is available in the office of the City Clerk of the City of Chino.

Angela Robles, City Clerk
Publish: April 10, 2021
Chino Valley Champion 171-21

Bulk Sale and Intention to Transfer of Alcoholic Beverage License

NOTICE TO CREDITORS OF BULK SALE AND OF INTENTION TO TRANSFER ALCOHOLIC BEVERAGE LICENSE(S)
(UCC Sec. 6105 et seq. and B & P 24073 et seq.)
Escrow No. 21-3101-KK

NOTICE IS HEREBY GIVEN that a bulk sale of assets and a transfer of alcoholic beverage license(s) is about to be made. The name(s) and business address(es) of the Seller(s)/Licensee(s) are: BABYPIG, INC, 3277 GRAND AVENUE, SUITE H CHINO HILLS, CA 91709

Doing Business as: LOVE LETTER CHINO HILLS

All other business names(s) and address(es) used by the Seller(s)/Licensee(s) within the past three years, as stated by the Seller(s)/Licensee(s), is/are:

The name(s) and address of the Buyer(s)/Applicant(s) is/are: NARI FOOD INC, 5434 LA CRESCENTA AVENUE LA CRESCENTA, CA 91214

The assets being sold are generally described as: FURNITURE, FIXTURES, EQUIPMENT, TOOLS, GOODWILL, TRADENAME, LEASEHOLD INTEREST, LEASEHOLD IMPROVEMENTS, ALL TRANSFERABLE PERMITS AND LICENSES, AND INVENTORY OF STOCK IN TRADE and is/are located at: 3277 GRAND AVENUE, SUITE H, CHINO HILLS, CA 91709

The type of license and license no(s)to be transferred is/are: ON-SALE BEER & WINE EATING PLACE 41-597727 And are now issued for the premises located at: SAME

The bulk sale and transfer of alcoholic beverage license(s) is/are intended to be consummated at the office of: ACE ESCROW INC, 1725 S. NOGALES STREET #104, ROWLAND HEIGHTS, CA 91748 and the anticipated sale/transfer is MAY 6, 2021

The purchase price or consideration in connection with the sale of the business and transfer of the license, is the sum of $310,000.00, including inventory estimated at $10,000.00, which consists of the following: DESCRIPTION, AMOUNT: CASH $110,000.00; NOTE $200,000.00; ALLOCATION-SUB TOTAL $310,000.00; ALLOCATION TOTAL $310,000.00

It has been agreed between the Seller(s)/

Petition to Administer

NOTICE OF PETITION TO ADMINISTER ESTATE OF: KELLY MARTIN SMITH CASE NO. PROPS2100368

To all heirs, beneficiaries, creditors, contingent creditors, and persons who may otherwise be interested in the WILL or estate, or both of KELLY MARTIN SMITH.

A PETITION FOR PROBATE has been filed by BRITTANEY SMITH AND BRADLEY SMITH in the Superior Court of California, County of SAN BERNARDINO.

THE PETITION FOR PROBATE requests that BRITTANEY SMITH AND BRADLEY SMITH be appointed as personal representative to administer the estate of the decedent.

THE PETITION requests authority to administer the estate under the Independent Administration of Estates Act. (This authority will allow the personal representative to take many actions without obtaining court approval. Before taking certain very important actions, however, the personal representative will be required to give notice to interested persons unless they have waived notice or consented to the proposed action.) The independent administration authority will be granted unless an interested person files an objection to the petition and shows good cause why the court should not grant the authority.

A HEARING on the petition will be held in this court as follows: 05/19/21 at 9:00AM in Dept. S37 located at 247 W. THIRD STREET, SAN BERNARDINO, CA 92415

IF YOU OBJECT to the granting of the petition, you should appear at the hearing and state your objections or file written objections with the court before the hearing. Your appearance may be in person or by your attorney.

IF YOU ARE A CREDITOR or a contingent creditor of the decedent, you must file your claim with the court and mail a copy to the personal representative appointed by the court within the later of either (1) four months from the date of first issuance of letters to a general personal representative, as defined in section 58(b) of the California Probate Code, or (2) 60 days from the date of mailing or personal delivery to you of a notice under section 9052 of the California Probate Code.

Other California statutes and legal authority may affect your rights as a creditor. You may want to consult with an attorney knowledgeable in California law.

YOU MAY EXAMINE the file kept by the court. If you are a person interested in the estate, you may file with the court a Request for Special Notice (form DE-154) of the filing of an inventory and appraisal of estate assets or of any petition or account as provided in Probate Code section 1250. A Request for Special Notice form is available from the court clerk.

Attorney for Petitioner
FRED EDWARDS - SBN 317309
THE LAW OFFICE OF FRED W. EDWARDS

PUBLIC NOTICES:
Look what Champion readers notice:

Fictitious Business Names • Petition to Administer • Name Change • Lien Sales • Public Notice • Bulk Sales

City of Chino Hills

NOTICE OF PUBLIC HEARING TO ADOPT A RESOLUTION RELATED TO THE CITY OF CHINO HILLS URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the City Council of the City of Chino Hills will hold a Public Hearing on June 22, 2021, 7:00 p.m. telephonically through Zoom and broadcast live on the City's website, pursuant to Section 3 of Executive Order N-29-20, issued by Governor Newsom on March 17, 2020, to receive public comments and to consider adopting a resolution related to the proposed 2020 Urban Water Management Plan (UWMP).

In compliance with the California Urban Water Management Planning Act, the City of Chino Hills is currently preparing an updated UWMP. The Final Draft of the 2020 UWMP can be reviewed beginning Tuesday, June 1, 2021. An electronic copy of the plan can be obtained from Mark Wiley, Utility Operations Manager, by email (mwiley@chinohills.org).

ALL INTERESTED PARTIES are invited and encourage to submit comments in writing beforehand or may give oral testimony at the public hearing regarding the proposed UWMP. Please direct any correspondence and all written comments to the City Clerk, City of Chino Hills, 14000 City Center Drive, Chino Hills, CA 91709.

NOTICE IS FURTHER GIVEN that the City Council meeting and public hearing will be held telephonically through Zoom and broadcast live on the City's website. To ensure the health and safety of the public, the Council Chambers will not be open to the public for the meeting. Further information and instructions about joining the meeting and submitting comments via Zoom, will be posted on June 17, 2021 on the City website at: https://www.chinohills.org/60/Agendas-Minutes.

NOTICE IS HEREBY FURTHER GIVEN that if you challenge the above described action in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

ADDITIONAL INFORMATION regarding the proposed 2020 Urban Water Management Plan is available by contacting Mark Wiley at (909) 364-2800, Monday through Thursday 7:30 a.m. to 4:30 p.m.

Dated: April 7, 2021
s/Cheryl Balz, City Clerk
Publish: Chino Hills Champion
Saturday, April 10, 2021
Saturday, April 17, 2021
Chino Valley Champion 175-21

Lien Sale

City of Chino Hills

NOTICE OF PUBLIC HEARING MASTER SCHEDULE OF FEES, FINES AND PENALTIES

NOTICE IS HEREBY GIVEN that the City Council of the City of Chino Hills will hold a public hearing on April 27, 2021, 7:00 p.m., telephonically through Zoom and broadcast live on the City's website, pursuant to Section 3 of Executive Order N-29-20, issued by Governor Newsom on March 17, 2020, to consider adopting a resolution modifying the City's Master Schedule of Fees, Fines and Penalties.

The purpose of the meeting will be to receive public comment relative to the proposed resolution amending the City of Chino Hills Master Schedule of Fees, Fines and Penalties establishing new and revised fees charged for City services.

A copy of the proposed fee schedule and the data indicating the amount of cost, or estimated cost, required to provide the services for which the fees are levied and the revenue sources anticipated to provide the service, including General Fund revenues, will be made available for public review on Monday, April 12, 2021, electronically via this link https://www.chinohills.org/DocumentCenter/View/23556/Master-Schedule-of-Fees-Fines-and-Penalties-Effective-July-1-2021 or by appointment at the Office of the City Clerk, 14000 City Center Drive, Chino Hills, and thereafter Monday through Thursday from 7:30 a.m. to 5:30 p.m. by calling (909) 364-2620 to schedule an appointment.

NOTICE IS HEREBY FURTHER GIVEN that if you challenge the above described action in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

ALL PERSONS INTERESTED are invited to comment remotely as follows:

Join from a PC, Mac, iPad, iPhone, or Android device:

Please use this URL https://zoom.us/j/2685759176

PLEASE NOTE: If joining the meeting via Zoom, your phone number will appear on the screen.

Or join by phone: *67 1-669-900-6833
Enter Meeting ID: 268 575 9176

If you want to comment during the public comment portion of the agenda, Press *9 and we will select you from the meeting cue.

Please be advised that joining the meeting may display your telephone number or computer name. Options are available to anonymize this information. Contact the City Clerk's office if you need help with this option.

To give the City Clerk adequate time to print out your comments for consideration at the meeting, please

Petition to Administer

**NOTICE OF PETITION TO ADMINISTER ESTATE OF: LISA WEST AKA LISA ANN WEST AKA LISA A. WEST
CASE NO. PROPS2100342**

To all heirs, beneficiaries, creditors, contingent creditors, and persons who may otherwise be interested in the WILL or estate, or both of LISA WEST AKA LISA ANN WEST AKA LISA A. WEST.

A PETITION FOR PROBATE has been filed by SUMMER RUBIO in the Superior Court of California, County of SAN BERNARDINO.

THE PETITION FOR PROBATE requests that SUMMER RUBIO be appointed as personal representative to administer the estate of the decedent.

THE PETITION requests authority to administer the estate under the Independent Administration of Estates Act. (This authority will allow the personal representative to take many actions without obtaining court approval. Before taking certain very important actions, however, the personal representative will be required to give notice to interested persons unless they have waived notice or consented to the proposed action.) The independent administration authority will be granted unless an interested person files an objection to the petition and shows good cause why the court should not grant the authority.

A HEARING on the petition will be held in this court as follows: 04/29/21 at 9:00AM in Dept. S35 located at 247 W. 3RD STREET, SAN BERNARDINO, CA 92415

IF YOU OBJECT to the granting of the petition, you should appear at the hearing and state your objections or file written objections with the court before the hearing. Your appearance may be in person or by your attorney.

IF YOU ARE A CREDITOR or a contingent creditor of the decedent, you must file your claim with the court and mail a copy to the personal representative appointed by the court within the later of either (1) four months from the date of first issuance of letters to a general personal representative, as defined in section 58(b) of the California Probate Code, or (2) 60 days from the date of mailing or personal delivery to you of a notice under section 9052 of the California Probate Code.

Other California statutes and legal authority may affect your rights as a creditor. You may want to consult with an attorney knowledgeable in California law.

YOU MAY EXAMINE the file kept by the court. If you are a person interested in the estate, you may file with the court a Request for Special Notice (form DE-154) of the filing of an inventory and appraisal of estate assets or of any petition or account as provided in Probate Code section 1250. A Request for Special Notice

Petition to Administer

**NOTICE OF PETITION TO ADMINISTER ESTATE OF: KELLY MARTIN SMITH
CASE NO. PROPS2100368**

To all heirs, beneficiaries, creditors, contingent creditors, and persons who may otherwise be interested in the WILL or estate, or both of KELLY MARTIN SMITH.

A PETITION FOR PROBATE has been filed by BRITTANEY SMITH AND BRADLEY SMITH in the Superior Court of California, County of SAN BERNARDINO.

THE PETITION FOR PROBATE requests that BRITTANEY SMITH AND BRADLEY SMITH be appointed as personal representative to administer the estate of the decedent.

THE PETITION requests authority to administer the estate under the Independent Administration of Estates Act. (This authority will allow the personal representative to take many actions without obtaining court approval. Before taking certain very important actions, however, the personal representative will be required to give notice to interested persons unless they have waived notice or consented to the proposed action.) The independent administration authority will be granted unless an interested person files an objection to the petition and shows good cause why the court should not grant the authority.

A HEARING on the petition will be held in this court as follows: 05/19/21 at 9:00AM in Dept. S37 located at 247 W. THIRD STREET, SAN BERNARDINO, CA 92415

IF YOU OBJECT to the granting of the petition, you should appear at the hearing and state your objections or file written objections with the court before the hearing. Your appearance may be in person or by your attorney.

IF YOU ARE A CREDITOR or a contingent creditor of the decedent, you must file your claim with the court and mail a copy to the personal representative appointed by the court within the later of either (1) four months from the date of first issuance of letters to a general personal representative, as defined in section 58(b) of the California Probate Code, or (2) 60 days from the date of mailing or personal delivery to you of a notice under section 9052 of the California Probate Code.

Other California statutes and legal authority may affect your rights as a creditor. You may want to consult with an attorney knowledgeable in California law.

YOU MAY EXAMINE the file kept by the court. If you are a person interested in the estate, you may file with the court a Request for Special Notice (form DE-154) of the filing of an inventory and appraisal of estate assets or of any petition or account as provided in Probate Code section 1250. A Request for Special Notice form is available from the court clerk.

City of Chino Hills

NOTICE OF 30-DAY PUBLIC REVIEW

CITY OF CHINO HILLS COMMUNITY DEVELOPMENT BLOCK GRANT DRAFT 2021-2022 ANNUAL ACTION PLAN

NOTICE IS HEREBY GIVEN tha the City of Chino Hills has prepared it Draft 2021-2022 Annual Action Plan for the Community Development Block Grant Program (CDBG).

The Annual Action Plan identifie community development activitie designed to address the needs of low and moderate-income persons in the City. The 2021-2022 Annual Action Plan includes the proposed budget fo CDBG funds, the Federal Application for Assistance, and a discussion of actions the City will undertak during the program year regarding homelessness and anti-poverty.

For fiscal year beginning July 1, 2021 and ending June 30, 2022 the City of Chino Hills proposes the utilization of CDBG funds to implemen the programs listed below:

Public Service Programs:	
Chino Hills Library	$11,000
House of Ruth	$15,000
Inland Fair Housing & Medication Board	$7,000
Chino Neighborhood House	$12,535
Heart2Serve	$12,000
Project Chela	$5,000
Grant Administration	$88,440
Home Improvement Grant Program	$25,000
Community Improvement Projects	$292,19
TOTAL	$468,17

PUBLIC COMMENT

Citizens and groups ar encouraged to submit written or verba comments on the Annual Action Plan during the 30-day comment period tha begins on April 3, 2021 and ends o May 2, 2021. Copies of the latest draft of this document will be available fo public review on the City's website a www.chinohills.org/CDBG and City of Chino Hills, Community Service Department, 14000 City Center Drive Chino Hills, CA 91709.

Questions and written comment regarding the *Annual Action Plan* ma be addressed to the following: City of Chino Hills, Community Service Department, Attn: Alma Hernandez Senior Management Analyst, 1400 City Center Drive, Chino Hills, CA 91709, (909) 364-2717 or e-ma ahernandez@chinohills.org

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