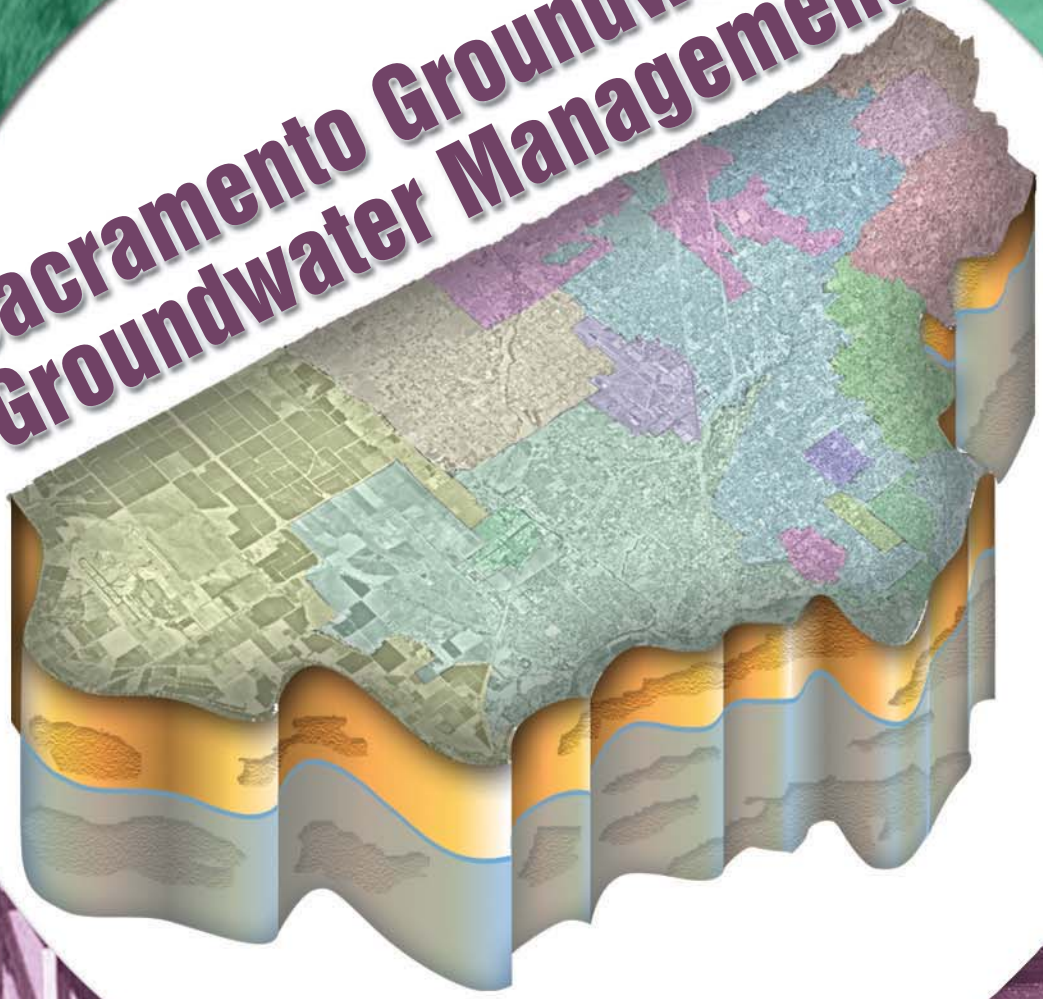
APPENDIX E

Cover Page of Groundwater Management Plan

Sacramento Groundwater Authority Groundwater Management Plan



SGA

December 2003

GROUNDWATER MANAGEMENT PLAN

DECEMBER 2003

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Sacramento Groundwater Authority
Managing Groundwater Resources in Northern Sacramento County

December 11, 2003

Sacramento Groundwater Authority
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Members:
California-American Water Company
Carmichael Water District
Citrus Heights Water District
Del Paso Manor Water District
Fair Oaks Water District
Folsom, city of
Natomas Central Mutual Water Company
Orange Vale Water Company
Rio Linda/Elverta Community Water District
Sacramento, city of
Sacramento, county of
Sacramento Suburban Water District
San Juan Water District
Southern California Water Company
agricultural and self-supplied representatives

To Interested Parties and Individuals:

The Sacramento Groundwater Authority (SGA) is pleased to release this Groundwater Management Plan (GMP), adopted December 11, 2003. The plan represents a critical step in establishing a framework for maintaining a sustainable groundwater resource for the various users overlying the basin in Sacramento County north of the American River. It includes specific goals, objectives and an action plan to provide a "road map" for coordination among the 14 overlying water purveyors.

SGA and its members are committed to the regional objectives established by the historic Sacramento Water Forum Agreement, and these objectives are incorporated into the plan. Since SGA's formation in 1998, SGA members have taken many steps to preserve the valuable groundwater resources underlying our region. These activities and specific future actions are described in the GMP.

The plan is the product of several months of effort, with valuable input from technical and policy review committees as well as the public. SGA is grateful for the excellent input, technical assistance and funding provided through partnerships with the U.S. Army Corps of Engineers and the California Department of Water Resources.

This plan represents a starting point for basin management; it is intended to be adaptive. Comments and suggestions to improve our management efforts in the basin are welcome.

Sincerely,

Edward D. Winkler
Executive Director

RESOLUTION NO. 2003-07

A RESOLUTION OF THE SACRAMENTO GROUNDWATER AUTHORITY ADOPTING A GROUNDWATER MANAGEMENT PLAN AND A FINDING OF EXEMPTION FROM THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

The Board of Directors of the Sacramento Groundwater Authority (SGA) does hereby find that:

WHEREAS, the SGA was formed under the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code) on August 11, 1998 by the Cities of Citrus Heights, Folsom, and Sacramento, and the County of Sacramento; and

WHEREAS, the SGA was created for the purposes of protecting, preserving, and enhancing, for current and future beneficial uses, the groundwater resources in the North Area Groundwater Basin, in Sacramento County, north of the American River; and

WHEREAS, the SGA has prepared a Groundwater Management Plan for the North Area Groundwater Basin; and

WHEREAS, the Groundwater Management Plan will further ongoing efforts to protect groundwater and interdependent environmental resources in the North Area Groundwater Basin, will facilitate collection of information to further understand and evaluate additional policies and programs for protection of the groundwater resources in the North Area Groundwater Basin, and will assist in other ongoing efforts to study the feasibility of conjunctive use programs utilizing the North Area Groundwater Basin.

NOW, THEREFORE, be it resolved that:

1. The SGA Board hereby adopts a Groundwater Management Plan for the North Area Groundwater Basin, in Sacramento County, north of the American River, copy attached hereto as Exhibit A.

2. The SGA Board further finds that the adoption of the Groundwater Management Plan is exempt from the requirements of the California Environmental Quality Act. (CEQA Guideline §§ 15061, 15306, 15307, 15308, and 15262).

PASSED AND ADOPTED by the Board of Directors of the Sacramento Groundwater Authority, on December 11, 2003.

By: Ronald Bachman
Chairperson, Sacramento Groundwater Authority

Attest: Nancy Egger
Nancy Egger, Administrative Services Manager/Clerk

Acknowledgments

This Groundwater Management Plan (GMP) is a direct result of the commitment that Sacramento Groundwater Authority (SGA) members made to sustain the groundwater resource for present and future uses in northern Sacramento County. SGA would like to thank the staff of Montgomery Watson Harza in preparing the critical elements of this plan. Also of great value in preparing this plan was the insight generated by public outreach studies by Lucy & Company. Preparation of this GMP was generously supported by a funding partnership with the U.S. Army Corps of Engineers. Much of the data used to generate the information in this GMP was compiled using grant funds and a funding partnership with the California Department of Water Resources. Finally, SGA would like to thank the dedication of the Policy Committee and the Technical Review Committee in guiding the preparation of this plan. The names of the committee members and alternates are listed below:

Policy Committee

Ron Bachman, chair
Tom Barandas (alternate)
Jack DeWit
Tom Gray
Lyle Hoag (alternate)
Shauna Lorance
Gary Reents
Rob Roscoe (alternate)
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Technical Review Committee

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ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
Aerojet	Aerojet-General Corporation facility
AF	Acre-feet
AF/year	Acre-feet per year
AFRPA	Air Force Real Property Agency
ARBCUP	American River Basin Regional Conjunctive Use Program
ARWRI	American River Water Resources Investigation
BMO	Basin Management Objective
Cal-Am	California-American Water Company
CALFED	CALFED Bay-Delta Program
CAS	California Aquifer Susceptibility
cfs	Cubic feet per second
CHWD	Citrus Heights Water District
CMP	Sacramento Coordinated Water Quality Monitoring Program
COC	Contaminants of concern
Cooperating Agencies	American River Basin Cooperating Agencies
CSUS	California State University, Sacramento
CTP	Cooperative Transmission Pipeline
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWC	California Water Code
CWD	Carmichael Water District
DCA	1,2-dichloroethane
DCE	cis-1,2-dichloroethene
Delta	Sacramento/San Joaquin River Delta
DHS	California Department of Health Services
DPMWD	Del Paso Manor Water District
DMS	Data Management System
DWR	California Department of Water Resources
DWSAP Program	Drinking Water Source Assessment and Protection Program
EMD	Sacramento County Environmental Management Department
EWA	Environmental Water Account
Folsom	City of Folsom
FOWD	Fair Oaks Water District
GMP	Groundwater Management Plan
gpm	Gallons per minute
Groundwater Forum	Central Sacramento County Groundwater Forum
IGSM	North American River and Sacramento County Combined Integrated Groundwater and Surface Water Model
InSAR	Interferometric Synthetic Aperture Radar
ISI	Integrated Storage Investigation
JPA	Joint Powers Authority
Lincoln	City of Lincoln
LSCE	Luhdorff & Scalmanini Consulting Engineers

LUST	Leaking Underground Storage Tank
M&I	Municipal and industrial
Mather AFB	Mather Air Force Base
McClellan AFB	McClellan Air Force Base
MCL	Maximum Contaminant Level
MWH	Montgomery Watson Harza
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
mg/L	Millgrams per liter
mgd	Million gallons per day
msl	Mean sea level
NAWQA	National Water Quality Assessment
NCMWC	Natomas Central Mutual Water Company
NGS	National Geodetic Survey
NTP	Northridge Transmission Pipeline
OVWC	Orange Vale Water Company
PBE	Physical Barrier Effectiveness
PCAs	Potential Contaminating Activities
PCE	Tetrachloroethene
PCWA	Placer County Water Agency
PL	Public Law
POU	Place of Use
Reclamation	U.S. Bureau of Reclamation
RLECWD	Rio Linda/Elverta Community Water District
Roseville	City of Roseville
RWA	Regional Water Authority
RWMP	Regional Water Master Plan
Sac Regional	Sacramento Regional Wastewater Treatment Plant
Sac Suburban	Sacramento Suburban Water District
SACOG	Sacramento Area Council of Governments
Sacramento	City of Sacramento
SAFCA	Sacramento Area Flood Control Agency
SCWA	Sacramento County Water Agency
SCWC	Southern California Water Company
SGA	Sacramento Groundwater Authority
SJWD	San Juan Water District
SMWA	Sacramento Metropolitan Water Authority
SOP	Standard Operating Procedure
South Sutter	South Sutter Water District
SRCSD	Sacramento Regional County Sanitation District
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
TDS	Total dissolved solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
Water Forum	Sacramento Area Water Forum
WEP	Water Efficiency Program

WFA	Water Forum Agreement
WTP	Water treatment plant

1 INTRODUCTION

The Sacramento Groundwater Authority (SGA) is a joint powers authority (JPA) created to manage the Sacramento region's North Area Groundwater Basin. The SGA's formation in 1998[1] resulted from a coordinated effort by the Sacramento Metropolitan Water Authority (SMWA) and the Sacramento Area Water Forum (Water Forum) to establish an appropriate management entity for the basin. The SGA is recognized as one of the essential tools to implement a comprehensive program to preserve the lower American River and ensure a reliable water supply through the year 2030.

The SGA draws its authority from a joint powers agreement[2] signed by the cities of Citrus Heights, Folsom, and Sacramento and the County of Sacramento to exercise their common police powers to manage the underlying groundwater basin. The agreement is included as **Appendix A** in this document. In turn, these agencies chose to manage the basin in a cooperative fashion by allowing representatives of the 14 local water purveyors and a representative from each agricultural and self-supplied pumpers to serve as the Board of Directors of the SGA[3].

At the core of the SGA's management responsibility is a commitment to not exceed the average annual sustainable yield of the basin, which was estimated to be 131,000 acre-feet[4] in the Water Forum Agreement (WFA)[5]. To accomplish this objective and to provide a safe, reliable water supply for the rapidly growing northern Sacramento County, this groundwater management plan (GMP) is necessary to begin to identify the many actions that should be taken in the North Area Groundwater Basin. This GMP represents a starting point from which the SGA will continually assess the status of the groundwater basin and make appropriate management decisions to ensure a sustainable resource. The SGA's boundary as well as the area covered by this GMP include only the portion of Sacramento County north of the American River (**Figure 1**). Continuing effort will be made to coordinate SGA's GMP activities with adjacent areas.

1.1 OTHER REGIONAL MANAGEMENT EFFORTS

Over the past several decades, the water supplies of the region have been impacted by:

- Prolonged drought and prolonged wet periods.
- Increasing pressure to dedicate surface water for environmental purposes.
- Declining groundwater levels.
- Impacts and growing threats to surface water quality and groundwater quality.

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1 The SGA was originally formed in 1998 as the Sacramento North Area Groundwater Management Authority. In 2002, it was renamed the Sacramento Groundwater Authority.

2 The agreement is included in this report as **Appendix A**.

3 SGA Board members include representatives of California-American Water Company, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Sacramento, County of Sacramento, Del Paso Manor Water District, Fair Oaks Water District, Natomas Central Mutual Water Company, Orange Vale Water Company, Rio Linda/Elverta Community Water District, Sacramento Suburban Water District, San Juan Water District, Southern California Water Company, and individual representatives from agriculture and self-supplied groundwater users (principally parks and recreation districts).

4 This value was estimated based on water use and facilities in the basin at the time of the WFA. This value was based on a number of assumptions, and was not intended to be a fixed value that could not be modified as conditions and assumptions changed in the basin. Examples of changed conditions include new or improved water conveyance, treatment, and storage facilities or changes in water supply contracts.

5 The WFA is available online at http://www.waterforum.org or contact the Water Forum office at (916) 264-1999.

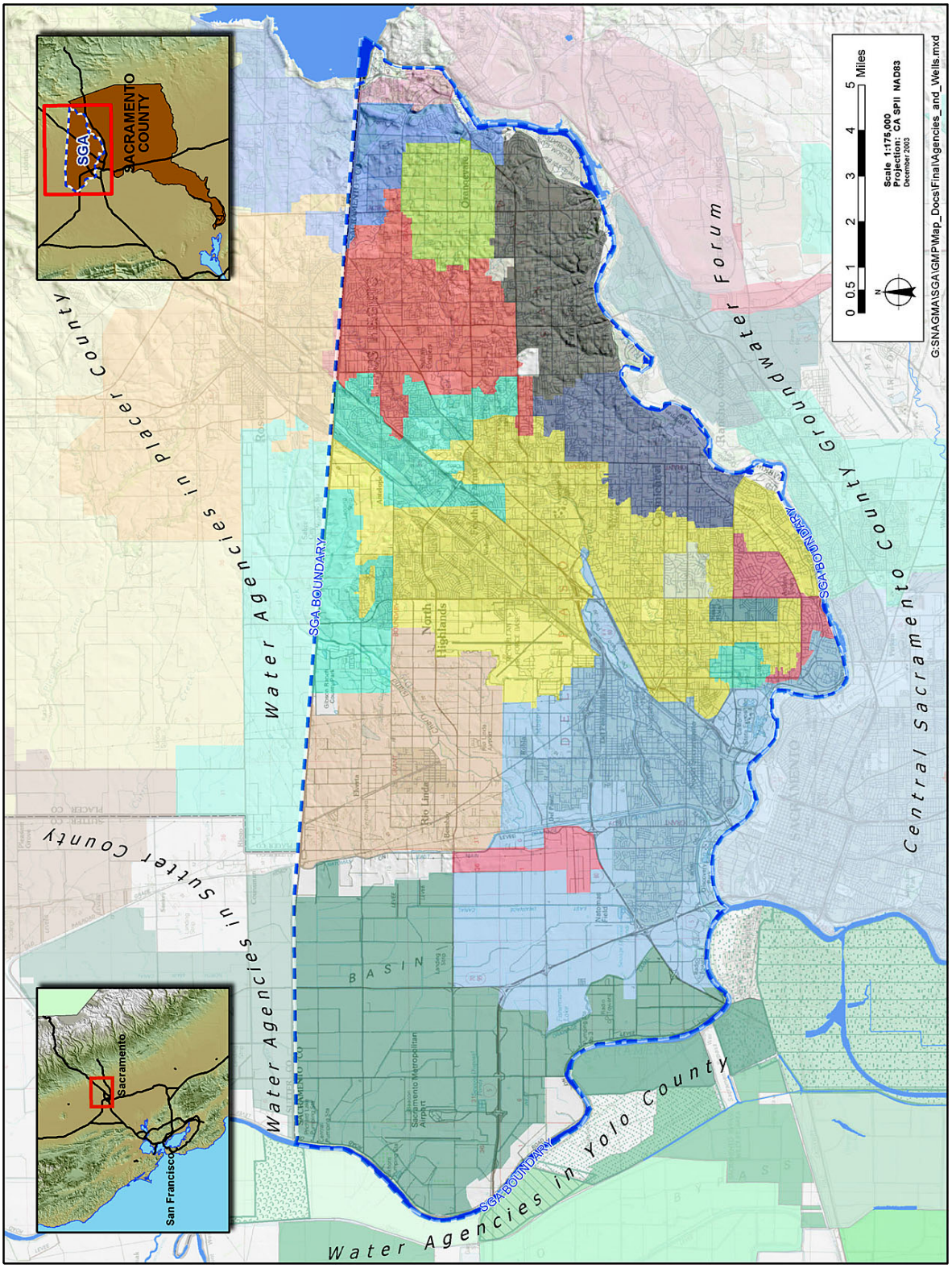

Figure 1. Boundary of the SGA and Area Covered by this Groundwater Management Plan

All the while, demand for water in the region has continued to grow.

To address these problems, water purveyors in the region have invested substantial time and resources in a progression of regional planning efforts. In particular, the planning efforts most directly related to the SGA's efforts include:

- The SMWA.
- The Water Forum process.
- The American River Basin Cooperating Agencies Regional Water Master Plan (Cooperating Agencies RWMP).
- The Regional Water Authority (RWA), successor to the SMWA.

Each of these regional planning efforts is discussed further below.

1.1.1 SMWA

Formed in 1990, the SMWA was a combined JPA and non-profit public benefit association of 17 public water suppliers within Sacramento County[6]. A primary objective of the SMWA was to facilitate actions needed to restore and maintain the quantity and the quality of the groundwater in the area. In support of that objective, the SMWA was a vital participant in the development of the WFA (see below). The SMWA also developed and adopted a GMP as authorized by Assembly Bill (AB) 3030 of 1992 (commonly referred to as AB 3030 Plans, see the California Water Code (CWC) § 10750 *et seq.*), but the plan was not fully implemented. In 2001, the SMWA was superceded by the RWA (see description below).

1.1.2 Water Forum

Begun in 1993, the Water Forum is a group comprised of business and agricultural leaders, citizens groups, environmentalists, water managers, and local governments in the Sacramento Region that joined together to fulfill two co-equal objectives:

- To provide a reliable and safe water supply for the region's economic health and planned development through the year 2030.
- To preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

In 2000, Water Forum members approved the WFA, which consists of seven integrated actions necessary to accomplish these objectives. The WFA prescribes a local conjunctive use program for Folsom Reservoir, the lower American River, and the adjacent groundwater basin. One of the seven elements is groundwater management. This element divides Sacramento County groundwater basins into three subunits, the North, Central, and South areas, and recommends that the SGA (then known as the Sacramento North Area Groundwater Management Authority) serve as the governing body for the North Area Groundwater Basin. The groundwater element also estimated and recommended an average annual sustainable groundwater yield for the SGA

[6] The SMWA members were located both north and south of the American River and included (note that some purveyor names have been changed and/or undergone consolidation since the formation of the SMWA): City of Folsom, City of Galt, Arden Cordova Water Service Company, Arcade Water District, Carmichael Water District, Citrus Heights Water District, Clay Water District, Del Paso Manor Water District, Elk Grove Water Works, Fair Oaks Water District, Galt Irrigation District, Northridge Water District, Omochumne-Hartnell Water District, Orange Vale Water Company, Rancho Murieta Community Services District, Rio Linda/Elverta Community Water District, and San Juan Water District.

area of 131,000 acre-feet per year (AF/year) (roughly equivalent to the 1990 groundwater pumping rate within the North Area Groundwater Basin). The Water Forum continues to function with a dedicated staff in the Water Forum Successor Effort program to coordinate with other agencies and groups, such as the SGA, to ensure that the elements of the WFA are carried out.

1.1.3 Cooperating Agencies

The Cooperating Agencies are an ad-hoc group of local water purveyors in northern Sacramento County and southern Placer County[7]. Each of the Cooperating Agencies is a signatory of the WFA. The Cooperating Agencies were formed to complete a RWMP, the objective of which is to identify the facilities and operational agreements necessary to implement the WFA for the northern Sacramento/Placer area. This plan will result in identifying opportunities to improve the availability of water supplies through additional conjunctive use of surface water and groundwater in the region. These expanded conjunctive use opportunities are a key component to assuring a sustainable groundwater resource within the SGA's area. Upon completion of the RWMP, the Cooperating Agencies have sunset as an organization with much of their function assumed by the RWA.

1.1.4 RWA

The RWA succeeded the SMWA in 2001 through a JPA to serve and represent the regional water supply interests, and assist members in protecting and enhancing the reliability, availability, affordability, and quality of water resources. One of the principal missions of the RWA is facilitating implementation of the conjunctive use program prescribed by the WFA and the RWMP. The RWA currently has eighteen members and three associate members[8] including each of the Cooperating Agencies except the Sacramento County Water Agency (SCWA). Nearly all members are signatory to the WFA.

As with the Cooperating Agencies, the success of implementing additional conjunctive use opportunities will be an important factor in the SGA's ability to ensure a reliable groundwater supply within its area. The activities of the RWA and SGA are highly coordinated as they share a common office and staff.

1.1.5 Other Ongoing Groundwater Management-Related Activities within the SGA Area

In addition to the on-going programs by individual SGA members, there are several other on-going groundwater-related activities within the SGA area. Coordination between these efforts

[7] The "Cooperating Agencies" include water purveyors in both Sacramento County and Placer County: California-American Water Company, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Roseville, City of Sacramento, Del Paso Manor Water District, Fair Oaks Water District, Placer County Water Agency, Rio Linda/Elverta Community Water District, Sacramento County Water Agency, Sacramento Suburban Water District, and San Juan Water District.

[8] The membership of the RWA encompasses water users in both Sacramento County and Placer County including: California-American Water Company, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Lincoln, City of Roseville, City of Sacramento, Del Paso Manor Water District, El Dorado Irrigation District, Fair Oaks Water District, Fruitridge Vista Water Company, Orange Vale Water Company, Placer County Water Agency, Rancho Murieta Community Services District, Rio Linda/Elverta Community Water District, Sacramento Suburban Water District, San Juan Water District, and the Southern California Water Company. Associate members do not directly retail drinking water and do not vote in RWA matters. Associate members include: El Dorado County Water Agency, Sacramento Municipal Utility District, and Sacramento Regional County Sanitation District.

and the SGA will be discussed in more detail later in this GMP. The activities closely related to the SGA's groundwater management efforts include, but are not limited to, the following:

- Groundwater contamination investigation and remediation activities at the former McClellan Air Force Base (McClellan AFB).
- Groundwater contamination investigation and remediation activities at the Aerojet-General Corporation facility (Aerojet).
- Monitoring of groundwater levels and quality by the California Department of Water Resources (DWR).
- Monitoring of groundwater levels and quality at California State University, Sacramento (CSUS).
- Monitoring of groundwater quality by the U.S. Geological Survey (USGS) as part of its National Water Quality Assessment (NAWQA) Program.
- Monitoring of site investigations and remediation efforts at known leaking underground storage tanks (LUSTs) coordinated by the Central Valley Regional Water Quality Control Board (CVRWQCB).
- In the mid-1990s, DWR conducted a study on the feasibility of conjunctive use in northwest Sacramento County and western Placer County (DWR, 1997). Natomas Central Mutual Water Company (NCMWC), an SGA member, was a cooperating agency to the study. Two multi-depth monitoring wells were constructed in the northwest Sacramento County as a result of the study and are currently monitored by DWR.

1.2 PURPOSE OF THE SGA GMP

The groundwater management goal of the SGA is to maintain a sustainable, high-quality groundwater resource for the users of groundwater basin underlying Sacramento County north of the American River consistent with the objectives of the WFA. To meet that goal, the purpose of this GMP is to serve as the initial framework for coordinating the many independent management activities into a cohesive set of management objectives and related actions necessary to meet those objectives.

1.3 AUTHORITY TO PREPARE AND IMPLEMENT A GMP

The authority of the SGA to manage the North Area Groundwater Basin is provided through the joint powers agreement. The SGA Board of Directors elected to prepare this GMP as one of the tools necessary to effectively manage the basin. The SGA is preparing this GMP consistent with the provisions of CWC § 10750 *et seq.* as amended January 1, 2003.

1.4 GMP COMPONENTS

The SGA GMP includes the following required and recommended components:

- CWC § 10750 *et seq.* (seven mandatory components). Recent amendments to the CWC § 10750 *et seq.* require GMPs to include several components to be eligible for the award of funds administered by DWR for the construction of groundwater projects or groundwater quality projects[9].
- DWR Bulletin 118 (2003) components (seven recommended components).

[9] These amendments to the CWC were included in Senate Bill 1938, effective January 1, 2003.

- CWC § 10750 *et seq.* (12 voluntary components). CWC § 10750 *et seq.* includes 12 specific technical issues that could be addressed in GMPs to manage the basin optimally and protect against adverse conditions.

Table 1 lists the section(s) in which each component is addressed.

Table 1. Location of SGA GMP Components

Description	Section(s)
A. CWC § 10750 *et seq.*, Mandatory Components	
1. Documentation of public involvement statement.	3.4.1, 6.3
2. Basin Management Objectives (BMOs).	3.2
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping.	3.5
4. Plan to involve other agencies located within groundwater basin.	3.4.2
5. Adoption of monitoring protocols by basin stakeholders.	3.5, 6.4
6. Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in DWR Bulletin 118.	**Figure 2**
7. For agencies not overlying groundwater basins, prepare GMP using appropriate geologic and hydrogeologic principles.	N/A
B. DWR's Suggested Components	
1. Manage with guidance of advisory committee.	3.4.3
2. Describe area to be managed under GMP.	2.1 – 2.5
3. Create link between BMOs and goals and actions of GMP.	**Figure 10**
4. Describe GMP monitoring program.	3.5, **Figure 12, Figure 13**
5. Describe integrated water management planning efforts.	3.8
6. Report on implementation of GMP.	4.1
7. Evaluate GMP periodically.	4.2
C. CWC § 10750 *et seq.*, Voluntary Components	
1. Control of saline water intrusion.	3.6.6
2. Identification and management of wellhead protection areas and recharge areas.	3.6.3, 3.6.4
3. Regulation of the migration of contaminated groundwater.	3.6.5
4. Administration of well abandonment and well destruction program.	3.6.2
5. Mitigation of conditions of overdraft.	3.7
6. Replenishment of groundwater extracted by water producers.	3.7
7. Monitoring of groundwater levels and storage.	3.5
8. Facilitating conjunctive use operations.	3.7
9. Identification of well construction policies.	3.6.1
10. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.	3.6.5, 3.7
11. Development of relationships with state and federal regulatory agencies.	3.4.4
12. Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination.	3.8.1, 6.5

2 WATER RESOURCES SETTING

Locations of water purveyors within the SGA boundaries are shown in **Figure 1**. Within the SGA boundaries, water purveyors currently utilize both surface water and groundwater. Some rely exclusively on either groundwater or surface water to meet their needs; others use a combination of surface water and groundwater. The groundwater and surface water supplies available to the region are summarized below.

2.1 GROUNDWATER SUPPLIES

This section provides a regional description of the geologic and hydrogeologic conditions of the underlying groundwater basin. A map showing the area of the groundwater basin, as defined by DWR Bulletin 118 (2003), and the SGA boundaries within this basin is presented in **Figure 2**.

The North American Subbasin is defined by DWR as the area bounded on the west by the Feather and Sacramento rivers, on the north by the Bear River, on the south by the American River, and on the east by the Sierra Nevada (DWR, 2003). DWR Bulletin 118 (2003) provides additional information about the North American Subbasin on the agency's Web site[10] including:

- Surface Area: 548 square miles.
- The eastern basin boundary is a north-south line extending from the Bear River south to Folsom Reservoir. This represents the approximate edge of the alluvial basin where little or no groundwater flows into or out of the groundwater basin from the Sierra Nevada.
- The western portion of the subbasin consists of nearly flat flood basin deposits from the Bear, Feather, Sacramento and American rivers, and several small east side tributaries

The SGA area is located in the southern portion of the North American Subbasin extending as far north as the Sacramento-Placer County line. Regional and grouped data are provided in this section; water purveyor-specific data are presented in **Appendix B.**

2.1.1 Overview of Hydrogeologic Setting

The groundwater resources of Sacramento County have been extensively investigated and reported in the DWR Bulletin 118-3, Evaluation of Ground Water Resources: Sacramento County (July, 1974).

2.1.1.1 Hydrostratigraphy of SGA Area

DWR Bulletin 118-3 identifies and describes the various geologic formations that constitute the water-bearing deposits underlying Sacramento County. These formations include an upper, unconfined aquifer system consisting of the Victor, Fair Oaks, and Laguna Formations, and a lower, semi-confined aquifer system consisting primarily of the Mehrten Formation. These formations are shown on **Figure 3** and are typically composed of lenses of inter-bedded sand, silt, and clay, interlaced with coarse-grained stream channel deposits. **Figure 3** illustrates that these deposits form a wedge that generally thickens from east to west to a maximum thickness of about 2,000 feet under the Sacramento River.

[10] At: http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/5-21.64_North_American.pdf.

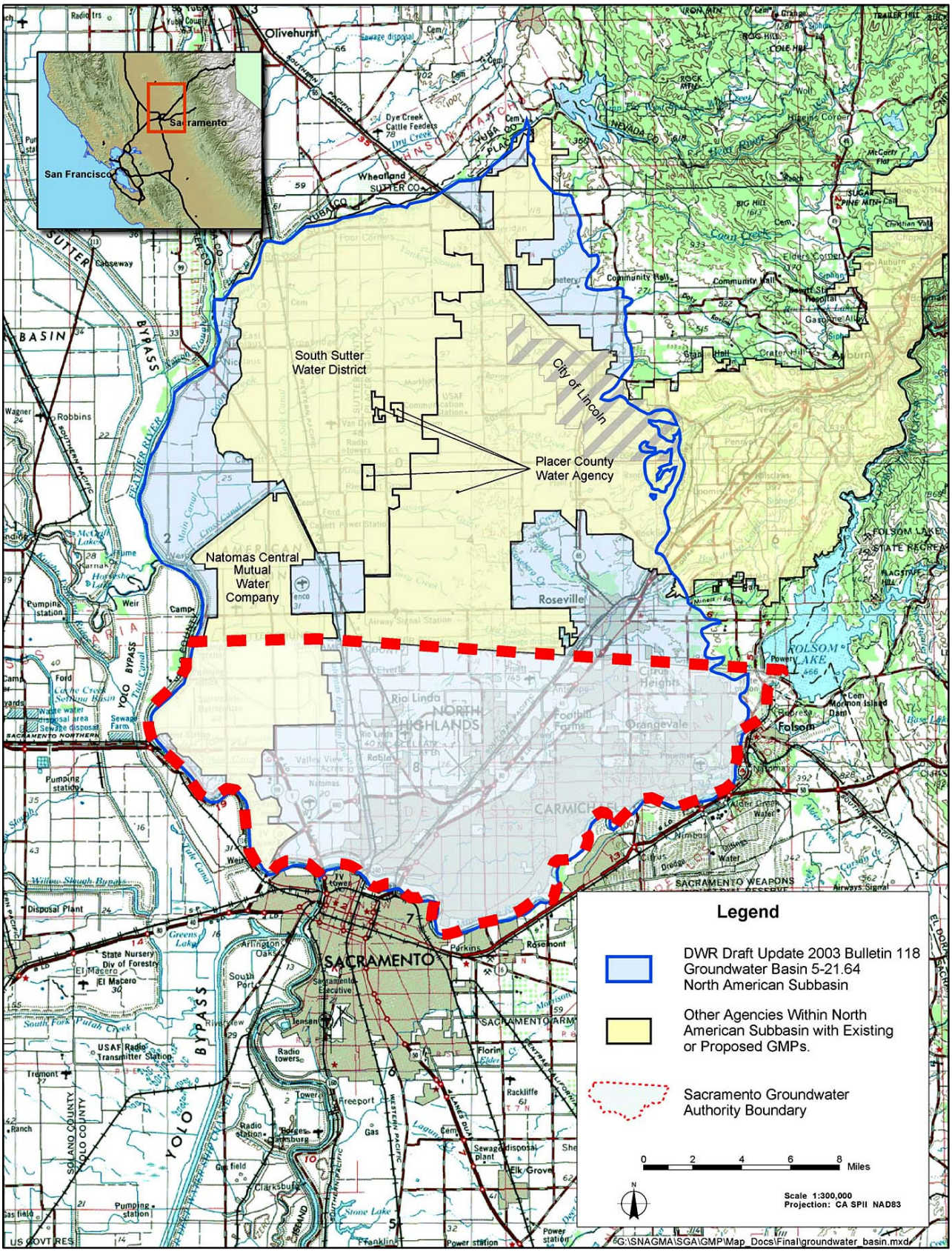

Figure 2. Location of North American Groundwater Subbasin

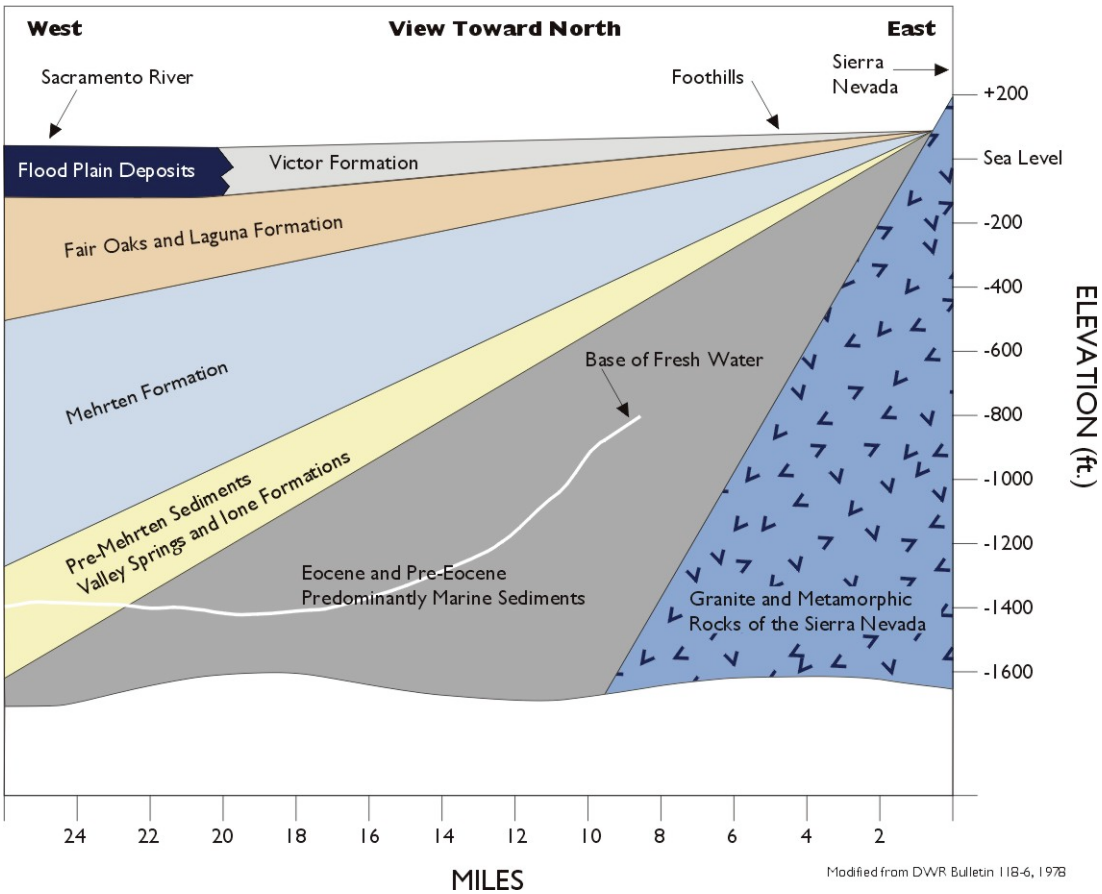

Figure 3. Regional Stratigraphic Column

Groundwater occurs in unconfined to semi-confined states throughout the North American Subbasin. Semi-confined conditions occur in localized areas; the degree of confinement typically increases with depth below the ground surface. Groundwater in the Victor, Fair Oaks, and Laguna Formations (upper aquifer) is typically unconfined. However, due to the heterogeneous nature of the alluvial depositional system, semi-confined conditions can be encountered at shallow depths in the aquifer. The deeper Mehrten Formation (lower aquifer) typically exhibits semi-confined conditions. There are no regionally-extensive fine grained layers in the subsurface to create a regionally confined aquifer such as is observed in the San Joaquin Valley from the Corcoran Clay layer.

2.1.1.2 Groundwater Quality

The water quality in the upper aquifer system is regarded as superior to that of the lower aquifer system. The upper aquifer is preferred over the lower aquifer principally because the lower aquifer system (specifically the Mehrten formation) contains higher concentrations of iron and manganese. Water from the upper aquifer generally does not require treatment (other than disinfection). The lower aquifer system also has higher concentrations of total dissolved solids (TDS, a measure of salinity) than the upper aquifer, although it typically meets standards as a potable water supply. In general, at depths of approximately 1,200 feet or greater (actual depth varies throughout the basin), the TDS concentration exceeds 2,000 milligrams per liter (mg/L). At such concentrations, the groundwater is considered non-potable without treatment.

Background Water Quality. This description of background water quality is based on data used to populate the Data Management System (DMS). Available groundwater quality data from monitoring between 1991 and 2002 for 260 wells were used to populate the DMS. The DMS was used to query data and develop statistics and graphics for the constituents included in this evaluation. Evaluations were performed for constituents of primary concern related to aesthetics, regulatory impacts, and contaminant plumes, and constituents of future concern related to aesthetics and regulatory concerns.

Total Dissolved Solids. TDS results in most wells are within the secondary drinking water standard; therefore, TDS will not limit the potable use of groundwater by the overlying agencies. The TDS levels vary quite significantly throughout the SGA portion of the basin, ranging from 34 to 657 mg/L, although most wells have levels between 140 and 320 mg/L.

Iron and Manganese. Iron and manganese results for most wells are within the secondary drinking water standards; therefore, iron and manganese will not limit the potable use of groundwater by the overlying agencies. Iron can range from non-detect, less than 10 micrograms per liter (μg/L), to very high levels such as 16,000 μg/L, although most wells have average values less than 200 μg/L. Manganese concentrations range from non-detectable, less than 2 μg/L, to 1,700 μg/L, although most wells have average values less than 50 μg/L.

Arsenic and Chromium. Arsenic and chromium results for most wells are within the current primary drinking water standards; therefore, arsenic and chromium will not limit the potable use of groundwater by the overlying agencies. Currently, there is a primary federal Maximum Contaminant Level (MCL) for arsenic of 10 μg/L, however compliance is not yet required in California below 50 μg/L. Arsenic concentrations range from non-detectable, less than 1 μg/L, to 22 μg/L, although most wells have average values less than 5 μg/L.

Currently, total chromium has a primary MCL of 50 μg/L. Chromium concentrations range from non-detectable, less than 1 μg/L, to 52 μg/L, although most wells range between 8 and 12 μg/L.

Nitrate. It appears that all wells are within the current primary nitrate drinking water standard and nitrate will not limit the potable use of groundwater by the overlying agencies. Currently, nitrate has a primary MCL of 45 mg/L. Most SGA wells have low levels (< 15 μg/L) of nitrate.

Known "Principal" Plumes. Principal groundwater contaminant plumes within or near the SGA area are known to exist from source areas at the former McClellan AFB, the former Mather Air Force Base (Mather AFB), and Aerojet and are shown on **Figure 4**. During Phase II development of the DMS, contaminant plume data were collected by SGA from the following documents:

- URS. Former McClellan Air Force Base, Installation Restoration Program, Groundwater Monitoring Program: Quarterly Report, Third Quarter 2002. January 2003.
- Montgomery Watson Harza (MWH). Mather Air Force Base Annual and Fourth Quarter 2002 Sitewide Groundwater Monitoring Report. March 2003.
- Aerojet Environmental Remediation. Aerojet Sacramento Site, American River Study Area Groundwater Monitoring Results, April – June 2002. August 2002.

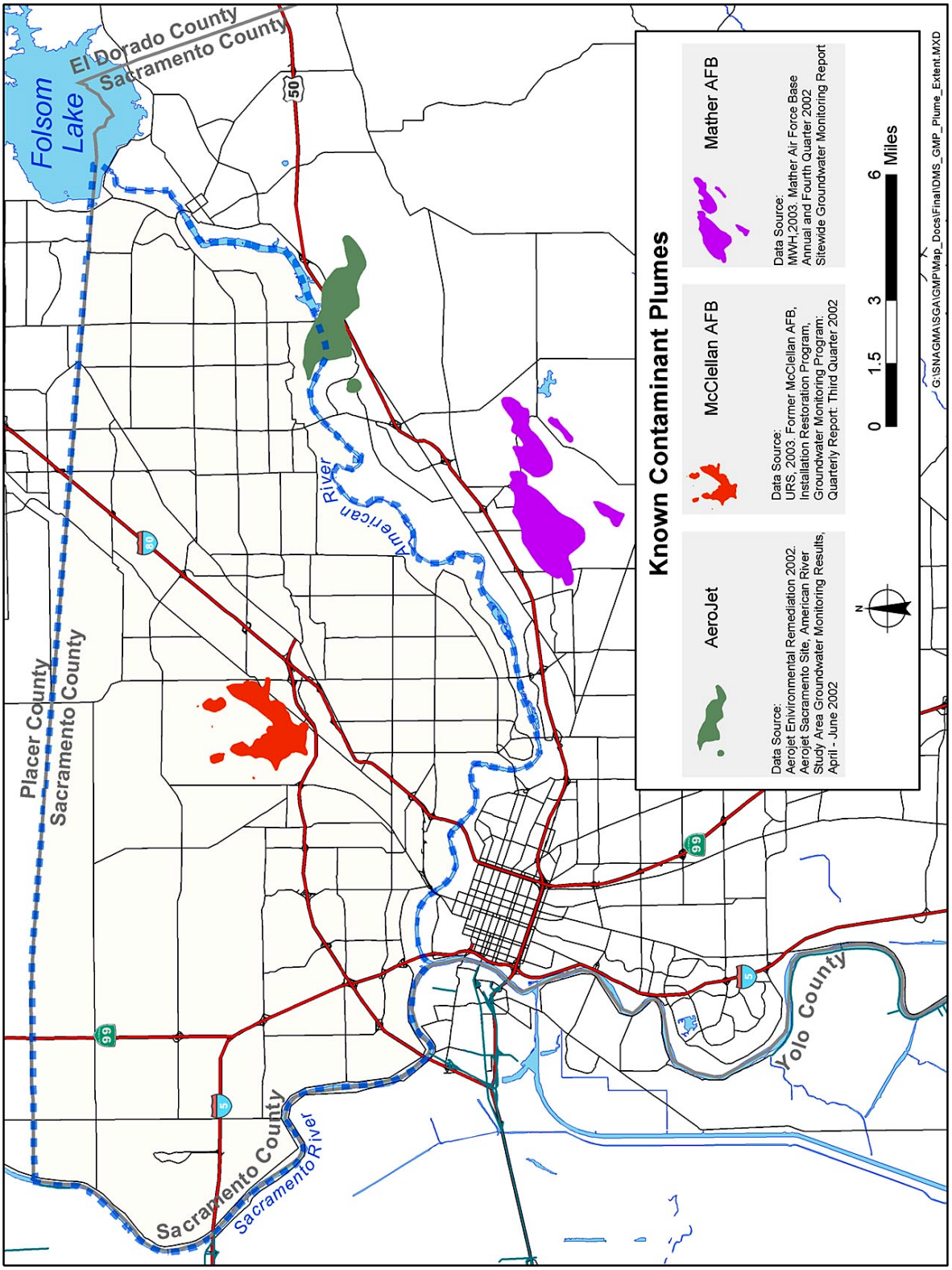

Figure 4. Principal Contaminant Plumes

Although other localized plumes exist within the SGA area, the principal plumes shown in **Figure 4** are the largest and have the greatest current impact on existing groundwater use. For the McClellan AFB plumes, the primary contaminants of concern (COC) are trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (DCE), and 1,2-dichloroethane (DCA). The McClellan AFB plume edges represent the California drinking water MCL of 5 μg/L TCE, the most extensive contaminant.

For the Mather AFB plumes, the primary COCs are TCE, PCE, and carbon tetrachloride. The Mather AFB plume edges represent a composite COC concentration of 0.5 μg/L, which is one-tenth of the MCL for these constituents.

For the Aerojet plume, the primary COCs are TCE and perchlorate. The Aerojet plume edges represent a concentration of 5 μg/L TCE, the most extensive contaminant.

There are currently about 190 active LUST sites within the SGA area (source: http://geotracker.swrcb.ca.gov). While many sites can be fully remediated, the aggregate impact from undetected contamination on groundwater quality in the basin cannot be determined at this time and may ultimately be considerable.

2.1.1.3 Recharge and Extraction of Groundwater in Sacramento County

Evaluating changes in aquifer conditions requires understanding the dynamic processes and interactions taking place as extractions and recharge in the aquifer occur. Conceptual models of the aquifer that describe induced recharge, aquifer storage, and differences between localized and regional effects on the aquifer are discussed below. These conceptual models are meant to clarify concepts; not all aspects of groundwater hydraulics are described. Some of the concepts presented pertain only to the northern Sacramento County aquifers.

Recharge. Groundwater in northern Sacramento County moves from sources of recharge to areas of discharge. Recharge to the local aquifer system occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly in American River and Sacramento River channels. Prior to development of the area, additional recharge would have occurred along the eastern boundary of the SGA area at the transition point from consolidated rocks of the Sierra Nevada to the alluvial deposited basin sediments. Other sources of recharge within the area include inflow of groundwater generally from the northeast; subsurface recharge from fractured geologic formations to the east; and deep percolation from applied surface water, precipitation, and small streams. An example of recharge from deep percolation can be seen in the western SGA area where extensive agricultural operations in NCMWC have redistributed surface water from the Sacramento River over a much broader area. Some of the water not used by the crops grown in the area will eventually act as a source of recharge to the groundwater basin.

Changes in the groundwater surface elevation result from changes in groundwater recharge, discharge, or extraction. In some instances within northern Sacramento County, this change in groundwater elevation can induce natural recharge at locations where rivers or streams and the aquifer are hydraulically connected. To the extent that a hydraulic connection exists, as groundwater conditions change, the slope or gradient of the groundwater surface may change as well. A steeper gradient away from the stream would induce higher recharge from surface water into the aquifer.

The rate of recharge from streams that are hydraulically disconnected from the groundwater surface is indifferent to changes in groundwater elevations or gradient. This is typically true with smaller streams where the groundwater surface is located far below the streambed. In such cases, surface water percolates through the unsaturated zone to the groundwater and is a function of the aquifer materials underlying the streambed and the water level in the surface stream. The rate of infiltration under these conditions is not controlled by the change in elevation of the underlying groundwater. There is also some evidence to suggest these conditions exist along the Sacramento River in northern Sacramento County.

Localized Impacts of Groundwater Extraction. When extractions occur from a single well, a concentrated localized cone of depression is formed around the well. The shape and depth of the localized cone of depression depend on several factors including (but not limited to): (1) the rate of extraction, (2) the presence of nearby sources of recharge and extraction, (3) aquifer transmissivity, and (4) the "confined" or "unconfined" state of the aquifer, (i.e., storage coefficient). Over a period of time, extraction from an unconfined aquifer can de-water the aquifer around the well. However, when extraction ceases, the water level within the aquifer typically rebounds to its pre-extraction condition.

A confined or semi-confined aquifer behaves differently since the water is under pressure from a recharge source. Instead of de-watering the aquifer, a change in confining pressure occurs as a result of extractions; the aquifer remains saturated. In a confined aquifer, the pressure or piezometric surface elevation decline is more dramatic than in an unconfined aquifer; however, the recovery to pre-extraction conditions is typically much faster.

Regional Impacts of Groundwater Extraction. Large regional cones of depression can form in areas where multiple groundwater extraction wells are in operation. The location and shape of a regional cone of depression is influenced by the same factors as a single well. The regional cone of depression within the SGA area is shown on **Figure 5,** a water elevation contour map for spring of 2002. This map was prepared using water elevation data from DWR's water data library available on-line at: http://wdl.water.ca.gov. The Inverse Distance to a Power gridding method was used to contour the water elevation data posted on **Figure 5**. This contouring method is a weighted average interpolator and is best used when there is a uniform distribution of data. With Inverse Distance to a Power, data are weighted during interpolation such that the influence of one point relative to another declines with distance from the grid node. Normally, Inverse Distance to a Power behaves as an exact interpolator. When calculating a grid node, the weights assigned to the data points are fractions, and the sum of all the weights are equal to 1.0.

Fluctuations in regional cones of depression are measured over years and result from: (1) changes in recharge, and (2) changes in extractions from increasing and decreasing water demands. A sequence of successive dry years can decrease the amount of natural recharge to the aquifer and often a coinciding increase in groundwater extraction, creating an imbalance between natural recharge and extractions. Consequently, groundwater elevations decrease in response to this imbalance between recharge and extraction. Over time, the shape and location of the aquifer's regional cone of depression fluctuates.

Intensive use of the groundwater basin has resulted in a general lowering of groundwater elevations near the center of the basin away from the sources of recharge. As early as 1968, pumping depressions were evident in northern Sacramento County. These depressions have grown and coalesced into a single cone of depression centered in the SGA area as shown in **Figure 5**.

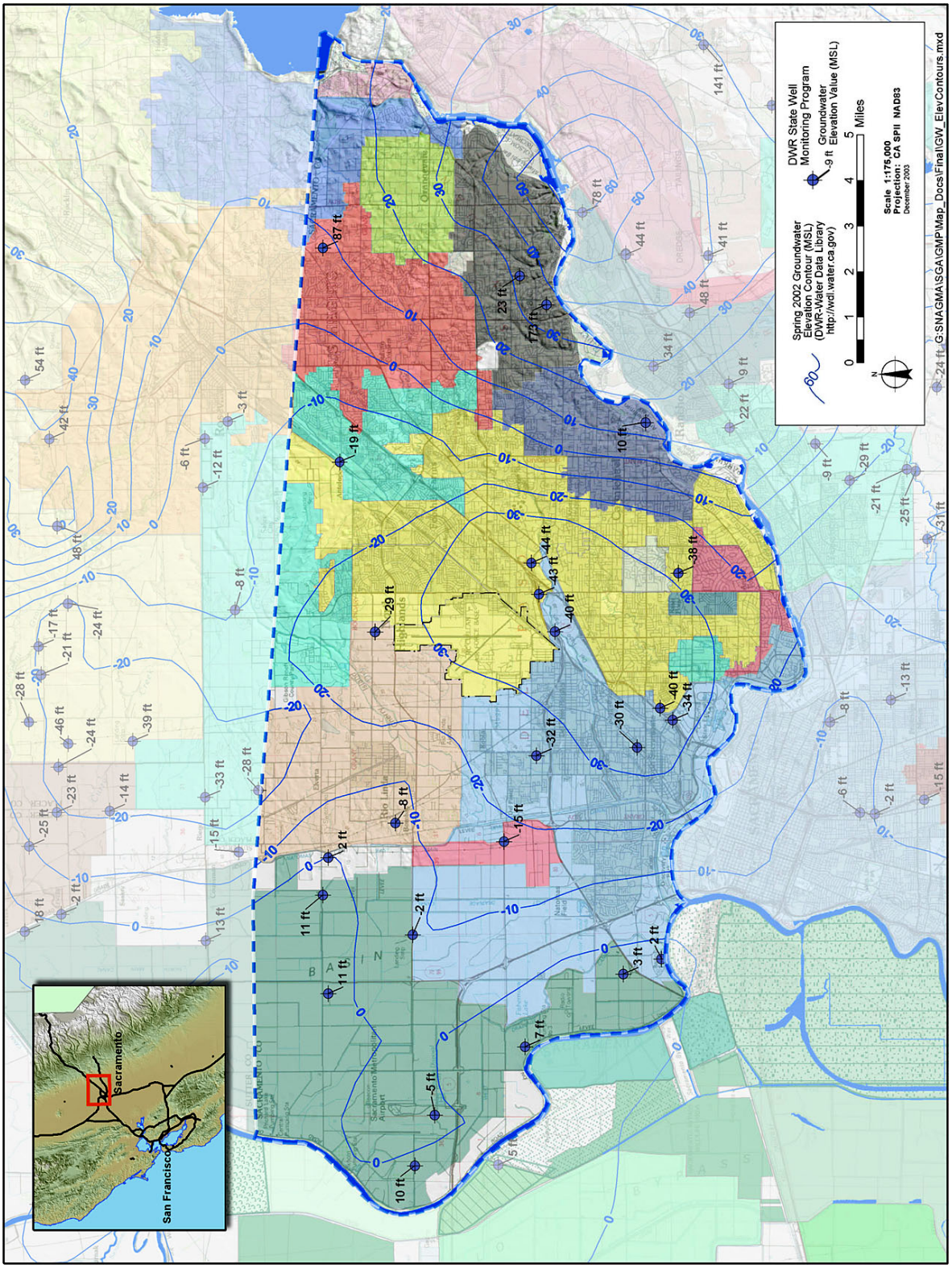

Figure 5. Spring 2002 Groundwater Elevation Contours

Groundwater Level Trends. To observe characteristic trends in groundwater elevation, selected well hydrographs have been prepared and are presented on **Figure 6.** For the purpose of this discussion, the SGA area has been divided into four sub-areas.

Western Area. The western portion of the SGA area is bounded by the Sacramento River and is relatively undeveloped compared to the rest of the SGA area. Groundwater level trends in this area can be seen in hydrographs from SWP-216 (located near the Sacramento River), and SWP-216 (also located near the Sacramento River) shown on **Figure 6**. The hydrographs for these wells show groundwater levels varying between -5 and 20 feet above mean sea level (msl) between wells. Long-term trends of increasing or decreasing groundwater levels are not evident in these wells, however, groundwater levels do fluctuate seasonally in each well.

North-Central Area. The north-central portion of the SGA area is bounded by the county line on the north. Water in the north-central portion of the SGA area is supplied entirely by groundwater sources. Furthermore, pumping of groundwater occurs at treatment extraction wells being operated at McClellan AFB, which is located in the center of this region of the SGA area. The general trend in this area is steeply declining groundwater levels until the early 1990s and then stabilized levels. For example, SWP-276 (**Figure 6**) shows a decline of about 17 feet per decade from 1950 to 1990 and then stabilization of groundwater elevation at approximately 40 feet below msl to the end of the record in 1996. Water level trends in SWP-270 show the same decline from 1955 to 1990 followed by stabilized levels (with seasonal fluctuation) at 40 feet below msl from 1990 to the present.

South-Central Area. The south-central portion of the SGA area is bordered to the south by the American River and is supplied by approximately even proportions of surface water and groundwater. The general trend in this area is gently to moderately declining groundwater levels over time **(Figure 6)**. Water level trends in this area can be seen in hydrographs from wells SWP-220 (located south of McClellan AFB away from the American River), SWP-232 (located near the river), and SWP-240 (located near the river). The hydrograph SWP-232 shows approximately 20 feet of groundwater elevation decrease over a 34-year period ending 2002.

Eastern Area. Foothills bound the eastern portion of the SGA area. The eastern portion of the SGA area has experienced rapid residential growth in recent years and extends into the Sierra Nevada foothills. The water supply in this area is approximately 80 percent from surface water sources and 20 percent from groundwater sources. The general trend in this area is stable groundwater elevations near the American River and high elevations in the foothills, with declining groundwater levels away from the river and foothills. Water level trends in this area can be seen in hydrographs from wells SWP-236 (located near the River) and SWP-283 (located high in the foothills). The hydrographs for these wells show stable groundwater levels near the river and in the foothills.

2.2 SURFACE WATER SUPPLIES

Individual water purveyors utilize both surface water and groundwater. The supply mix may include combinations of groundwater; American River water diverted pursuant to water rights, contract entitlements, or other agreements; or Sacramento River water diverted pursuant to water rights or contract entitlements. This section describes surface water supplies available to the water purveyors within the SGA. Regional and grouped data are provided in this section; water purveyor-specific data are presented in **Appendix B.**

2.2.1 Water Rights/Contract Entitlements

2.2.1.1 American River Water Rights

Four of the water purveyors within the SGA boundaries have water rights on the American River: Carmichael Water District (CWD), City of Folsom (Folsom), City of Sacramento (Sacramento), and San Juan Water District (SJWD).

The place of use (POU) for CWD's water right is coincident with the boundaries of the District.

The POU for Folsom's water right is coincident with the city limits and portions of the lands owned by Aerojet.

The POU for Sacramento's water rights on the American River extends beyond the boundaries of the city limits. The authorized POU outside the city limits includes (1) portions of California-American Water Company (Cal-Am), Arden service area; (2) Del Paso Manor Water District (DPMWD); (3) Sacramento Suburban Water District (Sac Suburban), Arcade service area (Town and Country subarea) and portions of Northridge service area; (4) SCWA, Arden Park Vista service area; (5) Southern California Water Company (SCWC), Arden Town service area; and (6) portions of CWD. In addition, a portion of Sacramento's American River POU overlaps with the place of use for the Sacramento River water rights and contract entitlements of NCMWC.

The POU for SJWD's water rights is the District's wholesale service area which encompasses SJWD retail service areas in Sacramento and Placer Counties, Citrus Heights Water District (CHWD), Fair Oaks Water District (FOWD), Orange Vale Water Company (OVWC), and that portion of Folsom that lies north of the American River.

2.2.1.2 American River Contract Entitlements

In Sacramento County, two water purveyors have existing water supply contract entitlements with the U.S. Bureau of Reclamation (Reclamation) Central Valley Project (CVP): Folsom and SJWD. SJWD provides CVP water to agencies within its wholesale service area.

In addition, SJWD and SCWA executed a water supply contract entitlement with Reclamation from Public Law (PL) 101-514 (commonly referred to as "Fazio Water") in 1999. However, the contract is currently being renegotiated under the CVP long-term contract renewals. SJWD's contract entitlement is for 13,000 AF/year, and this supply is used within SJWD's Sacramento County wholesale area. SCWA's contract entitlement is for 22,000 AF/year, and this supply is used within Zone 40 (south of the American River). Folsom has a subcontract with SCWA for 7,000 AF/year (out of the potentially available 22,000 AF/year).

Sac Suburban has a water sale agreement with Placer County Water Agency (PCWA). The POU for this water includes Sac Suburban's Northridge service area and Arcade service area (North Highlands subarea only) and the service areas of SJWD, FOWD, OVWC, CHWD, the former McClellan AFB, Cal-Am (Antelope and Lincoln Oaks\Royal Oaks service areas), and Rio Linda/Elverta Community Water District (RLECWD).

2.2.1.3 Sacramento River Water Rights

Two of the water purveyors within the SGA boundaries have water rights on the Sacramento River: Sacramento and NCMWC. The POU for NCMWC's water rights on the Sacramento River is the water company service area that includes both the Sacramento County and Sutter County areas. The POU for Sacramento's water rights on the Sacramento River is the city limits.

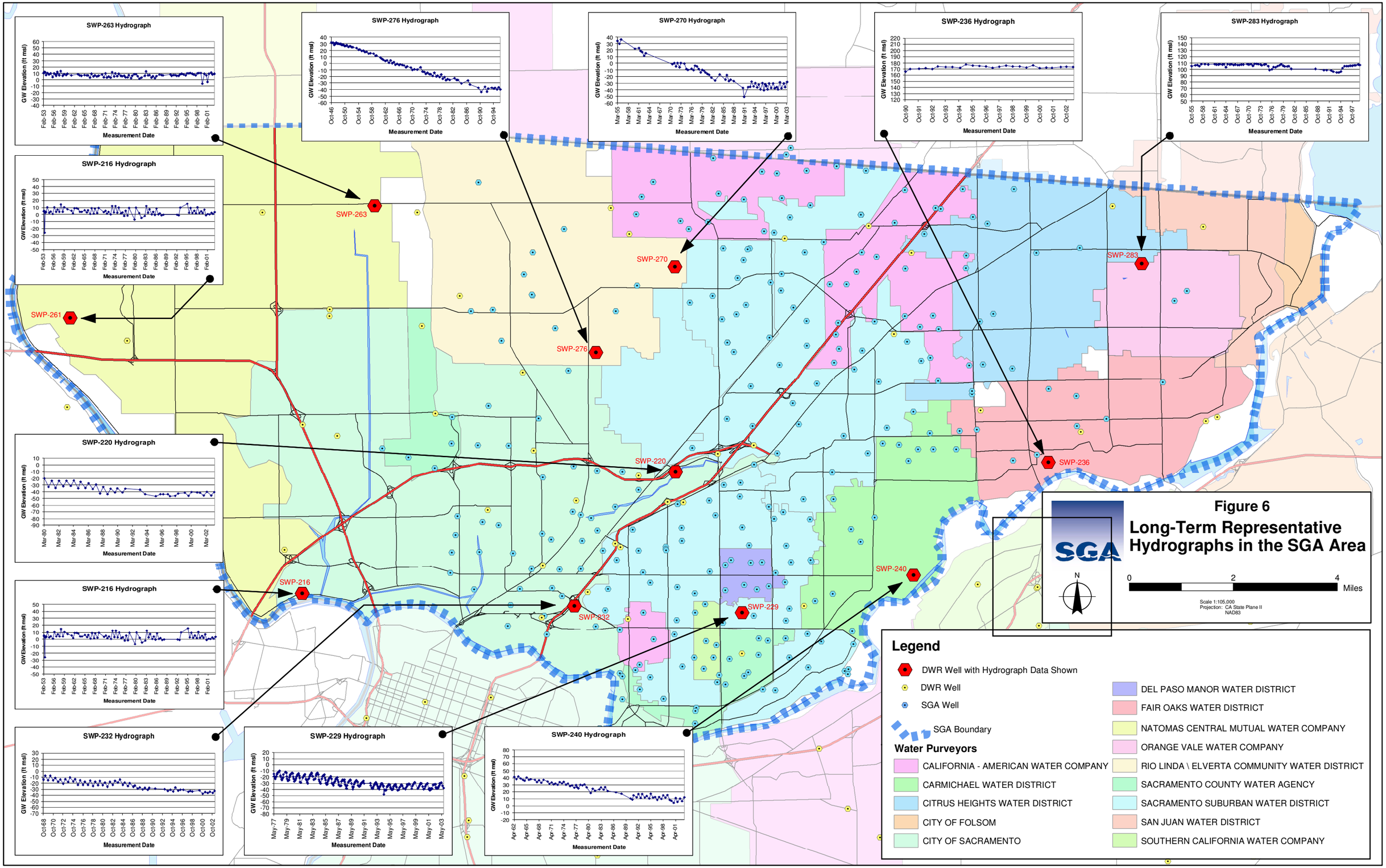

Figure 6

Long-Term Representative Hydrographs in the SGA Area

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2.2.1.4 Sacramento River Contract Entitlements

One water purveyor within the SGA boundaries has a CVP contract entitlement on the Sacramento River: NCMWC. The POU for this water is the water company service area that includes both the Sacramento County and Sutter County areas.

2.2.1.5 Other Agreements

Sacramento has agreements with Sac Suburban (for use within the Arcade Service Area only) and DPMWD to make surface water available for use within the portions of their service areas that lie within Sacramento's POU.

Sac Suburban has a temporary contract with Reclamation for surplus water (often referred to as Section 215 water). This contract has been exercised since 1991. Sac Suburban's Section 215 supplies ranged between approximately 100 AF/year and 11,880 AF/year during the period 1991 through 2000. Section 215 water is available on an intermittent basis subject to hydrologic conditions.

2.2.2 Surface Water Quality

Based on current Update Reports to the Watershed Sanitary Surveys for the American and Sacramento Rivers, these are both excellent supplies for drinking water in the Sacramento Metropolitan Area. The source waters can be treated to meet all Title 22 drinking water standards using conventional and direct filtration processes, as well as membranes. There are no persistent constituents in the raw waters that require additional treatment processes. However, there are sometimes seasonal treatment requirements for rice herbicides on the Sacramento River, which can be addressed through chemical oxidation processes. High turbidities during storm events are sometimes a treatment challenge, which can be managed by optimizing operations including adjusting chemical types and dosing schemes and reducing plant flow (Montgomery Watson and Archibald & Wallberg, 2000).

2.2.2.1 American River

Surface water quality in the American River is a function of the mass balance of water quality from tributary streams, diversions, agricultural return flows, subsurface drainage flows, permitted discharges from municipal and industrial (M&I) sources, and urban runoff. In general, the quality of water in the American River is high from the river's headwaters to its confluence with the Sacramento River. It is low in alkalinity, low in disinfection by-product precursor materials, low in mineral content, and low in organic contamination. Limited data also indicate that the source of water is low in microbial contamination from *Giardia* and *Cryptosporidium*. Turbidity levels in the American River tend to be higher in the winter than summer because of higher flows associated with winter storms.

Folsom Reservoir. Water diverted from Folsom Reservoir is provided to the following SGA members: SJWD, CHWD, FOWD, OVWC, Folsom, and Sac Suburban[11]. Because the treatment facilities serving these areas share a common Folsom Dam intake facility, the raw water is considered to be similar with respect to quality. Characterization of Folsom Reservoir raw water quality is based on data collected by the Cities of Folsom and Roseville as well as SJWD.

Water diverted from the Folsom Dam is treated by SJWD and Folsom using conventional filtration processes with chlorine disinfection. Treated water quality varies depending on the specific type of treatment provided, but meets or exceeds all federal and state drinking water

[11] Water is also diverted, treated, and distributed by Roseville, located within Placer County.

standards for both SJWD and Folsom under current operations. Both agencies include corrosion control practices in their treatment of the water.

American River at CWD's Bajamont Way Membrane Filtration Water Treatment Plant. CWD uses American River water diverted by three Ranney Collectors for water supply, therefore this is groundwater under the direct influence of surface water. This source now supplies 80 percent of CWD's needs. The Collectors are located within the American River floodplain and adjacent to the streambed. They serve as intake and pump structures to provide pre-filtered water to the Bajamont Way Membrane Filtration (Bajamont) Water Treatment Plant (WTP). The Bajamont WTP has a design capacity of 16 million gallons per day (mgd) and can be expanded to 22 mgd. The WTP is composed of microfiltration membrane units. After filtration, the water is chlorinated with sodium hypochlorite and the pH is adjusted with caustic soda prior to distribution. The treated water meets all current Title 22 drinking water quality standards (Archibald & Wallberg and MWH, 2003).

Lower American River at Sacramento's E.A. Fairbairn Water Treatment Plant. Water is diverted by Sacramento on the lower American River just downstream of the Howe Avenue crossing at the E.A. Fairbairn WTP. This water may be used by other entities within the POU on a wholesale basis. Water diverted at the plant undergoes conventional treatment and disinfection. The treated water meets all current Title 22 drinking water quality standards (Archibald & Wallberg and MWH, 2003).

2.2.2.2 Sacramento River

Sacramento River water quality is largely influenced by a mass balance of water quality from upstream reservoir release operations, tributary flows (including the lower American River), agricultural runoff, subsurface drainage flows, and diversions, with other impacts from permitted discharges from M&I sources, urban runoff and spills. In general, the quality of the Sacramento River is high in the vicinity of the SGA boundary. There are moderate amounts of alkalinity and minerals and low levels of disinfection by-product precursors. Turbidity levels in the Sacramento River are higher during the winter and early spring months, usually associated with reservoir releases or runoff from storm events. There are very infrequent detects of organic chemicals, many of which are pesticides or herbicides from agricultural operations. Data collected to date indicate that there is a low prevalence of *Giardia* and *Crytposporidium* in the river, with protozoa only detected sporadically and at very low concentrations.

The characterization of the Sacramento River water quality in the vicinity of the SGA boundary is based on reports for the Sacramento River Water Treatment Plant (Sacramento River Watershed Sanitary Survey; 1995 Report and 2000 Update, prepared by MWH and Archibald & Wallberg).

Sacramento River at Sacramento's Sacramento River Water Treatment Plant. Water is diverted by Sacramento on the Sacramento River just downstream of the confluence with the American River. This water can be supplied to Sacramento and other entities within the place of use on a wholesale basis. Characterization of the Sacramento River raw water quality at the Sacramento River WTP is based on data collected by Sacramento (Sacramento River Water Treatment Plant – Finalization of Preliminary Design, prepared by Montgomery Watson, 1998).

Water is treated by Sacramento using conventional filtration processes with chlorine disinfection. Treated water quality meets or exceeds all federal and state drinking water standards under current operations. Sacramento includes corrosion control in their treatment of the water.

Primary drinking water standards are set for constituents that cause an adverse impact to human health. Secondary drinking water standards are set for constituents that cause an unpleasing aesthetic impact on the water quality; these are not health-based standards. There were no violations of primary or secondary drinking water standards reported for any of the characterization points discussed above.

2.3 "OTHER" SUPPLIES

Currently, limited opportunities exist for using recycled water north of the American River. In Sacramento County, the most probable recycled water opportunity exists at the Sacramento Regional Wastewater Treatment Plant (Sac Regional) located on the Sacramento River near Freeport (south of the American River and outside the SGA boundaries). At this time, however, Sac Regional does not appear to be a likely source of recycled water for the area north of the American River. The cost of pumping recycled water from Sac Regional to areas north of the American River is currently prohibitive. A more economic reclamation program might include the scalping of wastewater flows north of the American River for treatment at satellite plants.

In Placer County, Roseville has a recycled water program and is delivering recycled water for irrigation of golf courses and streetscape. Under this program, Roseville is studying potential locations for direct groundwater recharge with recycled water, in both Placer and northern Sacramento counties.

2.4 EXISTING FACILITIES AND OPERATIONS

2.4.1 Major Infrastructure

For the purposes of this GMP, the existing major infrastructure is divided into three major categories: surface water supply facilities, groundwater supply facilities, and system distribution/transmission and storage facilities. **Figure 7** presents a regional map of existing and planned principal infrastructure[12].

2.4.1.1 Surface Water Supply Facilities

There are four major diversion and treatment facilities on the American and Sacramento rivers that provide surface water within the SGA boundaries (see **Table 2**).

2.4.1.2 Groundwater Supply Facilities

The water purveyors within the SGA boundaries maintain and operate 269 groundwater wells (see **Table 3** and **Figure 6**). Most production capacities are in the range of 330 to 2,250 gallons per minute (gpm).

2.4.1.3 System Distribution/Transmission and Storage Facilities

The Cooperative Transmission Pipeline (CTP)/Northridge Transmission Pipeline (NTP) is the only existing major transmission facility capable of conveying water across the region. Major intra-agency transmission and distribution systems are also shown on **Figure 7**. Most agency-to-agency interconnections are presently used for emergency purposes only.

[12] Much of the planned infrastructure is attributable to the RWA's American River Basin Regional Conjunctive Use Program (see **Section 3** for a description). Individual agencies may be considering facilities that are not shown here.

Table 2. Treatment Capacity at WTPs Providing Surface Water within the SGA Boundaries

Source Water/Facility/Owner	Treatment Capacity (million gallons per day, mgd)
Folsom Reservoir	
Peterson WTP (SJWD)	120 [1]
Lower American River	
Bajamont WTP (CWD)	22
E.A. Fairbairn WTP (Sacramento)	200 [2]
Sacramento River	
Sacramento River WTP (Sacramento)	160 [2]

Notes:
[1] Planned improvements to solids handling system and backwash treatment will increase treatment capacity from 108 mgd (reliable capacity) to 120 mgd (design hydraulic capacity).
[2] Expansions to listed treatment capacities currently under way.

Table 3. Groundwater Wells within SGA Boundaries

Water Purveyor	Number of Groundwater Wells
Cal-Am	51
CWD	14
CHWD	11
Folsom	0
Sacramento	40
DPMWD	8
FOWD	8
NCMWC	0
OVWC	2
RLECWD	12
Sac Suburban	
Arcade Service Area	66
Northridge Service Area	32
SCWA	17
SCWC	8
SJWD	0
Individual representatives from agriculture and self-supplied groundwater users (principally parks and recreation districts)	-- [1]

Source: DMS, August 2003
NOTES:
[1] SGA does not have information on these wells.

Water purveyors that serve primarily groundwater (e.g., DPMWD) have little aboveground storage, relying instead on the groundwater basin for storage. Conversely, water purveyors that serve surface water (either partially or entirely) have made investments in aboveground storage for both raw and treated waters and associated pump stations. These purveyors include: Cal-Am, CWD, Sacramento, FOWD, Sac Suburban, and SJWD.

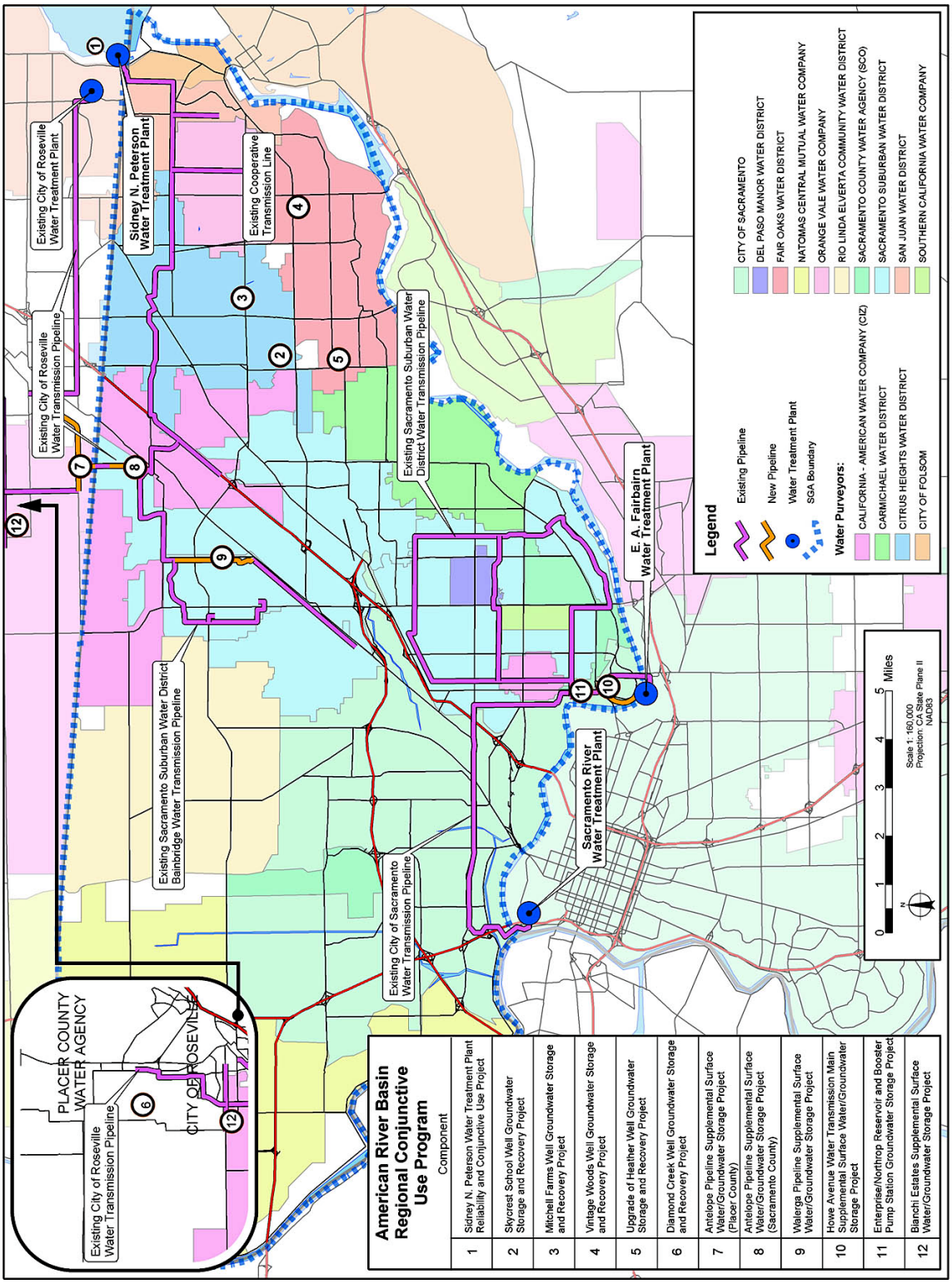


Figure 7. Existing Principal Infrastructure and Additional Infrastructure Resulting from American River Basin Regional Conjunctive Use Program

2.4.2 Operations

Recent (year 2002) surface water and groundwater use by the water purveyors within the SGA boundaries are shown in **Table 4** and on **Figure 8**. **Table 4** shows that Sacramento, Sac Suburban, and Cal-Am extracted the largest volumes of groundwater. These districts serve the largest, and some of the most densely populated, regions within the SGA boundaries. NCMWC, OVWC, Folsom, and SJWD extracted the least amount of groundwater. These agencies get the vast majority of their water from surface water sources, as shown in **Figure 8**. Total groundwater extraction by SGA member agencies during the last five years (1998 – 2002) is shown in **Figure 9**.

2.5 FUTURE FACILITIES AND OPERATIONS

Phase I of the RWMP identified and described a "menu" of project and program alternatives for implementing the WFA north of the American River. Phase II provided detailed hydrologic (including surface water and groundwater modeling), engineering (including conceptual design, operational analyses, and estimates of costs), and legal/institutional (including operational agreements and funding) evaluations of those projects and programs that best aligned with the goals and objectives of the individual water purveyors and the WFA. The recommendations resulting from Phase II were used to structure the SGA and RWA's regional projects and programs including: SGA-Sacramento Area Flood Control Agency (SAFCA) Pilot Study, 2002 CALFED Bay-Delta Program (CALFED) Environmental Water Account (EWA) Pilot Study, Sac Suburban's Groundwater Stabilization Project, Proposition 13 Groundwater Storage Program Construction Grant (i.e., American River Basin Regional Conjunctive Use Program or ARBCUP), and other ongoing efforts. Some of the planned infrastructure is shown in **Figure 7** and described in **Table 5**.

2.6 EFFECTS OF WFA IMPLEMENTATION

Implementation of the local conjunctive use program prescribed by the WFA will determine the year 2030 water supply scenarios for the water purveyors within the SGA's boundaries. (More detailed water purveyor-specific data are presented in **Appendix B**.) In general, the intent of the WFA is to increase the use of groundwater in dry years and reduce surface water diversions. The decrease in available dry year diversions is a consequence of the WFA objective to provide instream flows in the lower American River for environmental purposes. In wet years, when more surface water is available, diversion will be increased and groundwater extraction will be reduced, thereby promoting recharge of the basin.

2.6.1 Water Year Types

The WFA identifies three principal water year types. These year types are based on estimated March through November unimpaired inflow into Folsom Reservoir and are categorized as wet/average years, drier years, and driest years. For the water purveyors listed in **Table 4**, the specific year type criteria are stated.

Table 4. Year 2002 and Projected 2030 Water Supply Scenarios for Water Purveyors within SGA Boundaries

Water Purveyor	2002 Water Supply Scenario		Projected 2030 Water Supply Scenario [1]	
	Annual Demands [2] (AF/year)	Water Supply Mix, Surface Water/ Supplemental Supply[2], [3] (AF/year)	Annual Demands [4] (AF/year)	Water Supply Mixes by WFA Year Type, Surface Water/ Supplemental Supply[3] (AF/year)
Area "D" Agencies (within Sacramento's POU, north of American River) [5]:			**27,420**	W/A: 27,420/ 0 [7] Drier: 3,500/23,920 [7] Driest: 3,500/23,920 [7]
Cal-Am – Arden Service Area	-- [6]	-- [6]	3,340	
SCWA – Arden Park Vista Service Area	-- [6]	-- [6]	3,150	
DPMWD	1,692	0 / 1,692	1,570	
Sac Suburban – Arcade Service Area (Town & Country Sub-area)	-- [6]	-- [6]	17,990	
SCWC – Arden Town Service Area	1,317	0 / 1,317	1,370	
CWD	13,280	9,507 / 3,773	**12,000** [8]	W/A: 0/12,000 [9] Drier: 0/12,000 [9] Driest: 0/12,000 [9]
Folsom – north of American River only	1,149	1,149 / 0	-- [10]	-- [10]
Sacramento – north of American River only	51,732	26,734 /24,998 [11]	**64,110**	W/A: 64,110/ 0 [12] Drier: -- [12] Driest:42,110/22,000 [12]
NCMWC	88,028 [13]	88,028 / 0 [13]	**51,570**	W/A: 45,610/ 5,960 Drier: 45,610/ 5,960 Driest: 45,610/ 5,960
Sac Suburban and others within PCWA transfer water supply POU in Sacramento County:			**64,820**	W/A: 29,000/35,820 [15] Drier: 0/64,820 [15] Driest: 0/64,820 [15]
Cal-Am – Royal Oaks/Lincoln Oaks Service Areas	19,867 [6]	0 /19,867 [6]	19,910	
RLECWD	3,367	0 / 3,367	18,690	
Sac Suburban:				
Arcade Service Area, North Highlands Sub-area	22,711 [6]	0 /22,711 [6]	5,220	
Northridge Service Area	18,640	16,938 / 1,702 [11]	19,490	
McClellan AFB	-- [14]	-- [14]	1,510	
Sacramento International Airport	-- [16]	-- [16]	**6,260**	W/A: 0/ 6,260 [9] Drier: 0/ 6,260 [9] Driest: 0/ 6,260 [9]
SCWA – Northgate Service Area	5,279 [6]	0 / 5,279 [6]	**1,150**	W/A: 0/ 1,150 [9] Drier: 0/ 1,150 [9] Driest: 0/ 1,150 [9]
SJWD and consortium in Sacramento County			**43,920**	W/A: 43,920/ 0 [9] Drier: Ranging from[9],[18] 43,920/ 0 to 35,510/ 8,410 Driest:35,510/ 8,410 [9]
CHWD	19,913	17,617 / 2,296 [11]	16,420	
FOWD	14,067	11,456 / 2,611 [11]	14,220	
OVWC	4,377	4,377 / 0	6,750	
SJWD	4,661	4,661 / 0	6,530 [17]	
Individual representatives from agriculture and self-supplied groundwater users	-- [16]	-- [16]	-- [16]	-- [16]

Table 4. Year 2002 and Projected 2030 Water Supply Scenarios for Water Purveyors within SGA Boundaries (continued)

NOTES:

[1] Values rounded to nearest 10 AF.

[2] Surface water/supplemental water supply mixes from SGA DMS – year 2002 values as reported by individual water purveyors. Year 2002 water demands based on surface water/supplemental water supply mixes (assumes no shortages).

[3] Supplemental supplies may include groundwater extraction, demand management, and/or recycled water.

[4] From Cooperating Agencies RWMP, Phase II, Technical Memorandum 2, Table 1.

[5] Does not include portions of CWD and Sac Suburban (Northridge Service Area) also located within the Area "D" boundaries.

[6] SGA DMS reports data by water purveyor but not by service area.

[7] Assumes:

(1) Sac Suburban PSA accepted by Water Forum Successor Effort.

(2) Surface water from Sac Suburban and DPMWD contract agreements with Sacramento may be used within Area "D".

(3) Diversions at Fairbairn WTP are dependent upon flows bypassing the WTP exceeding the Hodge Flow Condition. (Hodge Flow Condition: Parties to the litigation (*Environmental Defense Fund et al. v. East Bay Municipal Utility District*) cannot divert water from the American River unless instream flows measure at least 2,000 cubic feet per second (cfs) from October 15 through February; 3,000 cfs from March through June; and 1,750 cfs from July through October 14.)

[8] CWD will divert up to its license amount of 14,000 AF. By the year 2030, it is most likely that the water demand for CWD will be reduced to their historic baseline level of 12,000 AF by implementation of the Urban Water Conservation Best Management Practices. Signatories to the WFA acknowledge and agree that CWD shall not relinquish control of or otherwise abandon the right to any quantity it has foregone delivery and/or diversion of under this Agreement, and shall retain the right (if any) to transfer that water for the other beneficial uses, after that water has served its purpose of assisting in the implementation of the Improved Pattern of Fishery Flow Releases, for diversion or rediversion at, near or downstream of the confluence of the lower American River.

[9] Wet/Ave Years: As it applies to these diverters, years when projected March through November Unimpaired Inflow to Folsom Reservoir is greater than 950,000 AF.

Drier Years: As it applies to these diverters, years when projected March through November Unimpaired Inflow to Folsom Reservoir is less than 950,000 AF.

Driest Years (i.e. Conference Years): Years when projected March through November Unimpaired Inflow to Folsom Reservoir is less than 400,000 AF. Conference years are those years that require diverters and others to meet and confer on how best to meet demands and protect the American River.

[10] Portion of Folsom (north of American River) included in SJWD.

[11] Data reflects participation in 2002 EWA Pilot Study.

[12] Wet/Average, Drier, and Driest year diversions are estimated. Diversions at Fairbairn WTP are dependent upon the flows bypassing the WTP exceeding the Hodge Flow Condition. (Hodge Flow Condition: Parties to the litigation (*Environmental Defense Fund et al. v. East Bay Municipal Utility District*) cannot divert water from the American River unless instream flows measure at least 2,000 cfs from October 15 through February; 3,000 cfs from March through June; and 1,750 cfs from July through October 14.)

[13] SGA DMS includes surface water diversions from both Sacramento and Sutter counties.

[14] McClellan AFB included in Sac Suburban (Northridge) data.

[15] Wet/Ave Years: As it applies to these diverters, years when projected March through November Unimpaired Inflow to Folsom Reservoir is greater than 1,600,000 AF.

Drier Years: As it applies to these diverters, years when projected March through November Unimpaired Inflow to Folsom Reservoir is less than 1,600,000 AF.

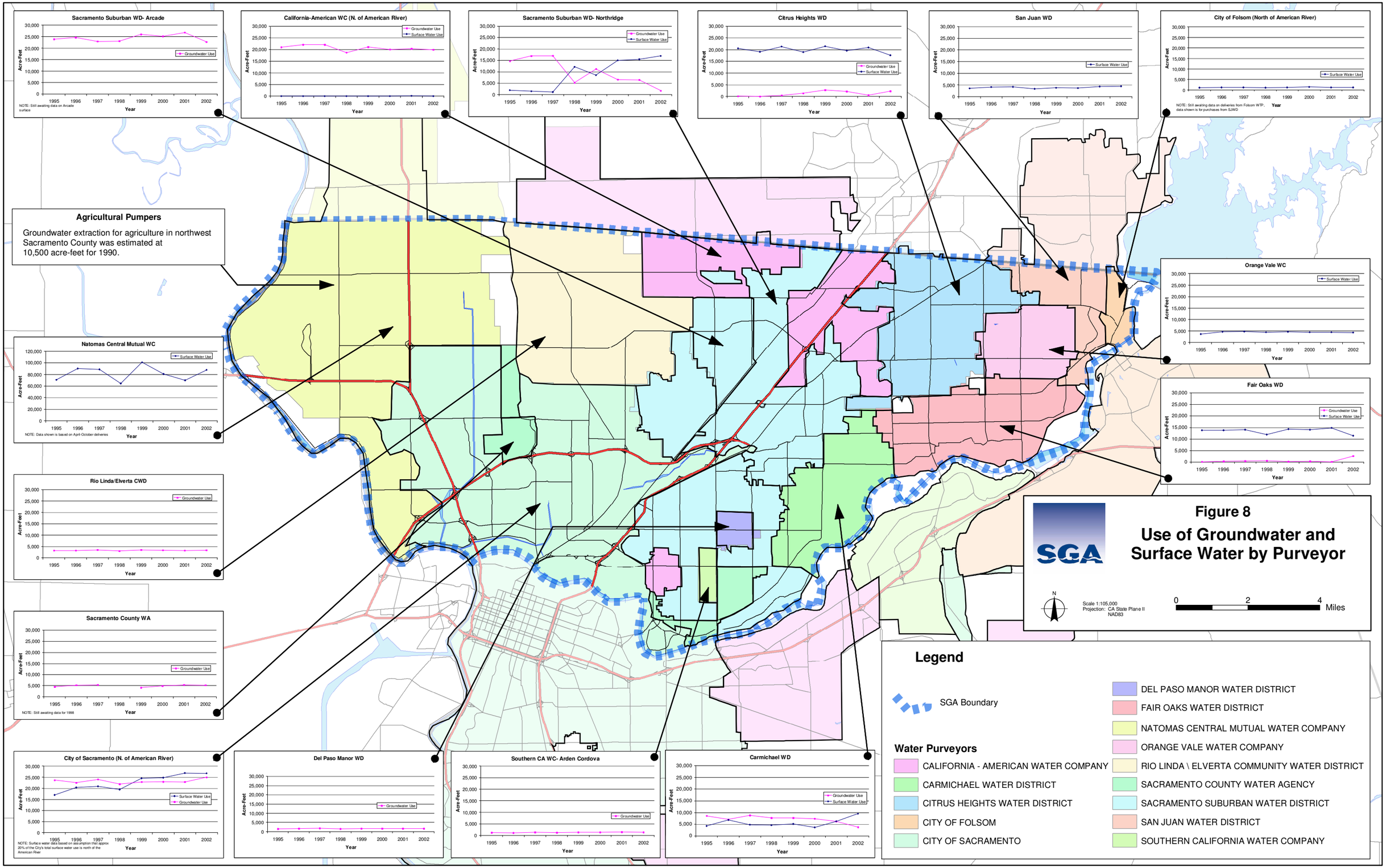
[16] Currently not tracked in the SGA DMS.

[17] Includes portion of Folsom (north of American River).

[18] Decrease in amount of surface water in proportion to the decrease in unimpaired flow from Folsom Reservoir.

2.6.1.1 Definition of Wet/Average Years

For most diverters, wet/average years are defined as those years when the projected March through November unimpaired inflow into Folsom Reservoir is equal to or greater than 950,000 acre-feet (AF). For Sac Suburban's water sale agreement with PCWA, a wet/average year is defined as a year when the March through November unimpaired inflow into Folsom Reservoir is greater than 1,600,000 AF. For Sacramento, diversions from the American River at the Fairbairn WTP are based on meeting the Hodge Flows in the lower American River.



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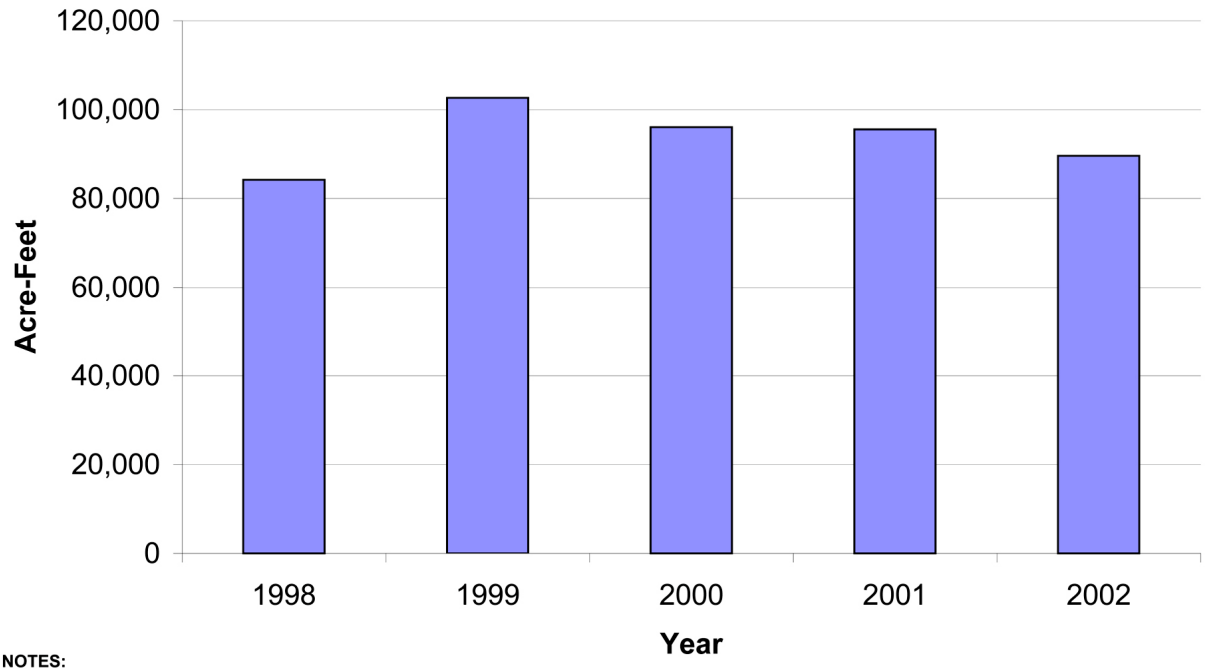

NOTES:
Does not include groundwater extraction by agriculture, self-supplied users, and private landowners.
1998 groundwater extraction does not include Sacramento County (still awaiting data).
1999 groundwater extraction includes participation in the SGA-Sacramento Area Flood Control Agency Pilot Study.
2000 through 2002 groundwater extraction reflects surface water deliveries to SSWD through its water sale agreement with PCWA.
2002 groundwater extraction also reflects participation in the CALFED Bay-Delta Program Environmental Water Account Pilot Study.

Figure 9. Total Annual Groundwater Extraction by SGA Member Agencies (1998 – 2002)

2.6.1.2 Definition of Drier Years

For most diverters, drier years are defined as those years when the projected March through November unimpaired inflow into Folsom Reservoir is less than 950,000 AF but equal to or greater than 400,000 AF.

2.6.1.3 Definition of Driest Years

The driest years, also referred to as "conference years", are defined as those year when the projected March through November unimpaired inflow into Folsom Reservoir is less than 400,000 AF.

2.6.2 WFA Water Supply Availability

Year 2030 implementation of the WFA will require increased groundwater extraction in the drier and driest years when less surface water is available from the American River. In the wet/average years, surface water diversions will be increased and groundwater pumping will be reduced. Projected year 2030 surface water and supplemental supply[13] use by the water purveyors within the SGA boundaries are shown in **Table 4**.

[13] Supplemental supplies may include groundwater extraction, demand management, and/or recycled water.

Table 5. RWA ARBCUP – Summary of Program Facilities

	Program Component	Operating Agency	Description	Grant Award Amount
1	Sidney N. Peterson WTP Reliability And Conjunctive Use Project	SJWD	WTP expansion and enhancement to increase rated capacity from 108 mgd (165 cfs) to 120 mgd (185 cfs)	$6,467,683
2	Skycrest School Well Groundwater Storage And Recovery Project	CHWD	Groundwater well (capacity up to 2,500 gpm and depth of 500 feet) to augment groundwater extraction capacity for CHWD	$506,225
3	Mitchell Farms Well Groundwater Storage And Recovery Project	CHWD	Groundwater well (capacity up to 2,500 gpm and depth of 500 feet) to augment groundwater extraction capacity for CHWD	$527,846
4	Vintage Woods Well Groundwater Storage And Recovery Project	FOWD	Groundwater well (capacity up to 2,500 gpm and depth of 600 feet) to augment groundwater extraction capacity for FOWD	$756,505
5	Upgrade Of Heather Well Groundwater Storage And Recovery Project	FOWD	Groundwater well (capacity up to 2,500 gpm and depth of 600 feet) to augment groundwater extraction capacity for FOWD	$667,371
6	Diamond Creek Well Groundwater Storage And Recovery Project	Roseville	Groundwater well (capacity of 2,000 gpm and depth of 400 feet) to augment the groundwater extraction capacity for Roseville	$786,111
7	Antelope Pipeline Supplemental Surface Water / Groundwater Storage Project (Placer County)	Roseville	Interconnection pipeline (portion within Placer County) connecting SJWD's Peterson WTP and Roseville WTP. Length is approx. 12,000 linear feet (2.3 miles) with 24-and 36-inch diameter pipeline, and capacity of 20 mgd (30 cfs)	$2,000,069
8	Antelope Pipeline Supplemental Surface Water / Groundwater Storage Project (Sacramento County)	Sac Suburban	Interconnection pipeline (portion within Sacramento County) connecting SJWD's Peterson WTP and Roseville WTP. Length is approx. 3,500 linear feet (.7 miles) with 36-inch diameter pipeline, and capacity of 20 mgd (30 cfs)	$1,294,327
9	Walerga Pipeline Supplemental Surface Water / Groundwater Storage Project	Sac Suburban	Interconnection pipeline will provide enhanced ability to deliver treated surface water to southern portion of Sac Suburban's Northridge Service Area and to McClellan AFB. Length is approx. 8,195 linear feet (1.6 miles) with 36-inch diameter pipeline, and capacity of 20 mgd (30 cfs)	$2,662,391
10	Howe Avenue Water Transmission Main Supplemental Surface Water / Groundwater Storage Project	Sacramento	Transmission main will provide additional capacity across American River for delivery to Sacramento and Sac Suburban's Arcade Service Area. Length is approx. 6,446 linear feet (1.2 miles) with 54-inch diameter pipeline, and capacity of 50 mgd (80 cfs)	$3,861,067
11	Enterprise / Northrop Reservoir And Booster Pump Station Groundwater Storage Project	Sac Suburban	Facility includes above-ground treated water storage reservoir for flow equalization and pump station for boosting treated water out of Sacramento's water transmission line into Sac Suburban's Arcade Service Area. Size of the storage tank is 5 million gallons (15 AF) and capacity of pump station is 20 mgd (30 cfs)	$2,078,266
12	Bianchi Estates Supplemental Surface Water/Groundwater Storage Project	PCWA	Project includes pipeline tie-in and individual property water meters for 46 residential customers that have historically relied on groundwater. By changing to surface water supply, 45 AF of water will be recharged annually into basin through in-lieu recharge. Additionally, project will include property owner conservation training, which in combination with meters will promote water use efficiency	$63,836
				$21,671,697

2.6.2.1 Water Use by Year Type

Water Use in Wet/Average Years. In wet/average years, surface water diversions will be maximized. In those years, surface water use by the water purveyors within the SGA boundaries will total approximately 222,060 AF/year. Estimates for each water purveyor's surface water use in wet/average years are shown in **Table 4**.

Supplemental supplies will make up the difference between demands and available surface water supplies. In wet/average years, the need for supplemental supplies is estimated to be approximately 49,190 AF/year and is generally assumed to be met with groundwater supplies. It should be noted that this is well below the 131,000 AF/year long-term sustainable yield estimate cited in the WFA. Estimates for each water purveyor's supplemental supplies in a wet/average year are shown in **Table 4**.

Water Use in Drier Years. In drier years, surface water diversions will be less than those in wet/average years, ranging from 169,140 to 138,730 AF/year. In drier years, the annual diversion amounts prescribed in the WFA are on a sliding scale based on the inflow to Folsom Reservoir. Estimates for each water purveyor's surface water use in wet/average years are shown in **Table 4**.

Supplemental supplies will make up the difference between demands and available surface water supplies. The need for supplemental supplies is estimated to range from 102,110 to 132,520 AF/year. It should be noted that in some drier years, the groundwater extraction rate will exceed the 131,000 AF/year long-term sustainable yield estimate cited in the WFA. Estimates for each water purveyor's surface water use in drier years are shown in **Table 4**.

Water Use in Driest Years. In the driest years, surface water diversions will be minimized, totaling 138,730 AF/year. As shown in **Table 4**, this is approximately an 83,330 AF/year reduction in diversions from the wet/average years. In the driest years, the need for supplemental supplies will increase to 132,520 AF/year. The majority of these supplemental supplies will be derived from groundwater extraction, exceeding the 131,000 AF/year long-term sustainable yield estimate cited in the WFA.

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3 MANAGEMENT PLAN ELEMENTS

The elements of this GMP include an overall goal, a set of management objectives, and a series of plan components that discuss and identify the actions necessary for meeting the goal and objectives (see **Figure 10**).

3.1 GROUNDWATER MANAGEMENT GOAL

The goal of this GMP is to ensure a viable groundwater resource for beneficial uses including agricultural, industrial, and municipal supplies that support the WFA's co-equal objectives of providing a reliable and safe water supply and preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River.

3.2 BASIN MANAGEMENT OBJECTIVES

To meet the goal stated above, the SGA has adopted five specific basin management objectives (BMOs). These BMOs include the following:

1. **Maintain or improve groundwater quality in the SGA area for the benefit of basin groundwater users.** The groundwater supplied for public consumption meets all public health criteria. However, occurrences of large-scale groundwater contamination are documented in the basin. It is the intent of the SGA that use of groundwater by member agencies in the basin is not hindered by contamination, and that such use does not cause degradation of the quality of the resource. Where contamination is documented, or occurs in the future, the SGA will coordinate with appropriate state and federal regulatory agencies to pursue actions that result in the containment and eventual remediation of the contaminant.
2. **Maintain groundwater elevations that result in a net benefit to basin groundwater users.** Over the past several decades, the extensive groundwater pumping to support urban development has resulted in a persistent cone of depression. The lowering of groundwater elevations can have adverse impacts ranging from increased energy costs to the need to deepen existing wells or even construct new ones. Increased conjunctive use in the basin, particularly additional groundwater extraction during drier years, may result in short-term water levels being drawn down below previous historical lows. The SGA intends that the impacts during these times be minimized and that overall groundwater levels in the basin be improved over time from the present condition.
3. **Protect against any potential inelastic land surface subsidence.** Land subsidence can cause significant damage to essential infrastructure. Historic land surface subsidence within the SGA area has been minimal, with no known significant impacts to existing infrastructure. Given the historical trends, the potential for land surface subsidence from groundwater extraction in the north area basin is remote. However, the SGA intends to monitor for potential land surface subsidence. If inelastic subsidence is documented in conjunction with declining groundwater elevations, the SGA will investigate appropriate actions to avoid adverse impacts.

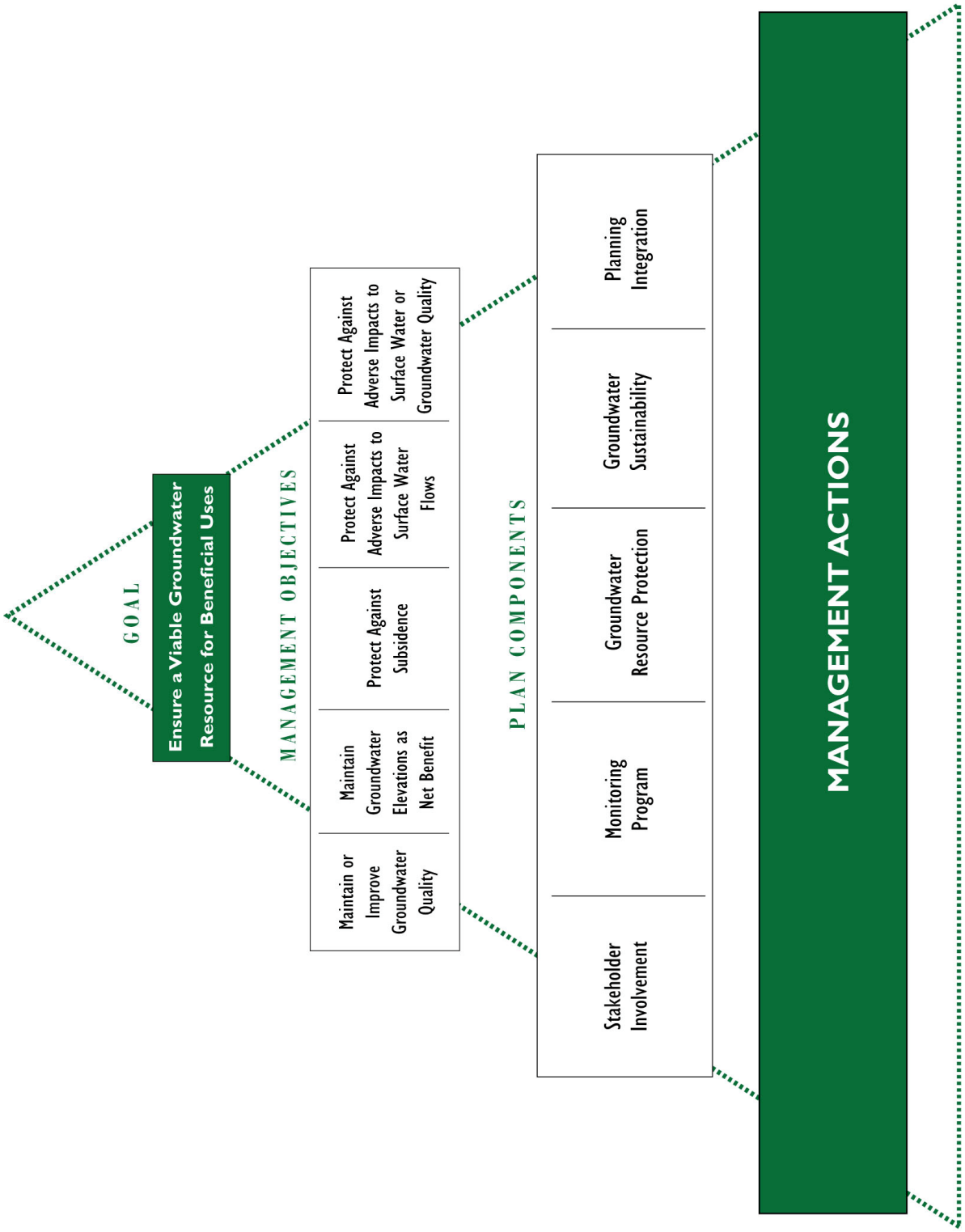

Figure 10. Organization of Management Plan Elements

4. **Protect against adverse impacts to surface water flows in the American River and Sacramento River.** Among other important uses, the American and Sacramento rivers provide habitat for a variety of fish and wildlife species. The SGA and its members are committed to the objectives of the WFA, including the objective to protect and enhance the lower American River. Important elements of the WFA include commitments to reduce lower American River diversions during dry years and to not exceed agreed upon groundwater extractions of 131,000 AF/year on average. In addition, the SGA plans to monitor and evaluate the relationship (if any) between groundwater pumping and adjacent river or stream flows.
5. **Protect against adverse impacts to water quality resulting from interaction between groundwater in the basin and surface water flows in the American River and Sacramento River.** In most natural settings, groundwater is higher in TDS and most other constituents than surface water. At the present time, the flow regime is such that groundwater is not discharging to the river systems in the SGA area. It is possible that future actions could temporarily alter that condition. It is the SGA's intent that controllable operations of the groundwater system do not negatively impact the water quality of the area's rivers and streams. The SGA will seek to gain a better understanding of potential impacts of the discharge of local-area groundwater to surface water channels.

3.3 GMP COMPONENTS

The GMP includes a variety of components that are required by CWC § 10753.7, recommended by DWR Bulletin 118 (2003), optional under CWC § 10753.8, and other components that the SGA has already begun. These components can be grouped into five general categories: (1) stakeholder involvement, (2) monitoring program, (3) groundwater resource protection, (4) groundwater replenishment, and (5) planning integration. Each category and its components are presented in this section. Under each component is a discussion, proposed actions, and identification of the objectives toward which the component is directed.

3.4 COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT

The management actions taken by the SGA may have a wide range of impacts on a broad range of individuals and agencies that ultimately have a stake in its successful management of the basin. The local consumer may be most concerned about water rates or assurances that each time the tap is turned a steady, safe stream of water is available. To large state and federal water resource agencies, the degree to which the SGA can achieve local supply reliability and further banking and exchange programs enhances the state and federal programs' opportunity to meet statewide needs, particularly in drier years. To address the needs of all of these stakeholders, the SGA has pursued several means of achieving broader involvement in the management of the North Area Groundwater Basin. These include: (1) involving members of the public, (2) involving other local agencies within and adjacent to the SGA area, (3) using advisory committees for development and implementation of the GMP, (4) developing relationships with state and federal water agencies, and (5) pursuing a variety of partnerships to achieve local supply sustainability. Each of these is discussed further below.

3.4.1 Involving the Public

Groundwater in California is a public resource, and the SGA is committed to involving the public in the development and implementation of its GMP. When the JPA creating the SGA was signed by the cities of Citrus Heights, Folsom, and Sacramento and the County of Sacramento,

those entities chose an inclusive governance structure consisting of Board membership from all water suppliers overlying the SGA portion of the basin. Many of these Board members are elected officials representing the various water districts and the citizens they serve.

In the preparation of this GMP, the SGA has filed four separate notices in the Sacramento Bee (**Appendix C**). In accordance with CWC § 10753.2, a notice of intent to adopt a resolution to prepare a GMP and inviting the public to the August 14, 2003 SGA Board meeting was published. Upon adoption of the resolution of intent, the resolution was also published in the Sacramento Bee. Additionally, a separate notice inviting the public to participate in developing the GMP and explaining how they could do so was published in May 2003 in the Sacramento Bee. Finally, the SGA provided a public comment period on the draft GMP and noticed and held a second meeting for the public to comment on the GMP prior to its adoption.

The SGA has also demonstrated its commitment to outreach and education. In addition to all required public notification, the SGA prepared a public outreach plan as part of a partnership with DWR. The plan includes many strategies for communicating with both internal and external audiences for various aspects of the program. The Public Outreach Plan Summary from the report by Lucy & Company (2003) is included in **Appendix C**.

In November 2003, the SGA released a Web site (www.sgah2o.org). The SGA will use its Web site to distribute information on GMP implementation activities to the public.

Actions. The SGA will take the following actions:

1. Continue efforts to encourage public participation as opportunities arise.
2. Review and take actions from the public outreach plan as necessary during implementation of various aspects of the GMP.
3. Provide briefings to the Water Forum Successor Effort on GMP implementation progress.
4. Work with members to maximize outreach on GMP activities including the use of the SGA Web site, member Web sites, or bill inserts.

3.4.2 Involving Other Agencies Within and Adjacent to the SGA Area

The SGA's legal boundary is limited to that of the JPA signatories in Sacramento County north of the American River. This includes all of Sacramento County north of the American River. All water purveyors in northern Sacramento County are SGA members and are participating in the development and implementation of this GMP. **Figure 11** shows the SGA purveyors and some of the key adjacent entities that SGA has begun coordinating with during development of the GMP. One key agency within the SGA boundary that is not a water purveyor is the Air Force Real Property Agency (AFRPA), which oversees remediation efforts of contaminated soil and groundwater at the former McClellan AFB. The SGA and the AFRPA have established a committee to meet and discuss issues related to groundwater management and remediation efforts at the former McClellan AFB, and is integrating some of the monitoring wells at McClellan AFB into the SGA monitoring network (see **Section 3.5**).

Other users in the basin not noted on **Figure 11** include agriculture and other self-supplied groundwater producers. The SGA should ensure effective outreach to these groups.

The SGA boundary covers approximately the southern one-third of the North American Subbasin as defined by DWR (**Figure 2**). The remainder of the subbasin includes portions of Sutter and Placer counties.

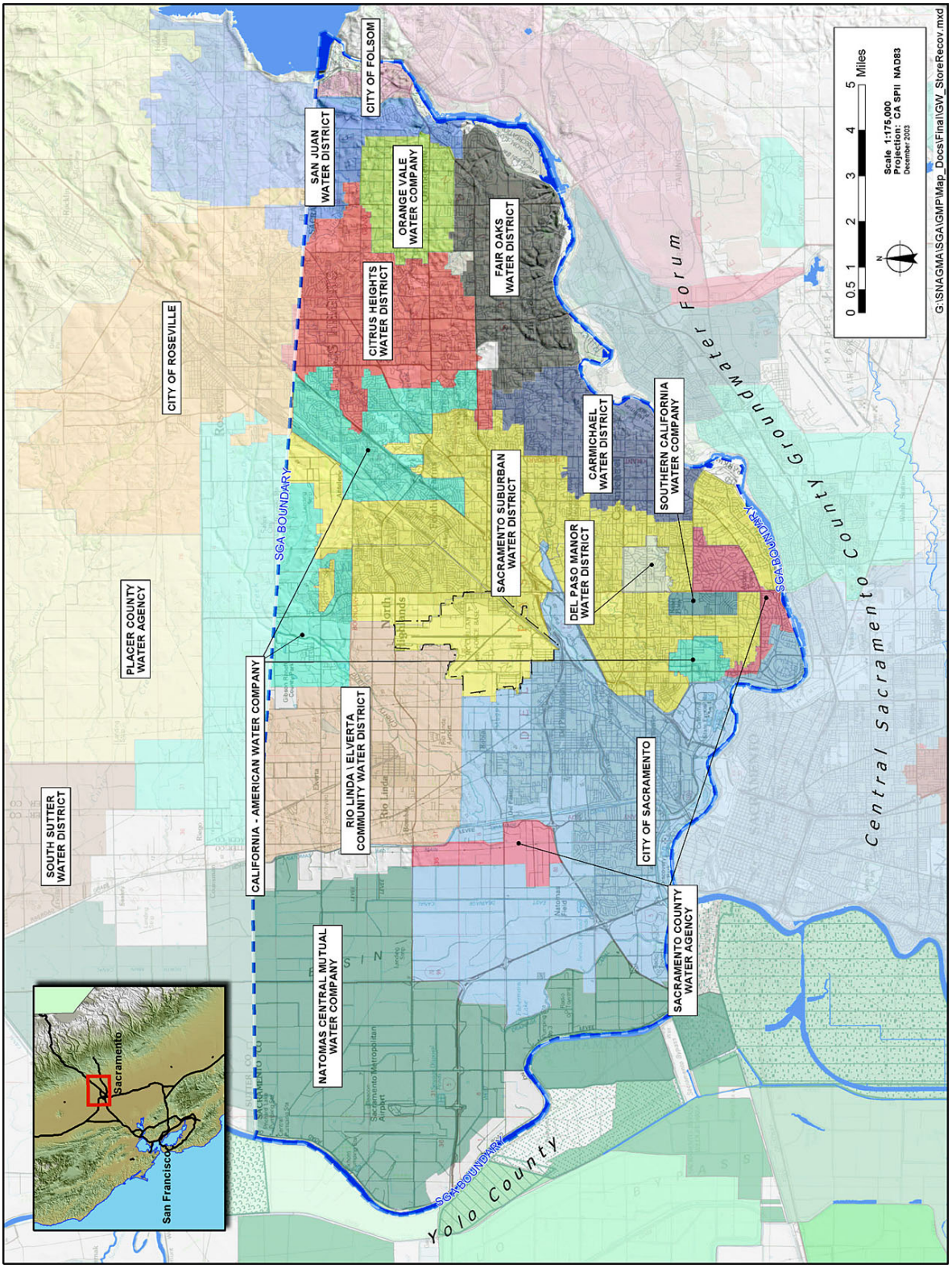

Figure 11. SGA Member Agencies and Other Adjacent Local Agencies

In 2000, NCMWC adopted a GMP for its service area in both Sacramento and Sutter counties (Luhdorff & Scalmanini Consulting Engineers (LSCE), 2000). That GMP will continue to apply to NCMWC's Sutter County service area, while the SGA GMP will be in effect for the Sacramento County portion. NCMWC and SGA are coordinating to ensure that NCMWC's management needs continue to be met in Sacramento County through the SGA GMP.

In Placer County, the SGA is closely connected to groundwater management activities through the RWA. PCWA, Roseville, and the City of Lincoln (Lincoln) are all members of the RWA. PCWA adopted an AB 3030 GMP in 1998, which includes Roseville. PCWA adopted an updated GMP in compliance with SB 1938 in November 2003. The RWA Executive Director is on a steering committee for implementation of the West Placer County Groundwater Management Plan. Lincoln is not covered by the PCWA plan, and adopted its own SB 1938-compliant GMP in November 2003. The RWA Executive Director is a member of the Advisory Committee organized to develop and implement that plan. Finally, SGA staff have briefed PCWA staff responsible for groundwater management on the SGA GMP development and have designated a representative from Placer County as a member of the SGA GMP Technical Review Committee (see **Section 3.4.3**).

In Sutter County, much of the subbasin is managed either by South Sutter Water District (South Sutter) or by NCMWC. NCMWC is an SGA member although the Sutter County portion of the district does not fall under this GMP because it is beyond the boundaries of the SGA's authority. South Sutter adopted an AB 3030 GMP in 1995. South Sutter provided a copy of that GMP to the SGA, and the SGA provided a briefing to the South Sutter General Manager on its current GMP development efforts. Finally, the SGA appointed a representative from Sutter County Department of Public Works as a member of the SGA GMP Technical Review Committee.

In addition to involving other agencies within the North American Subbasin, the SGA has briefed representatives of Yolo County (representing the Yolo Subbasin) to the west and the Central Sacramento County Groundwater Forum (or Groundwater Forum, representing the South American Subbasin) to the south. The SGA also maintains close coordination with the Central Sacramento County through the RWA by being an active associate member of the Groundwater Forum's water purveyor interest group.

Actions. The SGA will take the following actions:

1. Continue high level of involvement demonstrated through the SGA GMP development into implementation of the plan by continued participation on committees described above.
2. Provide copies of the adopted GMP and subsequent annual reports to representatives from Placer, Sutter, and Yolo counties, and the Groundwater Forum.
3. Meet with representatives from Placer, Sutter, and Yolo counties, and the Groundwater Forum as needed.
4. Coordinate a meeting with agricultural pumpers in the SGA area to inform them of the SGA's management responsibilities and activities, and develop a list of agricultural groundwater pumpers concerns and needs relative to the SGA's management of the area.
5. Coordinate a meeting with other self-supplied pumpers in the SGA area to inform them of the SGA's management responsibilities and activities, and develop a list of self-supplied groundwater pumpers concerns and needs relative to the SGA's management of the area.

3.4.3 Utilizing Advisory Committees

The SGA is committed to using advisory committees in its GMP development and implementation. Prior to beginning development of the GMP, the SGA Board appointed an ad hoc committee to make recommendations for the composition of a Policy Committee and Technical Review Committee to guide development of the GMP. The ad hoc committee recommended that the Policy Committee be composed of SGA members representing the overall composition of the groundwater users within the SGA boundaries and that the Technical Review Committee include broader membership including agencies outside the SGA boundaries to consider technical issues related to the plan. Each committee met on approximately a monthly basis during GMP development.

The primary groups represented on the Policy Committee include:

- Cal-Am
- Sacramento
- NCMWC
- Sac Suburban
- San Juan Family[14]
- Agriculture

The primary groups represented on the Technical Review Committee include:

- Sacramento
- NCMWC
- Placer County/Roseville
- Sac Suburban
- San Juan Family
- DWR
- Sutter County

Actions. The SGA will take the following action:

1. Upon adoption of the GMP, the Policy Committee will meet to discuss the continuation and composition of committees to guide implementation of the plan. Provide these recommendations to the SGA Board of Directors.

3.4.4 Developing Relationships with State and Federal Agencies

Working relationships between the SGA and the local, state, and federal regulatory agencies are critical to developing and implementing the various groundwater management strategies and actions detailed in this GMP. Examples of the SGA, RWA, Cooperating Agencies, and their member agencies working cooperatively with the regulatory agencies include:

- **Cooperating Agencies RWMP.** Both Reclamation and DWR participated in and provided funding for the RWMP effort (Phases I and II).

[14] The San Juan Family is comprised of SJWD, CHWD, FOWD, OVWC, and Folsom (north of the American River).

- **Banking and Exchange Program.** A partnership of the Cooperating Agencies and the SGA was the first signatory of a Memorandum of Understanding with DWR's Integrated Storage Investigation (ISI) in March 2000. The potential for a regional banking and exchange program was investigated through pilot studies and related activities. DWR's ISI provided funding for this effort.
- **SGA-SAFCA Pilot Study.** In 1999/2000, the SGA's first pilot study was conducted in conjunction with a local flood control agency (SAFCA) and Reclamation.
- **EWA Pilot Study.** In 2002, SGA's pilot study was the first water acquisition made by Reclamation on behalf of the EWA.
- **SGA DMS.** The U.S. Army Corps of Engineers (USACE) and DWR participated in the development of and provided funding for the SGA DMS (Phases I and II).
- **American Basin Conjunctive Use Feasibility Study.** In the mid-1990s, DWR conducted a feasibility study of conjunctive use parts of Sacramento, Sutter, and western Placer counties. NCMWC, an SGA member, was a cooperator in the study. The investigation serves as a good example of developing relationships between state and local agencies.

The SGA also coordinates and develops working relationships with other local, state, and federal regulatory agencies (e.g., Sacramento County, California Department of Health Services (DHS), U.S. Environmental Protection Agency (USEPA), etc.), as appropriate.

Actions. The SGA will take the following action:

1. Continue to develop working relationships with local, state, and federal regulatory agencies.

3.4.5 Pursuing Partnership Opportunities

The SGA is committed to facilitating partnership arrangements at the local, state, and federal levels. In the past decade, Sacramento-area water community and other local leaders have made great strides toward regional planning and collaboration on water issues. The historic WFA, which involved over 40 stakeholders and 7 years of facilitated discussions, resulted in a regional framework to balance the competing demands for increased use of surface and groundwater with the environmental needs of the lower American River through the year 2030. Several important partnerships have been formed to implement the WFA as well as provide a host of other benefits to water agencies and the customers that they serve.

The SGA itself is a unique partnership between the cities and county entering a joint powers agreement and allowing the agency to be overseen by a board of local water purveyors and self-supplied and agricultural interests. Regionally, the SGA is closely partnered with the RWA, the Water Forum Successor Effort, and the Cooperating Agencies. Together these activities define and support a conjunctive use program, which is critical to supporting the overall management goal of a safe and reliable water supply.

While the facilities necessary for local supply reliability through 2030 have been identified through the RWMP, the potential exists to expand conjunctive use operations in the basin to achieve broader regional and statewide benefits. The needed facilities, however, would require substantial resources. To investigate any further opportunities would require resources provided through partnerships from potential beneficiaries.

Actions. The SGA will take the following actions:

1. Continue to promote partnerships that achieve both local supply reliability and achieve broader regional and statewide benefits.
2. Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.

3.5 COMPONENT CATEGORY 2: MONITORING PROGRAM

At the heart of this GMP is a monitoring program capable of assessing the status of the basin and responses in the basin to future management actions. The program includes the monitoring of groundwater elevations, monitoring of groundwater quality, monitoring and assessing the potential for land surface subsidence resulting from groundwater extraction, and developing a better understanding of the relationship between surface water and groundwater along the American and Sacramento rivers. Also important is the establishing of monitoring protocols to ensure the accuracy and consistency of data collected. Finally, the monitoring program includes a tool, the DMS, for assembling and assessing the groundwater-related data in the North Area Groundwater Basin.

3.5.1 Groundwater Elevation Monitoring

The SGA has compiled historic water level data measurements extending from prior to 1950 through 2002. Sources of historic water level data for the SGA area include:

- DWR/SCWA
- SGA Member Agencies
- USGS
- CSUS

DWR and SCWA have maintained a program of measuring more than 30 wells in the basin, from which SCWA routinely generates annual contour maps for the county. However, the wells monitored have been added to and dropped off of the network over time, so it is difficult to compare a historic contour plot to a recent one. For this reason, the SGA is establishing a standardized network of wells that combines those monitored by DWR and SCWA with wells from member water purveyors and other sources. It is the SGA's intent that these wells be maintained as a consistent long-term network that represents overall groundwater elevation conditions in the basin. **Figure 12** shows the wells currently proposed for this network.

The wells were selected to provide uniform geographic coverage throughout the 195 square mile SGA area, and in an area around the northern, western, and southern perimeter of the SGA[15]. The well network was developed by first establishing a network of sampling grids using the following method:

- Overlay a matrix of evenly spaced points over the SGA area.
- Surround matrix of points with polygons.
- Conform boundaries of polygons to the SGA boundaries and regenerate area grids.

[15] No wells were selected east of the boundary because it is in consolidated rock outside of the groundwater basin.

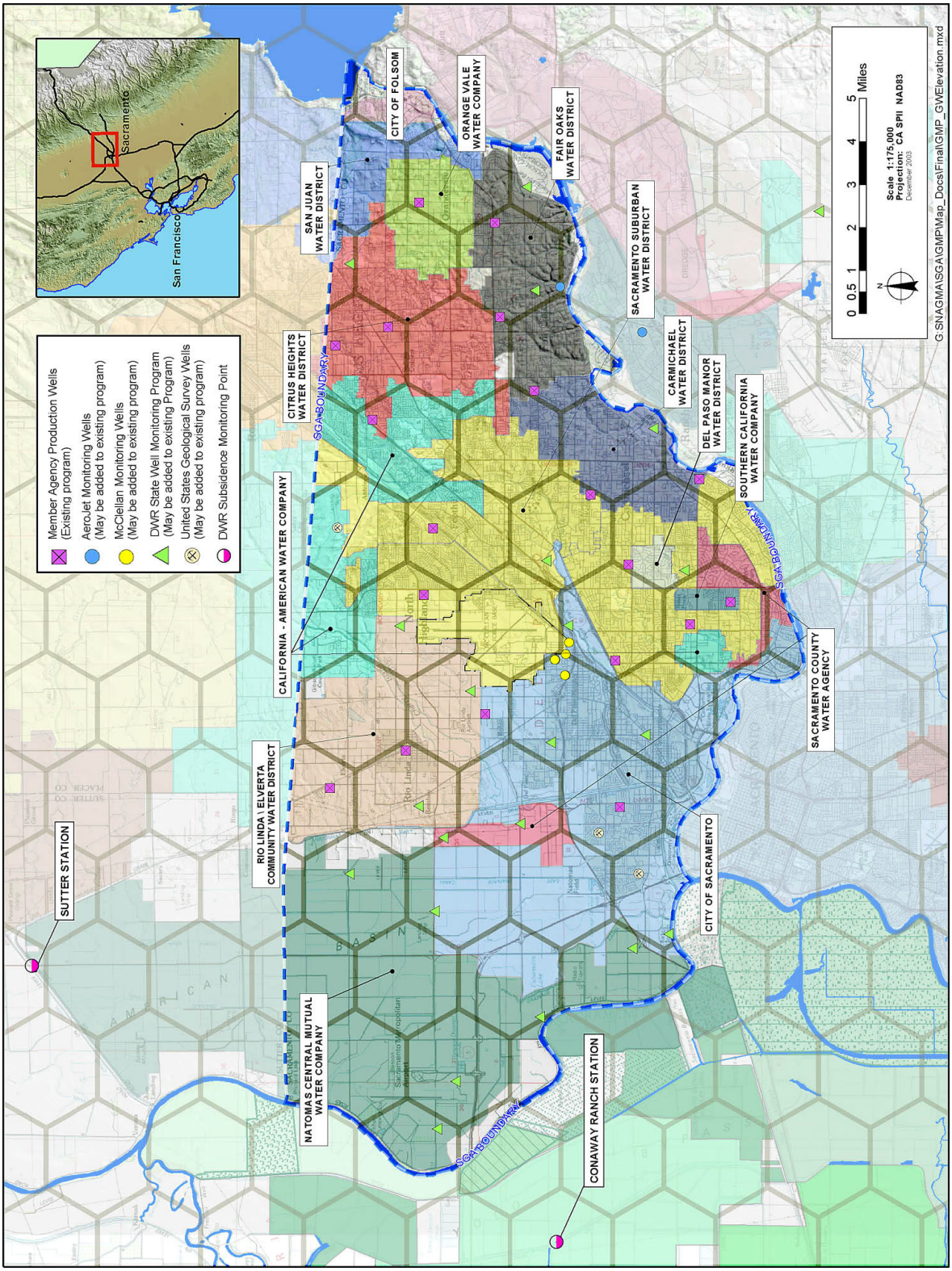

Figure 12. Initial Proposed Wells for Consideration in SGA Groundwater Elevation Monitoring Network

The resulting grid, shown on **Figure 12,** includes 44 polygons of roughly equal area of about five square miles each. The proposed set of member agency monitoring wells were selected from the DMS to represent water levels for as many polygons as possible. Individual wells were selected by:

- Giving preference to wells currently in DWR's and SCWA's monitoring program. These wells were selected because (a) they have long records of historic water level data and are useful in assessing trends within the groundwater basins, (b) uniform protocols were used in measuring and recording the water level data, and (c) these are non-producing wells, so water level readings represent relatively static levels.
- Identifying member agency wells with well construction information, long records of water level data and giving preference to those wells with the lowest recent extraction volumes.
- Plotting the location of USGS wells within the SGA area and choosing wells in those areas void of DWR or member agency wells.

Actions. Additional actions by the SGA will include:

1. Coordinate with member agencies and DWR to identify an appropriate group of wells for monitoring for a spring 2004 set of groundwater elevation measurements.
2. Coordinate with DWR and SCWA to ensure that the selected wells are maintained as part of a long-term monitoring network.
3. Coordinate with DWR and SCWA to ensure that the timing of water level data collection by member agencies coincides within one month of DWR and SCWA data collection. Currently DWR and SCWA collect water level data in the spring and fall.
4. Coordinate with member agencies to ensure that needed water level elevations are collected and verify that uniform data collection protocols are used among the agencies.
5. Coordinate with the USGS to determine the potential for integrating USGS monitoring wells constructed for the NAWQA Program into the SGA monitoring network.
6. Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.
7. Assess groundwater elevation trends and conditions based on the network annually.
8. Assess the adequacy of the groundwater elevation monitoring well network annually.
9. Identify a subset of monitoring wells that will be monitored more frequently than twice annually to improve the SGA's understanding of aquifer responses to pumping throughout the year.

3.5.2 Groundwater Quality Monitoring

Because most of the wells in the basin are used for public water supply, an extensive record of water quality data is available for most wells dating from about 1985 to present. The SGA has compiled available historic water quality data for constituents monitored as required by DHS under Title 22. Sources of water quality data include:

- DWR
- SGA Member Agencies

- USGS
- CSUS

This level of monitoring is sufficient under existing regulatory guidelines to ensure that the public is provided with a safe, reliable drinking water supply. It would ultimately be important to have in place a network of shallow (less than 200 feet deep), dedicated monitoring wells to serve as an early warning system for contaminants that could make their way to the greater depths in the basin where SGA members primarily extract groundwater. The SGA has identified the locations of several wells associated with the USGS NAWQA program and is working with AFRPA to identify a subset of the approximately 400 monitoring wells located in and around the former McClellan AFB for integration into the SGA monitoring effort. The SGA will also coordinate with the CVRWQCB, which oversees the remediation of LUSTs, to identify existing dedicated monitoring wells in the basin.

Figure 13 shows the existing SGA member agency production wells. Title 22 water quality reporting is required by DHS for each of these public drinking water supplies. The SGA's water quality monitoring network includes these wells. The water quality monitoring well network may be expanded to include additional DWR, USGS, McClellan AFB, Aerojet, CVRWQCB, and privately owned wells, based on the outcome of coordination meetings with these agencies.

Actions. The following actions will be taken by the SGA to monitor and manage groundwater quality:

1. Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.
2. Coordinate with the USGS to obtain historic water quality data for NAWQA wells, determine timing and frequency of monitoring under USGS program, and to discuss the potential for integrating USGS monitoring resources with the SGA network.
3. Coordinate with member agencies and other local, state, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data. Identify opportunities for collecting and analyzing water quality samples from those wells.
4. Assess the adequacy of the groundwater quality monitoring well network annually.

3.5.3 Land Surface Elevation Monitoring

Subsidence of the land surface resulting from compaction of underlying formations affected by head (water level) decline is a well-documented concern throughout much of the Central Valley. During a typical pumping season, changes in land surface elevation can be observed as a result of both elastic and inelastic subsidence in the underlying basin. Elastic subsidence results from the reduction of pore fluid pressures in the aquifer and typically rebounds when pumping ceases or when groundwater is otherwise recharged resulting in increased pore fluid pressure. Inelastic subsidence occurs when pore fluid pressures decline to the point that aquitard (a clay bed of an aquifer system) sediments collapse resulting in permanent compaction and reduced ability to store water in that portion of the aquifer.

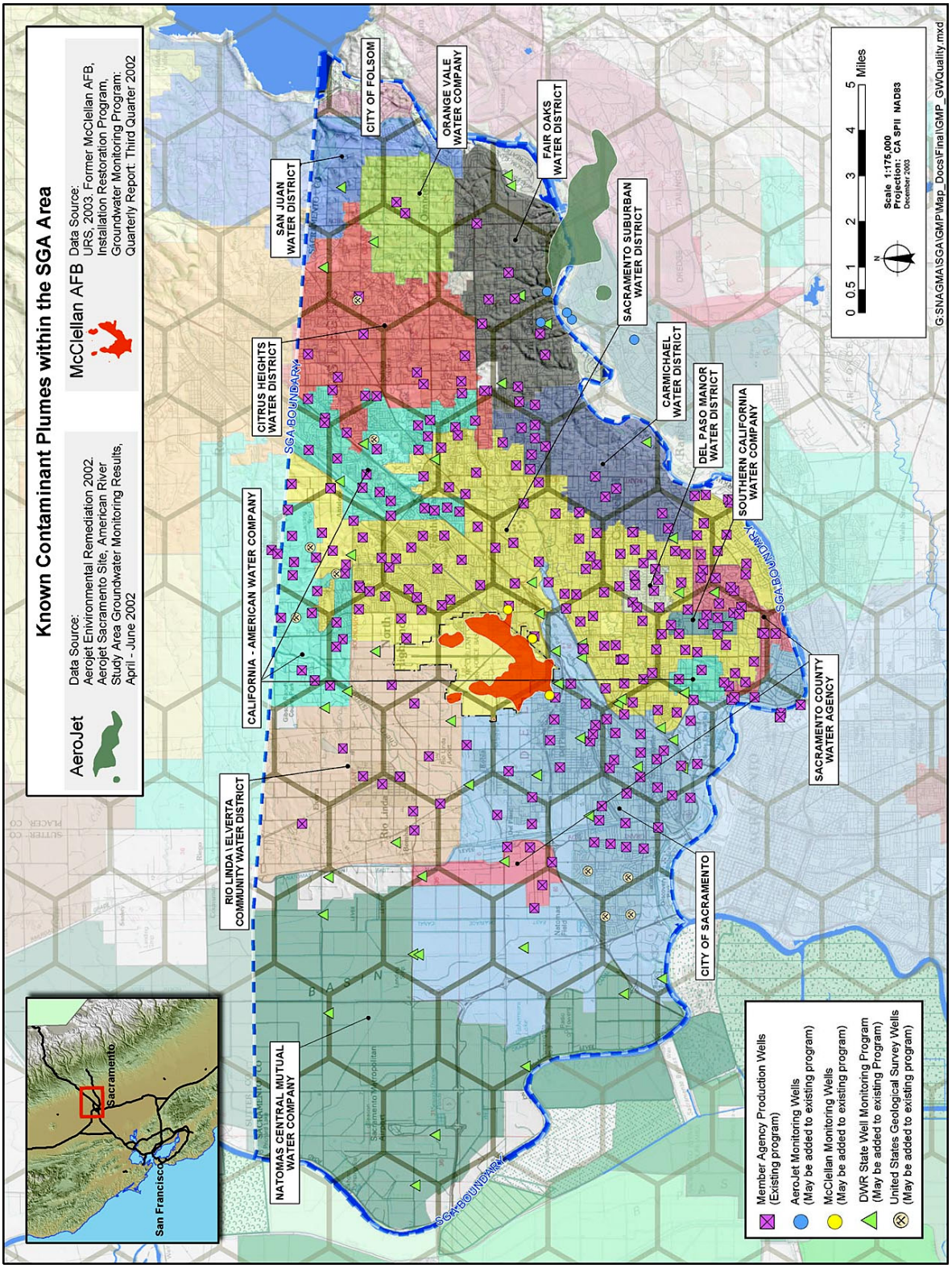

Figure 13. Existing and Proposed Wells in SGA Groundwater Quality Monitoring Network

While some land surface subsidence from compaction of water-bearing deposits caused by the removal of groundwater is known to have occurred west of the Sacramento River[16], the extent of subsidence east of the Sacramento River has been minimal. DWR maintains three subsidence monitoring stations in Sacramento Valley. The Sutter Station is located just north of the SGA area, where State Highway 99 crosses the Natomas Cross-Canal **(Figure 12)**. Total subsidence at the Sutter Station from spring 1995 to spring 2003 has been 0.026 feet (0.312 inch)[17]. Total subsidence at the Conaway Ranch Station, located west of the SGA area (**Figure 12**), from spring 1992 to spring 2003 has been 0.044 feet (0.526 inch)[18].

Historical benchmark elevation data for the period from 1912 through the late 1960s obtained from the National Geodetic Survey (NGS) were used to evaluate land subsidence in north Sacramento County. From 1947 to 1969 the magnitude of land subsidence measured at benchmarks north of the American River in Sacramento County ranged from 0.13 feet to 0.32 feet, with a general decrease in subsidence in a northeastward direction. This decrease is consistent with the geology of the area: formations along the eastern side of the Sacramento Valley are older than those on the western side and are subject to a greater degree of pre-consolidation making them less susceptible to subsidence. The maximum documented land subsidence of 0.32 feet was measured at both benchmark L846, located approximately two miles northeast of the former McClellan AFB, and benchmark G846, located approximately one mile northeast of the intersection of Greenback Lane and Elkhorn Boulevard.

Another land subsidence evaluation was performed in the Arden-Arcade area[19] of Sacramento County from 1981 to 1991. Elevations of nine wells in the Arden-Arcade area were surveyed in 1981, 1986, and 1991. The 1986 results were consistently higher than the 1981 results; this was attributed to extremely high rainfall totals in early 1986 that recharged the aquifer and caused a rise in actual land surface elevations. The 1991 results were consistently lower than the 1986 results; this was attributed to five years of drought immediately preceding the 1991 measurements, which caused depletion of the aquifer and resulting land surface subsidence. Comparison of eight[20] of the locations indicates that seven benchmarks have lower elevations in 1991 than in 1981 and one benchmark has a higher elevation in 1991. Of the seven benchmarks with lower elevations in 1991, the maximum difference is 0.073 feet (less than one inch). Whether this is inelastic subsidence is indeterminate from the data, but it is clear that the magnitude of the potential subsidence in the benchmarks during that period is negligible.

Actions. While available data and reports indicate that land surface subsidence is not a problem in the SGA area, the SGA is interested in pursuing additional possible actions to continue to monitor for potential land surface subsidence. These may include:

1. Investigate the feasibility and costs of re-surveying the wells in the Arden-Arcade area that were last measured in 1991.

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[16] From 1988-1992 cumulative net sediment compaction of 0.78 feet was measured at the extensometer in Yolo County between June 15, 1988 and October 1, 1992 (USGS data from the Woodland land subsidence monitoring station, Yolo County, California, water years 1988-1992, USGS Open File Report 94-494)

[17] Based on information provided by Central District of DWR to MWH on 12/11/03.

[18] Based on information provided by Central District of DWR to MWH on 12/17/03.

[19] The boundaries of the Arden-Arcade area are (1) Sacramento's city limits on the west, (2) Sacramento's city limits and the American River on the south, (3) CWD on the east, and (4) Sacramento's city limits and Sac Suburban (Northridge Service Area) on the north.

[20] One of the nine wells could not be compared between 1981 and 1991 because the benchmark was destroyed and replaced between 1981 and 1986.

2. Coordinate with the USGS to ascertain the suitability of the use of Interferometric Synthetic Aperture Radar (InSAR) images of the SGA and surrounding area. If the technology appears suitable, identify the costs of determining ground surface elevations and identify potential cost-sharing partners.
3. Coordinate with other agencies, particularly the City and County of Sacramento and the NGS to determine if there are other suitable benchmark locations in the SGA area to aid in the analysis of potential land surface subsidence.
4. Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence.

3.5.4 Surface Water Groundwater Interaction Monitoring

The interaction between groundwater and surface water has not been extensively evaluated within the SGA area. The SGA is currently aware of the following:

- A recent draft decision by the State Water Resources Control Board (SWRCB, 2003) regarding the American River, the SWRCB concluded that from Nimbus Dam to about 6,000 feet below the dam, groundwater elevations and surface water elevations were similar enough to each other that groundwater could be tributary to the American River. Beyond 6,000 feet down reach from Nimbus Dam, groundwater elevations are sufficiently lower than the river channel to conclude that the American River is a losing reach down to the confluence with the Sacramento River.
- Groundwater modeling (described in **Section 3.8.1**) has been used to estimate flow volumes between surface water and groundwater for various hydrologic conditions.
- CSUS in cooperation with DWR has recently installed several monitoring wells in and adjacent to the American River to investigate groundwater interaction with the American River and how recent USACE levee reinforcement projects might have changed the surface water-groundwater flow relationships.
- In 1991, Sacramento Regional County Sanitation District (SRCSD), Sacramento County, and Sacramento established the Sacramento Coordinated Water Quality Monitoring Program (CMP). Since that time, the CMP has monitored surface water quality for a variety of constituents including trace elements at several locations on the American River and Sacramento River. Within the SGA area, the CMP monitors the Sacramento River at the Interstate 5 Veteran Memorial Bridge, and the American River at Nimbus Dam and at Discovery Park.

Actions. The SGA will pursue actions to better understand the relationship between surface and groundwater in the SGA area, including:

1. Compile available stream gage data and information on tributary inflows and diversions from the American and Sacramento rivers to quantify net groundwater recharge or discharge between gages in the SGA area.
2. Coordinate with local, state, and federal agencies to identify available surface water quality data from the American and Sacramento rivers adjacent to the SGA area.
3. Correlate groundwater level data from wells in the vicinity of river stage data to further establish whether the river and water table are in direct hydraulic connection, and if the surface water is gaining or losing at those points.

4. Continue to coordinate with local, state, and federal agencies and develop partnerships to investigate cost-effective methods that could be applied to better understand surface water-groundwater interaction along the Sacramento and American rivers.
5. Coordinate with CSUS to analyze data obtained from recently constructed monitoring wells on the CSUS campus to better understand the relationship between the groundwater basin and surface water flows at that location.

3.5.5 Protocols for the Collection of Groundwater Data

The SGA has evaluated the accuracy and reliability of groundwater data collected by member agencies (MWH, 2002). The evaluation indicated a significant range of techniques, frequencies and documentation methods, for the collection of groundwater level and groundwater quality data. Although the groundwater data collection protocol may be adequate to meet the needs of the individual water districts, the lack of consistency between districts in the past yields an incomplete picture of basin-wide groundwater conditions. Other types of groundwater data collection protocols are included in **Sections 3.5.1** and **3.5.2** above.

Actions. To improve the comparability, reliability and accuracy of groundwater data, the SGA take the following actions:

1. Use a Standard Operating Procedure (SOP) for collection of water level data by each of the member agencies. **Appendix D** includes an SOP for Manual Water Level Measurements. This SOP was prepared using guidance documents available through USEPA and was included in the SGA technical memorandum summarizing the accuracy and reliability of groundwater data (MWH, 2002).
2. Provide member agencies with guidelines on the collection of water quality data developed by DHS for the collection, pretreatment, storage, and transportation of water samples (DHS, 1995).
3. Provide training on the implementation of these SOPs to member agencies, if requested.

3.5.6 Data Management System

The SGA membership includes 14 public agency and investor-owned water purveyors. Historically, the member agencies have maintained a varying range of groundwater-related data in a wide variety of formats. In order for the SGA to achieve its primary objective of sustaining the groundwater resource of the North Area Groundwater Basin, it was essential to develop a data storage and analysis tool, the DMS. The DMS was developed by MWH under contract with the USACE. Other local sponsors included DWR and the SGA.

Development of the DMS is a two-phase project. Phase I was completed in January 2003 and included initial development of the user interface and population of the DMS to a demonstration level of approximately one-fourth of the water purveyor wells. Phase II, to be completed by January 31, 2004, will fully populate the database and add further customization of the user interface with additional analysis features. Once the DMS is fully populated and quality-control checked a summary of existing basin conditions will be prepared. From this initial summary, analyses will be performed on at least an annual basis to assess the impacts of current and future SGA management actions on the groundwater system.

The DMS is a public domain application developed in a Microsoft Visual Basic environment and is linked to a SQL database of the SGA purveyor data. The DMS provides the end-user with ready access to both enter and retrieve data in either tabular or graphical formats. Security

features in the DMS allow for access restrictions based on a variety of user permission levels. Data in the DMS include:

- Well construction details.
- Known locations of groundwater contamination and potentially contaminating activities.
- Long-term monitoring data on:
  - Monthly extraction volumes.
  - Water elevations.
  - Water quality.
- Aquifer characteristics based on well completion reports.

The DMS allows for the viewing of regional trends in water level and water quality not previously available to the SGA (see **Figure 14** for a DMS screen capture). The DMS has the capability of quickly generating well hydrographs and groundwater elevation contour maps using historic groundwater level data. The DMS also has the ability to view water quality data for Title 22 required constituents as a temporal concentration graph at a single well or any constituent can be plotted with respect to concentration throughout the SGA area. Presentation of groundwater elevation data and groundwater quality data in these ways will be useful for making groundwater basin management decisions.

The SGA is currently in the process of establishing data transfer protocols so that groundwater data within the SGA area (by member agencies, DWR, AFRPA, USGS, etc…) can be readily appended to the database and analyzed through the DMS. Annual summaries of groundwater monitoring data will be prepared using the analysis tools in the DMS and presented in the update to the State of the Basin report (see **Section 4**).

Actions. To maintain and improve the usability of the DMS, the SGA will take the following actions:

1. Continue to update the DMS with current water purveyor data.
2. Make recommendations to the DMS developer on utilities to add to the DMS to increase its functionality.

3.6 COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION

The SGA considers groundwater protection to be one of the most critical components of ensuring a sustainable groundwater resource. In this GMP, resource protection includes both prevention of contamination from entering the groundwater basin and remediation of existing contamination. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, and protection of recharge areas. Containment and remediation include measures to prevent contamination from human activities as well as contamination from natural substances such as saline water bodies.

3.6.1 Well Construction Policies

The Sacramento County Environmental Management Department (EMD) administers the well permitting program for Sacramento County. The standards for construction are identified in Sacramento County Code No. SCC-1217 as amended on April 9, 2002. In addition to general well construction standards, Sacramento County has a policy of special review by appropriate regulatory agencies for well permits within 2,000 feet of a known contaminant plume (referred to

as Consultation Zones) and prohibits the drilling of new public supply wells at the former McClellan AFB. As part of the development of the DMS, the most recent extents of known contaminant plumes associated with the former McClellan AFB, the former Mather AFB, and Aerojet were delineated for the SGA.

Actions. The SGA will take the following actions:

1. Ensure that all member agencies are provided a copy of the county well ordinance and understand the proper well construction procedures.
2. Inform member agencies of Sacramento County's Consultation Zone and provide a copy of the boundary of the former McClellan AFB prohibition zone to appropriate member agencies.
3. Provide a copy of the most recently delineated plume extents at the former McClellan AFB, the former Mather AFB, and Aerojet to the EMD and SGA members for their review and possible use.
4. Coordinate with member agencies to provide guidance as appropriate on well construction. Where feasible and appropriate, this could include the use of subsurface geophysical tools prior to construction of the well to assist in well design.

3.6.2 Well Abandonment and Well Destruction Policies

The EMD administers the well destruction program for Sacramento County. The standards for construction are identified in Sacramento County Code No. SCC-1217 as amended on April 9, 2002. One concern expressed by the EMD[21] is that many abandoned domestic wells have not been properly destroyed. Historically, the north part of Sacramento County has been served by organized water districts, so there are not many privately owned domestic wells. As part of development of the DMS, DWR well records for all known wells in the basin were reviewed for reported abandonment and destruction. The wells were rated for the confidence of proper destruction based on the information provided on the report. This information was entered into the DMS. It is the SGA's opinion that the database as it currently stands, accurately reflects documented well destruction activities within the SGA area. The actions listed below will provide improved protection of groundwater quality within the SGA area.

Actions. The SGA will take the following actions:

1. Ensure that all member agencies are provided a copy of the code and understand the proper destruction procedures and support implementation of these procedures.
2. Follow up with member agencies on the reported abandoned and destroyed wells to confirm the information collected from DWR.
3. Provide a copy of the information on abandoned and destroyed wells in northern Sacramento County to fill any gaps in their records.
4. Meet with the EMD to discuss ways to ensure that wells in the SGA area are properly abandoned or destroyed.
5. Obtain "wildcat map from California Division of Oil and Gas to ascertain the extent of historic gas well drilling operations in the area as these wells could function as conduits of contamination if not properly destroyed.

[21] Faith King, pers. comm., August 11, 2003.

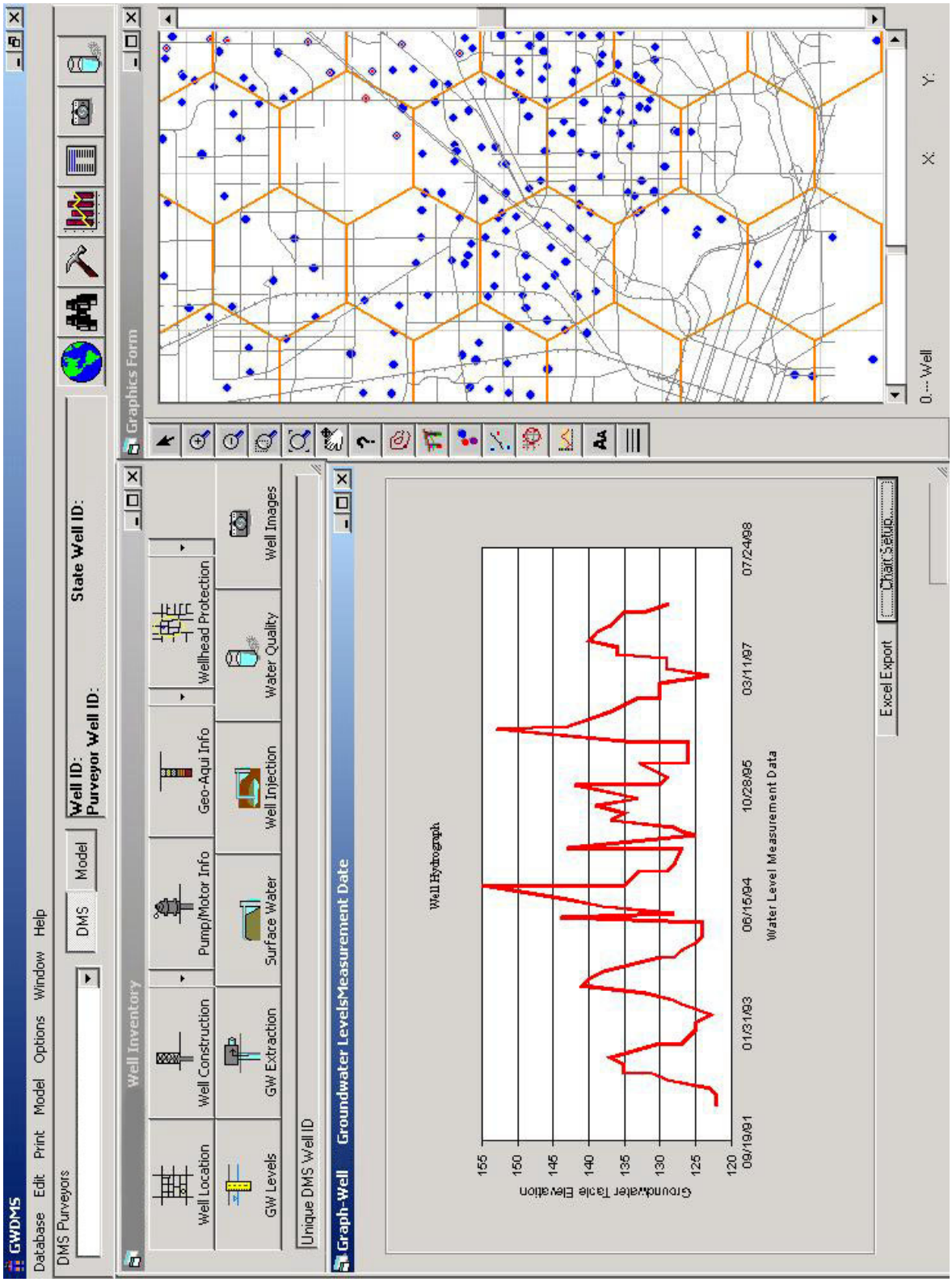

Figure 14. DMS Screen Capture

3.6.3 Wellhead Protection Measures

Identification of wellhead protection areas is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by DHS. DHS set a goal for all water systems statewide to complete Drinking Water Source Assessments by mid-2003. All SGA member agencies have completed their required assessments by performing the three major components required by DHS:

- Delineation of capture zones around sources (wells).
- Inventory of Potential Contaminating Activities (PCAs) within protection areas.
- Vulnerability analysis to identify the PCAs to which the source is most vulnerable.

Delineation of capture zones includes using groundwater gradient and hydraulic conductivity data to calculate the surface area overlying the portion of the aquifer that contributes water to a well within specified time-of-travel periods. Typically, areas are delineated representing 2-, 5-, and 10-year time-of-travel periods. These protection areas need to be managed to protect the drinking water supply from viral, microbial, and direct chemical contamination.

Inventories of PCAs include identifying potential origins of contamination to the drinking water source and protection areas. PCAs may consist of commercial, industrial, agricultural, and residential sites, or infrastructure sources such as utilities and roads. Depending on the type of source, each PCA is assigned a risk ranking, ranging from "very high" for such sources as gas stations, dry cleaners, and landfills, to "low" for such sources as schools, lakes, and non-irrigated cropland.

Vulnerability analysis includes determining the most significant threats to the quality of the water supply by evaluating PCAs in terms of risk rankings, proximity to wells, and Physical Barrier Effectiveness (PBE). PBE takes into account factors that could limit infiltration of contaminants including type of aquifer, aquifer material (for unconfined aquifers), pathways of contamination, static water conditions, hydraulic head (for confined aquifers), well operation, and well construction. The vulnerability analysis scoring system assigns point values for PCA risk rankings, PCA locations within wellhead protection areas, and well area PBE; the PCAs to which drinking water wells are most vulnerable are apparent once vulnerability scoring is complete.

The SGA has already added PCA and capture zone information from the DWSAP into the DMS. The DMS includes a feature that will automatically calculate wellhead protection areas if no data are available or if new well locations are proposed.

Actions. The SGA will take the following actions:

1. Request that member agencies provide vulnerability summaries from the DWSAP to the SGA to be used for guiding management decisions in the basin.
2. Contact groundwater basin managers in other areas of the state for technical advice, effective management practices, and "lessons learned," regarding establishing wellhead protection areas.

3.6.4 Protection of Recharge Areas

The SGA has also evaluated surface geology within and directly adjacent to its boundary for the purpose of delineating areas of potentially high recharge rates. Surface geology and estimates of relative recharge rates are shown on **Figure 15**. Much of the surface area considered to have the highest potential for recharge is already developed, so opportunities to ensure protection of these areas are somewhat limited.

Recently, most members of the SGA participated in the California Aquifer Susceptibility (CAS) Study administered by the SWRCB. Objectives of this study included sampling for many known contaminants at low detection levels to act as early indicators of potential problems particularly in recharge areas of aquifers. The results of this study are not yet available.

Actions. The SGA will take the following action:

1. When CAS results are available, meet with the SWRCB to discuss those results and consider follow-on actions.

3.6.5 Control of the Migration and Remediation of Contaminated Groundwater

The migration of contaminated groundwater in the SGA area is of primary concern from the McClellan AFB and Aerojet groundwater contamination plumes as shown in **Figure 4**. Also of concern is the localized contamination of groundwater by industrial point sources such as dry cleaning facilities and numerous fuel stations throughout the SGA area.

While the SGA does not have authority or the responsibility for remediation of this contamination, it is committed to coordinating with responsible parties and regulatory agencies to keep SGA members informed on the status of known contamination in the basin. For example, the SGA has requested and entered into its DMS a coverage of known LUSTs within the basin. This information is maintained by the SWRCB and CVRWQCB. Also, the SGA has been in communication with the AFRPA, which is overseeing remediation efforts at McClellan AFB (see **Section 3.4.2**).

Actions. The SGA will take the following actions:

1. Coordinate with known responsible parties to develop a network of monitoring wells to act as an early warning system for public supply wells.
2. If detections occur in these monitoring wells, facilitate meetings between the responsible parties and the potentially impacted member agency to develop strategies to minimize the further spread of contaminants. An example of a strategy would be to consider altering groundwater extraction patterns in the area to change to groundwater gradient.
3. Provide SGA members with all information on mapped contaminant plumes and LUST sites for their information in developing groundwater extraction patterns and in the siting of future production or monitoring wells.
4. Meet with representatives of the CVRWQCB to establish a mutual understanding about the SGA's groundwater management responsibilities. Identify ways to have open and expedient communication with CVRWQCB regarding any new occurrences of LUSTs, particularly when contamination is believed to have reached the water table.

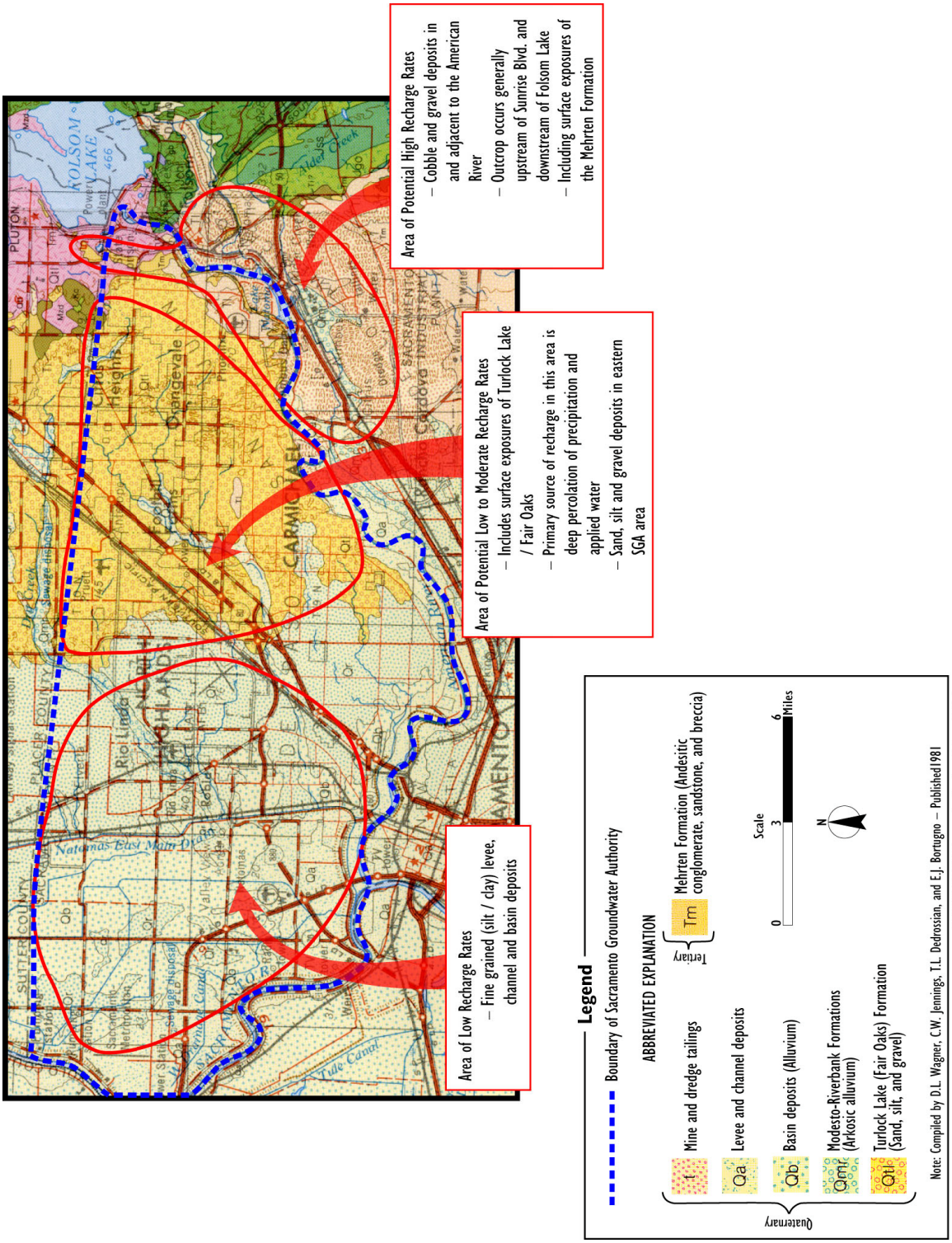

Figure 15. Surface Geology of the SGA Area – Implications for Surface Recharge Rates

3.6.6 Control of Saline Water Intrusion

Saline water intrusion from the Sacramento/San Joaquin River Delta (Delta) is not currently a problem in Sacramento County as a whole or in the North Area Groundwater Basin, and it is not expected to become a problem in the future. Higher groundwater elevations associated with recharge in the American and Sacramento rivers have maintained a historical positive gradient preventing significant migration of any saline water bodies associated with the Delta from migrating east into the Sacramento County region. These groundwater gradients will continue to serve to prevent any localized pumping depressions in the basin from inducing flow from the Delta into the North Area Groundwater Basin.

A more local source of saline water is beneath the base of fresh water in the North Area Groundwater Basin. Berkstresser (1973) mapped the base of fresh water (the point below which the specific conductivity of the water is greater than about 3,000 micromhos per centimeter (μmhos/cm)) for the Sacramento Valley. For the North Area Groundwater Basin, the minimum depth of fresh water is at an elevation of about 800 feet below mean sea level near the eastern basin margin and increases to a depth of approximately 2,000 feet below mean sea level on the western margin of the basin. The municipal suppliers in the North Area Groundwater Basin generally extract groundwater from depths of less than 500 feet, so their extractions are a substantially above the base of fresh water. Therefore, current pumping practices would not be expected to create a situation where deeper saline water is being drawn into the fresh water aquifer.

Actions. The SGA will take the following actions:

1. Track the progression, if any, of saline water bodies moving toward the east from the Delta. Because this is a highly unlikely scenario, this action will be limited to communicating with DWR's Central District Office on a biennial basis to check for significant changes to TDS concentrations in wells. DWR has a regular program of sampling water quality in select production wells throughout the adjacent Solano, San Joaquin, and Yolo counties. This will serve as an early warning system for the potential of saline water intrusion from the Delta.
2. Observe TDS concentrations in public supply wells of North Area Groundwater Basin water suppliers that are routinely sampled under the DHS Title 22 Program. These data will be readily available in the SGA's DMS and are already an on-going task for the annual review of basin conditions.
3. Inform all member water purveyor managers of the presence of the interface and the approximate depth of the interface below their service area for their reference when siting potential wells. The SGA will also ensure that the EMD, which issues well permits, is aware of the interface. The SGA will provide a map indicating the contour of the elevation of the base of fresh water in Sacramento County to the EMD for their reference when issuing well permits.

3.7 COMPONENT CATEGORY 4: GROUNDWATER SUSTAINABILITY

To ensure a long-term viable supply of groundwater, SGA members are seeking to maintain or increase the amount of groundwater stored in the basin over the long-term. The WFA's groundwater management element provides a framework by which the groundwater resource in the Sacramento County-wide area can be protected and used in a sustainable manner. It recommends an average annual sustainable groundwater yield within the SGA area of 131,000

AF/year. As documented in **Section 2** of the GMP, historic groundwater extractions have resulted in a net depletion of groundwater stored under the SGA area. To ensure a sustainable resource, SGA and RWA members have undertaken several actions toward increased conjunctive use of groundwater and surface in the basin and will continue to do so. Historically, water purveyors in the basin away from the rivers did not have access to surface water and a large cone of depression resulted in the middle of the SGA area. Recent conjunctive use activities have resulted in providing new surface water supplies to these areas. Although water purveyors in the region will rely more heavily on groundwater during dry periods, the net increase in available surface will result in a maintained or improved amount of groundwater in storage in the basin over the long term.

Two primary activities will result in an improved ability to sustain the viability of the groundwater resource for the region. Conjunctive management activities include the planning and construction of facilities to increase the available water supply to the area as well as to create opportunities for the banking and exchange of water with partners after local needs are met. These partnerships will result in some of the necessary capital improvements to help sustain the resource in a cost-effective way. Additionally, the SGA's ability to sustain the groundwater resource will be met in part through reductions in potable water demand through conservation measures and through the use of recycled water for landscape irrigation supply. These groundwater sustainability activities are discussed below.

3.7.1 Conjunctive Management Activities

The SGA and RWA members are committed to expanded conjunctive use operations and are investigating a variety of ways of recharging water into the available storage space in the basin. Opportunities for direct recharge from overlying land in the basin are limited, because much of the land is developed or is overlain by flood basin deposits. Most of the recharge occurring through current conjunctive use is from in-lieu recharge. One component of the RWA ARBCUP (see below) is an aquifer storage and recovery well, which will inject water just north of the basin. Current and potential future facilities in the basin are further described in the Cooperating Agencies RWMP Phase II Final Report (MWH, 2003).

Cooperating Agencies RWMP. As discussed in **Section 2.5**, Phase I of the RWMP identified and described a "menu" of project and program alternatives for implementing the WFA north of the American River. Phase II provided detailed hydrologic, engineering, and legal/institutional evaluations of those projects and programs that best aligned with the goals and objectives of the individual water purveyors and the WFA. The recommendations resulting from Phase II were used to structure the SGA and RWA's regional projects and programs.

Sac Suburban's Groundwater Stabilization Project. This project allows groundwater elevations underlying the SGA area to increase naturally (in-lieu recharge) by providing up to 29,000 AF of surface water per year to an area that has historically relied on groundwater. From 1998 through 2001, Sac Suburban utilized an annual average of about 12,850 AF of surface water, reducing its use of groundwater and resulting in stabilization of groundwater elevations that had been declining historically at a rate of about 1.5 feet per year (LSCE, 2002). This project is a prime example of the types of activities to be included in a conjunctive use program envisioned in the WFA.

RWA ARBCUP. The objective of the RWA ARBCUP is to implement elements of the regional conjunctive use program developed in the Cooperating Agencies RWMP. Through the RWA ARBCUP, treated surface water will be delivered to areas that have historically used

groundwater in wet years, resulting in in-lieu recharge. In dry years, the stored water will be recovered in areas that have historically used surface water, allowing forbearance of surface water diversions.

The RWA ARBCUP will provide an additional average water supply yield in the region of 21,400 AF/year. Projects such as these strongly support the goal and objectives of the SGA's GMP. The project consists of 12 program components (see **Table 5** and **Figure 7**) constructed by seven public agencies. Facilities include an expansion of surface water treatment plant capacity, water transmission system improvements (including pipelines, a pump station, and an aboveground water storage tank for flow equalization), groundwater extraction wells, and meter replacements. In 2001, the RWA submitted a grant application to DWR for a groundwater storage construction grant and was subsequently awarded $21.67 million. The RWA member agencies are matching the grant with local funds to construct the project.

SGA-SAFCA Pilot Study. In 1999/2000, a pilot study was conducted with SAFCA and Reclamation as a means of exercising the groundwater storage potential resulting form the regional cone of depression and investigating the mechanics of a large-scale conjunctive use program. In this pilot study, an on-call surface water supply was provided to SAFCA. Specifically, SAFCA diverted and stored (banked) 2,100 AF of water in the basin. The following year, surface water in the amount of 1,995 AF was made available by exchange through the extraction of groundwater in-lieu of diverting a CVP supply from Folsom Reservoir. SAFCA used this water on an as-needed basis to satisfy its refill obligations associated with flood management reservation in Folsom Reservoir.

EWA Pilot Study. In 2002, the SGA conducted an expanded pilot study. It entered into an agreement with Reclamation (on behalf of the EWA) for the one-year sale of up to 10,000 AF of surface water. A portion of this surface water (up to 5,000 AF) was made available in Folsom Reservoir through a transfer of a portion of SJWD's CVP contract entitlement. The other 5,000 AF was made available by Sacramento through forbearance of a surface water diversion right on the lower American River. In both cases, local demand was met by recovery of previously banked groundwater.

Actions. The SGA will take the following actions:

1. Continue to investigate conjunctive use opportunities within the SGA area. The SGA and its members will coordinate with the RWA and its members, as appropriate.
2. Continue to investigate opportunities for the development of direct recharge facilities in addition to in-lieu recharge (e.g. injection wells or surface spreading facilities, through constructed recharge basins or in river or streambeds).

3.7.2 Demand Reduction

Another way to stay within the sustainable yield of the basin and continue to achieve in-lieu recharge is by reducing demand on potable water supplies through conservation and by making recycled water available for irrigation of landscaping.

Water Conservation. The RWA has developed and implemented a regional Water Efficiency Program (WEP). The WEP assists members to meet their water conservation agreements with the Water Forum, the California Urban Water Conservation Council, and for some members the Central Valley Project Improvement Act (CVPIA). The water conserved as part of this effort is essential to the Water Forum's ability to meet its objectives of providing a safe, reliable water supply to 2030 and protecting the lower American River in two ways. First,

the conserved water will serve to meet increased future demands. Second, the conserved water will reduce the overall demand on the groundwater basin in drier years and can reduce the demand for water diverted from the lower American River. The goal of the WFA is to achieve system-wide conservation of slightly more than 25 percent by the year 2030.

SGA members have also implemented other conservation measures outside of the WFA. One example is in NCMWC's tailwater recovery system implemented in 1986. The program achieves conservation through the reapplication of water that runs off of agricultural fields within the NCMWC system. The system also results in reduced runoff of agricultural applied water to the Sacramento River thereby decreasing agricultural pesticides that would have been in the river.

Water Recycling. SRCSD treats wastewater for the Sacramento region at its Elk Grove Wastewater Treatment Plant and is looking for ways to increase the delivery of recycled from the plant to landscape irrigation uses. SRCSD joined the RWA as an associate member in September 2003. By joining the RWA, SRCSD can work closely with other member agencies to investigate opportunities to use recycled water throughout the area to more effectively develop the regional water supply. Currently, SRCSD is recycling 5 mgd at its Elk Grove facility and delivering it to nearby landscape irrigation users. SRCSD expects the capacity of that facility to increase to 10 mgd over the next few years. Currently, recycled water is only delivered to users south of the SGA area. SRCSD is investigating ways to deliver recycled water north of the American River in the future.

Actions. The SGA will take the following actions:

1. Coordinate with the RWA and its members that have signed specific agreements to the WFA to ensure that those conservation efforts are on track. For members that are not signatory, the SGA will ensure that they are informed of the benefits and regional importance of RWA's WEP.
2. Coordinate with SRCSD through the RWA to investigate opportunities for expanded use of recycled water throughout the county.

3.8 COMPONENT CATEGORY 5: PLANNING INTEGRATION

With the large number of autonomous water agencies and companies serving the greater Sacramento area, the need to integrate water management planning on a regional scale is a high priority and was one of the key reasons that the RWA and SGA organizations were formed. Individual members derive their supplies from the American River, the Sacramento River, the North Area Groundwater Basin, or some mix of these sources. Individual agency infrastructure systems are mostly independent; where interconnections do exist between agencies, they are typically for emergency purposes only.

The WFA provides a regional conjunctive use framework with commitments from individual agencies concerning groundwater and surface water operations, including limitations on surface water diversions from the lower American River during dry years. The SGA and RWA planning efforts seek to better integrate the individual plans of member agencies to implement various elements of the WFA in keeping with the 2030 regional framework. Such integration also promotes operational efficiency, cost savings, and in some cases generates larger statewide-system benefits. For example, the 2002 SGA partnership with Reclamation to provide water to the EWA involved integrating plans and operational actions of five SGA member agencies to produce over 7,000 AF of water in Folsom Reservoir for EWA purposes. The SGA provided the institutional and contractual mechanisms to ensure that individual agencies implemented the

operational changes necessary to produce the water and to ensure that the quality and yield of the groundwater basin was protected.

The RWA, which is better positioned to facilitate integrated planning because of its greater geographic extent (Sacramento, Placer, and El Dorado counties), is actively implementing the ARBCUP and plans to implement the follow-on program to the Cooperating Agencies RWMP. In addition, the RWA has implemented a regional WEP, a program to coordinate the development of agency drinking water source assessment and protection documents, and is actively coordinating with regional land use planning agencies regarding the availability of future water supplies to support planned growth.

3.8.1 Existing Integrated Planning Efforts

The SGA and RWA have already demonstrated implementation of integrated management in the region. Some of the integrated planning efforts to date are listed below.

Water Efficiency Program. Described in **Section 3.7.2**

Banking and Exchange. Described in **Section 3.4.4**

Urban Water Management Planning. Twelve SGA members are required to prepare Urban Water Management Plans. These plans, as defined by CWC § 10610 *et seq.*, require public water suppliers with more than 3,000 customers or that deliver more than 3,000 AF of water annually to identify conservation and efficient water use practices to help ensure a long-term, reliable water supply. To date, all 12 members have submitted plans to DWR. Ten of the plans have been approved by DWR. One additional plan has been resubmitted and is under review by DWR. One plan is currently being amended by the member agency.

Regional Sanitation. Described in **Section 3.7.2**

DWSAP Program. The DWSAP Program is administered by DHS. As a first step to a complete source protection program, DHS required water systems to conduct a preliminary assessment. The assessment includes:

> "delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply; an inventory of possible contaminating activities (PCAs) that might lead to the release of microbiological or chemical contaminants within the delineated area; and a determination of the PCAs to which the drinking water source is most vulnerable (http://www.dhs.ca.gov/ps/ddwem/dwsap/overview.htm)."

The assessments only apply to agencies that deliver groundwater for public drinking supply. All of the 11 SGA member agencies required to submit assessments have done so. Data from the assessments have been incorporated into the SGA's DMS.

Land Use Planning. In March 2002, the Water Forum Successor Effort approved a set of procedures for coordinating land use decision-making with water resources planning. As signatories to the WFA, the SGA members are committed to following the procedures outlined in **Appendix E**. In addition, the SGA will assist members in complying with these procedures. Through the RWA, better coordination and communication have been initiated with the Sacramento Area Council of Governments (SACOG) regarding meeting the water supply needs of future planned growth.

Integrated Surface Water and Groundwater Modeling. The SGA is interested in using and building upon existing groundwater models for the SGA area. In the late 1990s, a range of groundwater extraction and recharge scenarios were simulated using the North American River

and Sacramento County Combined Integrated Groundwater and Surface Water Model (IGSM[22]). This model was originally developed for the American River Water Resources Investigation (ARWRI) conducted by Reclamation and later updated by the Cooperating Agencies for their RWMP effort (see **Appendix F**).

The original version of IGSM used for the study originated from the ARWRI version of the model used for the "Draft Water Forum Solution Model" developed for the Water Forum. The purpose of the Water Forum was development of a conjunctive use strategy for the groundwater basin underlying northern Sacramento County and southern Placer County.

The SGA is interested in maintaining and updating the IGSM because it is the basis for the WFA and the Cooperating Agencies RWMP alternative analyses, and because it is the model used for regional planning by Reclamation and DWR for projects such as the ARWRI, the CVPIA, and the CALFED process.

The SGA recently completed a study in cooperation with DWR that focused on updating the Calibration Model. The objectives of this effort were to convert the existing IGSM input files to run in the most current version of IGSM (version 6.0). Historical water budgets from 1969 to 1995 were developed and a comparison of model results with actual measured values for groundwater elevations and streamflows over the calibration period were provided. The SGA is pursuing having the calibration period extended from 1995 to 2000.

Actions. The SGA will take the following actions:

1. Prepare and adopt a formal integrated water management plan in accordance with CWC § 10540 *et seq*. The plan will include, but not be limited to, the elements listed above. The SGA will form an ad hoc committee with the RWA to determine which agency would be most appropriate to prepare that plan.
2. Review the Water Forum Land Use procedures and make recommendations on what additional role, if any, the SGA should take with respect to land use decisions within the SGA area.

[22] The IGSM is a finite element, quasi three-dimensional, multi-layered model that integrates surface water and groundwater on a monthly time step. The IGSM was developed for use as a regional planning tool for large areas influenced by both surface water and groundwater. The tool is well-equipped to accommodate input and output of land use and water use data over large areas. Data input includes hydrogeologic parameters, land use, water demand, precipitation and other hydrologic parameters, boundary inflows, and historical water supply. For purposes of parameter definition and developing water budgets around physical and/or political boundaries, the IGSM divides Sacramento, Placer, Sutter, and San Joaquin counties into subregions. Each subregion is further divided into unique numbered elements varying from 200 to 800 acres in size. Overlying this grid is a coarse parametric grid utilized for specifying aquifer and other parameters.

4 PLAN IMPLEMENTATION

Table 6 summarizes the action items presented in **Section 3** and an implementation schedule. Many of these actions involve coordination by the SGA with other local, state and federal agencies and most of these will begin within 6 months, following adoption of this GMP. A few activities involve assessing trends in basin monitoring data for the purpose of determining the adequacy of the monitoring network. These assessments will be made as new monitoring data become available for review by the SGA, and results will be documented in an annual State of the Basin report (see below).

4.1 ANNUAL GMP IMPLEMENTATION REPORT

The SGA will report on progress made implementing the GMP in an annual State of the Basin report, which will summarize groundwater conditions in the SGA area and document groundwater management activities from the previous year. This report will include:

- Summary of monitoring results, including a discussion of historical trends.
- Summary of management actions during the period covered by the report.
- A discussion, supported by monitoring results, of whether management actions are achieving progress in meeting BMOs.
- Summary of any plan component changes, including addition or modification of BMOs, during the period covered by the report.

The State of the Basin report will be completed by April 1st each year and will report on conditions and activities completed through December 31st of the prior year.

4.2 FUTURE REVIEW OF GMP

This GMP is intended to be a framework for the first regionally-coordinated management efforts in the SGA area. As such, many of the identified actions will likely evolve as the SGA actively manages and learns more about the basin. Many additional actions will also be identified in the annual summary report described above. The GMP is therefore intended to be a living document, and it will be important to evaluate all of the actions and objectives over time to determine how well they are meeting the overall goal of the plan. The SGA plans to evaluate this entire plan within five years of adoption.

4.3 FINANCING

It is envisioned that implementation of the GMP, as well as many other groundwater management-related activities will be funded from a variety of sources including the SGA; in-kind services by member agencies; state or federal grant programs; and local, state, and federal partnerships. Some of the items that would likely require additional resources include:

- Monitoring for groundwater quality or elevations in non-purveyor wells.
- Customization of the DMS interface.
- Preparation of GMP annual reports.
- Updates of the overall GMP.
- Update of data sets and recalibration/improvement of existing groundwater model.

- Collection of additional subsidence data.
- Construction of monitoring wells where critical data gaps exist.
- Stream-aquifer interaction studies.
- Implementation of the GMP including:
    - Committee coordination.
    - Project management.
- Implementation of regional conjunctive use program.

During year one of plan implementation, an estimate of some of the likely costs associated with the above activities will be prepared.

Table 6. Summary of GMP Actions

	Description of Action	Implementation Schedule (approximate time for commencing activity following adoption of GMP)
I.	**COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT**	
	Involving the Public	
1	Continue efforts to encourage public participation as opportunities arise.	on-going
2	Review and take actions from the public outreach plan as necessary during implementation of various aspects of the GMP.	on-going
3	Provide briefings to the Water Forum Successor Effort on GMP implementation progress.	on-going
4	Work with members to maximize outreach on GMP activities including the use of the SGA Web site, member Web sites, or bill inserts.	12 months
	Involving Other Agencies Within and Adjacent to the SGA Area	
1	Continue high level of involvement demonstrated through the SGA GMP development into implementation of the plan by continued participation on committees described above.	on-going
2	Provide copies of the adopted GMP and subsequent annual reports to representatives from Placer, Sutter, and Yolo counties, and the Groundwater Forum.	3 months
3	Meet with representatives from Placer, Sutter, and Yolo counties, and the Groundwater Forum as needed.	6 months
4	Coordinate a meeting with the agricultural groundwater pumpers in the SGA area to inform them of SGA's management responsibilities and activities, and develop and develop a list of agricultural groundwater pumpers concerns and needs relative to SGA's management of the area.	6 months
5	Coordinate a meeting with other self-supplied pumpers in the SGA area to inform them of SGA's management responsibilities and activities, and develop a list of self-supplied groundwater pumpers concerns and needs relative to SGA's management of the area.	6 months
	Utilizing Advisory Committees	
1	Upon adoption of the GMP, the Policy Committee will meet to discuss the continuation and composition of committees to guide implementation of the plan.	3 months
	Developing Relationships with State and Federal Agencies	
1	Continue to develop working relationships with local, state, and federal regulatory agencies.	on-going
	Pursuing Partnership Opportunities	
1	Continue to promote partnerships that achieve both local supply reliability and achieve broader regional and statewide benefits.	on-going
2	Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.	on-going
II.	**COMPONENT CATEGORY 2: MONITORING PROGRAM**	
	Groundwater Elevation Monitoring	
1	Coordinate with member agencies and DWR to identify an appropriate group of wells for monitoring for a spring 2004 set of groundwater elevation measurements.	3 months
2	Coordinate with DWR and SCWA to ensure that the selected wells are maintained as part of a long-term monitoring network.	3 months
3	Coordinate with DWR and SCWA to ensure that the timing of water level data collection by member agencies coincides within one month of DWR and SCWA data collection.	3 months
4	Coordinate with member agencies to ensure that needed water level elevations are collected and verify that uniform data collection protocols are used among the agencies.	3 months
5	Coordinate with the USGS to determine the potential for integrating USGS monitoring wells constructed for the National Water Quality Assessment (NAWQA) Program into the SGA monitoring network.	3 months
6	Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.	3 months
7	Assess groundwater elevation trends and conditions based on the network annually.	Results and recommendations included in State of Basin report published in April of each year
8	Assess the adequacy of the groundwater elevation monitoring well network annually.	Results and recommendations included in State of Basin report published in April of each year
9	Identify a subset of monitoring wells that will be monitored more frequently than twice annually to improve the SGA's understanding of aquifer responses to pumping throughout the year.	12 months

Table 6. Summary of GMP Actions (continued)

	Description of Action	Implementation Schedule (approximate time for commencing activity following adoption of GMP)
	Groundwater Quality Monitoring	
1	Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.	6 months
2	Coordinate with the USGS to obtain historic water quality data for NAWQA wells, determine timing and frequency of monitoring under USGS program, and to discuss the potential for integrating USGS monitoring resources with the SGA network.	6 months
3	Coordinate with member agencies and other local, state, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data.	6 months
4	Assess the adequacy of the groundwater quality monitoring well network annually.	Results and recommendations included in State of Basin report published in April of each year
	Land Surface Elevation Monitoring	
1	Investigate the feasibility and costs of re-surveying the wells in the Arden-Arcade area that were last measured in 1991.	12 months
2	Coordinate with the USGS to ascertain the suitability of the use of Interferometric Synthetic Aperture Radar (InSAR) images of the SGA and surrounding area. If the technology appears suitable, identify the costs of determining ground surface elevations and identify potential cost-sharing partners.	12 months
3	Coordinate with other agencies, particularly the City and County of Sacramento and the National Geodetic Survey to determine if there are other suitable benchmark locations in the SGA area to aid in the analysis of potential land surface subsidence.	12 months
4	Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence.	12 months
	Surface Water Groundwater Interaction Monitoring	
1	Compile available stream gage data and information on tributary inflows and diversions from the American and Sacramento rivers to quantify net groundwater recharge or discharge between gages in the SGA area.	12 months
2	Coordinate with local, state, and federal agencies to identify available surface water quality data from the American and Sacramento Rivers adjacent to the SGA area.	12 months
3	Correlate groundwater level data from wells in the vicinity of river stage data to further establish whether the river and water table are in direct hydraulic connection, and if the surface water is gaining or losing at those points.	12 months
4	Continue to coordinate with local, state, and federal agencies and develop partnerships to investigate cost-effective methods that could be applied to better understand surface water-groundwater interaction along the Sacramento River and American River.	12 months
5	Coordinate with CSUS to analyze data obtained from recently constructed monitoring wells on the CSUS campus to better understand the relationship between the groundwater basin and surface water flows at that location.	6 months
	Protocols for the Collection of Groundwater Data	
1	Use a Standard Operating Procedure (SOP) for collection of water level data by each of the member agencies.	3 months
2	Provide member agencies with guidelines on the collection of water quality data developed by DHS for the collection, pretreatment, storage, and transportation of water samples (DHS, 1995).	3 months
3	3. Provide training on the implementation of these SOPs to member agencies, if requested.	3 months
	Data Management System	
	No Action Required	
III.	**COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION**	
	Well Construction Policies	
1	Ensure that all member agencies are provided a copy of the county well ordinance and understand the proper well construction procedures	3 months
2	Inform member agencies of Sacramento County's Consultation Zone and provide a copy of the boundary of the former McClellan AFB prohibition zone to appropriate member agencies.	6 months
3	Provide a copy of the most recently delineated plume extents at the former McClellan AFB, the former Mather AFB, and Aerojet to the EMD and SGA members for their review and possible use.	3 months
4	Coordinate with member agencies to provide guidance as appropriate on well construction. Where feasible and appropriate, this could include the use of subsurface geophysical tools prior to construction of the well to assist in well design.	3 months

Table 6. Summary of GMP Actions (continued)

	Description of Action	Implementation Schedule (approximate time for commencing activity following adoption of GMP)
	Well Abandonment and Well Destruction Policies	
1	Ensure that all member agencies are provided a copy of the code and understand the proper destruction procedures and support implementation of these procedures	3 months
2	Follow up with member agencies on the reported abandoned and destroyed wells to confirm the information collected from DWR	6 months
3	Provide a copy of the information on abandoned and destroyed wells in northern Sacramento County to fill any gaps in their records	12 months
4	Meet with the EMD to discuss ways to ensure that wells in the SGA area are properly abandoned or destroyed	6 months
5	Obtain "wildcat map from California Division of Oil and Gas to ascertain the extent of historic gas well drilling operations in the area as these wells could function as conduits of contamination if not properly destroyed.	12 months
	Wellhead Protection Measures	
1	Request that member agencies provide vulnerability summaries from the DWSAP to the SGA to be used for guiding management decisions in the basin.	6 months
2	Contact groundwater basin managers in other areas of the state for technical advice, effective management practices, and "lessons learned," regarding establishing wellhead protection areas	12 months
	Protection of Recharge Areas	
1	When CAS results are available, meet with the SWRCB to discuss those results and consider follow-on actions	6 months
	Control of the Migration and Remediation of Contaminated Groundwater	
1	Coordinate with known responsible parties to develop a network of monitoring wells to act as an early warning system for public supply wells.	6 months
2	If detections occur in these monitoring wells, work with the responsible parties and the potentially impacted member agency to develop strategies to minimize the further spread of contaminants.	on-going
3	Provide SGA members with all information on mapped contaminant plumes and LUST sites for their information in developing groundwater extraction patterns and in the siting of future production or monitoring wells	6 months
4	Meet with representatives of the RWQCB to establish a mutual understanding about SGA's groundwater management responsibilities	6 months
	Control of Saline Water Intrusion	
1	Track the progression, if any, of saline water bodies moving toward the east from the Delta.	on-going
2	Observe TDS concentrations in public supply wells of North Area Groundwater Basin water suppliers that are routinely sampled under the DHS Title 22 Program. These data will be readily available in the SGA's DMS and are already an on-going task for the annual review of basin conditions.	on-going
3	Inform all member water purveyor managers of the presence of the interface and the approximate depth of the interface below their service area for their reference when siting potential wells.	on-going
VI.	**COMPONENT CATEGORY 4: GROUNDWATER SUSTAINABILITY**	
	Conjunctive Management Activities	
1	Continue to investigate conjunctive use opportunities within the SGA area	on-going
2	Continue to investigate opportunities for the development of direct recharge facilities in addition to in-lieu recharge (e.g. injection wells or surface spreading facilities, through constructed recharge basins or in river or stream beds).	on-going
	Demand Reduction	
1	Coordinate with the RWA and its members that have signed specific agreements to the WFA to ensure that those conservation efforts are on track. For members that are not signatory, the SGA will ensure that they are informed of the benefits and regional importance of RWA's WEP.	on-going
2	Coordinate with SRCSD through the RWA to investigate opportunities for expanded use of recycled water throughout the county.	on-going
V.	**COMPONENT CATEGORY 5: PLANNING INTEGRATION**	
	Existing Integrated Planning Efforts	
1	Prepare and adopt a formal integrated water management plan in accordance with CWC Section 10540 et seq. The SGA will form an ad hoc committee with the RWA to determine which agency would be most appropriate to prepare that plan.	12 months
2	Review the Water Forum Land Use procedures and make recommendations on what additional role, if any, SGA should take with respect to land use decisions within the SGA area	6 months

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5 REFERENCES

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6 APPENDICES

APPENDIX A. SGA Joint Powers Agreement

APPENDIX B. Water Supply Data by SGA Member Agency

APPENDIX C. Outreach and Education

APPENDIX D. Standard Operating Procedure for Manual Water Level Measurements

APPENDIX E. Final Draft – "Relationship of the Water Forum Agreement to Land Use Decision Making", Water Forum Successor Effort, January 2002

APPENDIX F. Modeling

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6.1 APPENDIX A. SGA JOINT POWERS AGREEMENT

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NOTE: THIS AGREEMENT SUPERCEDES AG2000-074.

JOINT POWERS AGREEMENT BETWEEN THE CITY OF CITRUS HEIGHTS, THE CITY OF FOLSOM, THE CITY OF SACRAMENTO AND THE COUNTY OF SACRAMENTO CREATING THE SACRAMENTO-GROUNDWATER AUTHORITY

This Agreement is made and entered into this 7th day of May, 2002, by and between the City of Citrus Heights, a municipal corporation, the City of Folsom, a municipal corporation, the City of Sacramento, a municipal corporation, and the County of Sacramento, a political subdivision of the State of California ("County").

RECITALS

WHEREAS, each of the parties to this Agreement is a local government entity functioning within the County of Sacramento; and

WHEREAS, pursuant to the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code), two or more public agencies may by agreement jointly exercise any power held in common by the agencies entering into such an agreement; and

WHEREAS, each of the parties hereto has under its police power the authority to regulate groundwater; and

WHEREAS, the parties hereto have each been either directly or indirectly involved in the process commonly referred to as the Sacramento Area Water Forum ("Water Forum"); and

WHEREAS, the Water Forum process has resulted in the development of a Groundwater Management Element, dated August, 1998 ("Groundwater Management Element"), which provides for the formation of a groundwater management authority for the north area of the County of Sacramento pursuant to a joint powers agreement between the City of Citrus Heights, the City of Folsom, the City of Sacramento and the County; and

WHEREAS, a true and correct copy of the Groundwater Management Element is attached hereto and incorporated herein as Exhibit "A"; and

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WHEREAS, the completion of the Water Forum process and the approval of the final Water Plan by the Water Forum stakeholders has been delayed for reasons unrelated to groundwater management issues; and

WHEREAS, the parties hereto and the Water Forum stakeholders who have been involved in the development of the Groundwater Management Element believe that it is in the public interest to move forward with the development of the institutional framework necessary to implement the Groundwater Management Element within the North Area Basin, rather than suspending those efforts until such time as the Water Forum process is finalized; and

WHEREAS, the formation of the joint powers authority contemplated by this Agreement is not legally dependent upon the finalization of the Water Forum process, but is independently authorized by state law; and

WHEREAS, the parties hereto find that it is to their mutual advantage and benefit to establish such a groundwater management authority pursuant to this Agreement in order to implement the groundwater management policies embodied in the Groundwater Management Element; and

WHEREAS, the parties hereto find and declare that the conservation of groundwater resources within the North Area Basin for agricultural and municipal and industrial uses is in the public interest and for the common benefit of all water users within the County of Sacramento; and

WHEREAS, the overriding purpose of the joint powers authority established pursuant to this Agreement is to maintain the sustainable yield of the North Area Basin as set forth in the Groundwater Management Element; and

WHEREAS, it is the desire of the parties hereto to use the groundwater management powers which they have in common that are necessary and appropriate to further the purposes for which the joint powers authority is being established; and

WHEREAS, the parties hereto are receptive to amending this Agreement in the future to include public agencies outside the County of Sacramento who have a specific and relevant interest in the North Area Basin.

NOW, THEREFORE, in consideration of the promises, terms, conditions, and covenants contained herein, the City of Citrus Heights, the City of Folsom, the City of Sacramento and the County hereby agree as follows:

1. **Incorporation of Recitals.** The foregoing recitals are hereby incorporated by reference.

2. **Definitions.** As used in this Agreement, the following words and phrases shall have the meanings set forth below unless the context clearly indicates otherwise.

(a) "Conjunctive use" shall mean the planned management and use of both groundwater and surface water in order to maintain the sustainable yield of the North Area Basin.

(b) "North Area Basin" shall mean the groundwater basin underlying the area within the boundaries of the Authority.

(c) "Sustainable yield" shall mean the amount of groundwater which can be safely extracted from the North Area Basin on an estimated average annual basis while maintaining groundwater elevations and groundwater quality at acceptable levels as set forth in the Groundwater Management Element. Sustainable yield requires a balance between extraction and basin recharge and is expressed as the number of acre feet of

groundwater per year which can be extracted from the North Area Basin on an average annual basis as set forth in the Groundwater Management Element.

(d) "Water Production," for purposes of determining assessments, fees or charges to support Water Costs of the Authority, means the total amount of groundwater produced within the boundaries of the Authority by each retail provider, by Agricultural Interests, and by Commercial/Industrial Self-Supplied Water Users for use within the boundaries of the Authority or other areas approved by the Board.

3. **Purpose.** This Agreement is being entered into in order to establish a joint powers authority for the following purposes:

(a) to maintain the long-term sustainable yield of the North Area Basin;

(b) to manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors;

(c) to coordinate efforts among those entities represented on the governing body of the joint powers authority to devise and implement strategies to safeguard groundwater quality; and

(d) to work collaboratively with other entities, including groundwater management authorities that may be formed in other areas of the County of Sacramento and adjacent political jurisdictions, to promote coordination of policies and activities throughout the region.

4. **Establishment Of The Authority.** There is hereby established pursuant to the Joint Exercise of Powers Act a joint powers authority which shall be a public entity separate from the parties to this Agreement. The name of such entity shall be the Sacramento Groundwater Authority ("Authority"). The boundaries of the Authority shall be as follows: north of the American River to the Sacramento County line; bounded on the south by the

American River; on the west by the Sacramento River; on the north and east by the Sacramento County line; and including the City of Folsom. A map depicting the boundaries of the Authority is attached hereto and incorporated herein as Exhibit "B".

5. **Membership Of The Governing Board.** The governing body of the Authority shall be a Board of Directors of sixteen (16) members consisting of the following representatives who shall be appointed in the manner set forth in Section 7 of this Agreement:

(a) An elected member of the governing board or designated employee of each of the following public agencies: the City of Folsom, the City of Sacramento and the Sacramento County Water Agency.

(b) An elected member of the governing board of each of the following public agencies: the Carmichael Water District, the Citrus Heights Water District, the Del Paso Manor Water District, the Fair Oaks Water District, the Rio Linda/Elverta Community Water District, the Sacramento Suburban Water District, and the San Juan Water District.

(c) A member of the board of directors, or designee thereof, of each of the following private water purveyors or investor owned utilities: the Arden Cordova Water Company, California-American Water Company, the Natomas Central Mutual Water Company and the Orange Vale Water Company.

(d) One representative of Agricultural Interests within the boundaries of the Authority.

(e) One representative of Commercial/Industrial Self-Supplied Water Users within the boundaries of the Authority.

6. **Adjustment To Composition Of Governing Board.** Should circumstances change in the future, any person or entity may petition the parties hereto to amend this Agreement so as to add or delete representatives to the governing board to accurately reflect groundwater production within the boundaries of the Authority.

7. **Appointment Of Members Of Governing Board.**

(a) The members of the governing board of the Authority shall be appointed as follows:

(i) The City of Folsom representative shall be appointed by the Folsom City Council.

(ii) The Agricultural Interests representative shall be appointed by the County Board of Supervisors.

(iii) The representative of Commercial/Industrial Self-Supplied Water Users shall be appointed by the Sacramento City Council.

(iv) The Citrus Heights City Council shall appoint the representative of the Citrus Heights Water District.

(v) The Sacramento City Council shall appoint the representatives of the following entities: Arden Cordova Water Company, California-American Water Company, the City of Sacramento, Del Paso Manor Water District, the Natomas Central Mutual Water Company, and Sacramento Suburban Water District.

(vi) The County Board of Supervisors shall appoint the representatives of the following entities: Carmichael Water District, Fair Oaks Water District, Orange Vale Water Company, Rio Linda/Elverta Community Water District, San Juan Water District and the Sacramento County Water Agency.

(b) Prior to the appointment of the representatives of the entities described in subsections (a)(v) and (vi) above, those entities shall submit a recommended appointment for their respective representatives to the appointing authority. The appointing authority shall give consideration to such recommendations, but shall retain the absolute discretion to appoint any person satisfying the criteria for appointment set forth in Section 5 hereof.

8. **Governing Board Voting Requirements.**

(a) Each member of the governing board of the Authority shall have one vote. With the exception of fiscal items as set forth in subsections (b) and (c) below, a majority vote of all members of the governing board is required to approve any item.

(b) Fiscal items related to the **Administrative Costs** of the Authority shall require approval by a double majority consisting of the following: a majority vote of all members of the governing board and a majority vote weighted according to the financial contribution of each Retail Provider, of Agricultural Interests, or of Commercial/Industrial Self-Supplied Water Users to the total administrative budget for the last complete fiscal year. The weighted vote of each member of the governing board shall be established and fixed annually at the time the Financing Plan for the administrative budget is adopted, and shall remain in effect throughout the succeeding fiscal year and shall apply to all votes on fiscal items related to the Administrative Costs of the Authority.

(c) Fiscal items related to **Water Costs** shall require approval by a double majority consisting of the following: a majority of all members of the governing board and a majority vote weighted on the basis of Water Production as defined in Section 2(d) hereof.

(d) For purposes of subsection (c) hereof, the weighted vote of the representative of Agricultural Interests and the Commercial/Industrial Self-Supplied Water Users representative shall be weighted on the basis of groundwater production by all such interests and users within the boundaries of the Authority, adjusted to reflect any differential rate which may be paid by a particular classification of water users; e.g., if each acre-foot of water pumped equals one vote and Agricultural Interests pump 100,000

acre feet, but pay only 20% of the per acre-foot assessment, fee or charge levied on other types of pumpers, the vote of the Agricultural Interests representative would be calculated at 20,000 votes.

(e) Water Production, as defined in Section 2(d) hereof, shall be based on an annual determination by the governing body of the Authority during the previous calendar year. Until such time as the governing board of the Authority makes its annual determination of Water Production, the last complete yearly calculation shall be controlling for purposes of the double majority requirement set forth in subsection (c) above.

9. **Quorum.** A majority of the members of the governing board shall constitute a quorum for purposes of transacting business, except less than a quorum may vote to adjourn a meeting.

10. **Terms Of Office.** With the exception of the initial term of the representatives appointed by the City of Folsom and the City of Sacramento, the term of office of each member of the governing board the Authority shall be for a period of four (4) years. For the purpose of providing staggered terms of office, the term of the initial representatives appointed by the City of Folsom and the City of Sacramento shall be for a period of two (2) years. Thereafter, the term of office of each representative appointed by the City of Folsom and the City of Sacramento shall be for a period of four (4) years. Each member of the governing board shall serve at the pleasure of the appointing body and may be removed as a member of the governing board by the appointing body at any time. If at any time a vacancy occurs on the governing board, a replacement shall be appointed to fill the unexpired term of the previous representative pursuant to the provisions of Section 7 hereof within ninety (90) days of the date that such position becomes vacant.

11. **Alternates.** The City of Citrus Heights, the City of Folsom, the City of Sacramento and the County, in addition to their regular appointments, shall appoint one or more persons with the required qualifications to serve as alternate members of the governing board of the Authority. Any such alternates shall be empowered to cast votes in the absence of the regular members or, in the event of a conflict of interest preventing the regular member from voting, to vote because of such a conflict of interest.

12. **Organization Of The Authority.** The governing board of the Authority shall elect a chair, a vice chair and such other officers as the governing board shall find appropriate. Such officers shall serve for a term of one (1) year unless sooner terminated at the pleasure of the governing board.

13. **Treasurer, Controller, Clerk and Legal Counsel.** The governing board of the Authority shall appoint a treasurer, controller, clerk and legal counsel as it deems appropriate. The controller of the Authority shall cause an independent annual audit of the Authority's finances to be made by a certified public accountant in compliance with Government Code Section 6505. The treasurer of the Authority shall be the depositor and shall have custody of all money of the Authority from whatever source. The controller of the Authority shall draw warrants to pay demands against the Authority when the demands have been approved by the Authority or by its authorized representative pursuant to any delegation of authority adopted by the Authority. The treasurer and controller shall comply strictly with the provisions of statutes relating to their duties found in Chapter 5 (commencing with Section 6500) of Division 7 of Title 1 of the Government Code.

14. **Executive Director.** The governing board of the Authority shall appoint an Executive Director-who shall be responsible to the governing board for the proper and efficient administration of the Authority as directed by the governing board pursuant to the provisions of

this Agreement or of any ordinance, resolution or order of the governing board. In addition to any other duties which may be assigned, the Executive Director shall have the following authority:

(a) under the policy direction of the governing board, to plan, organize and direct all Authority activities;

(b) to authorize expenditures within the designations and limitations of the budget approved by the governing board;

(c) to make recommendations to and requests of the governing board concerning any matter which is to be performed, done or carried out by the governing board;

(d) to have the authority to appoint, discipline, assign and otherwise supervise and control the activities of any employees or contractors which may be hired or retained by the Authority; and

(e) to have charge of, handle and have access to any property of the Authority.

15. **Meetings.** The Authority shall provide for regular and special meetings in accordance with the Ralph M. Brown Act (Chapter 9 (commencing with Section 54950) of Part 1 of Division 2 of Title 5 of the Government Code) or with any successor provision.

16. **Powers and Functions.**

(a) The Authority shall have no power to regulate land use or to engage in the retail sale of water and shall be prohibited from restricting or otherwise limiting the extraction of groundwater within the boundaries of the Authority except by means of economic incentives and disincentives. The Authority shall further be prohibited from funding any capital construction projects. In addition, prior to October 13, 2003, the Authority shall be prohibited from levying annual fees or assessments to fund Water Cost payments that exceed an annual average charge during such five (5) year period of $5.00 for each acre

foot (minimum $0.00-maximum $10.00) of groundwater pumped from the North Area Basin during such five (5) year period. Further, during any individual year of such five (5) year period, the Authority shall be prohibited from levying annual fees or assessments to fund Water Cost payments that exceed a charge of $10.00 for each acre foot of groundwater pumped from the North Area Basin during any such year. For purposes of this section, Water Costs shall include the cost of water, pumping and treatment costs, and other costs related to any Conjunctive Use program administered by the Authority.

(b) Subject to the limitations set forth in subsection (a), the Authority shall have any and all powers commonly held by the parties hereto necessary or appropriate to regulate groundwater within the boundaries of the Authority including, but not limited to, the following powers:

(i) Collect and monitor data on the extraction of groundwater from, and the quality of groundwater in, the North Area Basin;

(ii) Establish and administer a Conjunctive Use program for the purpose of maintaining Sustainable yields in the North Area Basin consistent with the Groundwater Management Element;

(iii) Buy and sell water on other than a retail basis;

(iv) Exchange water;

(v) Distribute water in exchange for ceasing or reducing groundwater extractions;

(vi) Spread, sink and inject water into the North Area Basin;

(vii) Store, transport, recapture, recycle, purify, treat or otherwise manage and control water for the beneficial use of persons and property within the Authority;

(viii) To implement any Conjunctive Use program which the Authority deems necessary to maintain Sustainable yields in the North Area Basin consistent with the Groundwater Management Element; and

(ix) Study and plan ways and means to implement any or all of the foregoing powers.

(c) For purposes of exercising the authority set forth in subsection (b), and subject to the limitations set forth in subsection (a), the Authority shall have the following corporate and political powers:

(i) To sue and be sued in all actions and proceedings in all courts and tribunals.

(ii) To adopt a seal and alter it at its discretion.

(iii) To take by grant, purchase, gift, devise or lease, to hold, use and enjoy, and to lease, convey or dispose of, real and personal property of every kind, within or without the boundaries of the Authority, necessary or convenient to the full exercise of its power.

(iv) For the common benefit of the Authority, to store water in underground water basins or reservoirs within and outside the Authority, to appropriate water and acquire water rights within or outside the Authority, to import water into the Authority, and to conserve, or cause the conservation of, water within or outside the Authority.

(v) To exercise the right of eminent domain to take any property necessary to supply the Authority or any portion of it with replenishment water; provided that the right of eminent domain may not be exercised with respect to water and water rights, and may not be exercised with respect to any property owned or occupied

by any of the parties hereto or the entities represented on the governing board of the Authority.

(vi) To act jointly, or cooperate, with the United States or any agency thereof, the state, or any county or agency thereof, or any political subdivision or district therein, including flood control districts, private and public corporations, and any person, so that the powers of the Authority may be fully and economically exercised.

(vii) To cause taxes, assessments, fees or charges to be levied in accordance with applicable State law, and in a manner consistent with the Groundwater Management Element, to accomplish the purposes of the Authority.

(viii) To require the permitting of groundwater extraction facilities within the boundaries of the Authority, to maintain a record of extraction with respect to any such facilities, and to require the installation of meters on groundwater extraction facilities for the purpose of determining the amount of groundwater being extracted from the North Area Basin.

(ix) To make contracts, employ labor and to do all acts necessary for the full exercise of the Authority's powers.

(x) To carry on technical and other investigations of all kinds necessary to further the purposes of the Authority.

(xi) To fix rates at which water acquired by the Authority shall be sold for replenishment purposes, and to establish different rates for different classes of service or conditions of service, provided that the rates shall be uniform for like classes and conditions of service.

(xii) To participate in any contract under which producers may voluntarily agree to use surface water in lieu of groundwater, and to that end the Authority may become a party to the contract and pay from Authority funds that portion of the cost of the surface water as will encourage the purchase and use of that water in lieu of pumping so long as persons or property within the boundaries of the Authority are directly or indirectly benefitted by the resulting replenishment of the North Area Basin.

(xiii) To apply for, accept and receive state, federal or local licenses, permits, grants, loans or other aid from any agency of the United States, the State of California, or other public or private entity necessary or appropriate for the Authority's full exercise of its powers.

17. **Budgets.** Within ninety days after the first meeting of the governing board of the Authority, and thereafter prior to the commencement of each fiscal year (defined as July 1 through June 30), the governing board shall adopt a budget for the Authority for the ensuing fiscal year.

18. **Termination.** This Agreement shall remain in effect until terminated by one of the parties hereto pursuant to this section. This Agreement may be terminated by any of the parties hereto at any time and for any reason by providing ninety (90) days written notice of termination to the other parties. Except as provided in Section 19(b) hereof, the Authority shall automatically terminate upon the effective date of the termination of this Agreement.

19. **Disposition Of Authority Assets Upon Termination.**

(a) In the event of the termination of the Authority where there will be a successor public entity which will carry on the functions of the Authority and assume its assets, the assets of the Authority shall be transferred to the successor public entity.

(b) If there is no successor public entity which will carry on the functions of the Authority and assume its assets, the assets shall be returned to the parties hereto in proportion to the contribution of each party during the term of this Agreement.

(c) If there is a successor public entity which will carry on some of the functions of the Authority and assume some of its assets, the assets of the Authority shall be allocated by the governing board of the Authority between the successor public entity and the parties hereto.

20. **Liabilities.** The debts, liabilities and obligations of the Authority shall be the debts, liabilities and obligations of the Authority alone, and not of the parties to this Agreement.

21. **Rules.** The governing board of the Authority may adopt from time to time such rules and regulations for the conduct of its affairs as it deems necessary and appropriate.

22. **Minutes.** The clerk appointed by the governing board of the Authority shall cause to be kept minutes of all meetings of the governing board, and shall cause a copy of the minutes to be forwarded to each member of the governing board and to each of the parties hereto.

23. **Effective Date.** The Authority was created on October 13, 1998. This Agreement, which replaces and supercedes all prior Agreements and Amendments to the Joint Powers Agreement creating the Authority, shall become effective when the governing bodies of all the parties shall have authorized its execution.

24. **Amendments.** This Agreement may only be amended by the affirmative vote of the governing bodies of all of the parties hereto.

IN WITNESS WHEREOF, the parties hereto execute this Agreement on the date first

written above.

CITY OF CITRUS HEIGHTS

Dated: 6/26/02

By Roberta MacGlashe
Mayor

Attest:

City Clerk

Approved As To Form:

City Attorney

CITY OF FOLSOM

Dated: 8.18.02

By
Mayor

Attest:

Lisa Robinson
City Clerk

Approved As To Form:

City Attorney 8/16/02

CITY OF SACRAMENTO

Dated: 6-18-02

By Heather Fargo
Mayor

Attest:

Valerie C. Burrows
City Clerk

Approved As To Form:

Joel Robbins
City Attorney

COUNTY OF SACRAMENTO

MAY 07 2002

By Don Nottoli
Chairperson, Board of Supervisors

Attest:

Cindy H. Turner
Clerk of the Board

Approved As To Form:

John F. Whit
County Counsel

CITY
AGREEMENT NO. 2000-074-A

05-07-2002 SGA Revised JPA

CITY
AGREEMENT NO. 2000-074-A

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6.2 APPENDIX B. WATER SUPPLY DATA BY SGA MEMBER AGENCY

Appendix B of the SGA GMP includes the Cooperating Agencies RWMP, Phase I, Technical Memorandum 3. (Appendix A of TM 3 includes the water supply data by agency.) This document was completed in 1999, and the information contained herein is current as of that time.

Organizations and names remain unchanged (e.g., the SGA and Sac Suburban are not mentioned, but their predecessors are referenced (Sacramento North Area Groundwater Management Authority and Arcade Water District/Northridge Water District)). Recently constructed and expanded facilities may be listed as proposed (e.g., CWD's Bajamont WTP). Non-SGA member agencies are included (e.g., Roseville).

The revision and update of this document may be undertaken in the future.

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Technical Memorandum Three:

Summary of Existing Water Supplies

American River Basin Cooperating Agencies

Regional Water Master Plan

REGIONAL WATER MASTER PLAN
PHASE I: SCOPE OF WORK AND WORK PLAN DEVELOPMENT

TM 3: SUMMARY OF EXISTING WATER SUPPLIES

MONTGOMERY WATSON
in Association with
Bookman-Edmonston and CH2M-Hill

INTRODUCTION

OVERVIEW

This technical memorandum provides an inventory and qualitative characterization of the existing surface water, groundwater, and reclaimed water supplies currently available to the American River Basin Cooperating Agencies (Cooperating Agencies) and other users of the lower American River and the connected groundwater basin (see Figure 1). This inventory has four specific objectives:

- To summarize the water rights and contract entitlements that prescribe the surface water and groundwater supplies available for use by the Cooperating Agencies and selected other users of the lower American River and the connected groundwater basin.
- To identify the impact of the proposed Water Forum plan on the availability of those surface water and groundwater supplies.
- To summarize the general quality of the available surface water and groundwater supplies.
- To describe how anticipated future regulatory and institutional considerations might impact surface water and groundwater availability.

This information will be used in conjunction with information on existing and projected demands to identify the magnitude and timing of the individual Cooperating Agencies' need for supplemental supplies.

PRESENTATION OF DATA

Three types of information are summarized in this memorandum: grouped data, regional data, and agency-specific data. The grouped data and regional data are provided in the sections that follow; the agency-specific data are presented in Appendix TM 3/A.

Grouped Data

In the Water Forum plan, water supply and demand data were sometimes aggregated to larger purveyor groupings. Pursuant to the direction of the Cooperating Agencies Coordinating Committee, the initial water supply data developed for this memorandum are consistent with the agency groupings adopted in the Water Forum plan. These groupings are inclusive of all water purveyors in Sacramento County north of the American River. The individual agencies associated with each Water Forum grouping are listed in Table 1. Water supply information is also presented in this memorandum on an agency-by-agency basis (see Appendix TM 3/A).

In Placer County, the Water Forum groupings include:

- City of Roseville
- Placer County Water Agency

In Sacramento County, the Water Forum groupings include:

- Carmichael Water District
- City of Folsom
- City of Sacramento Place of Use north of the American River
- Natomas Central Mutual Water Company
- North Central Group (see Figure 2)
- San Juan Family (see Figure 3)

Each of these groupings is described in further detail in subsequent sections of this memorandum.

Table 1

Mix of Water Supplies Used North of the American River

WATER FORUM GROUPINGS Individual Agencies	GROUND-WATER	SURFACE WATER				
		American River			Sacramento River	
		Water Rights	Water Contracts	Agreements	Water Rights	Water Contracts
SACRAMENTO COUNTY						
Carmichael WD (1)	X	X				
City of Folsom (1)		X	X, P (2)			
City of Sacramento Place of Use						
City of Sacramento North (1)	X	X			X	
CUCC - Arden Area and Sierra Oaks (1)	X					
Del Paso Manor Water District	X			X		
Arcade Water District - Town & Country (1)	X			X		
Arden Cordova WSC - Arden Town	X					
SCWMD - Arden Park Vista (1)	X					
Portion of Natomas Central MWC	X				X	
North Central Group						
Northridge Water District (1)	X		P	N		
Arcade Water District - North Highlands (1)	X					
CUCC - Antelope and Royal Oaks (1)	X					
Rio Linda/Elverta Community Water District (1)	X					
McClellan AFB	X		P			
NCMWC and Miscellaneous Areas	X(3)					
Natomas Central MWC	X		P		X	X
Sacramento International Airport	X				X	X
SCWMD - Northgate (1)	X					
San Juan Family(4)		X	X,P			
Citrus Heights Water District (1)	X	X	X			
Fair Oaks Water District (1)	X	X	X			
Orange Vale Water Company	X	X	X			
SJWD - Sacramento County Retail Area (1)		X	X			
SJWD - Placer County Retail Area (1)		X	X			
Portion of City of Folsom (1)		X	X			
PLACER COUNTY						
Placer County Water Agency - American River		X	X			
Placer County Water Agency - Sacramento River						P
City of Roseville (1)	X		X	X		

NOTES:

(1) Member of the American River Basin Cooperating Agencies.

(2) The City of Folsom has a subcontract with Sacramento County Water Agency (SCWA) pending approval of the SCWA's "Fazio Water" contract with the United States Bureau of Reclamation.

(3) Groundwater is used by landowners within company boundaries, but is pumped from privately owned wells.

(4) The San Juan Family Grouping includes the San Juan Water District retail service areas in Sacramento and Placer Counties, Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company, and that portion of the City of Folsom north of the American River.

LEGEND:

X Existing Available Water Supply

P Pending Water Supply

N Northridge Water District began negotiations of an agreement for surface water with the City of Sacramento that has not been finalized.

Regional Data

Regional data described in this memorandum generally apply to more than one agency and include general surface water, groundwater, and water quality data, as well as regulatory and institutional considerations.

Agency-Specific Data

Agency-specific data are provided on an agency-by-agency basis in Appendix TM 3/A. These data include specific water rights and contract entitlements for surface water; local groundwater usage, elevations, and quality; use of surface water and groundwater in the Water Forum plan; and regulatory and institutional considerations that may affect specific surface water rights or contract entitlements and/or the use of groundwater.

INVENTORY OF AVAILABLE WATER SUPPLIES

Water purveyors in northern Sacramento County and southern Placer County utilize both surface water and groundwater. As shown in Table 1, some agencies rely exclusively on either groundwater or surface water to meet their needs; others use a combination of surface water and groundwater. Figure 4 illustrates the general water use pattern of the agencies by source.

The inventory of water supplies included in this memorandum identifies the surface water and groundwater supplies available to the Cooperating Agencies (and others as listed mentioned above). The objective is to summarize the existing surface water and groundwater supplies currently utilized by water purveyors in northern Sacramento County and southern Placer County. For individual agencies, this may include combinations of groundwater; American River water diverted pursuant to water rights, contract entitlements, or other agreements; or Sacramento River water diverted pursuant to water rights or contract entitlements.

SURFACE WATER SUPPLIES

This section provides a regional overview of available surface water supplies from the Sacramento River and the lower American River pursuant to water rights, contract entitlements, and other agreements. This information is presented on an agency-by-agency basis in Table 2. It is also recognized that there are proposed plans to serve surface water across agency boundaries (e.g., the Arden-Arcade Conjunctive Use Plan). Where applicable, these plans are discussed in Appendix TM 3/A.

American River Water Rights

Five of the Cooperating Agencies identified in Table 1 have water rights on the American River: Carmichael Water District, City of Folsom, City of Sacramento, San Juan Water District, and Placer County Water Agency. The City of Sacramento and Natomas Central Mutual Water Company also have water rights on the Sacramento River (see Table 1). Details of these water rights are summarized in Table 2.

The place of use for the Carmichael Water District's water right is coincident with the boundaries of the District.

The place of use for the City of Folsom's water right is coincident with the city limits and portions of the lands owned by Aerojet.

The place of use of the City of Sacramento's water rights on the American River extends beyond the boundaries of the city limits. As shown on Figure 5, the authorized place of use outside the city limits includes (1) portions of Citizens Utilities Company of California (CUCC or Citizens Utilities) Arden and Sierra Oaks service areas, (2) the Del Paso Manor Water District, (3) the Arcade Water District Town

Table 2

Water Rights and Contract Entitlements Held by the Cooperating Agencies and Others

AGENCY HOLDING WATER RIGHT OR CONTRACT ENTITLEMENT	STATE NUMBER OR CONTRACT NUMBER	DIRECT DIVERSIONS			DIVERSIONS TO STORAGE			MAXIMUM USE IN ACRE-FEET	PRIORITY DATE OR CONTRACT DATE	TYPE OF USE (a)	PLACE OF USE
		Begin	End	CFS	Begin	End	AF				
SACRAMENTO COUNTY											
Arcade WD	Agreement with City of Sacramento	Jan-1	Dec-31	72				26,064	2/13/64		That portion of the Arcade Water District that lies within Area "D" of the City's Place of Use
Arden Cordova Water Service Company	Pre-1914 Water Right							10,000	1/1/1853	M	Rancho Cordova Service Area
Carmichael WD	A000138	Jan-1	Dec-31	15				10,800	9/18/15	I, D	District Boundary
	A004743	May-1	Nov-1	10				3,600	8/22/25	I, D,M	District Boundary
	A012367	Jan-1	Dec-31	25				18,100	3/1/48	I, D,M	District Boundary
	TOTAL							**32,500**			
City of Folsom	Pre-1914 Water Right							22,000	1/1/1853	M	City Boundary
	Purchased from Arden Cordova							5,000			City Boundary
	Contract pending with Sacramento County Water Agency(PL101-514)							7,000			East Area
	TOTAL							**34,000**			
City of Sacramento - American River	A012140	Nov-1	Aug-1	500					10/29/47	M	Authorized Place of Use
	A012321	Nov-1	Aug-1	310	Nov-1	Aug-1	275,000		2/13/48	M	Authorized Place of Use
	A012622	Nov-1	Aug-1	1200	Nov-1	Aug-1	314,000		7/29/48	M	Authorized Place of Use
	A016060	Nov-1	Aug-31	175					9/22/54	M, R, J	Authorized Place of Use
	USBR Contract 14-06-200-6497	Jan-1	Dec-31	675 (b)				245,000 (b)	6/28/57	M	Authorized Place of Use
City of Sacramento - Sacramento River	Pre-1914 Water Right	Jan-1	Dec-31	75					Pre-1914	M	N/A
	A001743	Jan-1	Dec-31	225					3/30/20	M	City
	USBR Contract 14-06-200-6497	Jan-1	Dec-1	225 (b)				81,000 (b)	6/28/57		City
Del Paso Manor Water District	Agreement with City of Sacramento							2,460			District Boundary
Natomas Central Mutual Water Company	Settlement Contract with USBR							98,200			Water Company service area
	Contract with USBR							22,000			Water Company service area
	TOTAL							**120,200**			
Northridge Water District	Pending Agreement with City of Sacramento							9,023	not implemented		Area "D" within City's Place of Use
	Section 215 water - Contract No. 8-07-20-W1473	Jan-22	Feb-28						1/22/98	M, I	District Boundary
	Contract pending with PCWA							29,000			North Central Group, San Juan Family
San Juan Water District	A005830	Jun-1	Dec-31	75(c)				33,000 (c)	2/11/28	D, I	SJWD wholesale service area
	S000656	Jan-1	Dec-31	75(c)				33,000 (c)	1/1/1853	D, I	SJWD wholesale service area
	Contract with USBR							11,200			SJWD wholesale service area
	Contract pending with USBR(PL101-514)							13,000			Sacramento County portion of SJWD wholesale service area
	Contract with PCWA							25,000			Placer County portion of SJWD retail service area
	TOTAL							**82,200**			
PLACER COUNTY											
City of Roseville	Contract with USBR							32,000			City Boundary
	Contract with PCWA							30,000			City Boundary
	TOTAL							**62,000**			
Placer County Water Agency - American River	A018085							120,000			Agency Service Area
	S959	Jan-1	Dec-31	40				28,900	1864		Agency Service Area
	Contract with USBR							35,000 (d)			Agency Service Area
	Contract with PG&E							100,000			Agency Service Area
	TOTAL							**283,900**			
Placer County Water Agency - Sacramento River	Pending agreement on potential Sacramento River exchange							35,000			Pending

NOTES:

(a) Water Use Types: I - Irrigation, M - Municipal, D - Domestic, R - Recreational, J - Industrial

(b) Maximum annual usage is not specified in the City permits. In its water rights settlement contract with the USBR, the City agreed to limit its diversions to the rates and amounts shown and the USBR agreed to guarantee the supply.

(c) The combined total delivery limit for A005830 and S000656 is 75 cfs, with a maximum annual use of 33,000 acre-feet.

(d) Total contract for 117,000 acre-feet per year. Water in excess of 35,000 acre-feet per year under discussion.

and Country service area, (4) the Sacramento County Water Maintenance District Arden Park Vista service area, (5) the Arden-Cordova Water Service Company Arden Town service area, and (6) portions of the Northridge Water District and the Carmichael Water District. In addition, a portion of the City of Sacramento's American River place of use overlaps with the place of use for the Sacramento River water rights and contract entitlements of the Natomas Central Mutual Water Company.

The place of use for the San Juan Water District's water rights is the District's wholesale service area which encompasses the San Juan Water District retail service areas in Sacramento and Placer Counties, the Citrus Heights Water District, the Fair Oaks Water District, the Orange Vale Water Company, and that portion of the City of Folsom that lies north of the American River (see Figure 3).

The Placer County Water Agency place of use is the agency's boundary. This boundary is somewhat larger than Agency's service area and encompasses the City of Roseville, the San Juan Water District's Placer County retail service area, and the Citrus Heights Water District Placer County service area.

American River Contract Entitlements

In Sacramento County, two agencies have existing water supply contract entitlements with the United States Bureau of Reclamation (Reclamation) Central Valley Project (CVP): the City of Folsom and the San Juan Water District. San Juan Water District provides CVP water to agencies within its wholesale service area (see Figure 3). Details of these contract entitlements are summarized in Table 2.

In addition, the San Juan Water District and the Sacramento County Water Agency have pending water supply contract entitlements with Reclamation from Public Law (PL) 101-514 (commonly referred to as "Fazio Water"). San Juan Water District's pending contract entitlement is for 13,000 acre-feet per year. This supply would be used within San Juan's Sacramento County wholesale area. The Sacramento County Water Agency's pending contract is for 22,000 acre-feet per year. The Sacramento County Water Agency would use this supply within Zone 40 (south of the American River). The City of Folsom has a pending subcontract with the Sacramento County Water Agency for 7,000 acre/feet per year (out of the potentially available 22,000 acre/feet per year). Details of these pending contract entitlements are summarized in Table 2.

Northridge Water District has a pending water contract with Placer County Water Agency. The proposed place of use for the Northridge Water District contract with Placer County Water Agency includes the service areas of Northridge Water District, San Juan Water District, Fair Oaks Water District, Orange Vale Water Company, Citrus Heights Water District, Arcade Water District North Highlands service area, McClellan Air Force Base, Citizens Utilities Antelope and Lincoln Oaks\Royal Oaks service areas, and Rio Linda/Elverta Community Water District (see Figure 6). The State Water Resources Control Board has not yet approved the change in the place of use required for this transfer.

In Placer County, there are three agencies with water contracts: City of Roseville, San Juan Water District, and Placer County Water Agency. The City of Roseville has two water contracts: one with Reclamation for CVP water and another with the Placer County Water Agency. San Juan Water District has a water contract with Placer County Water Agency under which it can provide water to those portions of its retail and wholesale service areas located in Placer County. The San Juan Water District can also provide CVP contract supplies to its Placer County retail service area.

Placer County Water Agency has water contracts with Reclamation and PG&E. Placer County Water Agency also has existing contracts to supply water to the City of Roseville and San Juan Water District, as well as a pending contract to supply water to Northridge Water District as described above.

Other Agreements

The City of Sacramento has agreements with the Arcade Water District and the Del Paso Manor Water District to make surface water available for use within the portions of their service areas that lie within the City's place of use. The City entered into negotiations for a similar agreement with Northridge Water District, but such an agreement was never consummated.

Northridge water district has a temporary contract with Reclamation for surplus water (often referred to as Section 215 water). Northridge has exercised this contract since 1991. Section 215 water is available on an intermittent basis subject to hydrologic conditions.

GROUNDWATER SUPPLIES

This section provides a regional description of the geologic and hydrogeologic conditions of the underlying groundwater basin and the water level trends based on comparison of water level maps from the years 1968 and 1996.

Geologic Conditions

The groundwater resources of Sacramento County have been extensively investigated and reported in the Department of Water Resources (DWR) Bulletin 118-3, Evaluation of Ground Water Resources: Sacramento County (July 1974). Bulletin 118-3 identifies the various geologic formations that constitute the water-bearing deposits underlying Sacramento County. These formations include an upper aquifer system consisting of the Victor, Fair Oaks, and Laguna Formations, and a lower aquifer system consisting primarily of the Mehrten Formation. These formations are typically composed of lenses of interbedded sand, silt, and clay interlaced with coarse-grained stream channel deposits. These deposits form a wedge thickening from east to west at a fairly constant rate to a maximum thickness of 2,000 feet near the Sacramento River.

Hydrogeologic Conditions

Groundwater occurs in an unconfined to semi-confined state throughout the area. Semi-confinement may occur in local areas, and the degree of confinement typically increases with depth. Groundwater in the Victor, Fair Oaks, and Laguna Formations is typically unconfined. The deeper Mehrten Formation, a major source of groundwater, exhibits semi-confined conditions.

Groundwater in the region moves from sources of recharge to areas of discharge. Most recharge to the local aquifer system occurs along active stream channels where extensive sand and gravel deposits exist. As a result, the highest groundwater elevations occur near the American and Sacramento Rivers.

Groundwater Levels

Intensive use of the groundwater basin has resulted in a general lowering of groundwater elevations near the center of the basin away from the sources of recharge. As early as 1968, pumping depressions were evident in both northern Sacramento County and southern Placer County (see Figure 7). By 1996, these depressions had grown and consolidated into a single cone of depression centered in the northern Sacramento County (see Figure 8). A hydrologic section of the aquifer system showing the groundwater elevations for 1968 and 1996 is shown on Figure 9. The location of this hydrologic section is shown on Figure 10. The differences in groundwater elevations on an agency-by-agency basis for the 1968 to 1996 period are reviewed in Appendix TM 3/A.

RECLAIMED WATER

Currently, limited opportunities exist for using reclaimed water north of the American River. In Sacramento County, the most probable reclaimed water opportunity exists at the Sacramento Regional

Wastewater Treatment Plant (Sac Regional) located on the Sacramento River near Freeport (well south of the American River and the service areas of the Cooperating Agencies). At this time, however, Sac Regional does not appear to be a likely source of reclaimed water for the area north of the American River. The cost of pumping reclaimed water from Sac Regional to the service areas of the Cooperating Agencies is prohibitive. A more economic reclamation program might include the scalping of wastewater flows north of the American River for treatment at satellite plants. Note, however, there may be significant legal issues regarding large scale recycling at Sac Regional and the resultant decrease in the release of treated effluent to the Sacramento River.

In Placer County, the City of Roseville is currently pursuing a reclaimed water program. Large-scale opportunities for use by the Cooperating Agencies, however, have not been investigated.

IMPACT OF PROPOSED WATER FORUM PLAN

This section summarizes the year 2030 water supply scenarios described in the proposed Water Forum plan based on the year types adopted by the Water Forum. Generally speaking, the intent of the proposed Water Forum plan is to increase the use of groundwater in dry years and reduce surface water diversions. The decrease in available dry year diversions is a consequence of the objective of the Water Forum to provide in-stream flows in the lower American River for environmental purposes. In wet years, when more surface water is available, diversions will be increased and groundwater pumping will be reduced, thereby promoting recharge of the basin.

WATER YEAR TYPES

The proposed Water Forum plan identifies three principal water year types. These year types are based on estimated March through November unimpaired inflow into Folsom Lake and are categorized as wet/average years, drier years, and driest years.

Definition of Wet/Average Years

For most diverters, wet/average years are defined in the proposed Water Forum plan as those years when the projected March through November unimpaired inflow into Folsom Lake is equal to or greater than 950,000 acre-feet. For the pending water contract between Placer County Water Agency and Northridge Water District, the proposed Water Forum plan defines a wet/average year as those years when the March through November unimpaired inflow into Folsom Lake is greater than 1,600,000 acre-feet. For the City of Sacramento, diversion from the American River at an expanded E.A. Fairbairn Water Treatment Plant is based on meeting Hodge Flows in the lower American River.[1]

Definition of Drier Years

For most diverters, a drier year is defined in the proposed Water Forum plan as those years when the projected March through November unimpaired inflow into Folsom Lake is less than 950,000 acre-feet, but equal to or greater than 400,000 acre-feet. For some diverters, the drier year diversion amounts are still being negotiated.

Definition of Driest Years

The driest years, also referred to as "conference years", are defined in the proposed Water Forum plan as those years when the projected March though November unimpaired inflow into Folsom Lake is less than 400,000 acre-feet. For some diverters, the driest year diversion amounts are still being negotiated.

[1] Hodge Flows are a minimum flow requirement on the lower American River and are described in Appendix G of the Water Forum -*Draft Recommendations for the* Water Forum *Agreement* (January 1997).

PROPOSED WATER FORUM PLAN WATER SUPPLY AVAILABILITY

In order to implement the proposed Water Forum plan, groundwater pumping will be increased in the drier and driest years when less surface water is available from the American River. In the wet/average years, surface water diversions will be increased and groundwater pumping will be reduced.

Surface Water Supply Availability

Many of the water purveyors have access to surface water through water rights and water contract entitlements. The proposed Water Forum plan prescribes the volume of American River water available to each water agency for each year type (within their respective existing water rights and contract entitlements). Table 2 lists the water rights and contract entitlements for each agency. The surface water supplies available to each agency under the Water Forum plan for the various year types are summarized in Table 4.

Supplemental Supplies

Supplemental supplies will be used to make up the difference between demand and surface water availability. For a given agency, the need for supplemental supplies may be met through one or more of the following: groundwater extractions, demand management through either conservation or rationing, and reclaimed water. Rationing would generally be considered only by those agencies without access to groundwater to meet demands in the drier and driest years.

Groundwater Supply Availability

To address declining groundwater levels, the Water Forum negotiated an acceptable groundwater equilibrium elevation at which to operate the basin. Groundwater studies indicated that the selected groundwater elevation in the basin located in Sacramento County north of the American River coincided with a long-term average annual groundwater pumping rate of 131,000 acre-feet per year. This is roughly equal to the 1990 groundwater pumping rate for that area and is considered to be the long-term sustainable yield of the groundwater basin for an assumed acceptable level of impact on groundwater elevations. Table 3 shows the estimated 1990 groundwater pumping rate for the Water Forum Groupings and the individual agencies. The proposed Water Forum plan groundwater pumping rates will increase in dry years and decrease in wet years compared to the long-term average. The assumed groundwater pumping rates for the different year types are presented in Table 4.

Water Use by Year Type

The proposed wet/average, drier, and driest years water use is described below to bracket the range of surface water and supplemental water use in each year type.

Water Use in Wet/Average Years

In wet/average years, surface water diversions would be maximized. In those years, surface water use by the Cooperating Agencies (and others as listed mentioned above) would total about 386,350 acre-feet per year. Estimates for each agency's surface water use in wet/average years are shown in Table 4.

Supplemental supplies would make up the difference between demands and available surface water supplies. In wet/average years, the need for supplemental supplies is estimated to be about 81,400 acre-feet per year and is generally assumed to be met with groundwater supplies. All of this groundwater pumping would occur in Sacramento County. It should be noted that this is well below the 131,000 acre-feet per year long-term sustainable yield estimate. In Placer County (including the City of Roseville and Placer County Water Agency), there would be limited groundwater pumping for users served by

Table 3

Estimated 1990 Groundwater Pumping Amounts (a)

WATER FORUM GROUPING AND/OR AGENCY	ESTIMATED PUMPING (AF)	
SACRAMENTO COUNTY		
Carmichael WD	**5,400**	
City of Folsom	**0**	
City of Sacramento Place of Use	**53,500**	
City of Sacramento North	22,000	
Citizens Utilties - Arden Area and Sierra Oaks	3,300	
Del Paso Manor Water District	1,600	
Arcade Water District - Town and Country	19,500	
Arden Cordova Water Service Company - Arden Town	1,100	
Sacramento County Water Maintenance District - Arden Park Vista	4,500	
Portion of Natomas Central Mutual Water Company	1,500	(b)
North Central Group	**60,800**	
Northridge Water District	16,500	
Arcade Water District - North Highlands	5,000	
Citizens Utilties - Antelope and Royal Oaks	19,500	
Rio Linda/Elverta Community Water District	16,500	
McClellan Air Force Base	3,300	
NCMWC and Miscellaneous Areas	**11,500**	
Natomas Central Mutual Water Company	9,000	
Sacramento International Airport	1,700	
Sacramento County Water Maintenance District - Northgate	800	
San Juan Family	**200**	
Citrus Heights Water District	40	
Fair Oaks Water District	0	
Orange Vale Water Company	160	
San Juan Water District - Sacramento County Retail Area	0	
San Juan Water District - Placer County Retail Area	0	
Portion of City of Folsom that lies north of American River	0	
SACRAMENTO COUNTY TOTAL:	**131,400**	
PLACER COUNTY		
PCWA - American River	**0**	
PCWA - Sacramento River	**0**	
City of Roseville	**0**	
PLACER COUNTY TOTAL:	**0**	
TOTAL FOR SACRAMENTO AND PLACER COUNTY:	**131,400**	

(a) Information available based on proposed Water Forum plan groupings. Where appropriate the information is approximately disaggregated to individual agencies.

(b) Estimated land owner groundwater pumping within Natomas Central Mutual Water Company.

Table 4

Summary of Proposed Water Forum Plan Water Supply Mix by Water Year Type (a)

WATER FORUM GROUPING AND/OR AGENCY	YEAR 2030 WATER FORUM PLAN YEAR TYPES					
	Wet and Average Years		Drier Years		Driest Years	
	Surface Water	Supplemental Supplies (b)	Surface Water	Supplemental Supplies (b)	Surface Water	Supplemental Supplies (b)
Carmichael Water District	**12,000**	**0**	**12,000**	**0**	**12,000**	**0**
City of Folsom	**34,000**	**0**	**34,000 to 22,000**	**0 to 12,000 (c)**	**20,000**	**14,000 (c)**
City of Sacramento Place of Use North of American River	**60,100**	**37,400**	**60,100**	**37,400**	**51,600**	**45,900**
City of Sacramento North of American River	42,100	22,000	42,100	22,000	42,100	22,000
Citizens Utilities - Arden Area and Sierra Oaks	0	3,300	0	3,300	0	3,300
Del Paso Manor Water District	0	1,600	0	1,600	0	1,600
Arcade Water District - Town and Country	12,000	6,000	12,000	6,000	3,500	14,500
Arden Cordova Water Service Company - Arden Town	0	1,400	0	1,400	0	1,400
Sacramento County Water Maintenance District - Arden Park Vista	0	3,100	0	3,100	0	3,100
Portion of Natomas Central Mutual Water Company	6,000	0	6,000	0	6,000	0
North Central Group	**29,000**	**35,800**	**0**	**64,800**	**0**	**64,800**
Northridge Water District	12,300	7,200	0	19,500	0	19,500
Arcade Water District - North Highlands	5,200	0	0	5,200	0	5,200
Citizens Utilities - Antelope and Royal Oaks/Lincoln Oaks	10,000	9,900	0	19,900	0	19,900
Rio Linda/Elverta Community Water District	0	18,700	0	18,700	0	18,700
McClellan Air Force Base	1,500	0	0	1,500	0	1,500
Natomas Central Mutual Water Company/Miscellaneous Areas	**44,450**	**7,400**	**44,450**	**7,400**	**44,450**	**7,400**
Natomas Central Mutual Water Company	44,450	0	44,450	0	44,450	0
Sacramento International Airport	0	6,300	0	6,300	0	6,300
Sacramento County Water Maintenance District - Northgate	0	1,100	0	1,100	0	1,100
San Juan Family	**82,200**	**0 (d)**	**82,200 to 52,200**	**0 to 30,000 (d)**	**52,200**	**30,000 (d)**
Citrus Heights Water District	21,300	0 (d)	21,300 to10,300	0 to 11,000 (d)	10,300	11,000 (d)
Fair Oaks Water District	18,500	0 (d)	18,500 to 9,000	0 to 9,500 (d)	9,000	9,500 (d)
Orange Vale Water Company	8,800	0 (d)	8,800 to 4,300	0 to 4,500 (d)	4,300	4,500 (d)
San Juan Water District - Sacramento County Retail Area	6,500	0 (d)	6,500 to 5,500	0 to 1,000 (d)	5,500	1,000 (d)
San Juan Water District - Placer County Retail Area	25,000	0 (d)	25,000 to 21,300	0 to 3,700 (d)	21,300	3,700 (d)
Portion of City of Folsom north of the American River	2,100	0 (d)	2,100 to 1,800	0 to 300 (d)	1,800	300 (d)
PCWA - American River	**35,500**	**0**	**35,500**	**0**	**35,500**	**0**
PCWA Transfer - Sacramento River (e)	**35,000**	**0**	**35,000**	**0**	**35,000**	**0**
City of Roseville	**54,900**	**0**	**54,900 to 39,800**	**0 to 15,100**	**39,800**	**15,100**
TOTAL:	**387,150**	**80,600**	**357,350 to 300,250**	**110,400 to 167,500**	**290,550**	**177,200**

NOTES:

(a) Water supply data based on proposed Water Forum plan.
(b) The need for supplemental supplies may be D32met by demand side management (conservation or rationing), reclaimed water, or groundwater extraction.
(c) The City of Folsom has no significant groundwater resources. Thus, this need for supplemental supplies will be satisfied through demand management, reclaimed water, surface water transfers, or a combination of all three.
(d) Based on a pro rata distribution of water supplies, but all water rights and contract entitlements are held by the San Juan Water District and provided to the wholesale service area through water service contracts.
In the 'drier' and 'driest' years, San Juan Family demands will be reduced by up to 15 percent as described in the proposed Water Forum plan. In those years, areas without access to groundwater will be served treated surface water (namely, the San Juan retail service areas in both Sacramento and Placer County and the portion of the City of Folsom north of the American River). Those areas with access to groundwater will be supplied with a combination of surface water and groundwater (namely, Fair Oaks Water District, Citrus Heights Water District, Orange Vale Water Company).
(e) Based on proposed Water Forum plan. Includes 25,000 acre-feet of M&I water from the Sacramento River and 10,000 acre-feet of agricultural water from the Feather River.

these agencies. Estimates for each agency's supplemental supplies in a wet/average year are shown in Table 4.

Water Use in Drier Years

In drier years, surface water diversions by the Cooperating Agencies (and others as listed mentioned above) would be less than those in wet/average years, ranging from 357,350 to 300,250 acre-feet per year. In drier years, the annual diversion amounts prescribed in the Water Forum plan are on a sliding scale based on the inflow to Folsom Lake. Estimates for each agency's surface water use in drier years are shown on Table 4.

Supplemental supplies would make up the difference between demands and available surface water supplies. The need for supplemental supplies is estimated to range from 110,400 to 167,500 acre-feet per year. Most of this (110,400 to 148,700 acre-feet per year) would occur in Sacramento County. It should be noted that in some drier years, the groundwater pumping rate in Sacramento County would exceed the 131,000 acre-feet per year sustainable yield estimate. In Placer County, the City of Roseville would use up to 15,100 acre-feet per year of supplemental supplies. Estimates for each agency's groundwater use in drier years are shown in Table 4.

Water Use in Driest Years

In the driest years, surface water diversions would be minimized, totaling 290,550 acre-feet per year. As shown in Table 4, this is almost a 100,000 acre-foot per year reduction in diversions from the wet/average years. In the driest years, the need for supplemental supplies would increase to 177,200 acre-feet per year. In Sacramento County, much of the 158,400 acre-feet of supplemental supplies would be derived from groundwater pumping. This exceeds the 131,000 acre-feet per year long-term sustainable yield estimate. The greatest amounts of additional conservation and rationing would be required in the driest years. As shown in Table 4, this is almost a 100,000 acre-foot per year increase in supplemental supplies compared to wet/average years.

WATER QUALITY

EXISTING WATER QUALITY REGULATORY FRAMEWORK

The Safe Drinking Water Act (SDWA) was enacted in 1974. Through this legislation, the federal government gave the United States Environmental Protection Agency (EPA) the authority to set standards for contaminants in drinking water supplies in throughout the country.

The 1986 Amendments to the SDWA identified 83 additional contaminants to be regulated by the EPA. For each contaminant, the EPA was required to establish a maximum contaminant level (MCL) or a treatment technique (TT) to limit the level of these compounds in drinking waters. The EPA was also required to recommend a Best Available Technology (BAT) for removal of each contaminant during treatment. The 1986 Amendments required EPA to regulate the 83 contaminants within three years of promulgation and to identify 25 additional contaminants for regulation every three years thereafter.

The California Department of Health Services (DHS) is responsible for the implementation of all federal EPA regulations in the State of California. DHS must enforce regulations that are at least as strict as those promulgated by EPA. Table 5 presents a summary of the current federal regulations enforced by DHS through Title 22 of the California Administrative Code.

Table 5
Summary of Current Federal Drinking Water Regulations

Regulation	Year of Promulgation of Final Rule	Number of Contaminants	Targeted Contaminants
National Interim Primary Drinking Water Regulations (NIPDWR)	1975-1981	7	Total Trihalomethanes, Arsenic, Radionuclides
Fluoride	1986	1	Fluoride
Phase I Standards	1987	8	VOCs
Phase II Standards	1991	36	IOCs, SOCs, VOCs
Phase V Standards	1992	23	IOCs, SOCs, VOCs
Surface Water Treatment Rule (SWTR)	1989	5	Turbidity, Microbial Contaminants
Total Coliform Rule (TCR)	1989	1	Microbial Contaminants
Lead and Copper Rule (LCR)	1991	2	Lead and Copper

Source: Montgomery Watson (May 1997)

SURFACE WATER QUALITY

American River

American River water is generally characterized as high quality surface water that is low in alkalinity, low in disinfection by-product precursor materials, low in mineral content, and low in organic contamination. Limited data also indicates that the source of water is low in microbial contamination from *Giardia* and *Cryptosporidium*. Turbidity levels in the American River tend to be higher in the winter than summer because of higher flows associated with winter storms.

The following profile of American River water quality from Folsom Lake to the confluence with the Sacramento River is based on reports for specific diversions at Folsom Lake (*Water Treatment Plant Expansion and Master Plan, Future Regulatory Considerations Technical Memorandum*, prepared for the City of Roseville), Carmichael Water District (*Preliminary Design Report Bajamont Way Membrane Filtration Plant*, prepared for Carmichael Water District), and E.A. Fairbairn Water Treatment Plant on the American River (*E.A. Fairbairn Water Treatment Plant - Finalization of Preliminary Design Technical Memoranda*, prepared for City of Sacramento Department of Utilities).

Folsom Lake

Water diverted from Folsom Lake is provided to the agencies shown on Figure 11: City of Roseville, San Juan Water District, Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company, and the City of Folsom. In addition, Northridge Water District has received Section 215 water from Folsom Lake. Because the treatment facilities serving these areas share a common Folsom Dam intake facility, the raw water is considered to be similar. Figure 12 shows the locations of the water treatment plants for the City of Roseville, San Juan Water District, and the City of Folsom.

Characterization of Folsom Lake water quality is based on data collected by the City of Roseville from 1992 through 1997. Some additional data for total organic carbon, *Giardia,* and *Cryptosporidium* were collected from the San Juan Water District. Folsom Lake water satisfies all the current federal

regulations for raw and treated water listed on Table 5. All three agencies use conventional treatment with disinfection to provide treated water that exceeds current Title 22 drinking water quality standards.

American River at Carmichael Water District's Proposed Bajamont Way Membrane Plant

Downstream of Folsom Lake, water is diverted from the American River by Carmichael Water District at four Ranney Collectors, which provide incidental sand filtration. With chlorine disinfection, these facilities provide treated drinking water in compliance with all the state drinking water requirements. The Surface Water Treatment Rule has had a large impact on the Carmichael Water District surface water supply. The DHS has mandated multi-barrier treatment on the surface water supply, necessitating construction of a water treatment plant for continued use of the American River supply. The location of the proposed water treatment plant is shown on Figure 12.

American River at City of Sacramento's E.A. Fairbairn Water Treatment Plant

The City of Sacramento diverts water from the American River at the E.A. Fairbairn Water Treatment Plant (see Figure 12). Water diverted at the plant undergoes conventional treatment and disinfection. The treated water exceeds current Title 22 drinking water quality standards.

Additional Data

Some water quality data are available for the infiltration wells of Arcade Water District (see Figure 12). This diversion point is located between Carmichael Water District's plant and the E.A. Fairbairn Water Treatment Plant, and the water diverted there is considered to be of similar quality to these two sites. The shallow infiltration wells provide incidental sand filtration. Arcade Water District provides treated drinking water in compliance with all the state drinking water requirements.

Sacramento River at City of Sacramento's Sacramento River Water Treatment Plant

This discussion of Sacramento River water quality is based on a report on the Sacramento River Water Treatment Plant (*Sacramento River Water Treatment Plant - Finalization of Preliminary Design Technical Memoranda*, prepared for the City of Sacramento Department of Utilities). Water diverted at the Sacramento River Water Treatment Plant is used within the city limits of the City of Sacramento. Located at the confluence of the Sacramento and American Rivers (as shown on Figure 12), the plant uses conventional treatment with disinfection to provide treated water that exceeds current Title 22 drinking water quality standards.

GROUNDWATER QUALITY

Groundwater throughout the area is generally of good quality for municipal uses. It is a bicarbonate type with total dissolved solids ranging from 150 milligrams per liter (mg/l) to 300 mg/l and averages about 200 mg/l. Hardness ranges from 20 mg/l to 150 mg/l and averages about 95 mg/l. Fresh groundwater is underlain by saline connate water at depths ranging from 800 feet in the east to 2,000 feet in the west.

The main water quality problem is the presence of iron and manganese. Throughout the area, iron and manganese are found randomly in wells. Iron concentrations range up to 5 mg/l, but typically do not exceed 2 mg/l. Manganese concentrations up to 2 mg/l have been reported, but normally do not exceed 0.3 mg/l. Current drinking water standards are 0.3 mg/l for iron and 0.05 mg/l for manganese. Iron and manganese in these concentrations are not a health hazard, but do cause laundry and fixture staining and taste problems.

Table 6
Summary of Types of Contaminants in Principal Plumes

Contaminant Site	Volatile Organic Compounds	Heavy Metals	Inorganic Compounds	Phenols	Aromatic Hydro-carbons	Pesticides
Southern Pacific Transportation Co. Yard	X	X				
Pacific Gas and Electric Yard		X	X	X	X	
McClellan Air Force Base	X	X		X		
Aerojet/McDonnell-Douglas	X	X				X
Santa Fe Pacific Pipelines (Sacramento Site)	X		X			
Purity Oil (Sacramento Site)	X		X			
Purity Oil (Rancho Cordova Site)	X	X	X			

Source: Bookman-Edmonston Engineering, Inc. (September 1996)

In Sacramento and Placer Counties, numerous industrial contamination plumes threaten groundwater quality. The locations of these sites are shown on Figure 13. They include McClellan Air Force Base, Santa Fe Pacific Pipelines (Sacramento Site), Purity Oil (Sacramento Site and Rancho Cordova Site), Aerojet/McDonnell-Douglas, and Southern Pacific Transportation Company Yard. Table 6 lists the contaminants present at each site.

These contamination plumes have forced some wells to be taken out of service and continue to threaten other local groundwater supplies. For example, contaminant plumes from Aerojet have crossed beneath the American River and have threatened wells in Fair Oaks Water District. In addition, wells in Citizens Utilities and Arden-Cordova Water Service Company have also been impacted and shut down because of contaminant migration. The effects of local groundwater contamination must be considered in any conjunctive use plan.

ANTICIPATED FUTURE CONSIDERATIONS

INSTITUTIONAL CONSIDERATIONS

Several institutional considerations may affect short-term and long-term surface water supply availability in the Sacramento and American Rivers. It is likely that any outcome from these programs could potentially reduce the amount of water available on the Sacramento River and/or the American River. These institutional considerations include:

- Central Valley Project Improvement Act (CVPIA)
- CALFED Bay-Delta Process
- State Water Resources Control Board Hearings on the Draft Water Quality Control Plan for the San Francisco Bay-San Joaquin Delta Estuary.
- Administration of the Endangered Species Act
- National Marine Fisheries Service (NMFS) Endangered Species Listings

ANTICIPATED FUTURE REGULATORY FRAMEWORK

The EPA is currently in the process of formulating several new regulations needed to maintain compliance with the Surface Water Drinking Act and its amendments. It is anticipated that the new regulations listed on Table 7 will be promulgated and finalized within the next several years. These regulations may require additional treatment of surface water and groundwater. Surface water supplies could also be affected by some of the anticipated regulations. For example, the Enhanced Surface Water Treatment Rule will most likely regulate *Cryptosporidium*. Groundwater in the region may also be affected by some of the anticipated regulations. Both radon and arsenic are present in groundwater and may require additional treatment. The Groundwater Disinfection Rule is expected to require all water agencies utilizing groundwater supplies to provide disinfection prior to distribution.

Table 7
Summary of Anticipated Future Regulations

Regulation	Expected Date	Targeted Contaminants	COMMENTS
Phase III	Unknown	Radionuclides	Will include regulation on radon
Phase IV	2000	Disinfectants/ Disinfection by-products	Also called the Disinfectants/Disinfection By-Products Rule
Phase VIb	Unknown	IOCs, SOCs, VOCs	--
Enhanced Surface Water Treatment Rule (ESWTR)	2000	Microbial	Most likely will regulate *Cryptosporidium*
Arsenic	Unknown	Arsenic	Most likely will lower MCL ten-fold
Groundwater Disinfection Rule (GWDR)	Unknown	Microbial	Most likely will require CT on well (groundwater) sources
Information Collection Rule (ICR)	Promulgated May 14, 1996	For information only	Purpose is to generate and collect data on many contaminants

Source: Montgomery Watson (May 1997)

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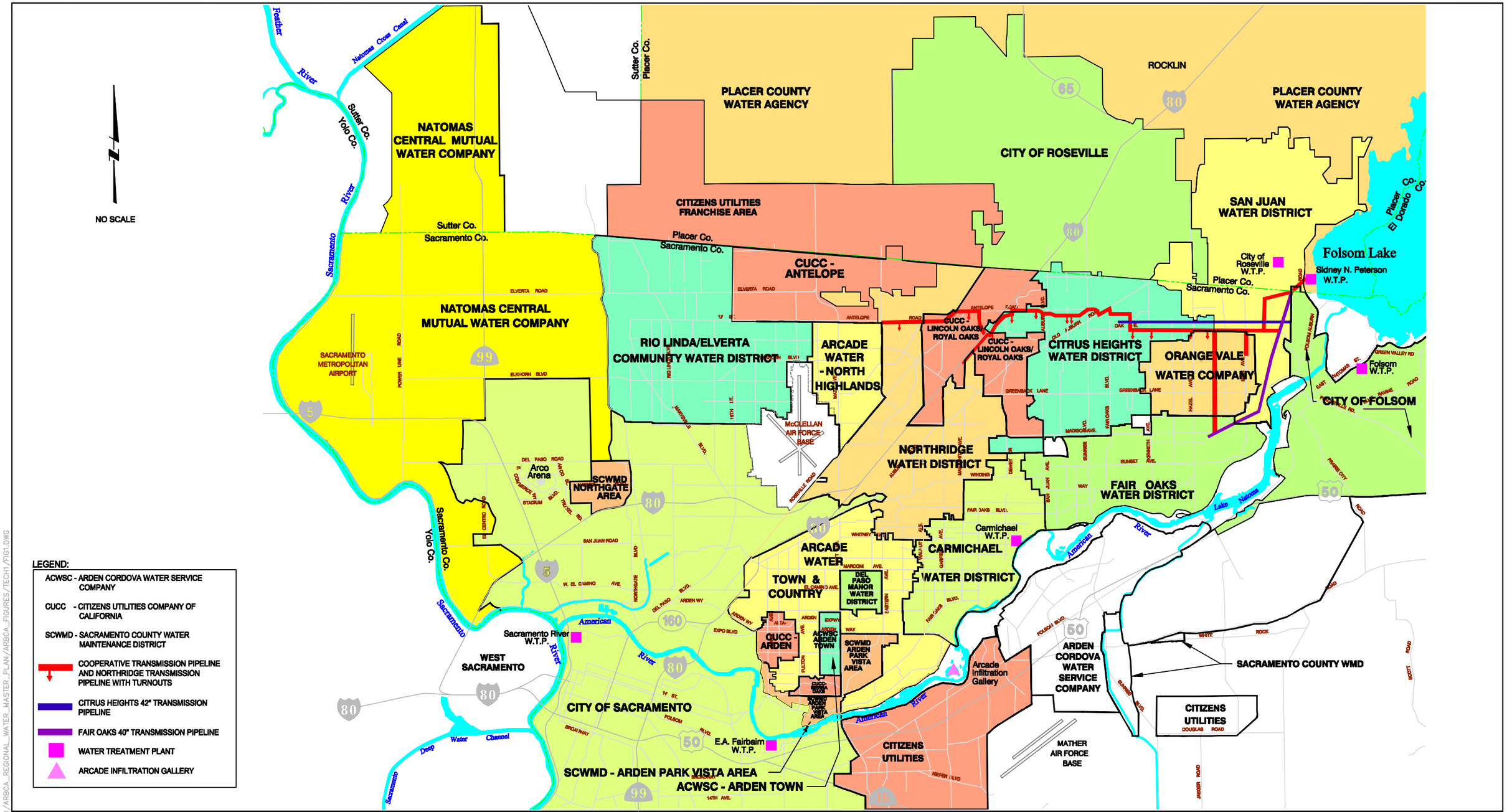


American River Basin Cooperating Agencies

Regional Water Master Plan

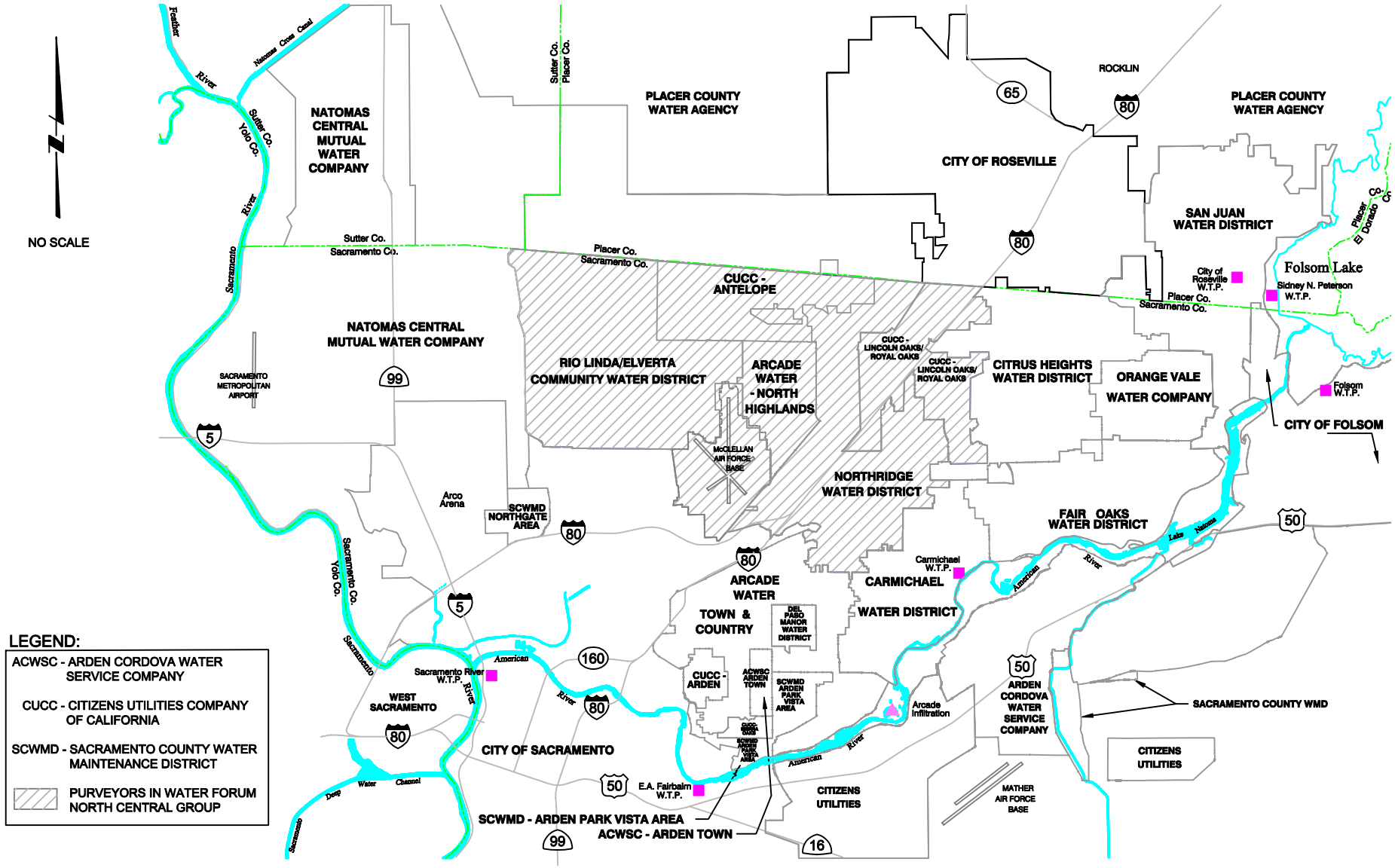
Location of Water Purveyors

Figure 1

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH1/FIG1.DWG

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/ NCENTRAL.DWG



American River Basin Cooperating Agencies

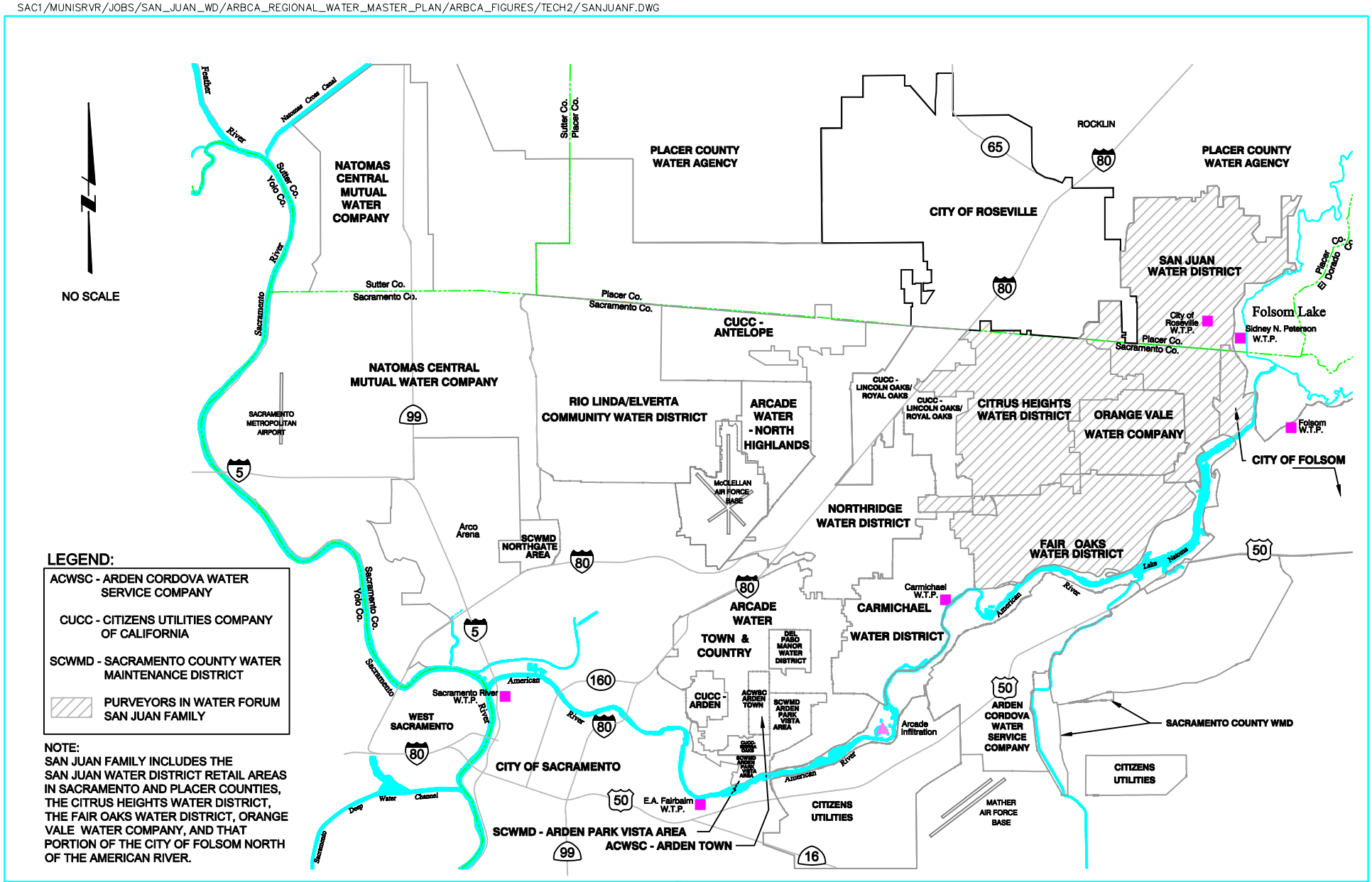
Regional Water Master Plan

Purveyors in Water Forum Grouping North Central Group

Figure 2

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/SANJUANF.DWG



American River Basin Cooperating Agencies

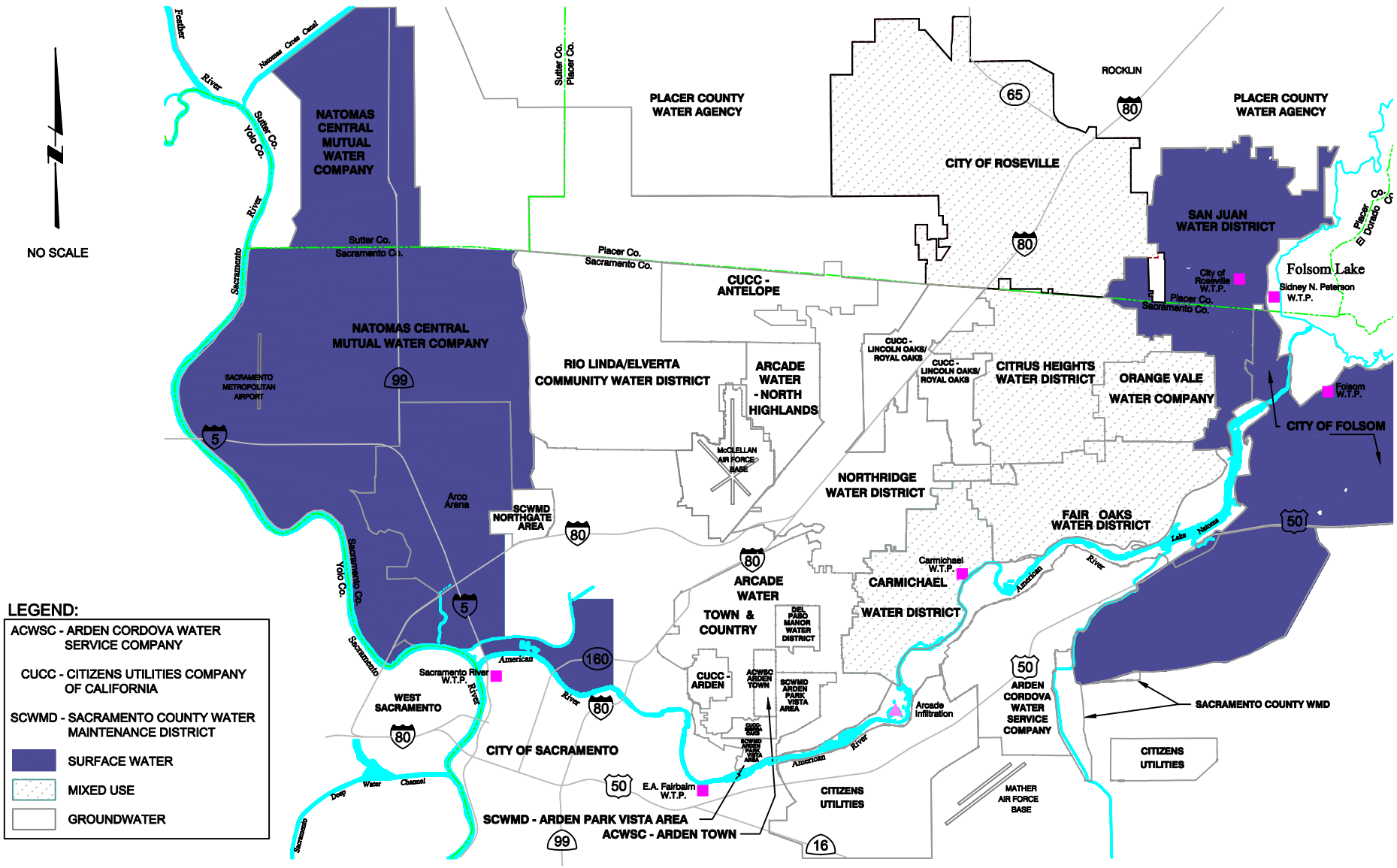
Regional Water Master Plan

Purveyors in Water Forum San Juan Family

Figure 3

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/SOURCE.DWG



American River Basin Cooperating Agencies

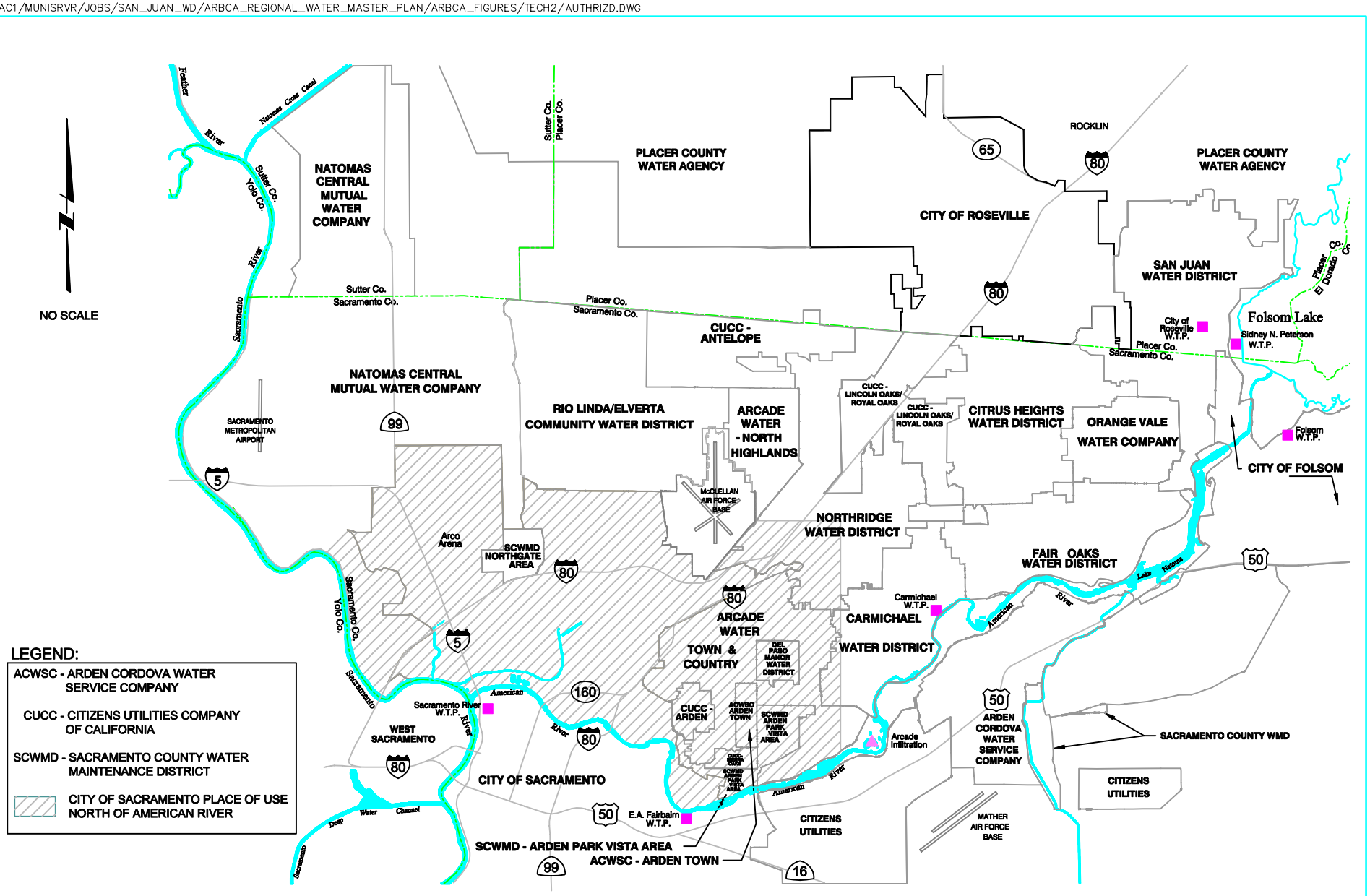
Regional Water Master Plan

Predominant Source of Water Use By Geographic Area

Figure 4

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/AUTHRIZD.DWG



American River Basin Cooperating Agencies

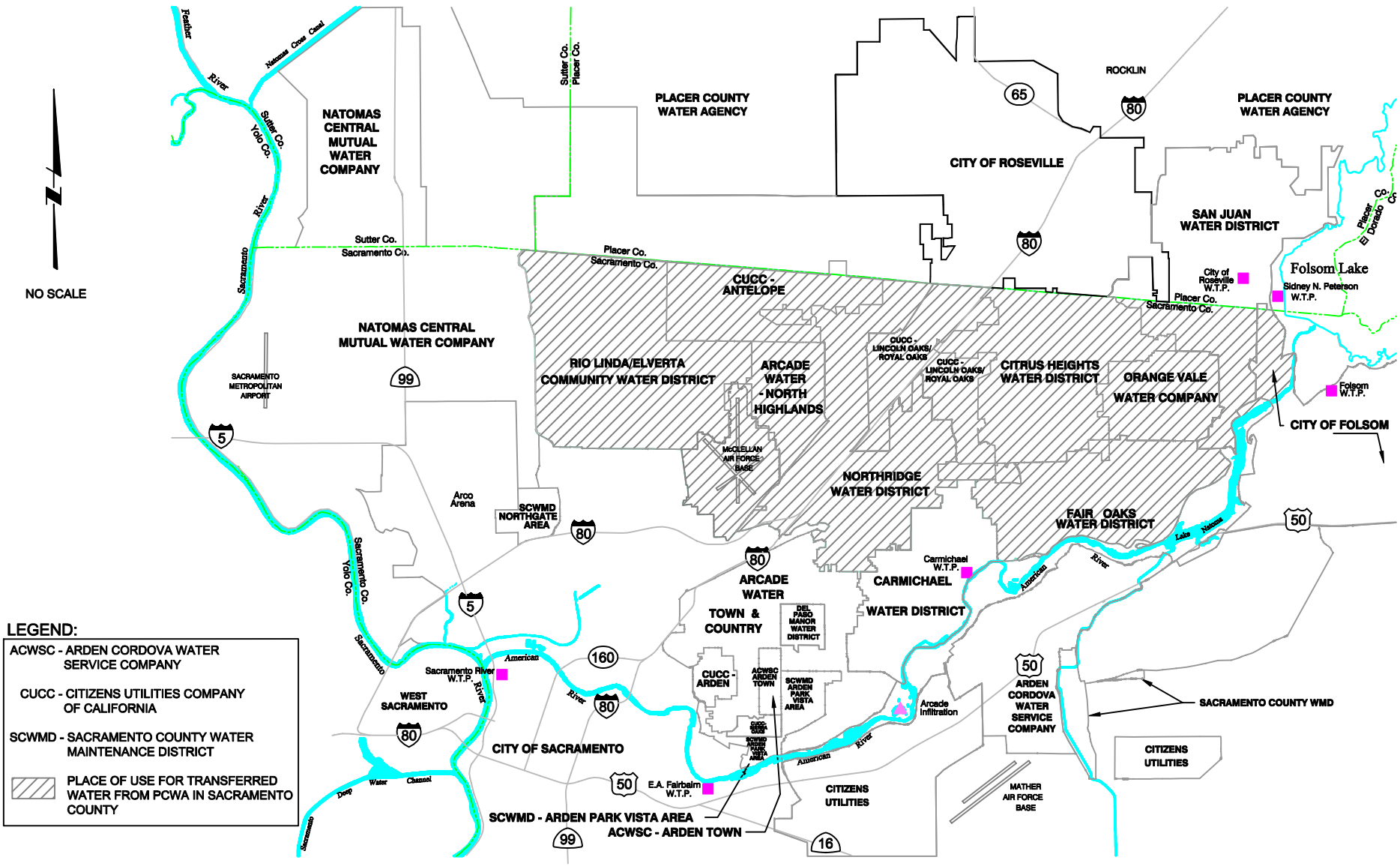
Regional Water Master Plan

City of Sacramento Authorized Place of Use North of American River

Figure 5

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/ TRANSFR.DWG



American River Basin Cooperating Agencies

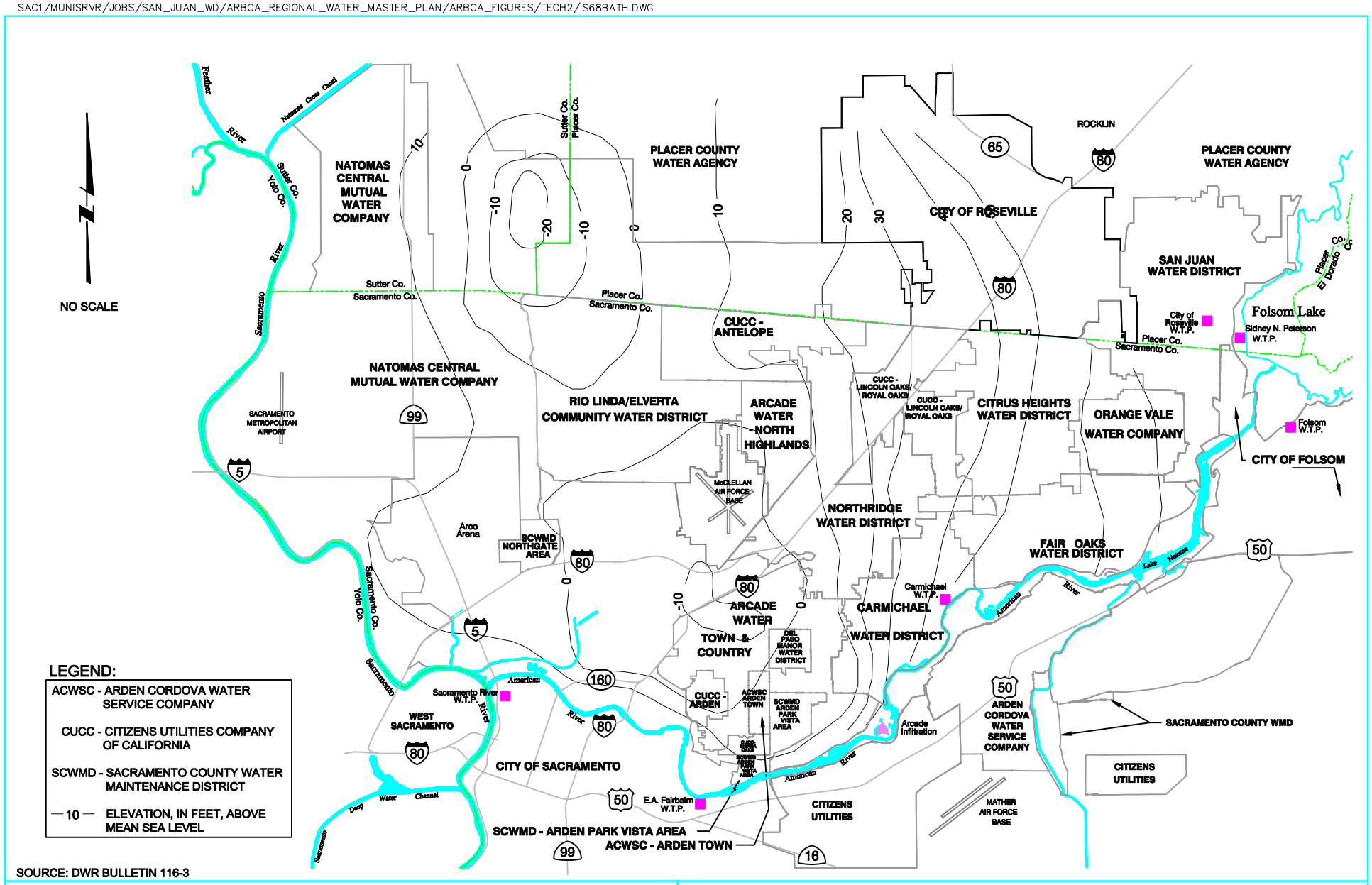
Regional Water Master Plan

PCWA Transfer Water in Sacramento County Place of Use

Figure 6

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/S68BATH.DWG



American River Basin Cooperating Agencies

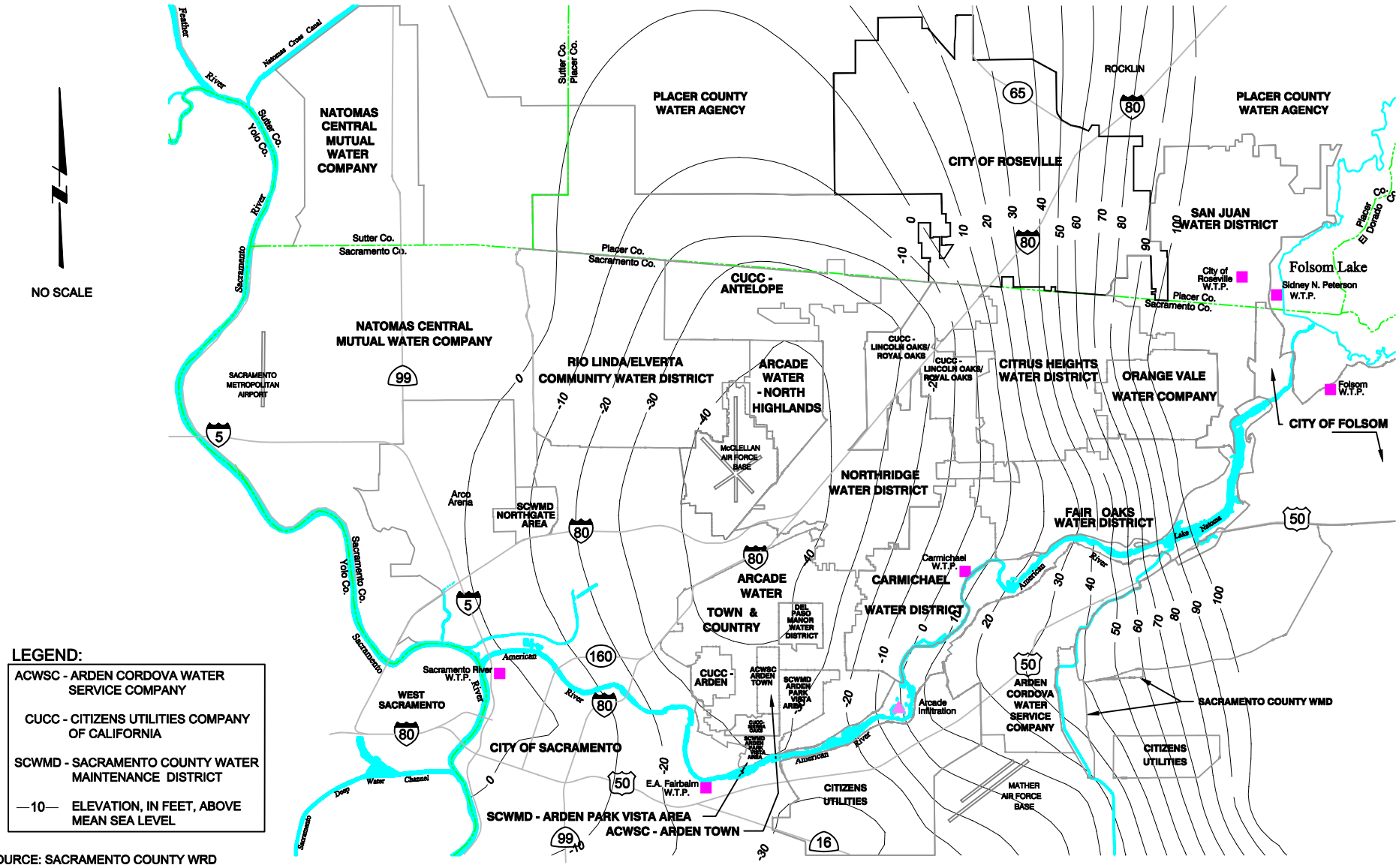
Regional Water Master Plan

Groundwater Elevation Above Mean Sea Level (Spring 1968)

Figure 7

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/F96BATH.DWG



SOURCE: SACRAMENTO COUNTY WRD

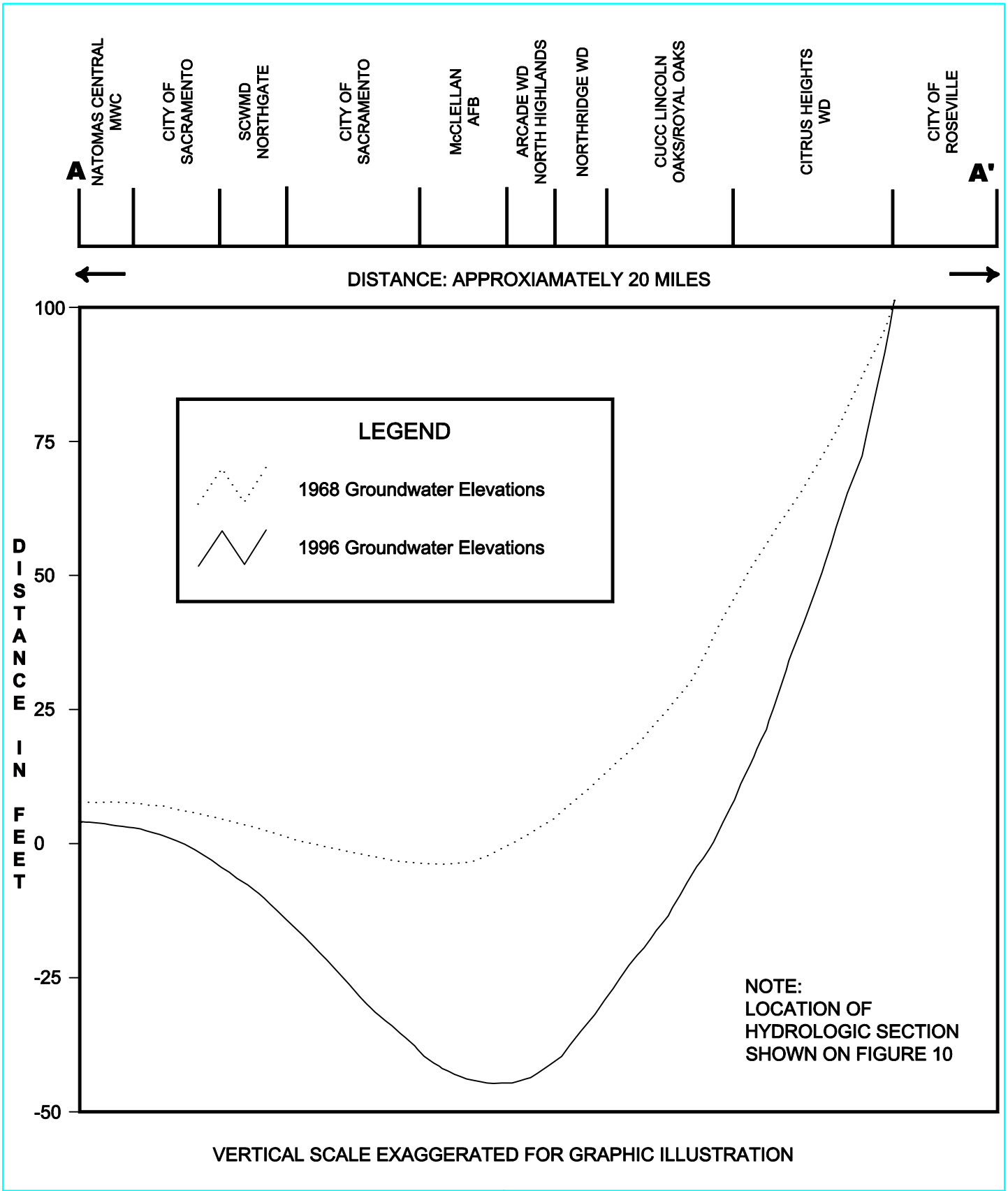
American River Basin Cooperating Agencies

Regional Water Master Plan

Groundwater Elevation Above Mean Sea Level (Fall 1996)

Figure 8

March 1999



American River Basin Cooperating Agencies

Regional Water Master Plan

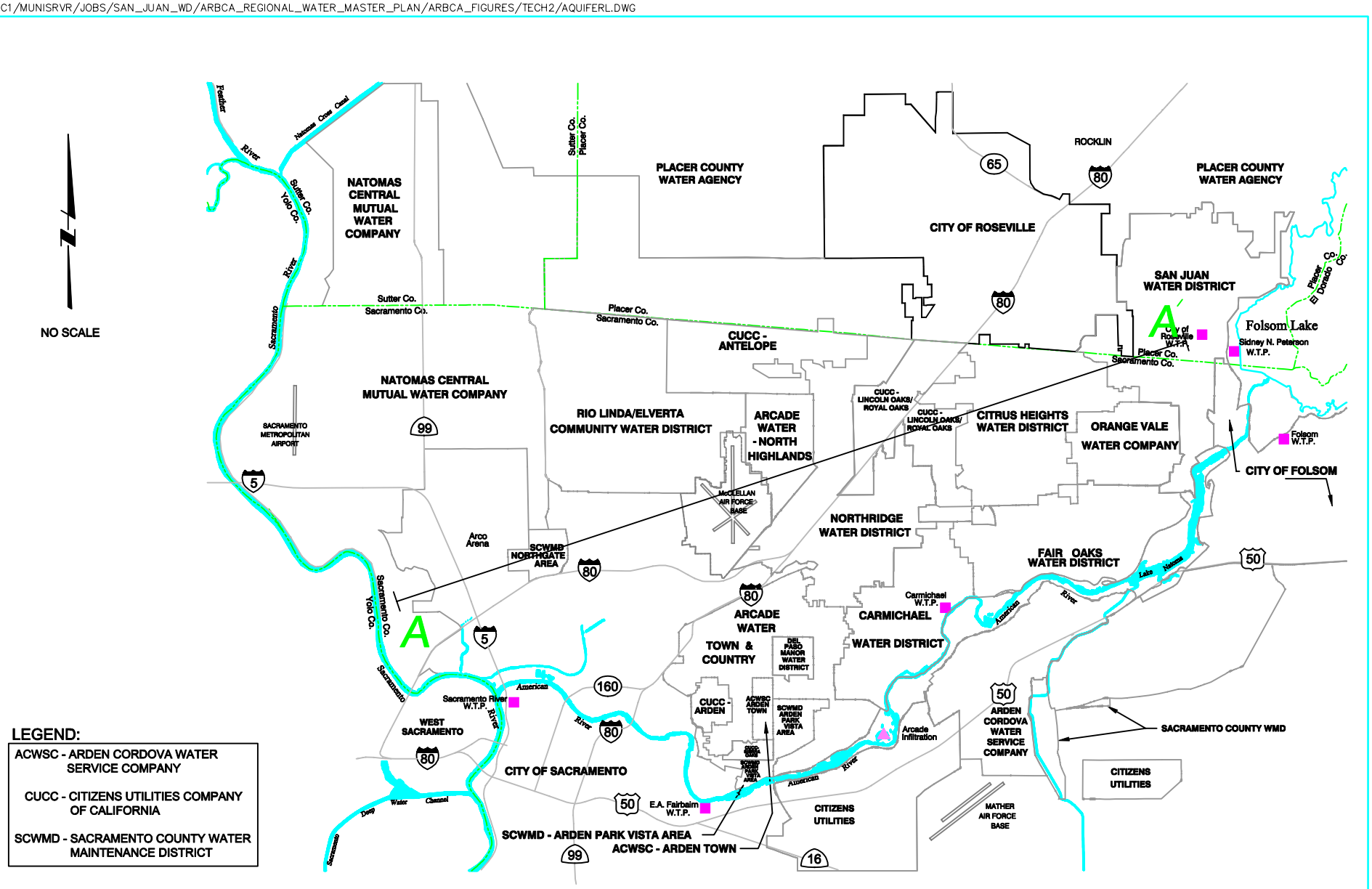
Hydrologic Section A-A' of Aquifer System (See Figure 10)

Figure 9

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH3/FIGURE9.DWG

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/AQUIFERL.DWG



American River Basin Cooperating Agencies

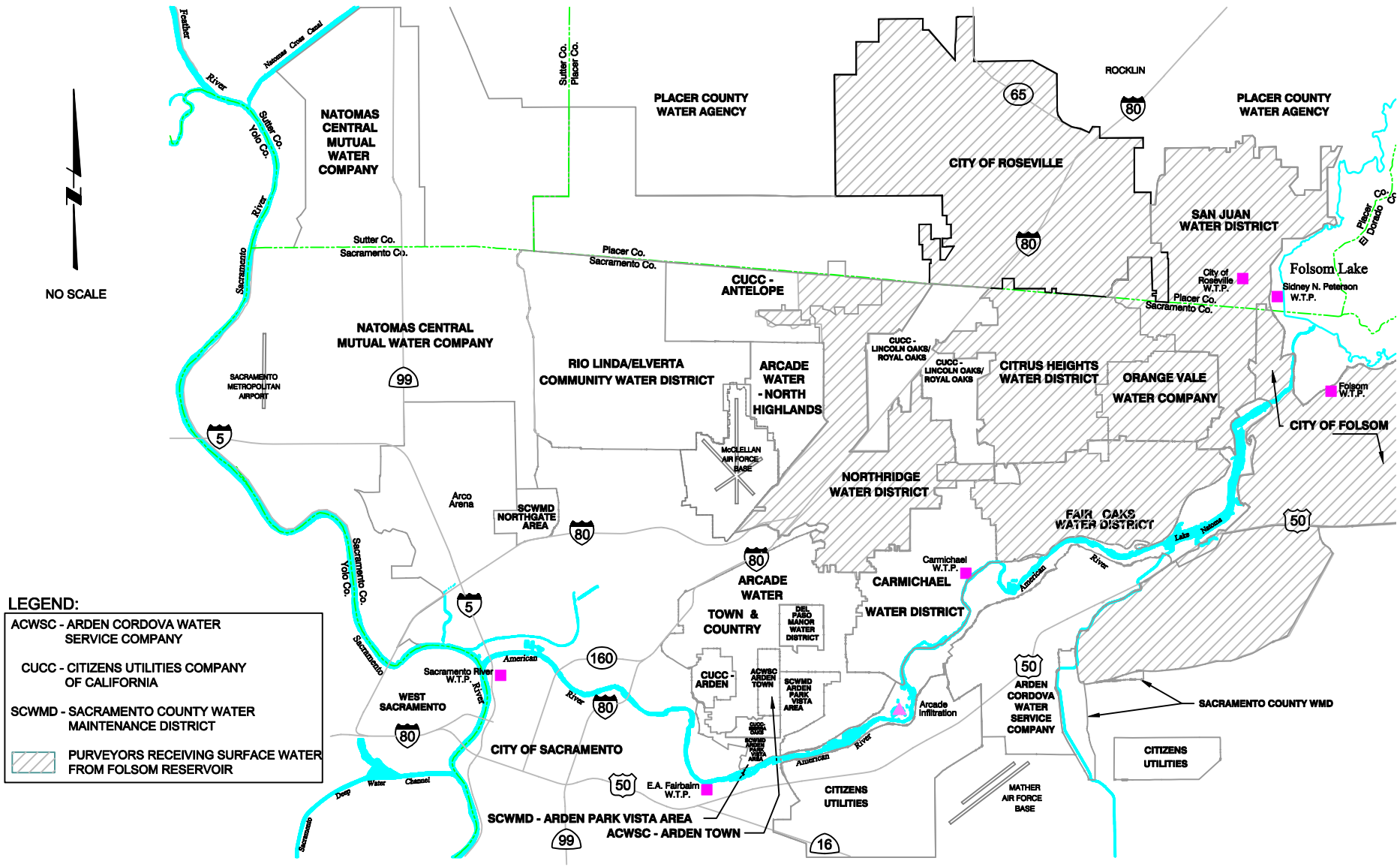
Regional Water Master Plan

Location of Hydrologic Section of Aquifer System Depicted in Figure 9

Figure 10

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/FOLSMDIV.DWG



American River Basin Cooperating Agencies

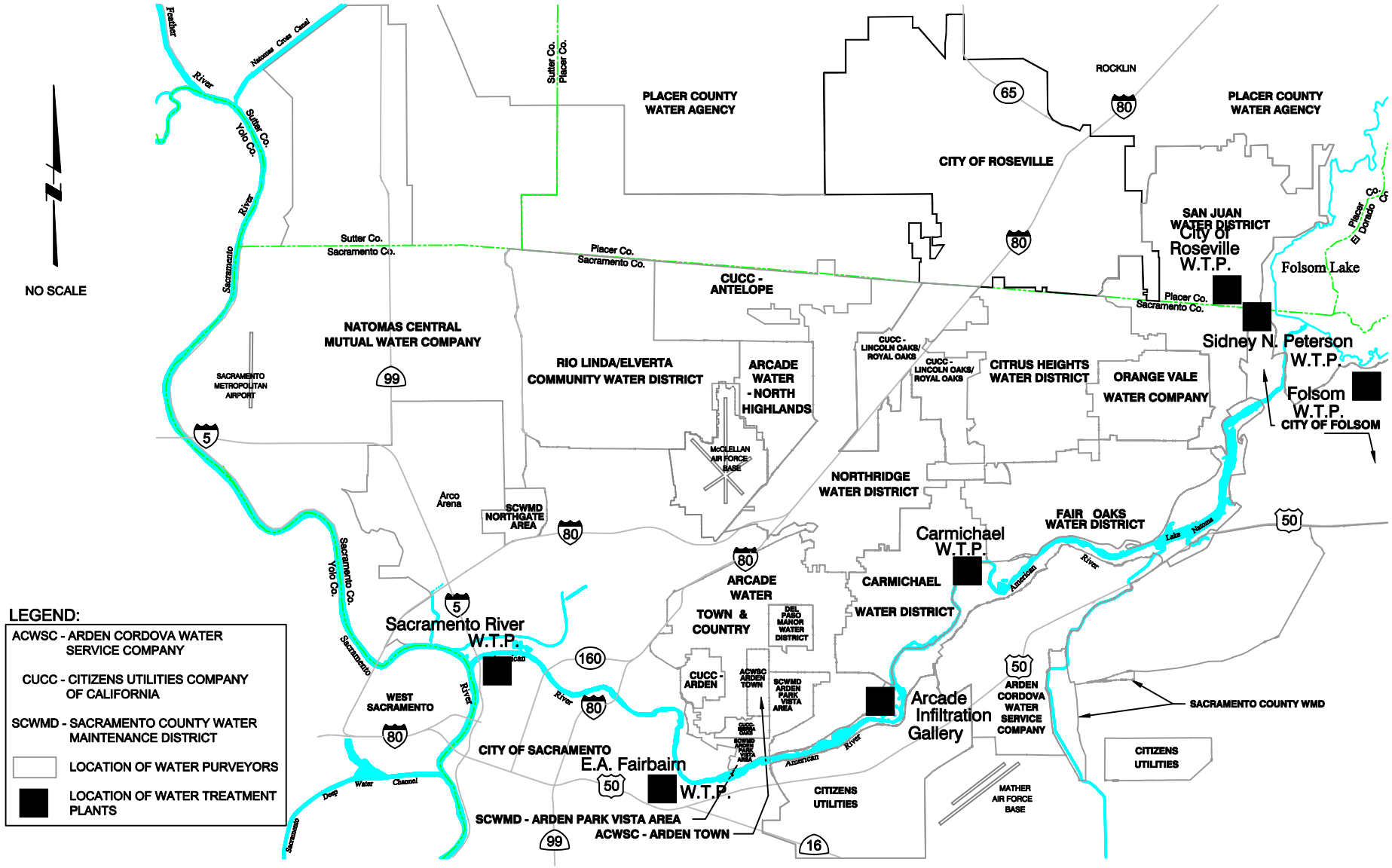
Regional Water Master Plan

Purveyors Currently Receiving Surface Water Diverted Directly from Folsom Reservoir

Figure 11

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/LOCWTP.DWG



American River Basin Cooperating Agencies

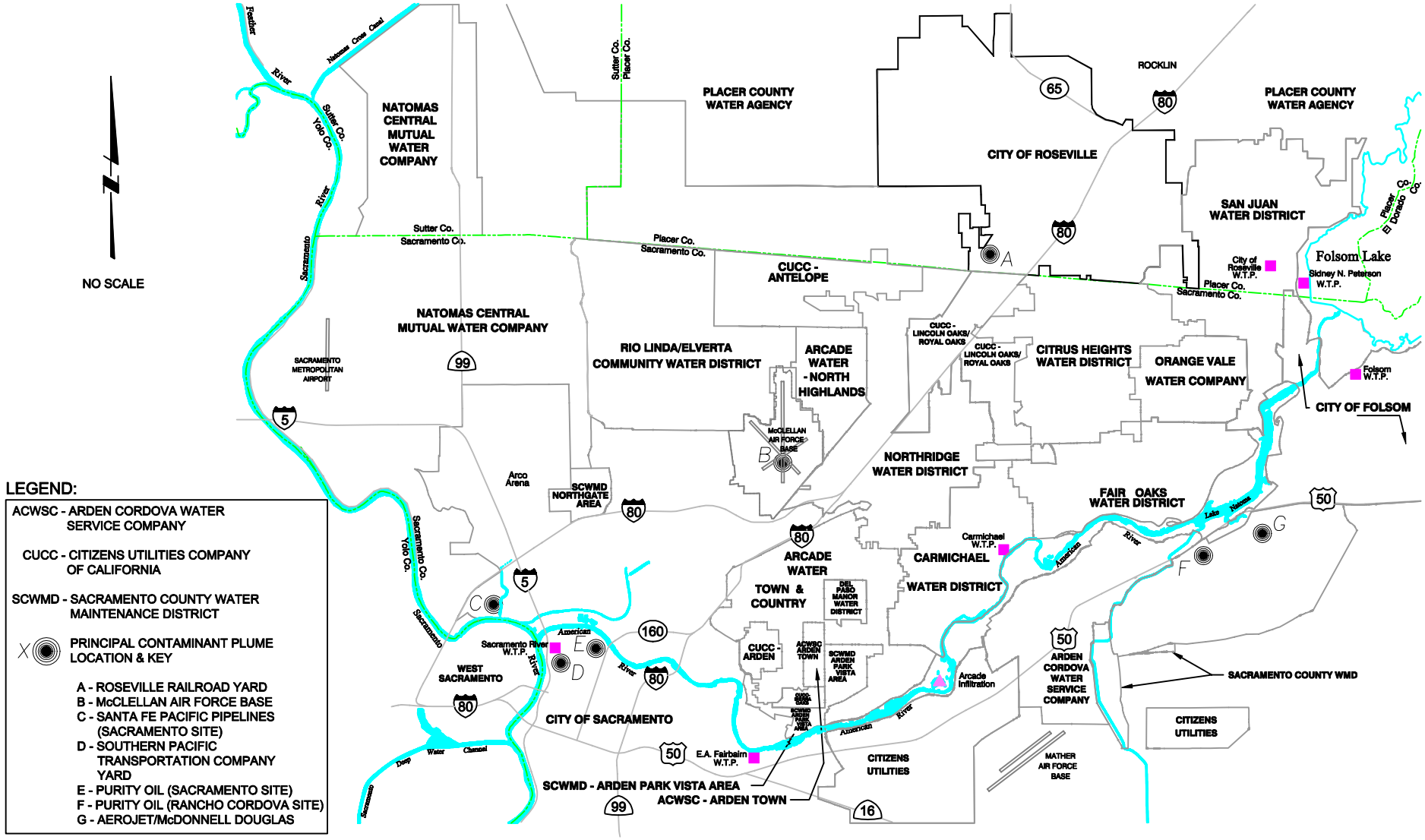
Regional Water Master Plan

Location of Water Treatment Plants

Figure 12

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/CONTMNT.DWG



American River Basin Cooperating Agencies

Regional Water Master Plan

Principal Contaminant Plume in Sacramento County

Figure 13

March 1999

REGIONAL WATER MASTER PLAN
TM 3: SUMMARY OF EXISTING WATER SUPPLIES

APPENDIX A - INDIVIDUAL AGENCY DATA

MONTGOMERY WATSON
in Association with
Bookman-Edmonston and CH2M-Hill

ARCADE WATER DISTRICT

General Description

Arcade Water District (Arcade) has two service areas: the Town and Country service area and North Highlands service area (see Figure 1). The Town and Country service area is located within Area "D" of the City of Sacramento's American River water rights place of use (see Figure 5). The Town and Country service area lies within the City of Sacramento Place of Use Group as defined by the proposed Water Forum plan. The demands of the Town and Country service area are presently being met in part by Arcade's American River well system; the balance is met from groundwater.

The North Highlands service area is included as part of the North Central Group (Figure 2) as defined by the proposed Water Forum plan. Because this area has no access to surface water at the present time, all demands are met with groundwater. Note, however, that Arcade has requested turnouts from the Cooperative Transmission Pipeline. As part of the North Central Group, it is included in the place of use of the pending water supply contract between Placer County Water Agency and Northridge Water District (see Figure 6).

Surface Water

Arcade Water District has a contract agreement with the City of Sacramento for 26,064 acre-feet of raw water diversion off the American River for use in the Town and Country service area (see Table 2). The contract agreement is also described in the City of Sacramento discussion and is a component of the Arden-Arcade Plan described below. To date, a maximum of 3,500 acre-feet per year of the total amount has been utilized.

Raw surface water diverted at the American River well system is of similar quality to that diverted at the Carmichael Water District's Proposed Bajamont Way plant and the E.A. Fairbairn Water Treatment Plant.

Groundwater

Both of Arcade Water District's service areas overlie the groundwater basin and have access to groundwater. In 1968, groundwater elevations in the Town and Country service area ranged from 10 feet above sea level to 10 feet below sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations to 30 to 45 feet below sea level (Figure 8). The 1968 groundwater elevations for the North Highlands service area ranged from zero to 10 feet above sea level (Figure 7). By 1996, the groundwater elevations had lowered to 40 to 45 feet below sea level (Figure 8).

McClellan Air Force Base, located between the two service areas, is a site of known groundwater contamination. Contaminants include volatile organic compounds and heavy metals. Migration of these contaminants off site could potentially threaten the District's groundwater supplies.

Proposed Water Forum Plan Water Supply Availability

Arcade Water District has not agreed to the procedural agreements of the proposed Water Forum plan. As part of the proposed Water Forum plan, the Town and Country service area will meet its 2030 demands with 11,200 acre-feet of surface water and 11,400 acre-feet of groundwater in wet/average years. In drier years, Arcade would operate on a similar water use pattern. In the driest years, the Town and Country service area would use 3,500 acre-feet of surface water and 19,100 acre-feet of groundwater.

At this time, the water supply mix for the North Highlands service area in the wet/average and drier years is undetermined. As mentioned, this service area lies within the place of use of the pending water

service contract between Placer County Water Agency and Northridge Water District, but the level of participation is uncertain. In the driest years, when this water would not be available, the service area would use groundwater to meet all its needs.

It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

Arden-Arcade Plan

In 1964, Arcade Water District entered into an agreement with the City of Sacramento granting the District "the right … to divert from the American River, that portion of its permanent supply which Arcade required for serving any portion of Area D ...". The boundaries of the Arden-Arcade Plan service area are (1) the city limits of the City of Sacramento on the west, (2) the city limits and the American River on the south, (3) the Carmichael Water District on the east, and (4) the city limits and the Northridge Water District on the north (see Figure A-1).

The boundaries that were established encompassed area water purveyors with a mutual need and desire for supplemental surface water. Water purveyors with potential entitlements to Area D surface water include:

- Arcade Water District (Town and Country service area)
- Arden-Cordova Water Service Company (Arden Town service area)
- Sacramento County Water Maintenance District (Arden Park Vista service area)
- Citizens Utilities (Arden Area and Sierra Oaks service areas)
- Del Paso Manor Water District

The total entitlement for the above purveyors is estimated on an acreage basis at 43,600 acre-feet per year according to a formula. Under the Arden-Arcade Plan, Arcade Water District proposes to utilize surface water in amounts to equal the total entitlements of the Arcade Water District and those cooperating water purveyors within Area D. It is the Arcade Water District's intent that the portion of Northridge Water District and Carmichael Water District in Area D would be served if requested by those Districts prior to development of final plans for the Arden-Arcade Plan area. Northridge Water District and Carmichael Water District represent an additional nearly 10,000 acre-feet of Area D entitlement for an approximate total of 53,600 acre-feet.

The City of Sacramento has indicated its willingness to provide surface water to Area D purveyors, provided such use is limited to areas covered by the City's water entitlements. Under the existing agreement for Area D surface water, "use up to the full amount of the water right is permissible …". Recent correspondence has affirmed that the City will provide wholesale water to Arcade Water District as a lead agency in the Arden-Arcade Plan. It should be noted that the City's willingness to provide treated surface water to Area D might depend on the proposed Water Forum plan.

ARDEN-CORDOVA WATER SERVICE COMPANY

General Description

The Arden-Cordova Water Service Company (Arden-Cordova) has two service areas: the Arden Town service area located north of the American River located within the City of Sacramento Authorized Place of Use and the Rancho Cordova service area located south of the American River just west of the City of Folsom (see Figure 1). The Rancho Cordova service area has access to groundwater and the American River through a diversion from the Folsom South Canal to meet its water supply needs. The Arden Town service area has access only to groundwater (with the exception of the Arden-Arcade Plan discussed under the Arcade Water District).

Surface Water

Arden-Cordova has a 10,000 acre-foot water right on the American River. This right and a pre-1914 water right of up to 22,000 acre-feet of American River water are held in a Co-Tenancy Agreement with the City of Folsom. In 1994, Arden-Cordova and the City of Folsom entered into an agreement wherein Arden-Cordova agreed to sell and Folsom agreed to buy 5,000 acre-feet of water each year. Arden-Cordova uses the remaining 5,000 acre-feet per year of American River water for treatment and delivery to the Coloma Water Treatment Plant.

Groundwater

Groundwater is used as the main source of supply for each service area. In 1968, groundwater levels in the Arden Town service area ranged from about sea level to 10 feet above sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations to about 30 to 35 feet below sea level (Figure 8). In the Rancho Cordova service area, 1968 water levels ranged from about 20 to 50 feet above sea level (Figure 7). By 1996, groundwater elevations ranged from about 10 to 30 feet above sea level (Figure 8).

Groundwater quality in the Arden Town service area is typical of the basin. In the Rancho Cordova service area, however, numerous wells have been shut down because of contamination from nearby industrial activities at Aerojet/McDonnell-Douglas.

Proposed Water Forum Plan Water Supply Availability

Arden-Cordova has not participated in the Water Forum. As such, that process does not prescribe their future water use patterns.

CARMICHAEL WATER DISTRICT

General Description

The Carmichael Water District (Carmichael), located along the north bank of the American River (Figure 1), presently uses a combination of surface water from the American River and groundwater to meet its demands. The western edge of the District lies within the City of Sacramento Authorized Place of Use for American River water (Figure 5).

Surface Water

Carmichael has three water rights, the details of which are summarized on Table 2. The first two water rights have been perfected and allow Carmichael to divert up to 14,400 acre-feet per year. The third right, if perfected, would allow an additional 18,100 acre-feet per year to be diverted. Historically, Carmichael has diverted up to 14,400 acre-feet per year.

Groundwater

Carmichael overlies the groundwater basin. Because the District is located near a source of recharge, it is on the edge of the cone of depression rather than near its center. In 1968, groundwater elevations in the District ranged from 10 feet to 50 feet above sea level (Figure 7). By 1996, groundwater elevations had lowered to 10 to 25 feet below sea level (Figure 8). The groundwater quality is good, and there are no nearby contamination plumes. Carmichael annually uses about 5,400 acre-feet of groundwater.

Proposed Water Forum Plan Water Supply Availability

The proposed Water Forum plan shows Carmichael will meet its entire 2030 water supply needs with surface water totaling 12,000 acre-feet per year. This holds true for all year types, wet/average, drier, and driest years. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

CITIZENS UTILITIES COMPANY OF CALIFORNIA

General Description

Citizens Utilities Company of California (Citizens Utilities or CUCC) has four service areas in Sacramento County north of the American River: Antelope, Lincoln Oaks/Royal Oaks, Arden, and Sierra Oaks (Figure 1). Citizens Utilities provides water service in Placer County for the Sabre City Mobile Home Park and is the exclusive franchisee for water service in western Placer County. The Antelope and Lincoln Oaks/Royal Oaks service areas are in the Water Forum North Central Group (Figure 2). The Arden and Sierra Oaks services areas are in the Water Forum Sacramento Place of Use Group (Figure 5). Citizens Utilities relies exclusively on groundwater. However, the Arden and Sierra Oaks service areas may have access to American River diversions through the Arden-Arcade Plan, and the Antelope, Lincoln Oaks/Royal Oaks service areas lie within the place of use of the proposed Placer County Water Agency water transfer to the Northridge Water District (see Figure 6).

Groundwater

Groundwater is currently used to meet all demands in each service area. Groundwater elevations in the Antelope and Lincoln Oaks/Royal Oaks service areas ranged from about sea level to 20 feet above sea level in 1968 (Figure 7). By 1996, increased groundwater pumping in the basin lowered groundwater elevations to about 30 feet below sea level to 10 feet above sea level (Figure 8).

In the Arden service area, 1968 groundwater elevations ranged from about sea level to 10 feet above sea level (Figure 7). In 1996, groundwater elevations were at about 30 feet below sea level (Figure 8). Groundwater quality is typical of the basin. McClellan Air Force Base is located near the Antelope service area, and contaminants migrating off site may threaten local groundwater supplies (Figure 13).

Proposed Water Forum Plan Water Supply Availability

As part of the proposed Water Forum plan, the Antelope and Lincoln Oaks/Royal Oaks service areas and other North Central Group water users would have access to 29,000 acre-feet of surface water in wet/average years, pending the contract with Placer County Water Agency (Table 4). For the drier and driest years, no contract surface water would be available, and all the demands would be met with groundwater. The Arden and Sierra Oaks service areas are anticipated to remain on groundwater for all year types (Table 4). It should be noted that this supply mix is used to meet the Water Forum demands including full implementation of the BMP's.

CITRUS HEIGHTS WATER DISTRICT

General Description

The Citrus Heights Water District (Citrus Heights) is located north of the American River in eastern Sacramento County and southern Placer County (Figure 1). It receives surface water on a wholesale basis from San Juan Water District and is included in the San Juan Family as defined in the proposed Water Forum plan (Figure 3). It uses primarily surface water provided from the San Juan Water District to meet its needs. Limited amounts of groundwater are used for peaking.

Surface Water

Citrus Heights has a contract with the San Juan Water District to purchase a minimum of 17,000 acre-feet per year of American River surface water. Recently, Citrus Heights has used between 17,000 acre-feet and 21,000 acre-feet of surface water per year. The water is diverted from Folsom Lake and treated at San Juan Water District's Peterson Water Treatment Plant. It should be noted that CVP water supplies, which make up a portion of San Juan Water District's total surface water supply, might be subject to deficiencies of up to 25 percent in dry years.

Groundwater

Citrus Heights overlies the groundwater basin and presently uses groundwater to meet peak demands. In 1968, the groundwater elevation in Citrus Heights ranged from about 20 to 100 feet above sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations in the District to 10 feet below sea level to 100 feet above sea level (Figure 8). Citrus Heights is located on the eastern edge of the cone of depression. Their average groundwater use since 1971 has been approximately 735 acre-feet per year.

Proposed Water Forum Plan Water Supply Availability

The proposed water use patterns for Citrus Heights are considered collectively as part of the San Juan Family. In wet/average years, the San Juan Family would use up to 82,200 acre-feet per year of surface water to meet all its needs. Groundwater would not be needed, except for occasional peaking purposes.

In drier years, the San Juan Family would use a decreasing amount of surface water from 82,200 acre-feet to 52,200 acre-feet based on inflows into Folsom Lake. In these years, up to 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater would be used to meet the remaining demands of the San Juan Family (see Table 4) as described in the proposed Water Forum plan. The proposed Water Forum plan does not define the distribution of surface water and groundwater to the members of the San Juan Family. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

In the driest years, the San Juan Family collectively would use 52,200 acre-feet of surface water and 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater to meet the remaining demands.

In the drier and driest years, San Juan Water District would continue to provide surface water first to those areas in the wholesale area that do not have access to groundwater. The conservation efforts described will affect the available surface water supplies. The remaining surface water would be provided on a pro rata basis to the remaining wholesale area that has access to groundwater. Groundwater pumping would be used in conjunction with the additional conservation to meet any demands not met by surface water. In the drier and driest years, additional conservation would account for about 12,300 acre-feet, and groundwater pumping would account for about 17,700 acre-feet.

Applying this to Citrus Heights shows that in the driest years, Citrus Heights would meet its demand using about 10,300 acre-feet of surface water with the balance made up from a combination of conservation and groundwater pumping (Table 4).

CITY OF FOLSOM

General Description

The City of Folsom (Folsom) is located in the northeast corner of Sacramento County (Figure 1). Most of Folsom is located south of the American River and is served treated surface water from Folsom's Water Treatment Plant. The small portion located north of the American River is served by the San Juan Water District and is considered part of the San Juan Family. For water supply estimates, the proposed Water Forum plan considers Folsom as its own group. Most of Folsom is located east of the groundwater basin; thus, surface water is currently exclusively utilized.

Surface Water

The City of Folsom has a pre-1914 water right of up to 22,000 acre-feet of American River water (Table 2). This right and a 10,000 acre-foot water right owned by Arden-Cordova Water Service Company are held in a Co-Tenancy Agreement. In 1994, Folsom and Arden-Cordova entered into an agreement wherein Arden-Cordova agreed to sell and Folsom agreed to buy 5,000 acre-feet of water each year.

Folsom also is in the process of subcontracting with Sacramento County Water Agency for 7,000 acre-feet of American River water for delivery from Folsom Lake as authorized by Public Law (PL) 101-514 (commonly referred to as "Fazio Water"). The City of Folsom has a total of 34,000 acre-feet of American River water from these three sources.

Groundwater

The limited groundwater available to the southwestern part of the city is contaminated by volatile organic compounds from the Aerojet/McDonnell-Douglas and by volatile organic compounds, heavy metals, and inorganics from Purity Oil (Rancho Cordova site).

Proposed Water Forum Plan Water Supply Availability

As part of the proposed Water Forum plan, Folsom would meet its entire 2030 demands with surface water. In wet/average years, Folsom would divert and use the entire 34,000 acre-feet of surface water. In drier years, it would divert and use a decreasing amount of surface water from 34,000 acre-feet to 22,000 acre-feet. In the driest years, it would reduce its diversions to 20,000 acre-feet per year. Folsom will meet its demands in the drier and driest years by using supplemental supplies. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

CITY OF ROSEVILLE

General Description

The City of Roseville (Roseville) is located in southwestern Placer County (Figure 1). For water supply estimates, the proposed Water Forum plan considers Roseville as its own group. The western part of Roseville is located along the edge of the groundwater basin, which can provide limited amounts of groundwater to Roseville. Roseville currently meets most of its water supply needs with surface water.

Surface Water

Roseville has a contract with the United States Bureau of Reclamation (Reclamation) Central Valley Project (CVP) for 32,000 acre-feet of American River water and a contract with Placer County Water Agency for 30,000 acre-feet of American River water. Historically, the CVP water has been subject to shortages of up to 25 percent. All of this surface water is diverted from Folsom Lake and treated at the City of Roseville Water Treatment Plant.

Groundwater

Limited amounts of groundwater are available along Roseville's western margins. In 1968, groundwater elevations in Roseville ranged from about 20 to 100 feet above sea level (Figure 7). By 1996, groundwater elevations had dropped about 20 feet and ranged from about sea level to 80 feet above sea level (Figure 8). Roseville is located east of the cone of depression.

Proposed Water Forum Plan Water Supply Availability

As part of the proposed Water Forum plan, Roseville would meet its 2030 demands with surface water and groundwater. In wet/average years, it would divert and use the entire 54,900 acre-feet of water. In drier years, it would divert and use a decreasing amount of surface water from 54,900 acre-feet to 39,800 acre-feet. In the driest years, it would divert 39,800 acre-feet of water. In the drier and driest years, the balance of the demands would be met with groundwater, additional conservation, and reclaimed water. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

CITY OF SACRAMENTO

General Description

A portion of the City of Sacramento lies north of the American River in western Sacramento County. The City exercises water rights on both the American River and the Sacramento River and uses groundwater.

Surface Water

The City has rights to use water from both the American and Sacramento Rivers. The water available to the City is under its rights as modified by a water rights settlement contract between the City and Reclamation.

The City claims a pre-1914 right to divert up to 75 cfs of Sacramento River water.

The City holds Permit 992 (A1743, 3/30/20) for diversion of up to 225 cfs from the Sacramento River. The allowable place of use is the City.

The City holds four permits for diversion of American River water: Permits 11358 (A12140, 10/29/47) and 11361 (A16060, 9/22/54) for direct diversion of up to 675 cfs; and Permits 11359 (A12321, 2/13/48) and 11360 (A12622, 7/29/48) for rediversion of up to 589,000 acre-feet per year of water diverted by SMUD at its Upper American River Projects. The allowable place of use for the American River water is a specified area of some 96,000 acres that includes the City as well as areas in Sacramento County on the east side of Sacramento.

In 1957, the City and Reclamation entered into a permanent water rights settlement contract under which the City agreed to limit its diversion to not more than 225 cfs of Sacramento River water and not more than 675 cfs of American River water. In turn, Reclamation guaranteed the availability of those amounts to the City with no dry year deficiencies.

The City has agreements with Arcade Water District and Del Paso Manor Water District to make surface water available for use within the portions of their service areas that lie within the City's allowable place of use. The City entered into a similar agreement with Northridge Water District, but it was never implemented.

Groundwater

The northeast part of Sacramento uses groundwater to meet its demands. In 1968, groundwater elevations in this part of Sacramento ranged from about 10 feet below sea level to sea level (Figure 7). By 1996, groundwater elevations had dropped about 40 feet and ranged from about 20 to 40 feet below sea level (Figure 8). Numerous contamination sites located in and around the City could pose a threat to conjunctive use plans (see Figure 13).

Proposed Water Forum Plan Water Supply Availability

Under the proposed Water Forum plan, the City would utilize a complex combination of water from the American River, Sacramento River, and underlying groundwater basin to meet its 2030 demands. It is based on water year types. Rather than try to explain the details of the operation, the reader is referred to pages 145 to 148 of the Draft Recommendation of the Water Forum Agreement (January 1997).

FAIR OAKS WATER DISTRICT

General Description

Fair Oaks Water District (Fair Oaks) is located on the north bank of the American River in eastern Sacramento County (Figure 1). It receives surface water on a wholesale basis from San Juan Water District and is included in the San Juan Family Water Forum Grouping (Figure 3). Fair Oaks relies primarily on surface water provided by the San Juan Water District. Limited amounts of groundwater are used to meet remaining demand.

Surface Water

Fair Oaks receives American River water through its contract with the San Juan Water District. The water is diverted from Folsom Lake and treated at Peterson Water Treatment Plant. Fair Oaks has a contract with the San Juan Water District to purchase a minimum of 15,000 acre-feet per year. It should be noted that the CVP water supplies, which make up a portion of the San Juan District's total surface water supply, might be subject to deficiencies of up to 25 percent in dry years.

Groundwater

Fair Oaks overlies the groundwater basin and primarily uses groundwater to meet peak demands. In 1968, the groundwater elevation in Fair Oaks ranged from about 30 feet to 100 feet above sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations to 10 feet below sea level to 100 feet above sea level (Figure 8).

Proposed Water Forum Plan Water Supply Availability

The proposed water use patterns for Fair Oaks are considered collectively as part of the San Juan Family. In wet/average years, the San Juan Family would use up to 82,200 acre-feet per year of surface water to meet all of its needs. Groundwater would not be needed, except for occasional peaking purposes.

In drier years, the San Juan Family would use a decreasing amount of surface water from 82,200 to 52,200 acre-feet based on inflows into Folsom Lake. In these years, up to 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater would be used to meet the remaining demands of the San Juan Family (Table 4) as described in the proposed Water Forum plan. The proposed Water Forum plan does not define the distribution of surface water and groundwater to the members of the San Juan Family. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

In the driest years, the San Juan Family collectively would use 52,200 acre-feet of surface water and 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater to meet the remaining demands.

In the drier and driest years, San Juan Water District would continue to provide surface water first to those areas in the wholesale area that do not have access to groundwater. The conservation efforts described will affect the available surface water supplies. The remaining surface water would be provided on a pro rate basis to the remaining wholesale area that has access to groundwater. Groundwater pumping would be used in conjunction with the additional conservation to meet any demands not met by surface water. In the drier and driest years, additional conservation would account for about 12,300 acre-feet, and groundwater pumping would account for about 17,700 acre-feet.

Applying this to Fair Oaks shows that in the driest years, Fair Oaks would meet its demand using about 9,000 acre-feet of surface water with the balance made up from a combination of conservation and groundwater pumping (Table 4).

NATOMAS CENTRAL MUTUAL WATER COMPANY

General Description

The Natomas Central Mutual Water Company (Natomas) is located in northwestern Sacramento County and southern Sutter County adjacent to the Sacramento River (Figure 1). Natomas has water rights and contracts to Sacramento River water (Table 2). Surface water is supplemented with minor amounts of groundwater from privately owned wells. The Sacramento County portion of Natomas, Sacramento International Airport, and the Sacramento County Water Maintenance District Northgate service area are collectively referred to in the Water Forum plan groupings as the Natomas Central Mutual Water Company and Miscellaneous Users. A portion of Natomas is located within the City of Sacramento's Authorized Place of Use.

Surface Water

Natomas has a settlement contract with Reclamation for a base supply of 98,000 acre-feet per year and a contract entitlement for CVP water of 22,000 acre-feet per year (Table 2). The place of use for this water is the water company service area that includes both the Sacramento County and Sutter County areas.

Groundwater

Groundwater is pumped by landowners using private wells. Natomas as a water company does not provide any groundwater. In 1968, groundwater elevations in Natomas ranged from about sea level to 15 feet above sea level (Figure 7). Because Natomas is located so close to the Sacramento River, groundwater elevations are fairly constant over time; thus, 1996 groundwater elevations remained at about sea level to 15 feet above sea level (Figure 8). Groundwater is slightly mineralized near the airport; otherwise, it is typical of groundwater quality in the basin.

Proposed Water Forum Plan Water Supply Availability

The proposed Water Forum plan shows that this group will meet all its 2030 water supply needs with surface water from the Sacramento River. This holds true for all year types, wet/average, drier, and driest. The total water use is projected to be 44,450 acre-feet of surface water and 7,400 acre-feet of groundwater. The portion of Natomas within the City of Sacramento place of use will meet its needs with about 6,000 acre-feet of surface water in all year types.

It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

NORTHRIDGE WATER DISTRICT

General Description

The Northridge Water District (Northridge) is located in the northern Sacramento County (Figure 1). The western portion of Northridge is located within the City of Sacramento's Authorized Place of Use, but presently Northridge does not receive any surface water from the City (Figure 5). The proposed Water Forum plan refers collectively to Northridge, the Citizens Utilities Antelope and Lincoln Oaks/Royal Oaks service areas, McClellan Air Force Base, and the Rio Linda/Elverta Community Water District as the North Central Group. Northridge's water supply needs have historically been met entirely by groundwater. In the last several years, however, groundwater has been supplemented with increasing amounts of Section 215 surface water. The construction and subsequent operation of the Cooperative Transmission Pipeline has given Northridge the ability to more fully utilize the Section 215 water.

Surface Water

Since 1991, Northridge has received some surface water from Section 215 Contract No. 8-07-20-W1473. Beginning in 1998, this water was delivered to Northridge through the Cooperative Transmission Pipeline. Northridge also has a contract pending with the Placer County Water Agency to import up to 29,000 acre-feet per year of American River water. The annual amount of the delivery to Northridge is subject to limitations based on water year types defined by the proposed Water Forum plan.

In addition, Northridge entered into discussion for an agreement with the City of Sacramento for 9,023 acre-feet per year of American River water to made available for use within that portion of Northridge's service area that lies within the City's existing American River allowable place of use. The agreement has not been implemented.

Groundwater

At certain times, groundwater is used to meet almost all of Northridge's water demands. Projected groundwater use is expected to decline in the future as the result of the importation of surface water. In 1968, groundwater elevations in Northridge ranged from 5 feet below to 30 feet above sea level (Figure 7). Increasing groundwater pumping in the basin resulted in declining water levels to such an extent that by 1996 the elevations ranged from about 20 to 40 feet below sea level (Figure 8).

The general groundwater quality is typical of the basin and considered good. Contamination plumes of volatile organic compounds and heavy metals west of Northridge at McClellan Air Force Base threaten local groundwater supplies. Some wells on the base and in neighboring areas have been shut down because of contaminant migration.

Proposed Water Forum Plan Water Supply Availability

As part of the proposed Water Forum plan, Northridge and other North Central Group water users would have access to 29,000 acre-feet of water in wet/average years, pending the contract with Placer County Water Agency. For the drier and driest years, however, no contract water is expected to be available and all the demands will be met with groundwater. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

ORANGE VALE WATER COMPANY

General Description

The Orange Vale Water Company (Orange Vale) is located north of the American River in eastern Sacramento County (Figure 1). It receives surface water on a wholesale basis from San Juan Water District and is included in the San Juan Family as defined by the proposed Water Forum plan (Figure 3). Orange Vale uses primarily surface water provided from San Juan Water District to meet its needs. Groundwater is used to meet any remaining demands including for peaking and emergency purposes.

Surface Water

Orange Vale receives American River water through its contract with San Juan Water District (Table 2). Orange Vale has a contract with San Juan Water District to purchase a minimum of 7,500 acre-feet per year of American River water. The water is diverted from Folsom Lake and treated at San Juan Water District's Peterson Water Treatment Plant. It should be noted that CVP water supplies, which make up a portion of San Juan Water District's total surface water supply, might be subject to deficiencies of up to 25 percent in dry years.

Groundwater

Orange Vale primarily uses groundwater to meet peak demands. In 1968, groundwater elevations ranged from about 50 feet to 100 feet above sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations in Orange Vale to 60 feet to about 100 feet above sea level (Figure 8). Orange Vale is located on the east of the cone of depression along the edge of the useable aquifer system.

Proposed Water Forum Plan Water Supply Availability

The proposed water use patterns for Orange Vale are considered collectively as part of the San Juan Family. In wet/average years, the San Juan Family would use up to 82,200 acre-feet per year of surface water to meet all of its needs. Groundwater would not be needed, except for occasional peaking purposes.

In drier years, the San Juan Family would use a decreasing amount of surface water from 82,200 to 52,200 acre-feet based on inflows into Folsom Lake. In these years, up to 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater would be used to meet the remaining demands of the San Juan Family (Table 4) as described in the proposed Water Forum plan. The proposed Water Forum plan does not define the distribution of surface water and groundwater to the members of the San Juan Family. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

In the driest years, the San Juan Family collectively would use 52,200 acre-feet of surface water and 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater to meet the remaining demands.

In the drier and driest years, San Juan Water District would continue to provide surface water first to those areas in the wholesale area that do not have access to groundwater. The conservation efforts described will affect the available surface water supplies. The remaining surface water would be provided on a pro rate basis to the remaining wholesale area that has access to groundwater. Groundwater pumping would be used in conjunction with the additional conservation to meet any demands not met by surface water. In the drier and driest years, additional conservation would account for about 12,300 acre-feet, and groundwater pumping would account for about 17,700 acre-feet.

Applying this to Orange Vale shows that in the driest years, Orange Vale would meet its demand using about 4,300 acre-feet of surface water with the balance made up from a combination of conservation and groundwater pumping (Table 4).

PLACER COUNTY WATER AGENCY

General Description

The Placer County Water Agency (PCWA) is located in the western part of Placer County (Figure 1). PCWA currently has water rights and contracts on the American River and a pending water contract on the Sacramento River (Table 2). In the proposed Water Forum plan, PCWA is considered its own group with all its demands met with surface water.

Surface Water

PCWA has 120,000 acre-feet per year of water rights on the American River. In addition, they have a water contract entitlement with Reclamation for 117,000 acre-feet of CVP water. The CVP water is subject to shortages of up to 25 percent. On this contract, water in excess of 35,000 acre-feet is under discussion. PCWA also has a contract with PG&E for 100,400 acre-feet of water from the Yuba and Bear Rivers. PCWA also has a pending water contract with the California State Water Project (SWP) to divert 35,000 acre-feet of Sacramento River or Feather River water to be treated and used in western Placer County.

Groundwater

Groundwater is available in the western portion of PCWA's service area. PCWA does not provide groundwater, but private wells are used. In 1968, groundwater elevations in the PCWA ranged from about 15 feet below sea level to 10 feet above sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations to about 30 feet below sea level to about 10 feet above sea level (Figure 8).

Proposed Water Forum Plan Water Supply Availability

In all proposed Water Forum plan year types, PCWA is expected to meet all its demands with surface water from the American and Sacramento Rivers (Table 4). This totals 70,500 acre-feet per year.

RIO LINDA/ELVERTA COMMUNITY WATER DISTRICT

General Description

Rio Linda/Elverta Community Water District (Rio Linda/Elverta) is located in the northwestern part of Sacramento County (Figure 1). It currently uses groundwater to meet all its needs. The proposed Water Forum plan combines Rio Linda/Elverta into the North Central Group (Figure 2).

Groundwater

Rio Linda/Elverta meets all its water needs with groundwater. In 1968, groundwater elevations in Rio Linda ranged from about 15 feet below sea level to sea level (Figure 7). By 1996, increased groundwater pumping in the basin had lowered groundwater elevations to about 10 to 40 feet below sea level (Figure 8). McClellan Air Force Base is located to the east of Rio Linda. Contamination from the base has migrated off site and shut down wells, requiring some of the eastern parts of Rio Linda to be served by an alternate water supply.

Proposed Water Forum Plan Water Supply Availability

As part of the proposed Water Forum plan, Rio Linda/Elverta and other North Central Group water users would have access to 29,000 acre-feet of water in wet/average years, pending the contract with Placer County Water Agency. For the drier and driest years, no contract water would be available, and all the demands would be met with groundwater. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

SACRAMENTO COUNTY WATER MAINTENANCE DISTRICT

General Description

The Sacramento County Maintenance District (County) has two service areas north of the American River: the Arden Park Vista service area and Northgate service area (Figure 1). The Arden Park Vista area is located within the City of Sacramento's Authorized Place of Use and is considered by the Water Forum to be part of the City of Sacramento Place of Use water users group (Figure 5). Also, the Arden Park Vista area may have access to American River diversions through the Arden-Arcade Plan.

The Northgate service area is located outside the City of Sacramento Authorized Place of Use and is considered by the Water Forum as part of the Natomas Central Mutual Water Company group. All of the demands of the Arden Park and the Northgate service areas are met by groundwater.

Groundwater

As mentioned, groundwater is used to meet all the demands in each service area. Groundwater elevations in the Northgate service area were about sea level in 1968 (Figure 7). By 1996, increased groundwater pumping in the basin lowered groundwater elevations to about 20 feet below sea level (Figure 8).

In the Arden Park Vista area, 1968 groundwater elevations ranged from about sea level to 10 feet above sea level (Figure 7). In 1996, groundwater elevations were at about 30 feet below sea level (Figure 8).

Proposed Water Forum Plan Water Supply Availability

The Northgate area and the Arden Park Vista area will continue to use groundwater to meet all their demands in all the proposed Water Forum plan year types (Table 4).

SAN JUAN WATER DISTRICT

General Description

The San Juan Water District (San Juan) has both retail and wholesale service areas located in northeastern Sacramento County and southern Placer County (Figure 1). The San Juan retail service areas shown on Figure A-2 includes those in both Placer County and Sacramento County. The wholesale service area shown on Figure 3 includes the San Juan Water District retail area, Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company, and that portion of the City of Folsom north of the American River. For water supply analysis, the proposed Water Forum plan considered the wholesale area in Sacramento County and Placer County as the San Juan Family (Figure 3). It should be noted that the place of use of some of the water rights and contract entitlements include the entire wholesale service area. This is explained further below.

Surface Water

San Juan has a pre-1914 water right of 33,000 acre-feet of American River water and a contract entitlement with the CVP for 11,200 acre-feet per year (Table 2). Both of these supplies can be used in the wholesale service area. The CVP water is subject to shortages of up to 25 percent. In addition, San Juan contracts with Placer County Water Agency for 25,000 acre-feet of water that can only be used in the Placer County wholesale service area as shown on Figure A-3. San Juan also is in the process of contracting with Reclamation for 13,000 acre-feet of American River water for delivery from Folsom Lake as authorized by PL 101-514 (often referred to as "Fazio Water"), which can only be used in the Sacramento County portion of the wholesale service area as shown on Figure A-4. All of these surface water supplies are diverted from Folsom Lake and treated at San Juan Water District's Peterson Water Treatment Plant.

Groundwater

The retail area of San Juan Water District is located east of the groundwater basin. Surface water is used to meet all of the retail area's demands.

Proposed Water Forum Plan Water Supply Availability

The proposed water use patterns for San Juan are considered collectively as part of the San Juan Family. In wet/average years, the San Juan Family would use up to 82,200 acre-feet per year of surface water to meet all of its needs. Groundwater would not be needed, except possibly for peaking purposes.

In drier years, the San Juan Family would use a decreasing amount of surface water from 82,200 to 52,200 acre-feet based on inflows into Folsom Lake. In these years, up to 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater would be used to meet the remaining demands of the San Juan Family (Table 4) as described in the proposed Water Forum plan. The proposed Water Forum plan does not define the distribution of surface water and groundwater to the members of the San Juan Family. It should be noted that this supply mix is used to meet the demands including full implementation of the BMP's as presented in the proposed Water Forum plan.

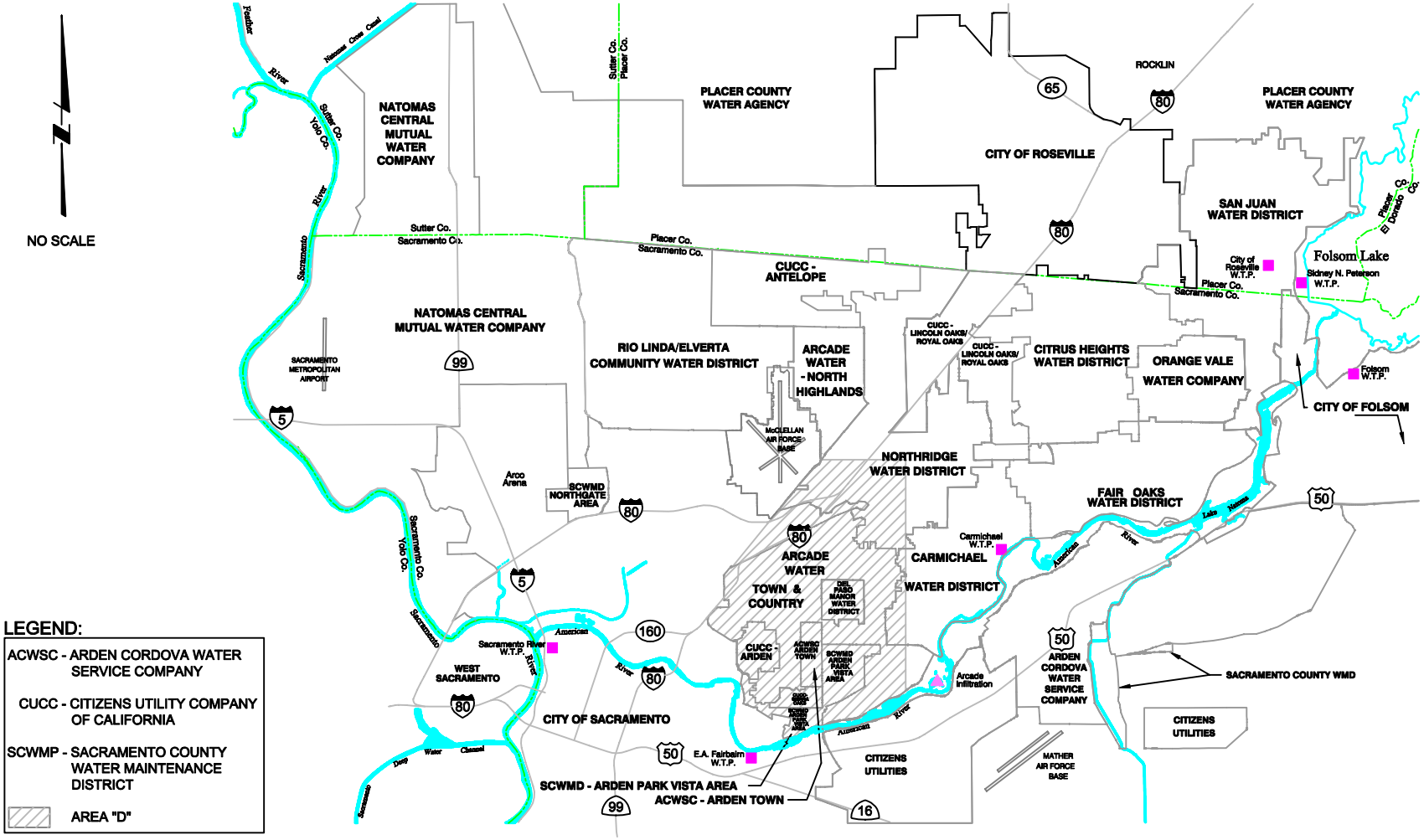
In the driest years, the San Juan Family collectively would use 52,200 acre-feet of surface water and 30,000 acre-feet of additional conservation (up to 15 percent) and groundwater to meet the remaining demands.

In the drier and driest years, San Juan would continue to provide surface water first to those areas in the wholesale area that do not have access to groundwater (San Juan Water District retail area and City of Folsom). The conservation efforts described will affect the available surface water supplies. The

remaining surface water would be provided as available to the remaining wholesale area (Citrus Heights Water District, Fair Oaks Water District, and Orange Vale Water Company). Groundwater pumping would be used in conjunction with the additional conservation to meet any demands not met by surface water. In the drier and driest years, additional conservation would account for about 12,300 acre-feet, and groundwater pumping would account for about 17,700 acre-feet.

In the driest years, San Juan would meet its demand using about 5,500 acre-feet and 21,300 acre-feet of its available surface supplies in the Sacramento County and Placer County retail areas, respectively. The balance would be made up from increased conservation (Table 4).

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/CONJAA.DWG



American River Basin Cooperating Agencies

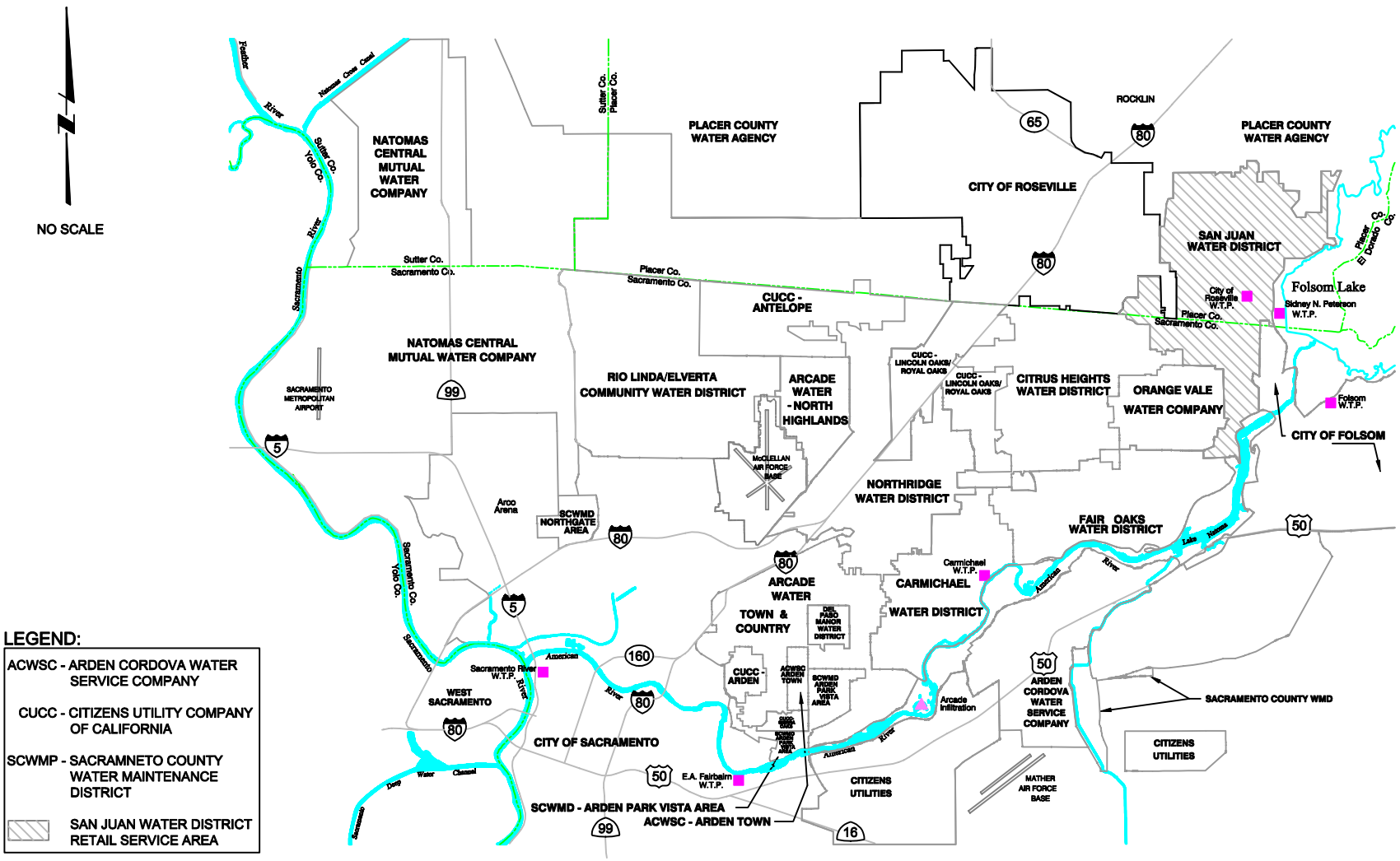
Regional Water Master Plan

Arden - Arcade Conjunctive Use Plan and Area "D"

Figure A-1

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/RETAILSJ.DWG



American River Basin Cooperating Agencies

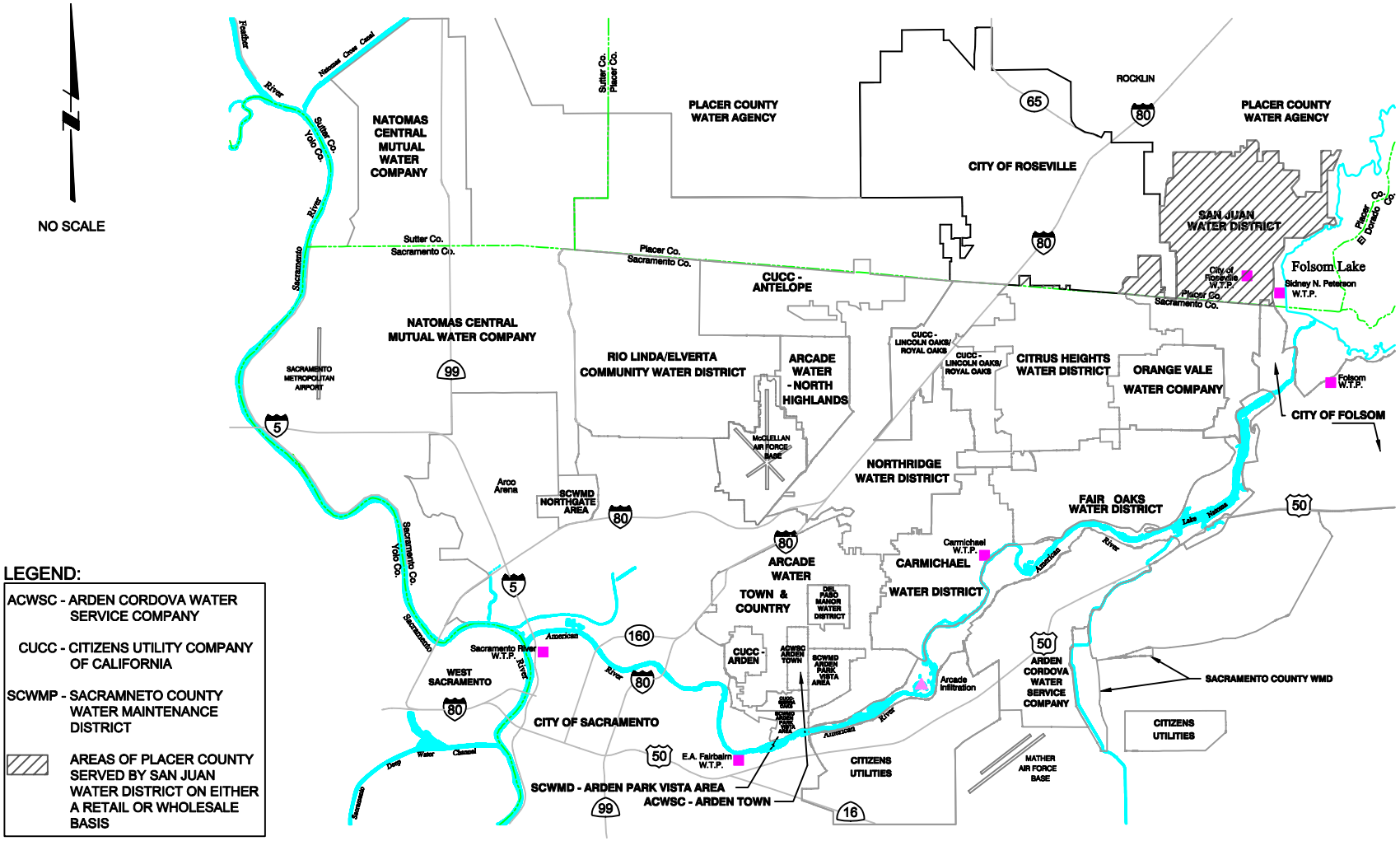
Regional Water Master Plan

San Juan Water District Retail Service Areas

Figure A-2

March 1999

SAC1/MUNISRVR/JOBS/SAN_JUAN_WD/ARBCA_REGIONAL_WATER_MASTER_PLAN/ARBCA_FIGURES/TECH2/RETAILPL.DWG



LEGEND:

ACWSC - ARDEN CORDOVA WATER SERVICE COMPANY

CUCC - CITIZENS UTILITY COMPANY OF CALIFORNIA

SCWMP - SACRAMNETO COUNTY WATER MAINTENANCE DISTRICT

AREAS OF PLACER COUNTY SERVED BY SAN JUAN WATER DISTRICT ON EITHER A RETAIL OR WHOLESALE BASIS

American River Basin Cooperating Agencies

Regional Water Master Plan

Areas of Placer County Served By San Juan Water Distict On Either a Retail or Wholesale Basis

Figure A-3

March 1999

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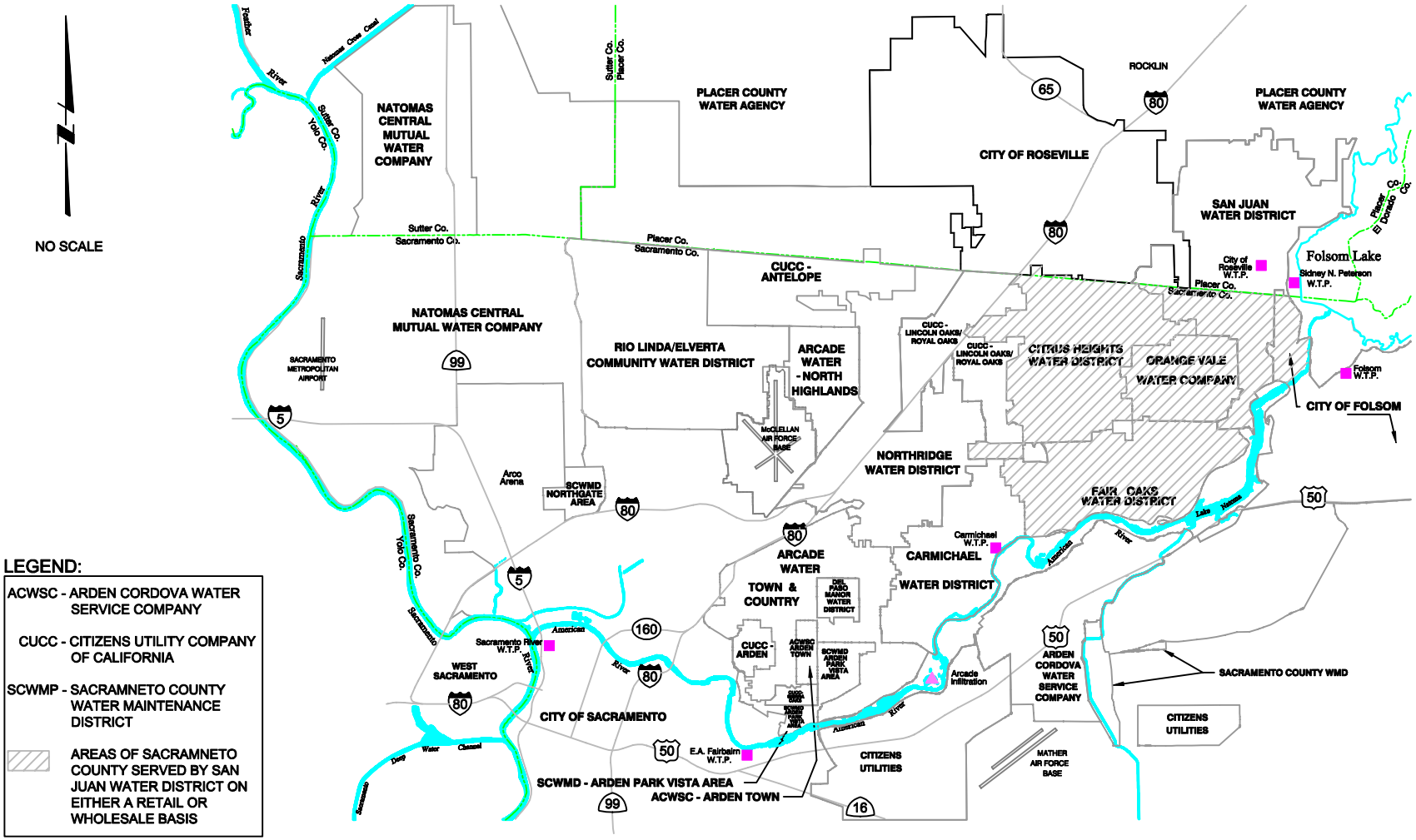

American River Basin Cooperating Agencies

Regional Water Master Plan

Areas of Sacramento County Served By San Juan Water District On Either a Retail or Wholesale Basis

Figure A-4

March 1999

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6.3 APPENDIX C. OUTREACH AND EDUCATION

6.3.1 Attachment A. SGA's Notices Published in the Sacramento Bee

6.3.2 Attachment B. "Summary of Public Outreach Plan for Groundwater Management" (Lucy & Company, 2003).

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REGIONAL WATER AUTHORITY
5620 BIRDCAGE ST #100
CITRUS HEIGHTS CA 95610-

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO

STATE OF CALIFORNIA

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 printer and principal clerk of the publisher of The Sacramento Bee, printed and published in the City of Sacramento, County of Sacramento, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sacramento, State of California, under the date of September 26, 1994, Action No. 379071; that the notice of which the annexed is a printed copy, has been published in each issue thereof and not in any supplement thereof on the following dates, to wit:

May 16, 2003

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on **May 16, 2003.**

Kelly Pelzer

(Signature)

NO 170 PUBLIC NOTICE

Sacramento Groundwater Authority

NOTICE OF PUBLIC PARTICIPATION

The Sacramento Groundwater Authority (SGA) is a joint powers authority (JPA) charged with protection and management of the groundwater basin underlying Sacramento County north of the American River. To maintain a sustainable groundwater resource for the more than half-million citizens that rely upon the basin for their daily water needs, SGA is developing a groundwater management plan. This is the first critical step in implementing an active groundwater management program that will ensure a safe supply for our present and future generations.

Public participation is encouraged in development of this plan. To a large degree, the public is already well-represented in this process. For example, signatories of the JPA include the County of Sacramento, the City of Sacramento, the City of Citrus Heights, and the City of Folsom. These signatories have delegated their authority to a sixteen member Board comprised of elected officials and other individuals selected by the signatories. Board members include representatives of California American Water Company, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Sacramento, County of Sacramento, Del Paso Manor Water District, Fair Oaks Water District, Natomas Central Mutual Water Company, Orange Vale Water Company, Rio Linda/Elverta Community Water District, Sacramento Suburban Water District, San Juan Water District, Southern California Water Company and individual representatives from agriculture and self-supplied groundwater users.

SGA encourages any individual interested in the development of this groundwater management plan to participate by either working through their respective water supplier representative on the SGA Board or by attending any of our public Board meetings held the second Thursday of each month. For more information on Board meetings or to find out who your Board representative is, please contact Rob Swartz of SGA at (916) 967-7692.

1Ti: May 16, 2003

REGIONAL WATER AUTHORITY
5620 BIRDCAGE ST #180
CITRUS HEIGHTS CA 95610-

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO

STATE OF CALIFORNIA

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August 2, 9, 2003

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on **August 9, 2003.**

(Signature)

NO 558 PUBLIC NOTICE

NOTICE OF INTENT TO ADOPT A RESOLUTION TO PREPARE A GROUNDWATER MANAGEMENT PLAN

The Sacramento Groundwater Authority (SGA) is a joint powers authority (JPA) charged with protection and management of the groundwater basin underlying Sacramento County north of the American River. To maintain a sustainable groundwater resource for the more than half-million citizens that rely upon the basin for their daily water needs, SGA intends to consider the adoption of a resolution to prepare a groundwater management plan at its August 14, 2003 Board meeting. The meeting, which is open to the public, will begin at 8 am at 5620 Birdcage Street, Suite 110 in Citrus Heights, CA.

SGA encourages any individual interested in the development of the groundwater management plan to attend the meeting. For more information on SGA Board meetings or to find out more about groundwater management planning efforts, please contact Rob Swartz of SGA at (916) 967-7692.

2Ti August 2 & 9, 2003

REGIONAL WATER AUTHORITY
5620 BIRDCAGE ST #180
CITRUS HEIGHTS CA 95610-

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO

STATE OF CALIFORNIA

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 printer and principal clerk of the publisher of The Sacramento Bee, printed and published in the City of Sacramento, County of Sacramento, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sacramento, State of California, under the date of September 26, 1994, Action No. 379071; that the notice of which the annexed is a printed copy, has been published in each issue thereof and not in any supplement thereof on the following dates, to wit:

August 20, 27, 2003

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on **August 27, 2003.**

(Signature)

NO 618 PUBLIC NOTICE

RESOLUTION NO. 2003-06

A RESOLUTION OF THE SACRAMENTO GROUNDWATER AUTHORITY DECLARING ITS INTENT TO PREPARE A GROUNDWATER MANAGEMENT PLAN AND ADOPTING A STATEMENT OF PUBLIC PARTICIPATION

The Board of the Sacramento Groundwater Authority (SGA) does hereby find that:

WHEREAS, the SGA was formed under the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code), pursuant to a Joint Powers Agreement by and among the City of Citrus Heights, the City of Folsom, the City of Sacramento, and the County of Sacramento dated August 11, 1998; and

WHEREAS, the SGA was created for the purposes of protecting, preserving, and enhancing, for current and future beneficial uses, the groundwater resources in the North Area Groundwater Basin, in Sacramento County, north of the American River; and

WHEREAS, one of the SGA's primary functions is to develop, adopt and implement a plan for the management of groundwater resources in the North Area Groundwater Basin.

NOW, THEREFORE, be it resolved that:
1. The SGA intends to develop, adopt and implement a groundwater management plan for the North Area Groundwater Basin, in Sacramento County, north of the American River. Among other components, SGA's groundwater management plan shall include the following components:

a. Basin Management Objectives;

b. Components relating to the monitoring and management of groundwater levels, groundwater banking, groundwater quality, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping;

c. Monitoring protocols to track changes in conditions related to the components in section (b) and to generate information for the purpose of meeting Basin Management Objectives and establishing effective management of groundwater;

d. A plan to involve other local agencies and water purveyors in the North Area Groundwater Basin in the development of the groundwater management plan;

e. A map depicting the area overlying the North Area Groundwater Basin, as defined by California Department of Water Resources Bulletin No. 118, the jurisdictional area of the SGA, and the boundaries of other local agencies and water purveyors in the North Area Groundwater Basin;

f. Rules related to implementation of the groundwater management plan.

2. The SGA further intends to provide and allow broad opportunity for public involvement in the development of the groundwater management plan for the North Area Groundwater Basin. SGA's plan for public involvement shall include the following:

a. The formation of a Technical Review Committee and Policy Committee to guide development of the groundwater management plan;

b. Preparation of a Public Outreach Plan;

c. Public review and comment period and public hearings.

3. This resolution supercedes and replaces Resolution 2003-03, adopted on March 13, 2003.

PASSED AND ADOPTED by the Board of Directors of the Sacramento Groundwater Authority, on August 14, 2003.

2Ti: Aug. 20th & Aug. 27th 2003

REGIONAL WATER AUTHORITY
5620 BIRDCAGE ST STE 180
CITRUS HEIGHTS CA 95610-

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO

STATE OF CALIFORNIA

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 printer and principal clerk of the publisher of The Sacramento Bee, printed and published in the City of Sacramento, County of Sacramento, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sacramento, State of California, under the date of September 26, 1994, Action No. 379071; that the notice of which the annexed is a printed copy, has been published in each issue thereof and not in any supplement thereof on the following dates, to wit:

November 28, 2003 &

December 5, 2003

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on December 5, 2003.

(Signature)

NO 131 PUBLIC NOTICE

NOTICE OF INTENT TO ADOPT A GROUNDWATER MANAGEMENT PLAN

The Sacramento Groundwater Authority (SGA) will hold a public hearing on December 11, 2003 to consider adopting a Groundwater Management Plan (GMP) for the groundwater basin underlying Sacramento County north of the American River. SGA is a joint powers authority created by agreement between the cities of Citrus Heights, Folsom, and Sacramento, and the County of Sacramento to collectively manage the groundwater basin.

The GMP outlines a set of actions to protect our crucial groundwater resources for present and future water supply needs. The overall goal of the GMP is to ensure a viable groundwater resource for beneficial uses, including agricultural, industrial, and municipal uses, and to support the Sacramento Area Water Forum's historic agreement to provide a reliable and safe water supply through the year 2030 while preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River. To achieve this goal, the GMP sets forth five management objectives and five primary plan components that identify the specific actions to implement the plan. Among the components is the first comprehensive monitoring plan established for the area, which will be of great benefit in tracking the overall health of the underlying basin.

The public is invited to attend and provide comments at the Board hearing on December 11, 2003, which will begin at 8 a.m. at 5620 Birdcage Street, Suite 110 in Citrus Heights, CA. Any protests by landowners in the area covered under the plan must be provided to the SGA, in writing, prior to completion of this meeting. Please contact Rob Swartz at (916) 967-7692 or rswartz@rwah2o.org if you would like to obtain a copy of the GMP or want more information on SGA Board meetings.

Run 2Ti, November 28 & Dec 5, 2003

Summary of Public Outreach Plan for Groundwater Management

Situation Analysis

Introduction

The Sacramento Groundwater Authority (SGA) was formed to protect the health of the groundwater basin within the northern portion of Sacramento County. The authority is charged with monitoring and managing both the water supply and quality of the groundwater basin underlying the service areas of water purveyors north of the American River. SGA plans to complete a Groundwater Management Plan (GMP) compliant with Senate Bill 1938 (SB 1938) in 2003. Additionally, developing a more comprehensive groundwater management program that is acceptable to stakeholders is one of the organization's top priorities. While SGA members understand the need for groundwater management, members also recognize that significant opportunities exist for banking and exchange partnerships with potential to generate revenue needed for infrastructure enhancements to increase local supply reliability.

The GMP will seek to establish a regional management approach, while maintaining local agency autonomy, for the groundwater basin at a time when increasing statewide demand is being placed on limited water resources. After the GMP is approved, the SGA will further develop a comprehensive groundwater management program with policy guidelines for managing the groundwater basin (water accounting framework), banking and exchange opportunities and potential partnership arrangements with outside entities to help offset local financing needs. A complete data management system is also an integral part of the groundwater management program.

In 2003, SGA approached Lucy and Company to conduct research and prepare a strategic public outreach plan for various stakeholder groups in the groundwater basin. To obtain the best qualitative analysis of issues and concerns about groundwater management, banking and exchange, water transfers and SGA policies about managing the groundwater basin, primary focus group and secondary research was conducted. This effort was supported by funds from the California Department of Water Resources Integrated Storage Investigations Program. A brief summary of both research efforts is included in this section. For a complete research summary, see Appendix A.

From the research, a strategic public outreach plan was written to include an analysis of target audiences, and objectives, strategies and tactics recommended for implementation of the groundwater management plan. The public outreach plan also recommends different strategies and tactics to gain stakeholder acceptance of the groundwater management program, including plans for banking and exchange, which could become controversial if not appropriately managed. The complete public outreach plan is included in Section II.

Background

In California, the only truly universal law governing groundwater pumping is the state constitutional mandate that "water not be wasted or put to an unreasonable use." In fact, California and Texas, which are the highest pumping states in the nation, are the only two states without legislated groundwater pumping restrictions. On average, California uses 1.3

million acre-feet of groundwater more than is naturally or artificially recharged, according to projected water budgets[1] The fact that 75 percent of California's yearly precipitation falls north of Sacramento, while more than 75 percent of the demand is south of the state capitol helps explain why groundwater management is critical.

Historically, the state has maintained that local water purveyors are better equipped than the state to manage the complexity of groundwater basins, but the water purveyors must take the initiative to protect the quality and quantity of water in the aquifers. Groundwater pumpers must agree among themselves how best to manage and protect their basins, and where needed, construct infrastructure for replenishing the groundwater basin through conjunctive use. With the passage of Assembly Bill 3030 in 1992 and SB 1938 in September 2002, local water providers such as those members of the SGA are more inclined to take the reins and actively collaborate to employ conjunctive use, implement banking and exchange projects, and take advantage of state financing opportunities.

Senate Bill 1938

Senate Bill 1938 requires that new groundwater management plans include the following components: documentation of a public involvement statement; basin management objectives; monitoring and management of groundwater elevations, water quality, land subsidence, changes in surface water flows affecting groundwater levels or quality or due to pumping; plans to involve other agencies within the basin; adoption of monitoring protocols by basin stakeholders; and a map of the basin showing the area to be managed. Organizations applying for state grant funds for groundwater-related projects must have an adopted SB 1938-compliant groundwater management plan.

groundwater management Program Approach

The groundwater management program under development by the SGA incorporates elements of the Water Forum Agreement and the American River Basin Cooperating Agencies Regional Water Master Plan (RWMP). The RWMP objective is to identify the facilities and operational agreements necessary to implement the Water Forum Agreement. Elements of the conjunctive use program are currently being implemented.[2] The Water Forum Agreement prescribes a conjunctive use program for Folsom Lake, the lower American River, and the adjacent groundwater basin.

The average annual operational yield determined in the Water Forum Agreement for the SGA area is 131,000 acre-feet per year. Historcal overpumping of the basin is estimated to have created 1.5 million acre-feet of available storage (i.e. de-watered aquifer capacity), with a cone of depression centered in the vicinity of the former McClellan Air Force Base. Approximately 400,000 to 500,000 acre-feet of the de-watered aquifer space are assumed to be usable for recharge.

[1] Water Education Foundation, Layperson's Guide to Groundwater (1998)
[2] MWH, "Draft Workplan for Groundwater Management Plan," Sacramento Groundwater Authority (February 2003)

The RWMP recommends taking advantage of the regional cone of depression in the Sacramento area and integrating the operation of Folsom Lake with the recharge of the groundwater basin.

Stakeholder Involvement

The SGA recognizes the need to incorporate stakeholder input, both internal and external, into its groundwater management efforts. In the Sacramento region, stakeholder involvement has proven to be an important ingredient to crafting agreements.For example, stakeholders have hailed the Water Forum Agreement as a model of successful stakeholder outreach. "You can have political discourse where each side has its own set of facts and they never intersect. The staff was able to gain the trust of most folks. The group then worked on creating a common set of facts rather than spending time developing their own facts to do war with," explained Ron Stork, senior policy advocate with the environmental protection group Friends of the River.

"In my view, a process like this is the way you get things done with contentious public policy issues. The 'I win, you lose' way was not getting anything done," Jim Ray, civil engineer, (firm name).

The SGA does not presume that groundwater management program activities will not generate "political" or public opposition. Consequently, the SGA recognizes the critical importance of keeping stakeholder groups of the Water Forum Successor Effort as well as sectors of the public aware, involved and engaged in the groundwater management program development.

External Stakeholder Environment

The timing of a recently publicized initiative forecasting water crises in the Western United States may assist the SGA in communicating to external stakeholders the vital need for a GMP this year and its associated groundwater management program. In Water 2025, released by the U. S. Department of Interior in May 2003, federal officials described the conflict potential in the Central Valley as "highly likely," due to drought, population growth and aging facilities.

"Today, in some areas of the West, existing water supplies are, or will be, inadequate to meet the water demands of people, cities, farms, and the environment even under normal water supply conditions.

"Water conflicts can have serious social, economic, and environmental impacts. Through Water 2025, the department advocates four key tools to help prevent future conflict and crises over water in the West.
1. Conservation, Efficiency, and Markets
2. Collaboration
3. Improved Technology
4. Remove Institutional Barriers and Increase Interagency Coordination"

The GMP and groundwater management program will demonstrate that the SGA is already working to implement these recommendations. In particular, Water 2025 suggests that participating in the innovative Environmental Water Account (EWA) through the CalFed process is one example of how Central Valley water agencies are addressing the inequities in the current water supply. "This account (EWA) provides a mechanism for state and federal governments to purchase water from willing sellers in order to meet important ecological restoration goals in the San Francisco Bay Delta region." The SGA participated in two pilot studies between 2001 and 2002 to bank and exchange water for the EWA and the Sacramento Area Flood Control Agency, and will pursue similar opportunities under the groundwater management program The EWA represents one of several program elements being undertaken by CALFED to improve water supply reliability.[3]

SGA's public outreach efforts could indirectly benefit from the collaborative initiative.Water 2025, and the public meetings the Interior department will hold this summer across the West, will help raise awareness among the public about the importance of groundwater and the best ways to manage and protect the resource. The meetings, which will engage farmers, environmentalists, water managers and others, will add weight to the arguments to act now to implement a groundwater management plan and program.

While the timing may be appropriate for the public to be able to grasp the need for groundwater management, they may find groundwater management concepts, such as banking and exchange particularly difficult to understand. The following qualitative research found that banking and exchange is a particularly complex subject to explain to lay public.

Additionally, proposed water transfer agreements, in particular from agricultural to urban communities, have historically been emotionally charged debates often referred to as "water grabs." The Owens Valley/Los Angeles water war and the city of Los Angeles' water exports from Mono Lake continue to be frequently cited, as justifiable reasons for suspicion about agreements to transfer water to Southern California.

Internal Stakeholder Environment

As in the pilot banking and exchange program, the SGA members may choose to continue to participate in future banking and exchange programs as one of the mechanisms to manage the groundwater basin. The SGA joint powers agreement allows SGA to make the contractual arrangements required to implement programs, while also providing potential partners with the prerequisite political and legal certainty for entering into banking and exchange agreements.

[3] CALFED Bay-Delta Program, "California's Water Future: A Framework for Action (June 2000) In the report, also known as the CALFED Record of Decision, actions are identified that will be taken to expand storage capacity by approximately 950,000 acre-feet, and implement a major expansion of more environmentally sensitive groundwater storage for an additional 500,000 to 1 million acre-feet. In addition, local agencies will continue to independently develop storage projects to meet local needs

Although the SGA may hold broad regulatory powers in managing the basin, the members of the SGA will likely pursue an implementation approach that favors voluntary agreements as opposed to regulatory dictums, given the favorable conditions for cooperative conjunctive use projects in the basin. Consequently, the RWMP focused on the identification and development of economic incentives/disincentives policies to encourage/discourage certain operational behaviors.[4] These are among the policy decisions SGA will seek agreements with its member agencies.

Primary Research Summary

The following section summarizes the findings of a focus group study conducted for the Sacramento Groundwater Authority by Lucy & Company. The groups were conducted in April and May 2003, to determine the reactions of several interest groups to SGA's planned implementation of a groundwater management plan (GMP) and program. Lucy & Company facilitated two groups of SGA board members, one group of industry representatives, one group of community leaders, and two groups of residential ratepayers.

The focus groups discussed the topics of the value of adopting a groundwater management plan, the role of SGA in implementing a GMP to manage the basin, and participation in groundwater banking and exchange programs such as CalFed's Environmental Water Account. Many key results or messages came from the focus groups and are summarized into several categories below. A detailed accounting of the focus group discussions is included in Appendix A.

Groundwater Management Plan

- Development of a GMP is critical for the Sacramento region; industry participants ranked monitoring water quality as the primary need for a GMP.
- For board participants, the most compelling reason for the SGA to adopt a GMP was "Local control will be taken away if no plan is in place." Second-most compelling was "The resource cannot be sustained without management."
- The cost of water treatment would constitute a primary reason for an individual agency's GMP-associated rate increases.
- Some agencies are already making changes or constructing infrastructure to accommodate the GMP, and are willing to do more.
- Some board members felt the goals for a groundwater management plan should emphasize policies and procedures over regulatory measures, but a few insisted on the inclusion of a regulatory element to address special circumstances.
- Board members generally favored coordination with adjacent basins, although they differed on whether it should happen now or wait until SGA has its groundwater management program in place.
- Industry participants favored regional cooperation as the means through which the groundwater basin would best be managed, with none preferring individual agencies, city or county ordinances, and/or adjudication in court.

[4] MWH, "Draft Regional Water Master Plan," American River Basin Cooperating Agencies (April 2003)

Conjunctive Use

- Community leader and residential participants generally comprehended the definition of conjunctive use and could restate the definition in their own words; the concept was well-received.
- Several board and industry participants cautioned that the role between the state and local agencies must be handled with care to reduce the risk of the state legislating a management role.
- Board and industry participants believed the state wants to see locally controlled projects with statewide benefits.

Sacramento Groundwater Authority

- Industry participants were fairly familiar with SGA; however, they were less familiar with its pilot projects. Familiarity with SGA appeared higher among the community leaders; however, when probed, most mischaracterized the authority of the organization. Some residential participants thought they had heard of SGA, but few were clear on its mission.
- Board members pointed out that full implementation of SGA's mission would not occur until the plan was in place. A few recognized SGA's regulatory authority to levy pumping fees to ensure that the basin is protected; however, the participants want SGA to assume this role only when necessary.
- Given groundwater management and protection through SGA versus individual agencies, board members generally sought a middle ground and emphasized that SGA should become involved only in unusual circumstances. Industry participants leaned more toward centralization.
- Board members felt that the GMP should dictate when the regulatory arm of SGA would take effect, such as when a purveyor started pumping excess water to sell elsewhere.
- Board members believed an adjudication process to determine baseline pumping allowances is unnecessary and would generally face strong opposition.
- Board members favored one of two tiered-rate options tied to pumping allowances as the means of controlling groundwater extractions, with a regulatory fee only if necessary.
- Industry participants favored regulation through economic incentives/disincentives with implementation of a regulatory fee only as a backstop measure to avoid overdraft conditions and ensure basin protection. Agricultural representatives, however, strongly opposed any regulation or fee structure.

Banking and Exchange

- Community leaders and residential participants had more difficulty understanding and restating the banking and exchange definition; simplification of the definition and the inclusion of graphics or illustrations depicting the concept would help.
- After lengthy discussion, community leaders were generally able to understand the value of banking and exchange, and to see benefits associated with it.
- Several wondered who determines water needs, at what point those needs are met, and where and how the water would be banked or stored, and how sellers would "get it

back."

Preferred Recipients of Water Sales by Five Geographic Areas

- Participants across all groups cautioned against the potential dilemma of local shortages in years of drought due to water sales elsewhere.
- Board members and industry participants cautioned that local needs must first be met before water benefits other purposes, such as the EWA.
- Board members supported the idea of short-term water sales to other areas, but only if such sales are conducted on a regional basis to minimize the potential for competition among water purveyors and maximize opportunities for reciprocity.
- All participants preferred water sales to regions located closer to them, e.g. counties adjacent to Sacramento and Sacramento Valley agricultural interests; least favored was Southern California.
- Some participants across all groups wanted to sell water to the highest bidder, but generally residents were leery of the potential for bidding wars.

Water Rates

- Most community leaders and residential participants thought that Sacramento's water rates were reasonable, if not inexpensive.
- Board members felt that ratepayers would react more positively to a GMP-related rate increase if the agencies explained that the increase would fund improved infrastructure.
- Residential participants felt infrastructure is a more justifiable reason for a rate increase than other reasons.
- A few residential participants felt thwarted by their attempts at public input into rate issues with their respective water purveyors. They felt a board's decision to increase rates was decided prior to a public hearing.
- Several residential participants questioned how banking and exchange would offset their rates. A few participants would more readily accept banking and exchange if its implementation would reduce the amount of water bill increases or hold rates steady.

Public Outreach/GMP Outreach

- Board members again emphasized that a GMP should be in place before implementing public outreach efforts – efforts they deemed to be important.
- Some noted that the inclusion of high-level influentials, such as local elected officials, in any outreach campaign enables them to become ambassadors for the program to ratepayers; at the same time, they acknowledged the difficulty of educating influentials on water-related issues.
- Ratepayers would put more credence behind a GMP outreach campaign if it was communicated by individual agencies, according to some board and industry participants.
- Message consistency and standardization would be critical regardless of the medium or the spokesperson – thus key messages must be developed for all audiences.

- Most community leaders would be comfortable allowing their water agency board or elected officials to make decisions about the groundwater management program.
- Community leader and residential participants suggested a variety of outreach methods be implemented to reach them and solicit their input; however, few residential participants would attend a public meeting about the GMP and any associated activities such as the banking and exchange water transfers.

Primary Research Recommendations

Internal

- SGA and member agencies should work within the framework of the Water Forum Agreement. The WFA has already gained broad stakeholder acceptance.
- Given the increasingly pervasive inequities of water supply in Northern California versus unmet demand in Southern California, state lawmakers may feel encouraged to pass measures over local groundwater management. Since SGA members anticipate the GMP may pre-empt adjudication by the courts, legislation by the state or ordinances by the county exercising authority in managing the groundwater basin, internal stakeholders must realize resolving differences is in their best interest. The authority should emphasize that the GMP will help ensure local control of the basin.
- Continue ongoing internal education to full SGA membership and consider conducting a member survey and facilitated meeting to resolve differences on policy issues associated with the GMP or program.
- Determine "principles of agreement" that will become ground rules for members to follow with groundwater management program activities.
- Reinforce that the GMP will ensure local needs are always met first. SGA should consistently implement this policy to sustain trust and credibility among member agencies and stakeholders.
- Although internal stakeholders generally preferred participating with regional partners as opposed to Southern California partners, the SGA should emphasize that the potential for state funding from partnerships or grants increases by participating in projects that also benefit other areas of the state.
- Through meeting presentations, keep others in water industry informed of progress in conjunctive use in order to learn about additional opportunities for cost-sharing partnerships, grant funding, and collaboration.

External

- Emphasize that the SGA has been committed to conducting early public outreach about the GMP and its groundwater management program and outreach will be sustained as the program evolves.
- Given the complexity of the concept of banking and exchange, come to an agreement on consistent definitions about banking and exchange, and conjunctive use and develop illustrations to accompany them. Encourage member agencies to use them frequently on newsletters or bill inserts.
- Address predominant concerns about "meeting local needs first" by continuing SGA's pursuit of short-term pilot projects to ensure adequate resources during a drought and continued growth phase in longer-term agreements as authority gains acceptance of plan.

- Make presentations to the Water Forum Successor Effort stakeholder groups, local elected officials and key lawmakers on water committees, reiterating that a groundwater management program fulfills a key Water Forum goal of protecting and managing the north-area groundwater basin.
- Use Folsom Lake as a visual aid to describe the potential capacity of storage within the groundwater basin.
- Educate stakeholders about how the goal of the groundwater management program is to ensure reliability, if not "drought-proof" the region's water supply.
- If local elected officials and member agency board members are kept updated, they can act as "ambassadors" to educate external audiences. SGA should not, however, assume local elected officials and board members are the only communication vehicle. Previous qualitative and quantitative research, performed by the Water Forum, indicated that Sacramento area residents viewed elected officials as having little credibility.
- Although ratepayers are unlikely to attend a public meeting about banking and exchange programs, qualitative research suggested they want to be invited to give input via a Web site or a postcard. Work with SGA member agencies to solicit input from ratepayers about any components of the groundwater management program which are likely to raise controversy such as rate increases, banking and exchange, or agreements with purveyors outside the region.
- Work with ACWA to reach key legislators about the groundwater management program and its benefits.
- A number of residential focus group participants receive their information via the newspaper or television news. Work with the news media to raise their understanding about the concepts of conjunctive use, banking and exchange and outside funding agreements and the value of all to sustaining the reliability of water in the Sacramento region.

Secondary Research Summary

The secondary research in this report highlights lessons learned about public outreach with highly sensitive water projects. The five case studies were based on telephone interviews with general managers or public information staff with Orange County Water District, Madera Irrigation District, Semitropic Water Storage District, Metropolitan Water District of Southern California and Dublin San Ramon Services District. More detailed accounts of the interviews are included as Appendix B.

While each project differed, and some succeeded while others failed, several recommendations about public outreach can be gleaned from the case studies:

- Actively involve the local community from the start and continue soliciting their involvement throughout the design and implementation phases of a project.
- Local control is critical. Allow local water purveyors to locally manage the project, as agricultural communities in particular are suspicious of "outsiders" implementing projects within their basin.
- Solicit input from regional water agencies sharing the same groundwater basin; do not assume stakeholder outreach has succeeded by working with one local purveyor.
- Regularly update local elected officials about project plans and benefits, and supply them with answers to local concerns.
- Clearly spell out the benefits to the local community of any project.

- Do not conclude that public outreach is done after an environmental impact report has been approved. Continue public outreach as opposition can mount during any phase of a project.
- Agricultural communities are fiercely protective of what they consider to be "their" groundwater basins, so proceed with caution. Be prepared to answer technical questions, listen and resolve differences before moving forward.

6.4 APPENDIX D. STANDARD OPERATING PROCEDURE FOR MANUAL WATER LEVEL MEASUREMENTS

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ATTACHMENT A
FIELD MANUAL

STANDARD OPERATING PROCEDURE

For

MANUAL WATER LEVEL MEASUREMENTS

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1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to set guidelines for the determination of the depth to water and separate phase chemical product (i.e., gasoline or oil) in a water supply well, monitoring well, or piezometer. These standard operating procedures may be varied or changed as required, dependent on site conditions , and equipment limitations. In all instances, the actual procedures employed will be documented and described on the field form. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Generally, water-level measurements taken in piezometers, or wells are used to construct water table or potentiometric surface maps and to determine flow direction as well as other aquifer characteristics. Therefore, all water level measurements in a given district should preferably be collected within a 24 hour period and SGA's area within one week. However, certain situations may produce rapidly changing groundwater levels that necessitate taking measurements as close in time as possible. Large changes in water levels among wells may be indicative of such a condition . Rapid groundwater level changes may occur due to:

- Atmospheric pressure changes
- Changes in river stage, impoundments levels, or flow in unlined ditches
- Pumping of nearby wells
- Precipitation
- Tidal influences

2.0 METHOD SUMMARY

A survey mark should be placed on the top of the riser pipe or casing as a reference point for groundwater level measurements. If the lip of the riser pipe is not flat, the reference point may be located on the grout apron or the top of the outer protective casing (if present). The measurement reference point should be documented on the groundwater level data form. All field personnel must be made aware of the measurement reference point being used in order to ensure the collection of comparable data. Before measurements are made, water levels in piezometers and monitor wells should be allowed to stabilize for a minimum of 24 hours after well construction and development. Measurements in water supply wells need to be noted as questionable if pumping has or is occurring. In low yield situations, recovery of water levels to equilibrium may take longer. All measurements should be made as accurately as possible, with a minimum accuracy of 0.1 feet. Future measurements may have to be more accurate (measurements to the nearest 0.01 foot may be needed for conjunctive use projects, ect.). Ideally, the minimum measurement accuracy is 0.1 feet and the recommended accuracy is 0.01 feet.

If there is reason to suspect groundwater contamination, water level measuring equipment must be decontaminated and, in general, measurements should proceed from the least to the most contaminated wells. This SOP assumes an absence of contamination and no need for air monitoring or decontamination.

Open the well and monitor the headspace with the appropriate air monitoring instrument if the presence of volatile organic compounds is suspected. For electrical sounders lower the device into the well until the water surface is reached as indicated by a tone or meter deflection. Record the distance from the water surface to the reference point. Measurement with a chalked tape will

necessitate lowering the tape below the water level and holding a convenient foot marker at the reference point. Record both the water level as indicated on the chalked tape section and the depth mark held at the reference point The depth to water is the difference between the two readings. Remove measuring device, replace riser pipe cap, and decontaminate equipment as necessary. Note that if a separate phase is present, an oil/water indicator probe is required for measurement of product thickness and water level.

3.0 POTENTIAL PROBLEMS

1. Cascading water, particularly in open-hole or rock wells, may interfere with the measurement.
2. Some older types of electric sounders are only marked at five-foot intervals. A surveyor's tape is necessary to extrapolate between the 5-foot marks.
3. Oil or other product floating on the water column can insulate the contacts of the probe on an electric sounder and give false readings. For accurate level measurements in wells containing floating product, a special oil/water level indicator is required, and the corrected water level must be calculated.
4. Tapes (electrical or surveyor's) may have damaged or missing sections, or may be spliced inaccurately.
5. An airline may be the only available means to make measurements in sealed production wells but the method is generally accurate only to approximately 0.2 foot.
6. When using a steel tape, it is necessary to lower the tape below the water level in order to make a measurement. This assumes knowledge of the approximate groundwater level.

4.0 EQUIPMENT

The electric water level indicator and the chalked steel tape are the devices commonly used to measure

water levels. Both have an accuracy of 0.01 feet. Other field equipment may include:

- Air monitoring instrumentation
- Well depth measurement device (sounder)
- Chalk
- Ruler
- Site logbook
- Paper towels and trash bags
- Decontamination supplies (assumed unnecessary)
- Groundwater level data forms

5.0 PROCEDURES

5.1 Preparation

1. Determine the number of measurements needed, the methods to be employed, and the equipment and supplies needed.
2. Decontaminate or pre-clean equipment, and ensure that it is in working order.

3. Coordinate schedule with staff and regulatory agency, if appropriate.
4. If this is an initial visit, perform a general site survey prior to site entry in accordance with a current approved site specific Health and Safety Plan (id applicable).
5. Identify measurement locations.

5.2 Procedures

Procedures for determining water levels are as follows:

1. If possible, and when applicable, start at those wells that are least contaminated and proceed to those wells that are most contaminated.
2. Rinse all the equipment entering the well.
3. Remove locking well cap, note well ID, time of day, and date on the groundwater level data form.
4. Remove well cap.
5. If required by site-specific condition, monitor headspace of well with a photoionization detector (PID) or flame ionization detector (FID) to determine presence of volatile organic compounds, and record results in logbook.
6. Lower water-level measuring device into the well. Electrical tapes are lowered to the water surface whereas chalked steel tapes are lowered generally a foot or more below the water surface. Steel tapes are generally chalked so that a 1-to 5-foot long section will fall below the expected water level.
7. For electrical tapes record the distance from the water surface, as determined by the audio signal or meter, to the reference measuring point and record. For chalked tapes, an even foot mark is held at the reference point, once the chalked section of the tape is below the water level. Both the water level on the tape and the foot mark held at the reference point is recorded. The depth to the water is then the difference between the two readings. In addition, note the reference point used (top of the outer casing, top of the riser pipe, ground surface, or some other reproducible position on the well head). Repeat the measurement.
8. Remove all downhole equipment, replace well cap and locking steel caps.
9. Rinse all downhole equipment and store for transport to the next well.
10. Note any physical changes, such as erosion or cracks in protective concrete pad or
11. Note any physical changes, such as erosion or cracks in protective concrete pad or variation in total depth of well on groundwater level data form.

6.0 CALCULATIONS

To determine groundwater elevation above mean sea level, use the following equation:

where:

$$\mathbf{E_w = E - D}$$

E_W = Elevation of water above mean sea level (feet) or local datum

E = Elevation above sea level or local datum at point of measurement (feet)

D = Depth to water (feet)

7.0 QUALITY ASSURANCE/QUALITY CONTROL

The following general quality assurance/quality control (QA/QC) procedures apply:

1. All data must be documented on the groundwater level data forms.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified.
3. Each well should be tested at least twice in order to compare results. If results do not agree to within 0.02 feet, a third measurement should be taken and the readings averaged. Consistent failure of consecutive readings to agree suggests that levels are changing because of one or more conditions as indicated in Section 1, and should be noted on the field form.
4. Results should be compared to historical measurements while in the field and significant discrepancies noted and resolved if possible.
5. Wells for which no or questionable measurements are obtained need to have the codes entered on the field form as follows:

No Measurement		**Questionable Measurement**	
0	Discontinued	**0**	Caved or deepened
1	Pumping	**1**	Pumping
2	Pumphouse locked	**2**	Nearby pump operating
3	Tape hung up	**3**	Casing leaking or wet
4	Can't get tape in casing	**4**	Pumped recently
5	Unable to locate well	**5**	Air or pressure gauge measurement
6	Well destroyed	**6**	Other
7	Special	**7**	Recharge operation at nearby well
8	Casing leaking or wet	**8**	Oil in casing
9	Temporarily inaccessible		
D.	Dry well		
F.	Flowing well		

6. The surveyor(s) must complete all fields on the field form and initial. Upon return from the field, appropriate corrective actions need to be communicated and completed prior to the next survey event.
7. All data entered into electronic spreadsheet or database should be double-keyed or hard copy printed and proofed by a second person.
8. Questionable wells or measurements noted during data compilation need to result in corrective actions if applicable.

8.0 HEALTH AND SAFETY

This SOP assumes that only uncontaminated wells are being measured. If not, a current approved site Health and Safety Plan should be consulted..

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6.5 APPENDIX E. FINAL DRAFT – "RELATIONSHIP OF THE WATER FORUM AGREEMENT TO LAND USE DECISION MAKING", WATER FORUM SUCCESSOR EFFORT, JANUARY 2002

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Final Draft:
IV. Relationship of the Water Forum Agreement to Land Use Decision-Making

Water Forum Successor Effort

February, 2002

A. Background

Water Forum signatories include cities and counties that have land use planning responsibilities and water purveyors that have water planning responsibility. Water Forum signatories recognize the need to coordinate between water resources planning and land use decision-making. Land use decisions should be based on reliable information regarding water supply and infrastructure availability. Conversely, water supply planning and management decisions should be informed by land use decisions.

This section documents the work of the Land Use Committee (note, this sub-committee's name will be changed for as a result of the procedure described herein) during 2001-2002 to implement the land use/water use coordination procedures for the Water Forum Agreement. The recommendations have been developed and discussed at a series of meetings between the members of the Land Use Committee with the assistance of the planning directors (or their designees) from each jurisdiction and a representative from LAFCO to review and react to the ideas. The entire Water Forum Successor Effort approved the procedures as of March 2002.

This section does not provide all of the details required for day-to-day implementation. It leaves some of the implementation procedures up to each local land use and water agency to determine with Water Forum staff assistance. In developing this section, the Water Forum considered a range of options for implementation. The land use procedures adopted here are designed to evolve as they are used and tested – an "adaptive management" approach. This section also only focuses on Sacramento County (particularly related to groundwater). Signatories recognize that other entities share the groundwater basin including those not signatory to the Water Forum Agreement. Additional discussion may be needed in addressing the full range of water supply-land use related issues.

The signatories acknowledge that there are a number of existing laws and procedures in place to link land use decisions and water supply. These include Senate Bills 221 and 610, adopted in 2001 and in place as of January 1, 2002, as well as other water supply information requirements set forth in Chapter 881 of the California Water Code ,the CEQA process, "can and will serve" letters from water purveyors and related requirements. The procedures outlined here are meant to augment established procedures and ensure consistent implementation.

Senate Bill 221 of 2001 (codified generally in California Government Code sections 66473, 66455, 65867, 66499 regarding subdivision provisions and sections 10631,10635 and 10910 of the California Water Code) prohibits cities and counties from approving large subdivision proposals (including those done by development agreement) unless a finding is made of adequate and reliable water supply. This finding is to based on information supplied by the water

purveyor (within 90 days of a request from the land use agency) including whether supplies are available in dry and multiple dry years and for existing and future water users. If new water sources are to be considered, the supply has to have secured water rights, infrastructure financing and permits and approvals. If the water purveyor does not provide the data or indicates that there is not adequate long-term water to supply the project, the local jurisdiction has the option of investigating alternative water supplies provided all the same tests of "adequacy" are met. This bill only applies to residential subdivisions over 500 units, or for small water systems (5,000 connections or fewer), a residential project that would use up more than 10% of the water connections. Urban infill and affordable housing projects are exempted from the water supply requirements.

Senate Bill 610 of 2001 (codified generally in California Water Code sections 10631, 10657, 10910, 10911, 10912) requires all water purveyors that prepare Urban Water Management Plans and rely on groundwater, to incorporate additional information in their plans and submit this to DWR for review. The information includes data on groundwater basin condition, present and potential extractions, management plans in place, future uses and adequacy of the basin, etc. The new provisions also revise several minor sections of a previous land use-water supply bill.

The new State law provisions further requires that for any large development project or plan (including general plan amendments) that receives an environmental impact report (EIR) or negative declaration (including mitigated negative declaration), a water supply assessment must be completed and included as part of the project review. If the project was assumed in the water purveyor's most recent Urban Water Management Plan or has a received a water supply analysis comparable to what the bill calls for, then that information can simply be incorporated into the project review and provided to the land use decision-makers. If the project was not assumed in the UWMP, then the land use agency requests a separate water supply assessment from the purveyor. With each of the new provisions, the purveyor has 90 days to provide the data (with a 30 day extension option) and it includes all water supplies and demands relevant to the proposal. The assessment is similar to that required for large subdivisions involving normal, dry and multiple dry years, factoring in all existing and future water users (including groundwater users if that is the source), and providing considerable detail on any future water sources that might be envisioned. If the water purveyor indicates that water supply is not or may nor be available, SB 610 requires some discussion of how the purveyor and/or the local jurisdiction plan to augment supplies to account for the proposal. All of these data are to be included in the environmental review and in the record for review by the land use agency.

The new provisions for long-range planning (ie. SB 610) apply to residential projects over 500 units (or over 10% of the connections for small water districts), commercial projects over 500,000 square feet, office projects over 250,000 square feet, industrial park projects over 40 acres or 650,000 square feet, mixed use projects meeting any of the thresholds and 500 room hotel/motels.

B. Intent, Framework Agreements, Goals and Assumptions

Intent

It is the intent of the signatories that land use decisions dependent on water supply from the American River or the three groundwater sub-basins in Sacramento County be consistent with the limits on water supply from the American River and the estimated average sustainable yield for those groundwater sub-basins as negotiated in the *Water Forum Agreement.*

Framework Agreements

The following agreements from the *January 2000 Water Forum Agreement* serve as a framework for this section:

1. All signatories recognize that land use decision-making authority remains the responsibility of land use agencies and neither the Water Forum nor the Successor Effort has any formal land use authority. These procedures do not provide any additional authority.

2. Signatories agree to comply with all relevant sections of the State Water Code and Government Code related to the coordination of water supply and land use decisions. If water supply/land use coordination laws are amended or new laws created, the Water Forum Successor Effort will revisit the procedures in this section to ensure compliance with State law.

3. Signatories will reference the *Water Forum Agreement*, including agreed upon estimated annual sustainable yields of each of the three sub-basins of the groundwater basin of Sacramento County (north area 131,000 acre-feet; south area 273,000 acre-feet; Galt area 115,000 acre-feet) and limits to diversions from the American River in their water master plans and urban water management plans.

4. The *Water Forum Agreement* includes surface water and groundwater to meet the region's projected water needs for growth planned to the year 2030. Included in Appendix B of the Agreement is a description of the methodology and assumptions used by the Water Forum for assessing the demand to the year 2030, and a map delineating geographic boundaries used in projecting demand in Sacramento County.

5. In the unincorporated portions of Sacramento County only, signatories retain the ability to support or oppose water facilities that would serve new development outside the Urban Services Boundary as defined in the Sacramento General Plan, December 1993. All parties also retain the right to support or oppose the sizing of water distribution facilities that would allow service to the new development outside the Urban Services Boundary.

6. The *Water Forum Agreement* contains estimated average annual yields for each of the sub-areas of the groundwater basin in Sacramento County and limits to diversions from the American River. Beyond these agreements, limits on water from other sources have not been negotiated as part of the *Water Forum Agreement.* Signatories retain the right to support or oppose water projects that would use water from sources that have not been negotiated as part of the agreement.

7. The *Water Forum Agreement* focuses on providing a reliable and safe water supply and protecting the Lower American River. As such it is not an agreement on land use planning. Therefore, all signatories retain the ability to support or oppose land use decisions on any basis except water supply availability insofar as these water supply decisions are consistent with the *Water Forum Agreement.*

8. There is a need for greater information exchange than just having water purveyors provide project-by-project assessments of water supply availability. Therefore, signatory water purveyors agree to participate in a proactive program to educate all land use authorities in the region about the provisions of the *Water Forum Agreement.*

Goals
Two goals were developed for the Water Forum Successor Effort to implement the framework agreements in the *Water Forum Agreement (January 2000).*
Goal # 1 is follows:

> Goal #1: Procedures will be developed by the Water Forum Successor Effort to advise land use agencies as they assess the consistency of proposed land use decisions with the estimated annual sustainable yield of the three sub-basins in Sacramento County and the diversions from the American River negotiated as part of the Water Forum Agreement.

This goal has been further defined by *Water Forum* signatories as follows:

- ***The procedure should provide land use agencies with clear, factual and timely information on water supply entitlements (consistent with the Water Forum Agreement) and infrastructure capacity, as compared to current, committed and planned water demand as land use agencies consider new land use proposals that come before them. Signatories want to ensure that future land use decisions are coordinated with water supply availability.***

The second goal for the Water Forum Successor Effort is a necessary part of implementing the first goal:

> Goal # 2: To create guidelines for developing the periodic accounting of the Water Forum "water budget."

(Note: This report only addresses goal #1. Work on goal #2 will begin in the winter of 2002.)

Assumptions
To develop the water supply/land use procedures, several assumptions were made:

1. Some type of Water Forum staff and some form of an interest-based Sub-Committee (called the Water Demand and Supply Information Committee) comprised of Water Forum Successor Effort members would remain active over the long term. Local water purveyors will be the primary sources of contact and information for the land use authorities with

support from the Water Forum. Signatories acknowledge that they do not want to create a new "bureaucracy" for land use or water supply or have Water Forum staff burdened by reviewing many environmental and related planning documents.

2. The existing land use planning and decision-making processes will continue as currently practiced. This means that many development proposals will be consistent with local general plans (GPs), and many will not. It also means that various jurisdictions will be revising and updating their GP's over time.

3. The Water Forum will be able to develop an objective and widely agreed upon water budget accounting/monitoring process as indicated in goal #2 for the Water Demand and Supply Information Committee. The procedures developed in this section need such a process to be implemented.

4. The land use procedures delineated here are intended to be clear, effective, as simple (and cost-effective) as possible to administer, flexible enough to adapt to changing circumstances, and cover all jurisdictions in a consistent manner. Procedures can be adapted for particular jurisdictions provided they are consistent with the guidelines in this section. These procedures are consistent with and complimentary to the requirements set forth in State law related to land use/water use coordination.

5. The procedures will need to be revised, adapted and evolve as the processes are tested and parties learn more about specific cases.

C. Specific Procedural Agreements

The proposed procedures are divided into three elements:

- Overall recommendations to implement immediately to improve coordination of land use and water use.

- A procedure for addressing community-initiated general plan updates and specific plans, as well as LAFCO approvals including sphere of influence changes.

- A procedure for addressing privately initiated land use development proposals.

1. Overall Recommendations

The following agreements are designed for immediate implementation.

a. Signatory water purveyors will send a copy of their most recent Urban Water Management Plans (including any water conservation plans) to the land use authorities in their purview and agree to meet and discuss the plans. This will allow purveyors to take full advantage of any established data sources, planning documents and existing information and procedures.

b. Water Forum staff will research the existing landscape water conservation ordinances of each local jurisdiction and provide this information to WFSE members to be included in the Water Efficiency discussions. The WFSE will use a Sub-Committee to monitor and work on water efficiency issues.

c. Water Forum staff will contact signatory water purveyors to review the communication procedures that the purveyor and the land use agency use to periodically exchange information (at least once per quarter) about pending land use applications and water supply/demand availability and status. Summaries of the information exchanges will be provided to WF staff in memo or spreadsheet form.

d. The land use agency and water purveyor will collaborate to provide WF staff with a compilation of land use changes approved during the course of each year and associated water demands. This cumulative total should be updated at least once per year so WF staff can update the current water use assumptions and keep track of regional water demands.

e. Water Forum staff will send WF agreements, water supply assumptions, and other relevant information to the planning and public works departments of the recently-incorporated city of Elk Grove to assist them as the city develops its new general plan. Similar information exchange will be needed as other communities incorporate or embark on new general plans.

f. Individual water purveyors and land use agencies may develop their own internal ways of implementing the land use/water supply information procedures, provided they are comparable to the procedures established in this section and consistent with State law. Each jurisdiction may develop streamlined procedures such as standard checklists, as long as the information remains accessible to the public.

g. The roles of the key players in the process need to be well defined as follows:

   Water Forum Staff: provide regional water information; act as a checkpoint to ensure that water-related information is prepared in a timely way according to a pre-agreed upon and consistent method; serve as monitor for the cumulative water budget.

   Water Purveyor Staff: provide localized water data including major facilities and infrastructure needs and availability; serve as the primary link to the local land use authority; update urban water master plans to be used in the monitoring process; work with, request information from and provide timely data to WF staff to keep the regional water budget accurate and up to date.

   Sacramento Groundwater Authority Staff: provide groundwater information in their service area (north of the American River) for land use/water use coordination purposes; become the authority and take a lead role in providing up-to-date groundwater management data in the north sub-basin.

Land Use Agency: continue to process planning applications and publicly-initiated plans as they do now; inform water purveyor of upcoming projects; take the water data provided and highlight it prominently in the application review process. Incorporate information into the review process as set forth in recent State requirements.

Water Demand and Supply Information Committee: provide a public forum for discussion of water/land use coordination issues; serve as a sub-committee of the Water Forum Successor Effort to review correspondence and process for significant land use/water use issues.

Other agencies may play a role in the future such as any groundwater management entity in south Sacramento County, the Regional Water Authority, Placer County or others.

h. Water Forum staff may respond directly to project proponents, non-governmental and citizen groups as requested, but will typically refer people to the local land use agency and/or local water purveyor for routine information needs. WF information will be provided when requested and as a routine matter when GP amendments and updates occur.

2. Procedure for General Plans/Specific Plans/LAFCO Decisions

(Please refer to diagram 1.) For community-initiated general plan updates, major specific plans (e.g. County GP, Elk Grove GP) and annexations, Water Forum information will be made available as early as possible to inform the planning process. This process would also be used for sphere of influence requests to LAFCO.

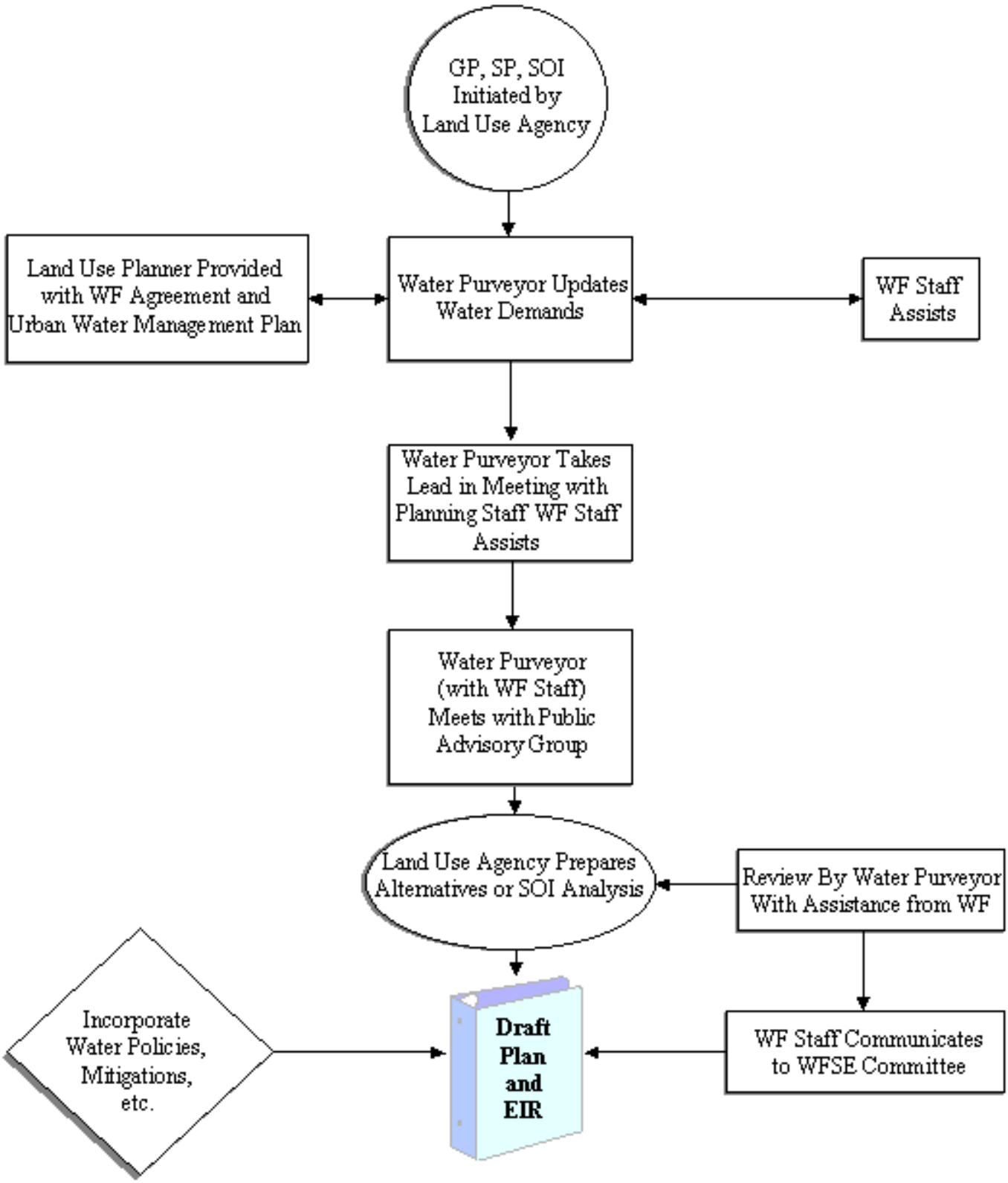
a. When a jurisdiction undertakes a general plan update, Water Forum staff will request that the water purveyor update the existing baseline water use/demand calculations to reflect current conditions. This will keep improving the information base as the WF moves toward more detailed monitoring. WF staff may provide technical assistance.

b. When a jurisdiction undertakes a GP or SP or requests an SOI change, the water purveyor and Water Forum staff will work together to communicate with the land use agency to ensure that the jurisdiction has the WF agreement (with highlighted key sections) and any other relevant material. The water purveyor will request a meeting with planning staff to interpret, clarify and explain the WF agreements, procedures, goals, technical data etc. WF staff may participate. When applicable, the land use agency will request the water purveyor to provide the water supply assessment information set forth in State law to be included in the environmental review of the project.

c. The water purveyor (with WF staff assistance) will offer to meet with a GP or SP committee (or comparable public body), attend a public workshop or forum or comparable venue to help inform advisors and decision-makers of the WF agreement and related water issues. Once this is done, the appropriate decision-makers in the GP or SP process may debate their land use issues as they choose with information from the water purveyor or WF and other stakeholders.

d. Once a Draft GP or SP and Draft EIR are issued, the WF may become involved in the notification/comment process as described in the next section. When applicable, the land use planner will incorporate the water supply assessment information required by State law into the environmental review and provide it for consideration by the land use agency.

Diagram 1
Public Proposals: General Plan Update, Specific Plan, LAFCO Sphere of Influence



e. Each jurisdiction may amend its GP (or various SPs) from time to time in a way that has no effect (or minimal effect) on water demands. Any GP or SP amendment that has minimal effect on water demands such as a change to a circulation or noise element will not be reviewed. Likewise, a package of multiple, single-parcel GP amendments without significant water supply implications may not be reviewed at the time of application, but will be incorporated into the annual cumulative record.

f. For sphere of influence (SOI) requests, LAFCO is mandated to address water supply as a public services issue. As a result, SOI requests are subject to the review procedure outlined in this report. SOI requests often occur with minimal information on the ultimate land uses that may be sought within the SOI area. Therefore, the level of detail and analysis on water supply and demand may be quite general. The water purveyor with assistance from WF staff will supply the best available information to LAFCO at the time of SOI request. LAFCO may impose conditions on the SOI approval that future annexations will have to be consistent with the WF agreement and potentially provide additional data on how the area is to be served with water.

g. The WF staff will keep the Water Demand and Supply Information Committee (or its successor) apprised of relevant consultation in these planning efforts. All WF-related responses will include sufficient context and background information to convey the complex regional water issues and implications (i.e. no simplistic "sound bites").

3. Procedure for Development Proposals

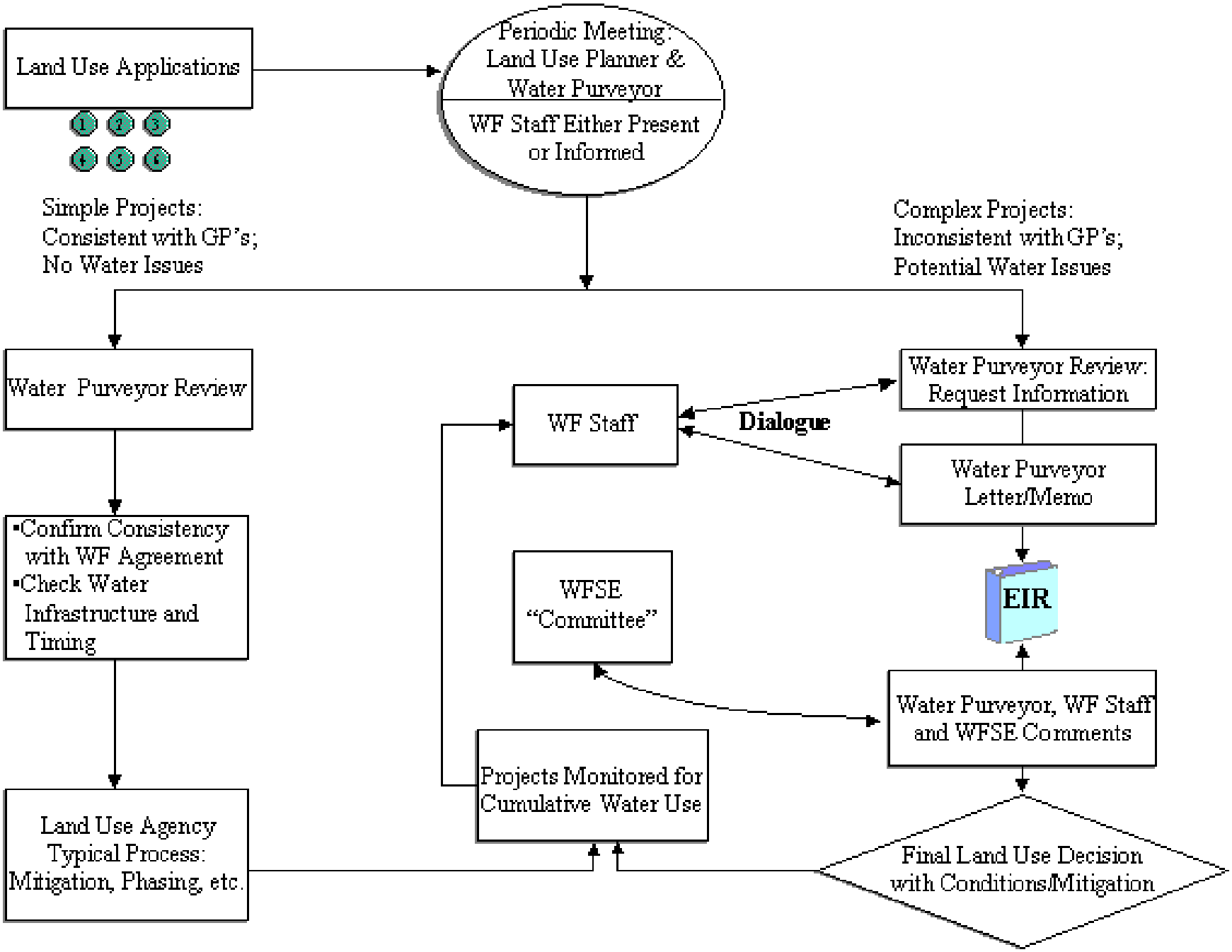
(See diagram #2 for a diagrammatic view.) For privately initiated development proposals (that are formally submitted for entitlements to a city or county), the following procedure will be used.

Simpler Cases

Certain land use proposals that are consistent with the community's general plan land use diagram contained in the WF agreement, and/or where water use is clearly not an issue, will require the following relatively simple procedure.

a. The water purveyor will notify the land use agency (via letter, memo, checklist or other written form) affirming consistency with the WF agreement. This would not be an endorsement of the project. However, it would clearly indicate whether the proposed project is assumed as part of the water use/demands calculated in the WF water budget and is consistent with the water allocations in the WF. WF staff will be notified of this communication at the time of the periodic meeting/information exchange. If the proposal is a residential subdivision greater than 500 units, then the land use agency and water purveyor will follow the water supply determination procedures required by State subdivision law.

Diagram 2
Privately - Initiated Development Proposals



b. The water purveyor may also provide information about available major facilities and infrastructure relative to the timing of proposed development. Overall water demands may be within the ultimate WF water allocation, but certain major facilities necessary to provide water may not yet be constructed. Land use authorities would have the ability to make informed decisions about project timing, phasing or mitigation relative to water-related infrastructure. It may be possible to utilize the development process to provide some early facility improvements. If the water supply determination requirements of State subdivision law apply, information on future water supply infrastructure will need to include applicable water rights, financing, and permits and approvals.

c. Many land use proposals (even those that change a GP designation, such as from commercial to light industrial) may have little or no measurable effect on water use. In these routine cases, the water purveyor's existing procedure of reviewing the application and providing information is sufficient.

More Complex Proposals

The following process will be used for major development proposals that may result in a significant departure in water demand from what was anticipated in the WF agreement. These are likely to be proposals outside the County's Urban Services Boundary or proposals outside current city boundaries seeking annexation and a change from non-urban to urban uses. For these type of proposals, the requirements of State law regarding water supply/land use coordination may apply and will be followed by local land use agencies and water purveyors.

a. The land use agency and water purveyor will determine whether a proposal fits in this complex category during their periodic meetings/information exchange. The land use agency will also determine if the proposal is large enough to be subject to State water supply/land use coordination requirements.

b. WF staff or any WF stakeholder may request that a particular land use proposal is "called up" for Water Forum discussion.

c. For complex projects, the following procedure will apply:

(1) The land use agency will notify the water purveyor and WF staff of the project as early in the process as reasonable. This may occur on a routine basis as each application is submitted or through the periodic meeting/information exchange (after a formal application has been filed). The land use agency will provide enough detail on the project so all parties clearly understand the land uses requested and project location to enable an estimate of water demand and proposed water supply. Water purveyor staff will discusses the project with the land use staff to establish a dialogue and determine if there are likely to be potential water problems and what solutions are possible. The WF staff may participate. If the

project is subject to State law requirements, the land use agency will specifically request the water supply assessment required under those statutes as part of the information.

(2) Water purveyor staff will send a preliminary letter or memo to the land use agency staff with copies to WF staff and the Water Demand and Supply Information Committee with the following information:

a) Description of appropriate WF information such as total water budget for that jurisdiction and assumptions about infrastructure.
b) A statement indicating the appropriate level of water supply analysis to be undertaken in the planning process (usually through environmental review).
c) A statement indicating whether the project is within or outside the water budget agreed to in the WF.
d) If State law requirements apply, then the water purveyor will provide any additional information needed.

(3) Once a draft environmental analysis is completed (EIR or negative declaration), the water purveyor staff will review the water use component of the environmental document and consult with WF staff, as necessary. The environmental document should address key issues like water supply availability, infrastructure/facilities, and potential water supply implications of the project. A complete analysis needs to address wet and normal years, dry years and critically dry years. The analysis also needs to address potential groundwater impacts and concerns. If State law requirements apply, the water supply analysis also needs to include the information required by those statutes.

(4) WF staff will bring the most significant proposals forward to the Water Demand and Supply Information Committee (or its successor) for discussion. The Committee will not evaluate the project's land uses, but rather whether the water supply proposal has any implications for the WF agreement. If water use has not been adequately considered this is the opportunity for the WFSE to raise the issue formally.

(5) The Committee will discuss and seek agreement on an appropriate response and then direct a letter back to the land use and water purveyor staff as part of the planning process. In the event the Committee can not agree, a procedure has been established (see sub-section 6). These letters will become part of the package of material to help inform land use decision-makers.

(6) Any communications will be made available to the WFSE plenary. An issue can be brought up to the plenary level at any time for broader dialogue.

4. Information Types

The following types of information may be included in comment letters from the WF and/or water purveyors. The information that is actually included will vary depending on the development application, its location and water source, when the application is filed relative to the water budget and other factors.

a. Overall water budget for the region and purveyor-specific agreements based on periodic monitoring (water supply and demand) as per WF agreement.

b. Overall statements regarding whether the water requirements of the land use proposal are consistent with the WF agreement, and the implications that may have for WF members.

c. Information regarding whether the land use proposal lies outside the County's Urban Services Boundary as defined in the Sacramento General Plan of 1993 and its relationship to the WF agreement.

d. In assessing the availability of water supply for new land uses in Sacramento County, the land use agencies shall take into account reasonable estimates of the following:

   - Sustained yield of the groundwater basin;
   - Best available data on current use of the sub-basin;
   - Anticipated use of currently unexercised water rights (or the proportion of use the land use proposal is of the unallocated portion of the basin);
   - Unmet demand within the Urban Policy Area;
   - Water demand for new uses between the Urban Policy Area and the Urban Services Boundary; and
   - Potential implications of this extraction on basin management or other issues.

e. Specific facilities and infrastructure needed for the land use proposal. Potentially, there may be water entitlements still needed to supply the land use proposal. Description of where facilities are in the process of development; funding status; time until completion; and related issues.

f. An objective, factual assessment of the level of efficiency with which the water is used in the land use proposal. For example, this may indicate how the specific land use proposal compares to the average per capita water demand for similar types/densities of land use.

g. Effectiveness of the water demand management programs that have occurred to date on a regional and local basis.

h. Identify local or regional limitations or thresholds that might limit water use, groundwater extraction, etc. or require major new water entitlements or facilities.

i. Specific implications of the land use proposal based on the proposed water source or some characteristic of the proposed water plan (storage, conveyance, treatment, etc.).

j. Commentary on the information provided as part of complying with the State requirements set forth regarding land use and water supply coordination.

5. Specific Challenges

One particular type of development proposal presents a unique challenge because it is "partially" within the assumed land use/water budget of the WF. These are proposals that occur on County lands between the urban services boundary and the urban policy areas. To estimate overall water demands to the year 2030, the WF water budget assumed water use in these areas (18,000 AFY plus potential conversion of current agricultural use of groundwater), but the water was not allocated either geographically or in time. For these areas, the same notification/comment process referenced above is to be used. Some of these projects may fall into the "complex" category.

Urbanization of any type between the Urban Services Boundary and Urban Policy Boundary will likely require a change in general plan land use and trigger the notification process. It is possible that in the early years, the water purveyor and others may have limited concerns with proposals that are able to secure water. Currently, County projects are subject to policy CO-20 (a policy of the Sacramento General Pan Conservation Element) which requires a water master plan prior to project approval. Over time, however, as the WF water budget accounting (Goal #2) demonstrates the water supply situation, proposals may receive more attention. Land use proposals that require significant amounts of water in areas without historic groundwater pumping, may also merit more attention. The signatories recognize the positive value of County policy CO-20 in requiring water supply plans and use of supplemental surface water. Continuing this type of requirement will help the WF monitor and plan for future water supplies.

Another specific type of proposal is a citizen initiative that has a major affect on land use. These proposals would be analyzed if WF staff or members determine that they merit examination. However, signatories acknowledge that land use agencies, water purveyors or WF members may not hear about such proposals in a timely way. It is the responsibility of each member of the WF to bring such proposals to the attention of the WF staff, Water Demand and Supply Information Committee or plenary if they believe the proposal has a material affect on water use. If a proposal is forwarded for discussion, it will be treated similarly to a complex development project.

6. In Case of Disagreements

The Water Forum discussed what procedure should be in place if the Water Demand and Supply Information Committee (or its successor) does not reach agreement on how to respond to a particular land use proposal. The following procedure was agreed upon:

a. Some form of "Water Demand and Supply Information Committee" will be maintained to consider land use/water supply issues. This group will be a sub-committee of the Water

Forum and must be representative of all the WF interests and have sufficient expertise and interest to address land use/water use questions.

b. In the event of a disagreement, the Committee will use the decision-making procedure that has guided the WFSE (75% of every caucus have to agree for a decision to move forward). If that level of agreement can not be achieved, the WF response will indicate areas of agreement and disagreement and the nature of the divergent positions. That way, the WFSE would not delay sending its response until it was too late in the process to have influence.

"Land Use" Committee Membership Who Worked on the Original Procedure (2001-2002)

Water Purveyor Interests

Tom Barandas, Natomas Central Mutual Water Company
Gordon Tornberg, City of Folsom Public Works

Public Interests

John Coppola, County of Sacramento Water Resources Division
Jim McDonald, City of Sacramento Planning Department
Gary Page, Sacramento County Alliance of Neighborhoods
Robert Sherry, County of Sacramento Planning Department
Gary Reents, City of Sacramento Utilities Department
Peter Brundage, LAFCO (invited guest)

Environmental Interests

Ellen Hemmert, ECOS
Vicki Lee, Sierra Club
Bill Berry, Save the American River Association
Ron Stork, Friends of the River
Earl Withycombe, ECOS

Business Interests

Brian Holloway, Association of Realtors
Bruce Houdesheldt, Building Industry Association (BIA)
Jim Ray, Jr., MacKay and Somps, and BIA
Jack Sevey, AKT

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6.6 APPENDIX F. MODELING

Chronological listing of water resource planning studies involving groundwater modeling recently performed in the SGA area.

- Sacramento County Groundwater Model Development and Basin Groundwater Yield for the Sacramento County Water Agency, MWH June 1993
- American River Water Resources Investigation – Planning Report and Environmental Impact Report/Environmental Impact Statement, U.S. Bureau of Reclamation, 1997.
- Final Report – Sacramento County Water Agency, Baseline Conditions for Groundwater Yield Analysis, Montgomery Watson, 1997.
- American River Basin Cooperating Agencies Regional Water Master Plan – Phase I, Final Report, Montgomery Watson, December 1999.
- American River Basin Cooperating Agencies Regional Water Master Plan – Phase II, Various Technical Memoranda, Montgomery Watson, December 1999 to Present.
- Water Forum Agreement, January 2000.
- American River Basin Regional Conjunctive Use Program – Groundwater Storage Program Construction Grant Application, MWH, December 2001.

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