Sacramento Groundwater Authority



Basin Management Report
2006-2007

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SGA Basin Management Report

Introduction

This Basin Management Report[1] documents management activities of the Sacramento Groundwater Authority (SGA) and its member agencies in 2006 and 2007. The biennial report is designed to document hydrologic conditions as well as management activities undertaken to help ensure the long-term sustainability of the region's vital groundwater resources. The report also documents the ongoing implementation of the SGA Groundwater Management Plan (GMP) and recommends future implementation activities.

SGA Background

The SGA is a joint powers authority (JPA) formed in 1998[2] to manage the groundwater basin in Sacramento County north of the American River. Known formally as the North Area Groundwater Basin (North Area Basin), the basin encompasses the southern one-third of the North American Subbasin (Basin 5-21.64) as defined by the California Department of Water Resources (Figure 1). Formed as an outgrowth of the Sacramento Area Water Forum, SGA is recognized as an essential part of implementing the groundwater management element of the historic Water Forum Agreement (WFA)[3] of 2000. A centerpiece of the agreement is a regional program to manage and conjunctively use groundwater and surface water to help meet water needs through the year 2030 while reducing diversions from the lower American River during environmentally sensitive times.

The SGA draws its authority from a joint powers agreement signed by the cities of Citrus Heights, Folsom and Sacramento and the County of Sacramento. The signatories chose to manage the basin cooperatively by delegating their common police powers to representatives of local public and private water purveyors (Figure

[1] This is the third comprehensive report completed for the SGA area. The first was published for the 2002 calendar year in February 2004. Originally known as a State of the Basin Report, the name has been changed to more appropriately reflect SGA's basin management responsibilities. Previous reports are available on-line at http://www.sgah2o.org/sga/news/publications/

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

[3] The WFA is available on-line at http://www.waterforum.org.

2), agricultural groundwater users and self-supplied groundwater users within their jurisdiction. These representatives constitute the Board of Directors of the SGA[4]. The agreement cites the following purposes for establishing SGA:

- To maintain the long-term sustainable yield of the North Area Basin;
- To manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors;
- 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
- 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] The SGA Board includes representatives of: California American Water, 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, Golden State Water Company (formerly Southern California Water Company), Natomas Central Mutual Water Company, Orange Vale Water Company, Rio Linda/Elverta Community Water District, Sacramento Suburban Water District, San Juan Water District, and individual representatives from agriculture and self-supplied groundwater users (principally parks and recreation districts). For convenience, water purveyors, whether public or private, are referred to as "agencies" throughout this report.

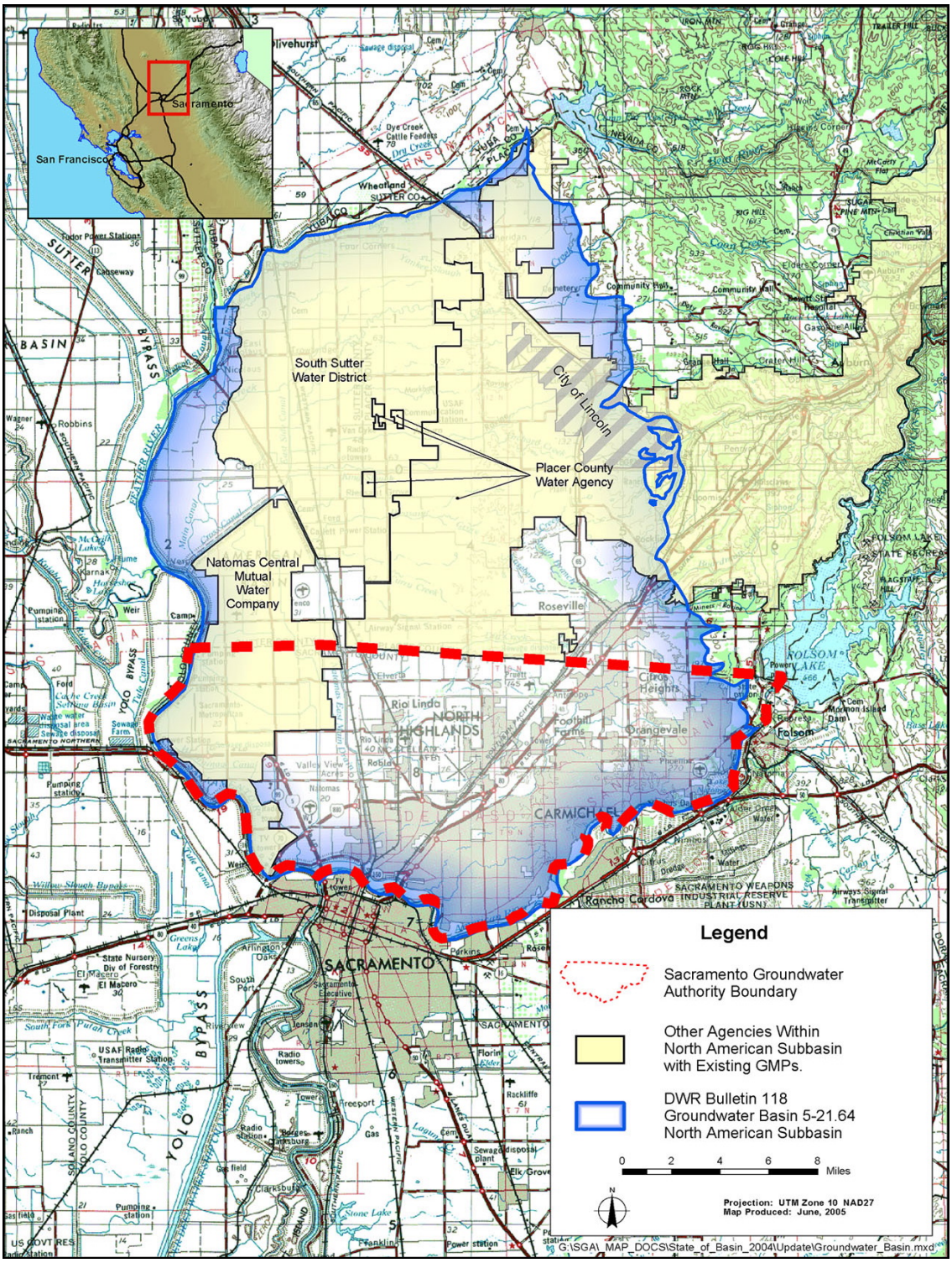


Figure 1. North American Subbasin

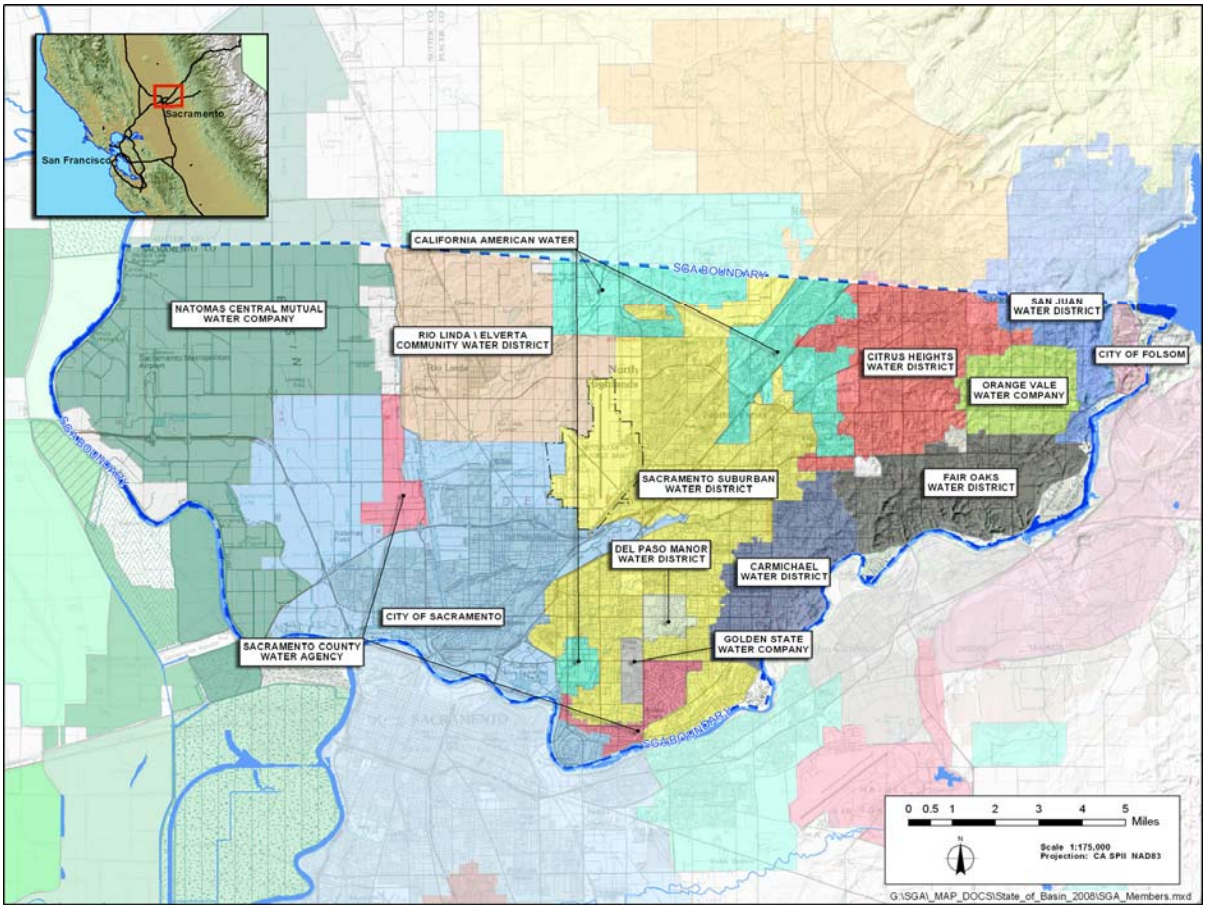


Figure 2. Local Water Purveyors in North Area Basin

SGA Groundwater Management Plan

In December 2003, SGA adopted a Groundwater Management Plan (GMP)[5] to create a framework for maintaining a sustainable, high-quality groundwater resource consistent with the objectives of the WFA. The GMP was prepared under the authority of SGA's JPA and is consistent with the provisions of California Water Code § 10750 *et seq.* Additionally, the GMP includes components recommended by the California Department of Water Resources in its 2003 update of *Bulletin 118: California's Groundwater*.

A key component of the GMP is to report periodically on the implementation of the GMP itself. Accordingly, this Basin Management Report includes a summary of the GMP's 63 initial action items and a description of progress to date on those items (see Appendix A). The GMP is currently being updated with a revised document expected to be released in early 2009.

[5] The SGA GMP is available on-line at http://www.sgah2o.org/sga/programs/groundwater/

Report Organization

The report is organized into the following sections:

Section 1: Introduction. This section introduces the purpose of this report, the SGA, and the SGA GMP.

Section 2: Basin Conditions. This section describes the hydrologic conditions in the basin during 2006 and 2007, as well as groundwater elevations and water quality for 2005 and 2006. There is a one-year time lag in this data because of the effort required to collect it and enter it into the SGA Data Management System.

Section 3: Basin Management Activities. This section describes the most significant management actions taken by SGA and other local agencies that affected SGA during the 2006 and 2007 calendar years.

Section 4: Conclusions and Recommendations. This section evaluates whether current basin management objectives are being met and makes recommendations for future management actions in the region.

Basin Conditions

Hydrologic Conditions

Hydrologic conditions in the region varied considerably in 2006 and 2007. Three indicators are used here to describe hydrologic conditions for this period: 1) Sacramento River Water Year Index, 2) Water Forum Agreement Year Type, and 3) total rainfall. Each of these is described further below.

Sacramento River Water Year Type

The Department of Water Resources (DWR) maintains a water year index based on Sacramento River and tributary runoff[6]. Hydrologic conditions are described as wet, above normal, below normal, dry, or critical. The 2006 and 2007 water years were classified as wet and dry, respectively. Overall, the region appears to be in a drier period with three of the last four years classified as below normal or dry. Table 1 summarizes the classifications from 1995 through 2007 and defines each classification.

Table 1. DWR Water Year Classifications

Water Year	Sacramento River Index Value (million acre-ft)	Year Type
1995	12.4	Wet
1996	9.7	Wet
1997	11.0	Wet
1998	12.4	Wet
1999	10.0	Wet
2000	9.2	Wet
2001	5.9	Dry
2002	6.5	Dry
2003	8.0	Above Normal
2004	7.7	Below Normal
2005	7.4	Below Normal
2006	13.0	Wet
2007	6.2	Dry

Year Type	Water Year Index (million acre-feet)
Wet	Equal to or greater than 9.2
Above Normal	Greater than 7.8, and less than 9.2
Below Normal	Greater than 6.5, and equal to or less than 7.8
Dry	Greater than 5.4, and equal to or less than 6.5
Critical	Equal to or less than 5.4

[6] A description of the calculation method is available at http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST

Water Forum Agreement Year Type

March-through-November total unimpaired inflows into Folsom Lake are of particular relevance to Sacramento area water purveyors. This inflow total dictates the amount water purveyors may divert from Folsom Lake and the lower American River as specified in their purveyor-specific agreements under the WFA. The 2006 and 2007 years were classified as wet and average, respectively, according to this index with 2007 being the driest of the last five years of inflow (Figure 3). Table 2 shows the definition of WFA water year types based on unimpaired inflow to Folsom Lake.

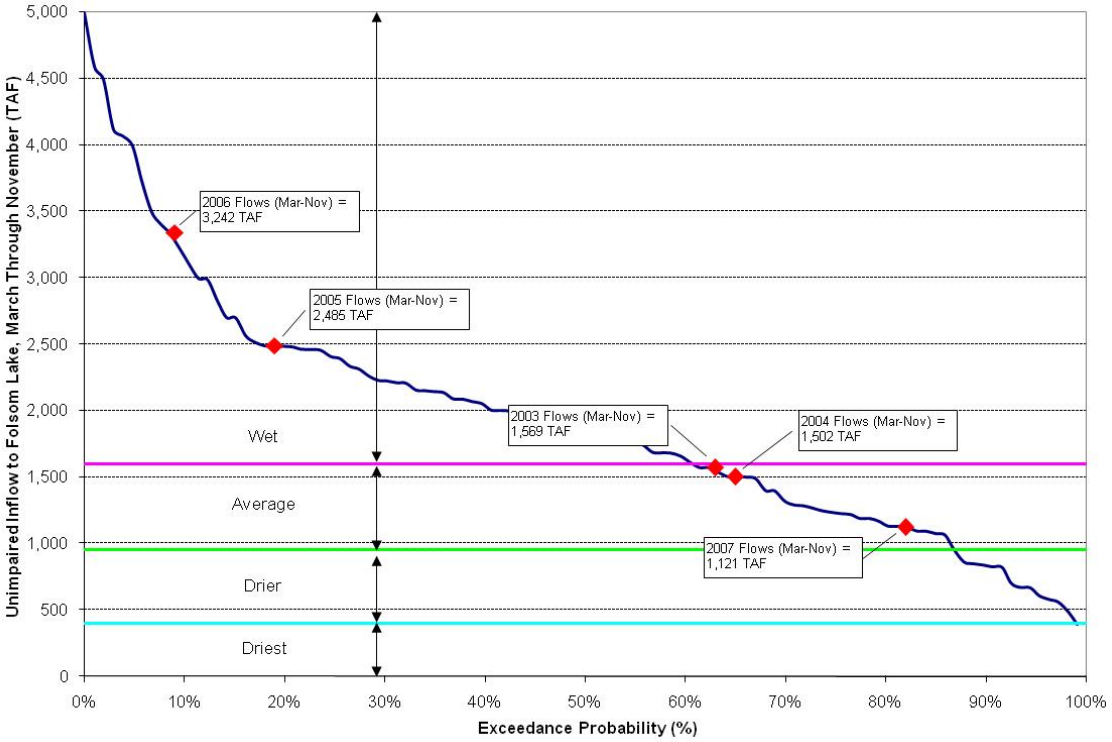


Figure 3. Unimpaired Inflow to Folsom Lake, March-November

Table 2. Water Year Types as Defined by Water Forum Agreement

Year Type	Unimpaired Inflow to Folsom Lake, March through November (acre-ft)
Wet	Greater than 1,600,000
Average	Greater than 950,000 and less than 1,600,000
Drier	Greater than 400,000 and less than 950,000
Driest[7]	Less than 400,000

[7] In these year types, diverters and others confer on how best to meet demands and protect the American River.

Total Rainfall

DWR maintains precipitation data on its California Data Exchange Center (CDEC) Web site (http://cdec.water.ca.gov) for six stations within and adjacent to the SGA area. The locations of these stations are shown on Figure 4, along with the annual precipitation totals for 2005, 2006 and 2007 for those stations. Data is available for six stations located at: Sacramento International Airport (SMF), Rio Linda (RLN), Roseville (RSV), near the American River (ARW), in Fair Oaks (CHG), and near Folsom Dam (FLD). The average precipitation at these stations for 2005, 2006 and 2007 was 21.80", 20.12" and 12.58", respectively.

Figure 5 shows the monthly average of the six CDEC sites for 2005, 2006 and 2007 in comparison to the long-term monthly average at Sacramento Executive Airport. The precipitation data shows that local precipitation does not directly correlate to the Water Year Type as discussed above. In 2005 and 2006, the average annual precipitation was very similar, while the Sacramento River Index was classified as below normal and wet, respectively, during those years.

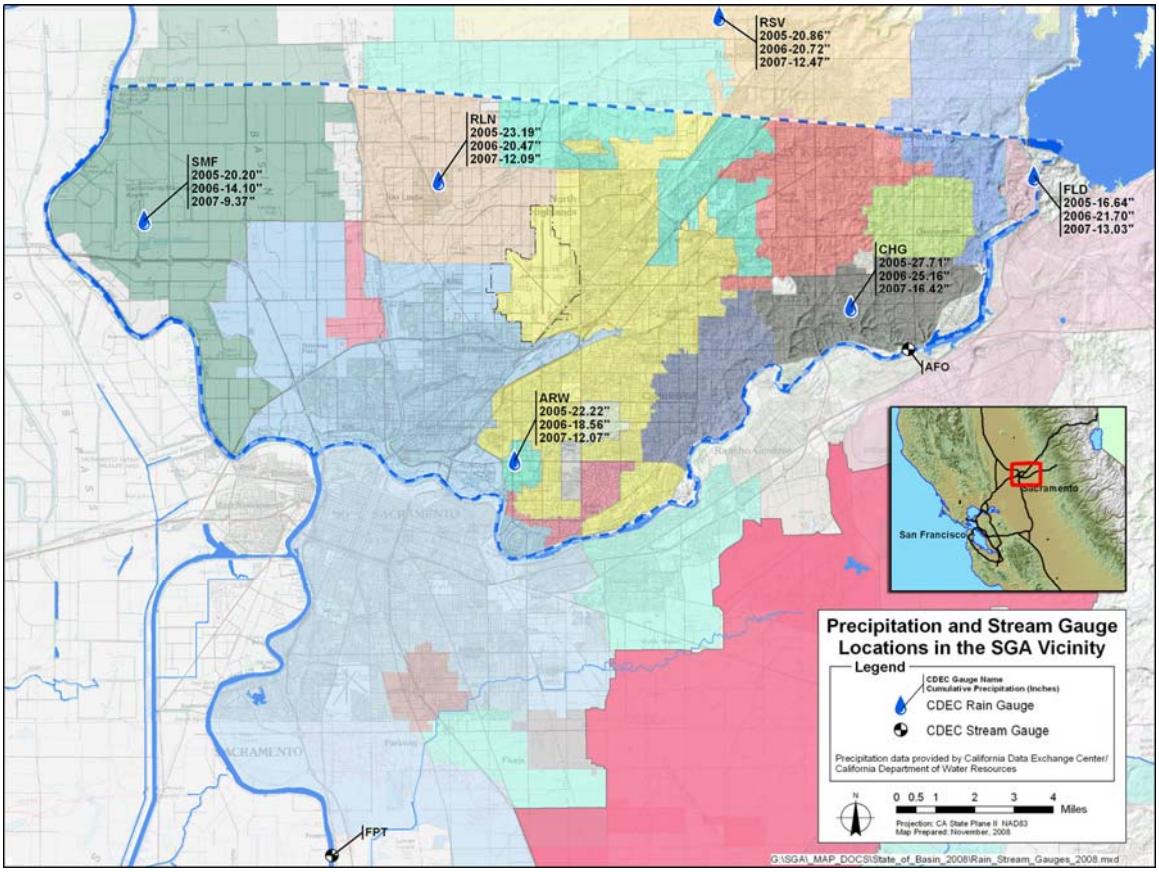


Figure 4. Locations and Precipitation Totals for Six CDEC Stations in SGA Vicinity

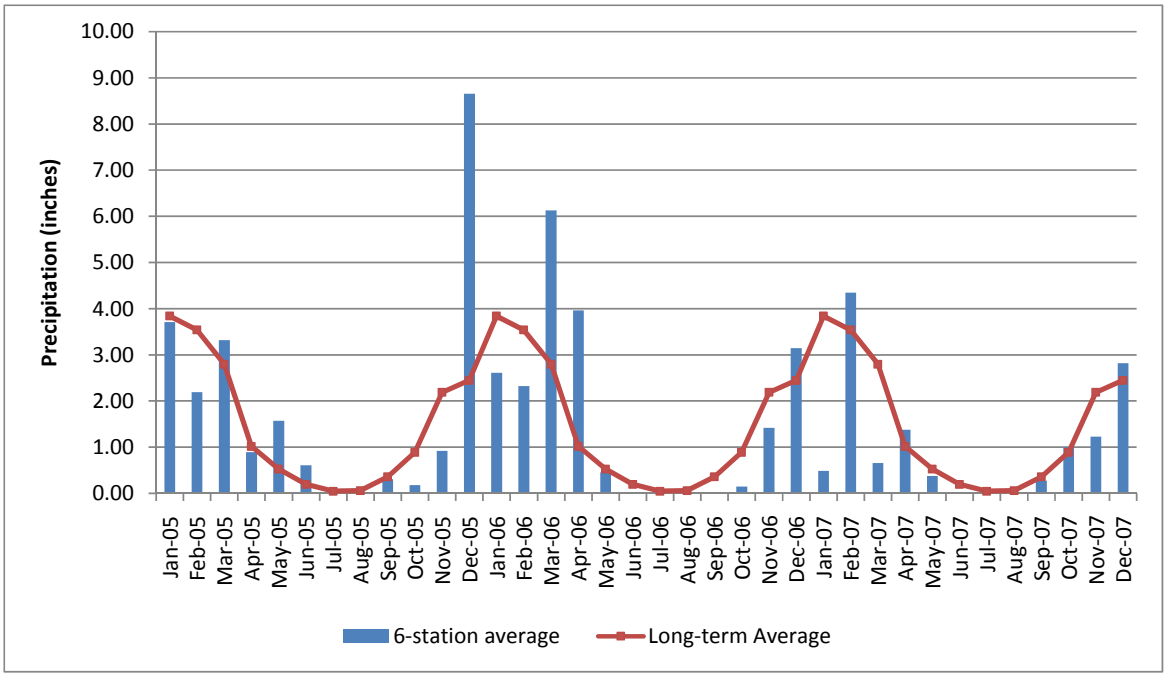


Figure 5. Monthly Six-Station Precipitation Average

Water Use

In aggregate, purveyors in the North Area Basin typically meet about half of their public water supply needs with groundwater and about half with surface water. Table 3 shows the reported surface water and groundwater supplies by agency from 2003 through 2007[8]. While the region has been moving toward more conjunctive use of surface water and groundwater, the table shows that some agencies still continue to rely entirely on groundwater, while others rely predominantly on surface water.

Figure 6 shows total reported groundwater pumping from 2000 through 2007. Over the period, groundwater extraction has decreased as additional surface water has been used under conjunctive use operations implemented in the basin following the Water Forum Agreement in 2000. Groundwater use by public water suppliers dipped below 80,000 acre-feet in 2005 and increased slightly in 2006. Previously, reported groundwater use by public water suppliers had not been below 80,000 acre-feet since 1989.

In 2007, groundwater extractions jumped to over 89,000 acre-feet. This was expected because additional surface water was not available under the dry 2007 conditions. This shift in supply demonstrates successful implementation of a conjunctive use program in the basin.

[8] This data does not include agricultural surface water supplies delivered by Natomas Central Mutual Water Company and groundwater extraction by agricultural and self-supplied users. It also does not include surface water supplies for portions of the San Juan Water District and the City of Folsom that are not within the SGA boundaries.

Table 3. Reported Surface and Groundwater Supplies by Agency

Water Purveyor	Year	Surface Water (AF)	Groundwater (AF)	Total Water Delivered (AF)
California American Water	2007	384	17,669	18,053
	2006	0	17,973	17,973
	2005	0	17,968	17,968
	2004	0	19,784	19,784
	2003	0	19,240	19,240
Carmichael WD	2007	9,509	2,868	12,377
	2006	8,971	3,519	12,490
	2005	9,722	2,347	12,069
	2004	9,843	3,836	13,679
	2003	9,358	3,265	12,623
Citrus Heights WD	2007	16,237	98	16,335
	2006	18,736	100	18,836
	2005	18,994	100	19,094
	2004	19,753	1,347	21,100
	2003	17,938	573	18,511
Del Paso Manor WD	2007	0	1,638	1,638
	2006	0	1,654	1,654
	2005	0	1,657	1,657
	2004	0	1,747	1,747
	2003	0	1,477	1,477
Fair Oaks WD	2007	11,533	899	12,432
	2006	11,178	845	12,023
	2005	12,282	172	12,454
	2004	13,629	312	13,941
	2003	12,333	240	12,573
Folsom, City of	2007	1,820	0	1,820
	2006	1,695	0	1,695
	2005	1,561	0	1,561
	2004	1,415	0	1,415
	2003	1,107	0	1,107
Golden State WC (formerly Southern California WC)	2007	0	1,252	1,252
	2006	0	1,296	1,296
	2005	0	1,248	1,248
	2004	0	1,372	1,372
	2003	0	1,311	1,311
Orange Vale WC	2007	4,452	0	4,452
	2006	3,642	0	3,642
	2005	3,376	0	3,376
	2004	4,165	0	4,165
	2003	3,816	0	3,816

Table 3 (Cont'd). Reported Surface and Groundwater Supplies by Agency

Water Purveyor	Year	Surface Water (AF)	Groundwater (AF)	Total Water Delivered (AF)
Rio Linda / Elverta CWD	2007	109	3,305	3,414
	2006	0	3,378	3,378
	2005	0	3,209	3,209
	2004	0	3,407	3,407
	2003	0	3,163	3,163
Sacramento, City of	2007	25,431	18,618	44,049
	2006	22,560	20,917	43,477
	2005	25,213	19,415	44,628
	2004	42,804	20,339	63,143
	2003	31,594	22,621	54,215
Sacramento, County of	2007	0	5,353	5,353
	2006	0	5,133	5,133
	2005	0	5,111	5,111
	2004	0	5,691	5,691
	2003	0	5,034	5,034
Sacramento Suburban WD	2007	7,544	37,932	45,476
	2006	13,345	26,559	39,904
	2005	14,364	26,830	41,194
	2004	15,338	33,261	48,599
	2003	15,214	32,494	47,708
San Juan WD	2007	4,213	0	4,213
	2006	4,038	0	4,038
	2005	3,839	0	3,839
	2004	4,379	0	4,379
	2003	4,261	0	4,261
Total for SGA Area	2007	81,232	89,632	170,864
	2006	84,165	81,374	165,539
	2005	89,351	78,057	167,408
	2004	111,326	91,096	202,422
	2003	95,621	89,418	185,039

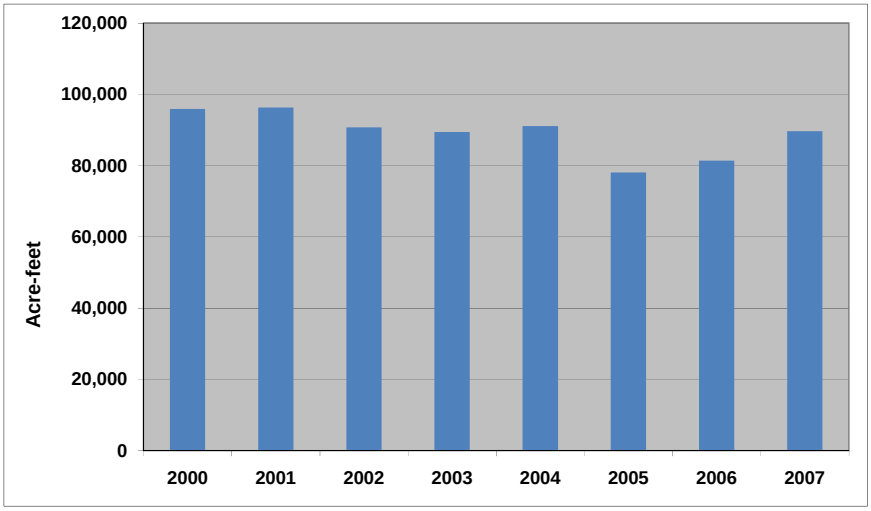


Figure 6. Groundwater Pumping in North Area Basin 2000-2007

Groundwater Elevation

DWR and Sacramento County Water Agency maintain a series of monitoring wells throughout Sacramento County with records typically dating back to the 1950s. Long-term hydrographs from the wells provide for observation of groundwater elevation trends throughout the period of major groundwater development of the underlying aquifer system. Additionally, there are many newer multiple-completion[9] monitoring wells within the basin. These wells offer a view of groundwater elevation trends as well as an understanding of the vertical gradients that exist between different depth intervals within the aquifer system.

Regional Groundwater Elevations

Since at least the 1950s, groundwater extraction was concentrated in the central part of the North Area Basin. This resulted in a regionally extensive cone of depression. Regional water purveyors have worked diligently over the past decade to finance and construct facilities to bring more surface water into the region when available, allowing groundwater levels to recover from their historical drawdown.

Figure 7 is a contour plot of equal elevations of groundwater in the North Area Basin for Spring 2006. Note the continued presence of a cone of depression in the central part of the North Area Basin. The low elevation in the area is approximately 35 feet below mean sea level (MSL), represented within the -30 foot contour. In general, the rest of the North Area Basin does not show any distinctive patterns with respect to

[9] Multiple-completion wells monitor more than one discrete depth from the same location.

regional groundwater elevations, and the water table tends to mimic the local topography. This is also reflected in the increasing density of water elevation contours as the land surface elevation gradient increases in the eastern part of the North Area Basin.

Figure 8 is a contour plot of equal elevations of groundwater in the North Area Basin for Spring 1997. Note that although the low elevation in the area was in roughly the same location as the 2006 depression, the elevation in 1997 was approximately 40 feet below mean sea level. Comparing the 1997 and 2006 elevations, it can be seen that groundwater elevations increased an average of more than five feet during that time. The increase suggests that greater use of surface water in conjunction with groundwater (conjunctive use) is having a positive impact on the basin. The effect is most noticeable within the Sacramento Suburban Water District service area (shown in yellow in both figures).

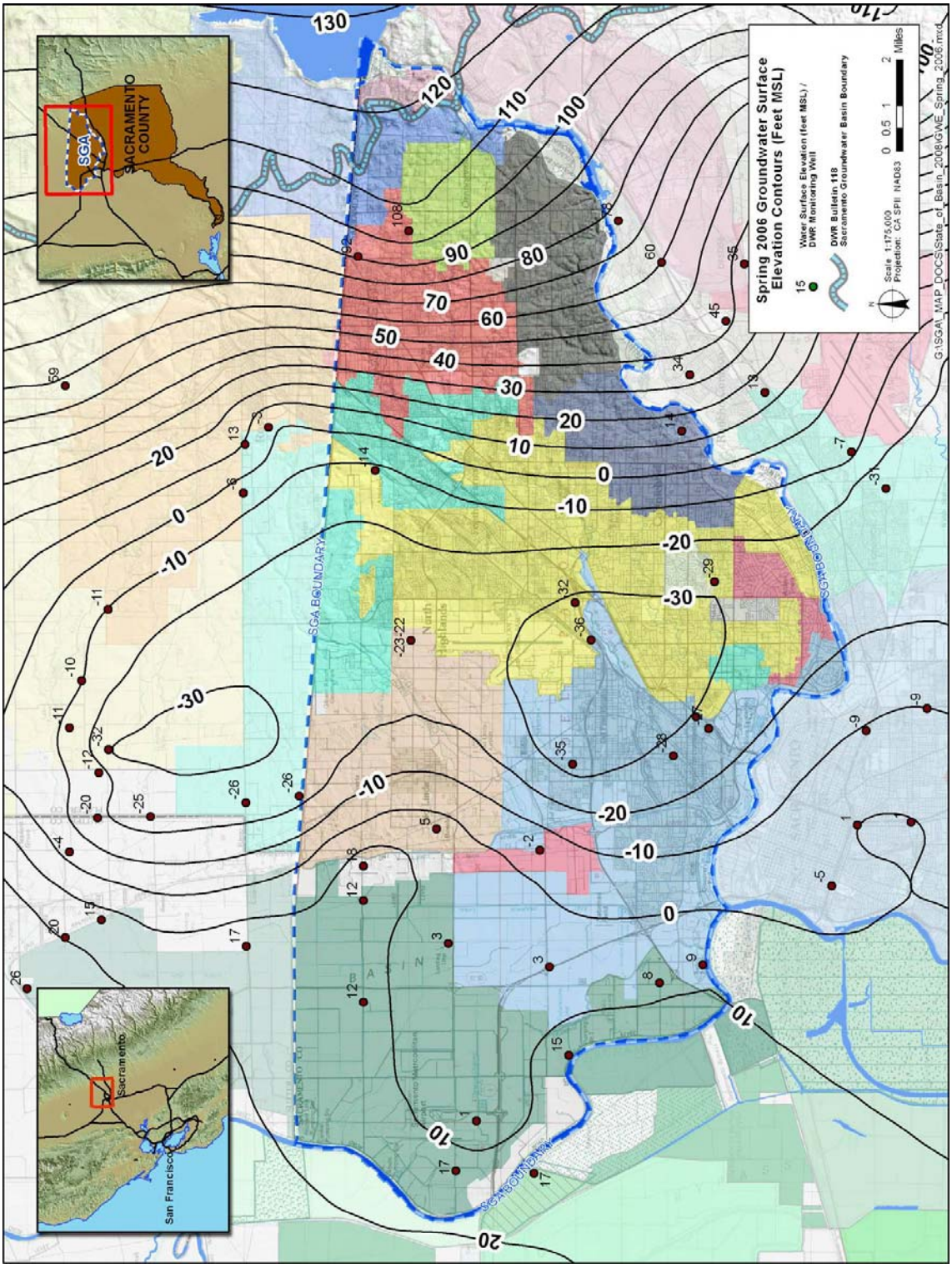


Figure 7. Groundwater Elevations in Spring 2006

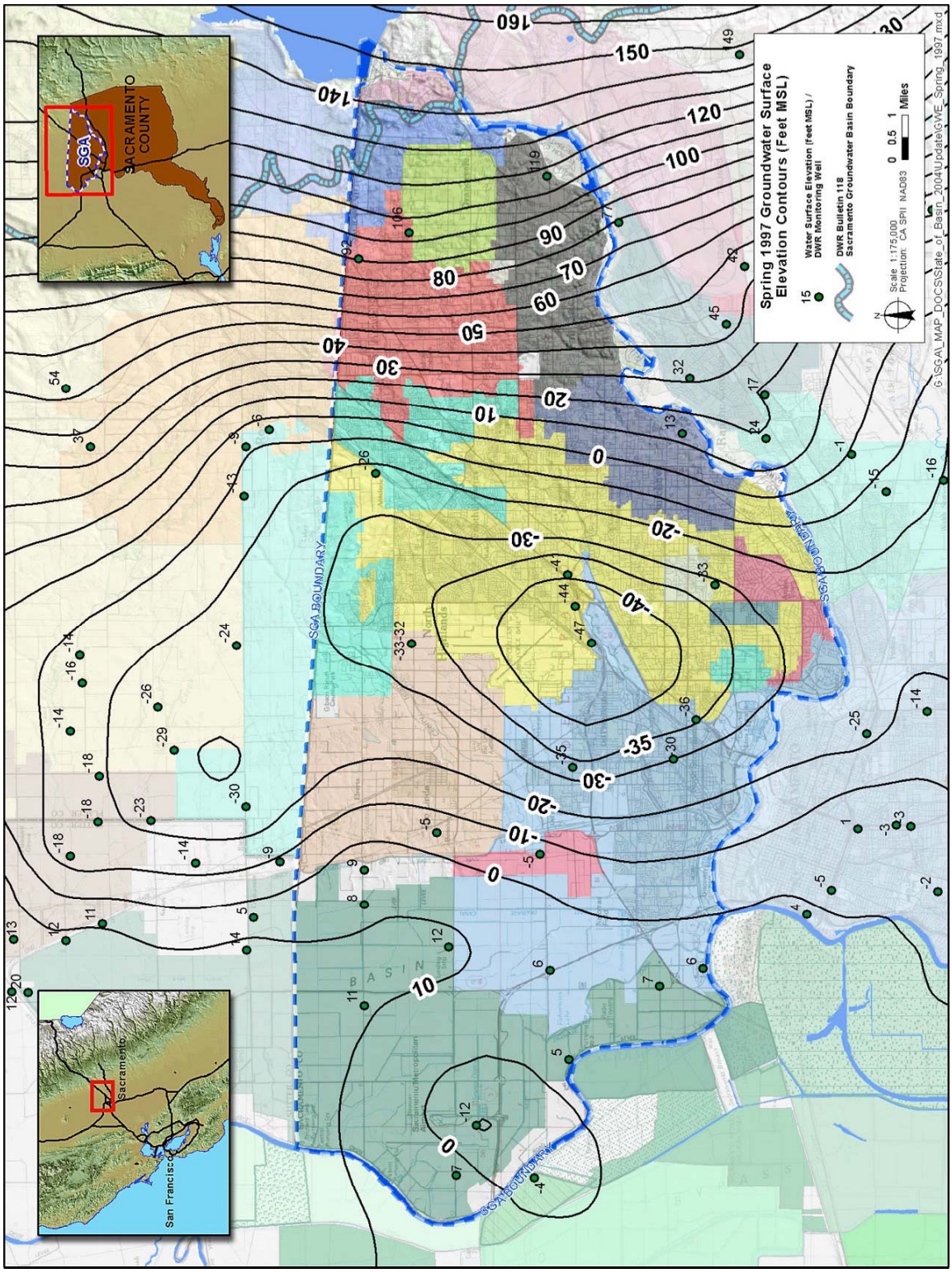


Figure 8. Groundwater Elevations in Spring 1997

Long-term Hydrographs

Figure 9 shows the locations and hydrographs of selected long-term monitoring wells in the basin. In general, data from 2005 through 2007 support observations of the previous decade that water levels are remaining stable in the basin and in some cases groundwater elevations are continuing to increase slightly. For purposes of further discussion, the North Area Basin can be divided into three sub-areas.

Western Area

The western portion of the North Area Basin is bounded by the Sacramento River on the west and extends east to approximately the boundary between Natomas Central Mutual Water Company and Rio Linda/Elverta Community Water District (Figure 9). This area is served almost exclusively by surface water. Hydrographs for SWP-216, SWP-261, and SWP-263 show that groundwater elevations range from about five feet below MSL to 20 feet above MSL. The hydrographs show that water levels have been fairly stable over the period of record, with very modest increases in 2003 and 2004. These wells typically experience only seasonal fluctuations.

Figure 10 shows a multiple-completion monitoring well constructed and maintained by DWR. This hydrograph shows that water elevations in the shallow aquifer have declined by less than five feet over the period of record and have dropped slightly over the past couple of years due to increased groundwater extractions. The hydrograph also demonstrates a downward vertical flow gradient in the middle and deeper monitored zones.

Central Area

The central portion of the North Area Basin is bounded roughly on the west by the boundary between Natomas Central Mutual Water Company and Rio Linda/Elverta Community Water District and to the east by a line running approximately along San Juan Avenue (Figure 9). This area currently uses a combination of surface water and groundwater, but has historically relied predominantly on groundwater. Hydrographs for SWP-220, SWP-229, SWP-232, SWP-240, SWP-270, and SWP-276 show that groundwater elevations currently range from about 10 feet above MSL to 40 feet below MSL. The drawdown in these wells over the past 60 years has been in excess of about 70 feet. Groundwater levels in this area continued to decline every year until around the mid-1990s, when water levels stabilize due, at least in part, to expanded conjunctive use operations. Water levels have increased slightly over previous years despite the increase in groundwater extraction in the basin in 2007. This is likely because groundwater for public supply has been reduced in the immediate vicinity of McClellan to help contain the movement of contamination.

Figure 11 shows a multiple-completion monitoring well constructed and maintained by the Air Force Real Property Agency at the former McClellan Air Force Base. The well is consistent with other longer-term hydrographs that show groundwater elevations continuing to decline into the mid- to late-1990s. Water levels have since stabilized and continue to show slight recovery. Also note that the deepest zone monitored has the highest groundwater elevation, indicating a slight upward gradient. This may be the result of the shallower three zones being pumped at a higher rate as part of groundwater remediation efforts at McClellan.

Eastern Area

The eastern portion of the North Area Basin extends roughly east of San Juan Avenue to the eastern edge of the basin (Figure 9). This area has historically relied primarily on surface water. Hydrographs for wells SWP-236 and SWP-283 are typically in excess of 100 feet above MSL. Groundwater elevations can be highly varied from one well to another, as the area has rolling topography and the groundwater level tends to mimic ground elevations. Hydrographs indicate that groundwater elevations have not changed greatly with time, reflecting the limited use of groundwater in the area. There were no notable changes in recent groundwater elevations.

Figure 12 shows a multiple-completion monitoring well constructed and maintained by Aerojet north of the American River in connection with groundwater remediation activities at the Aerojet facility near Rancho Cordova. The upper two zones are consistent with regional groundwater elevation trends declining by nearly 10 feet since the early 1990s through 2007. The deeper zone (1483) shows a downward trend beginning in the late 1990s. This is likely a localized effect associated with groundwater extractions as part of the American River Groundwater Extraction and Treatment (ARGET) facilities operated by Aerojet.

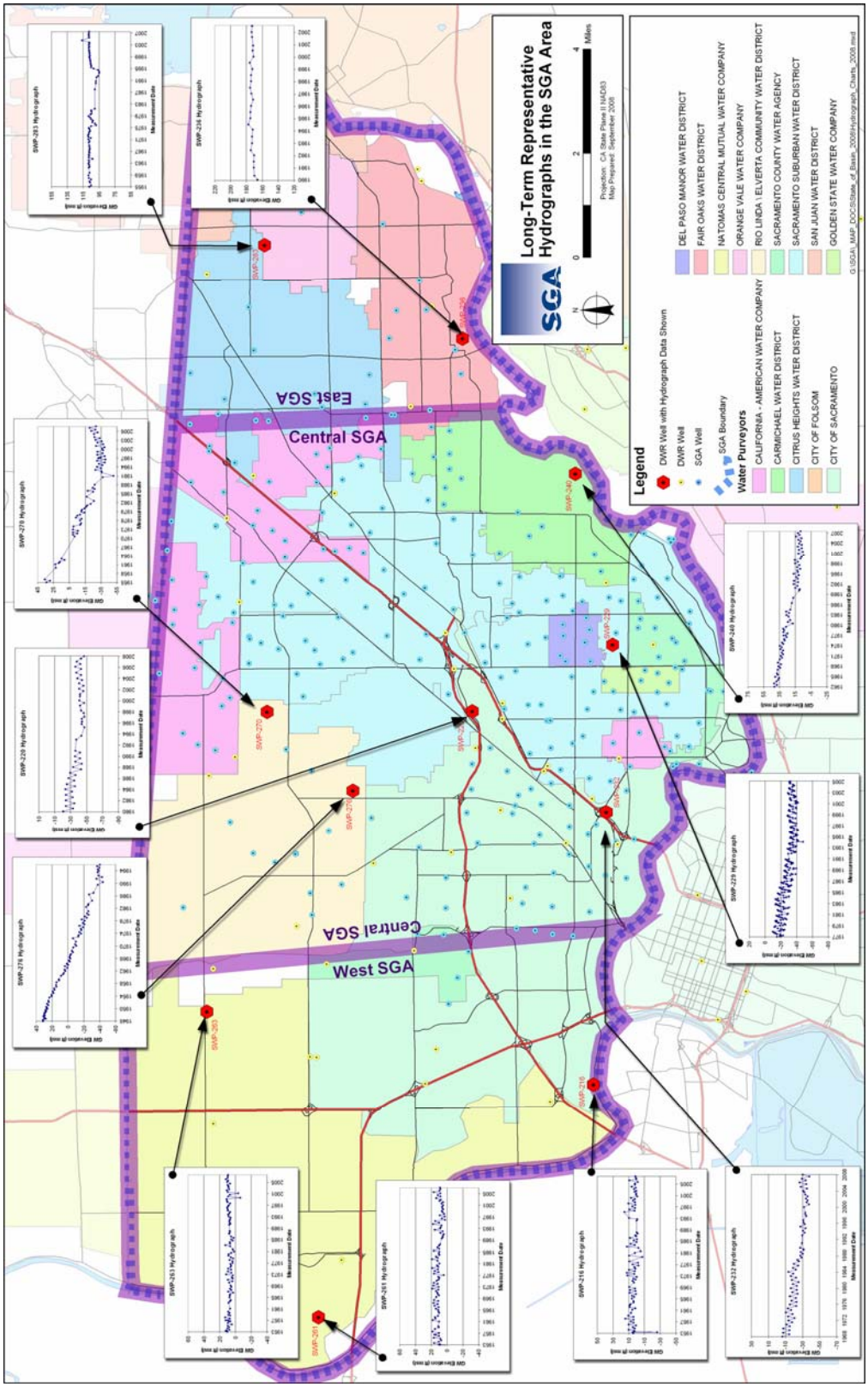


Figure 9. Long-Term Hydrographs for the North Area Basin

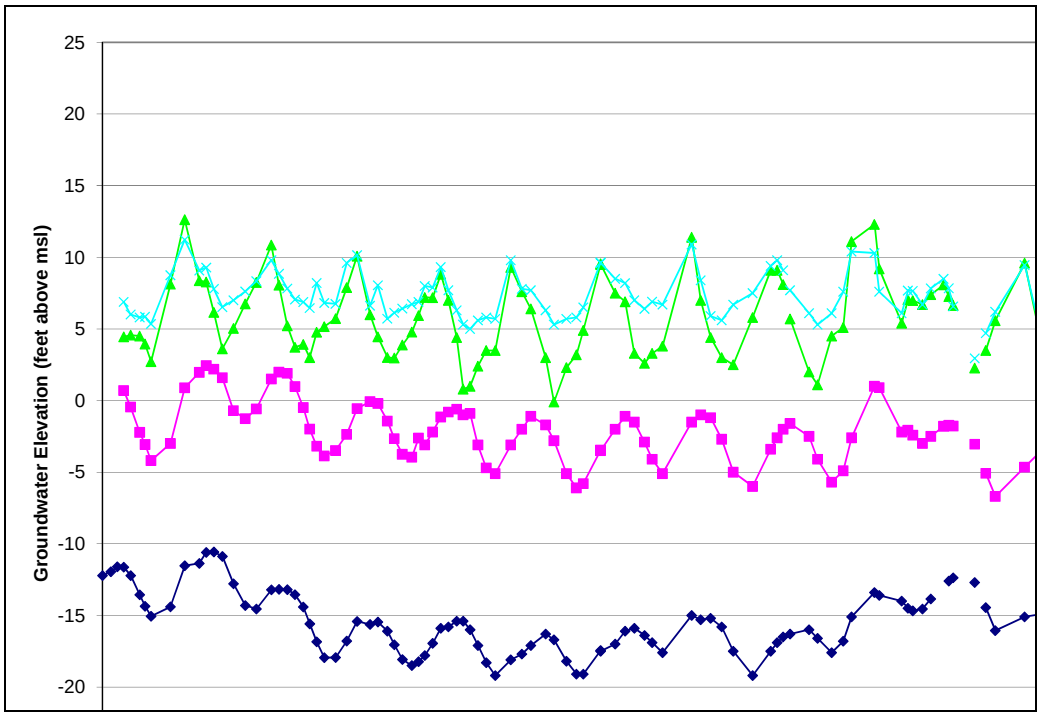


Figure 10. Multiple-Completion Monitoring Well Data for SGA Western Area

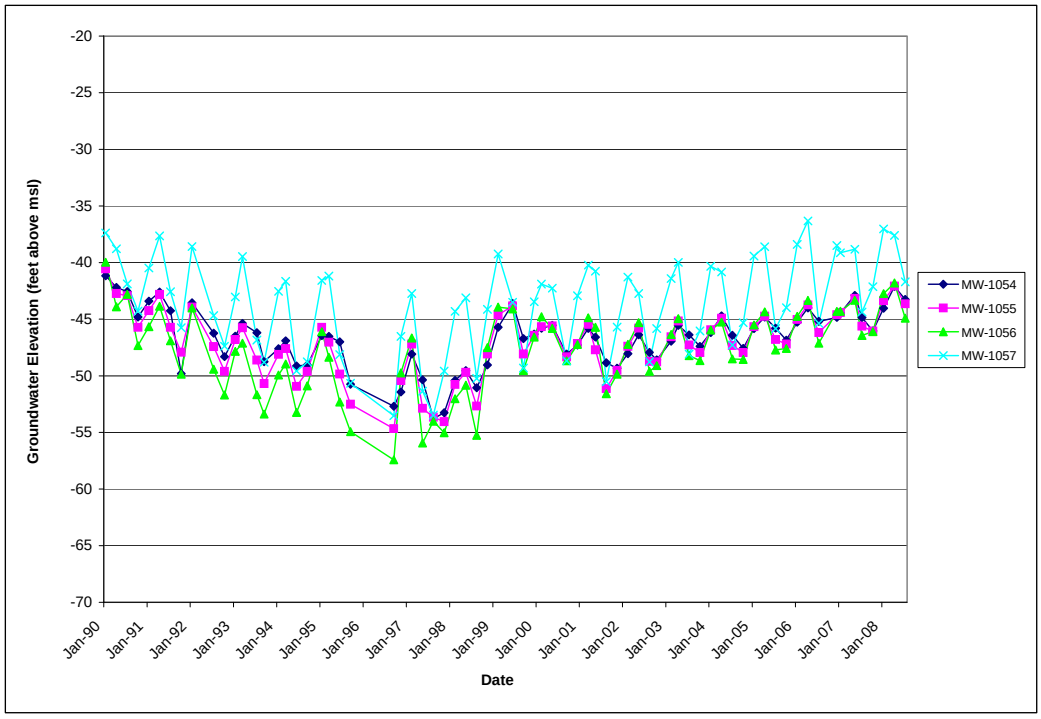


Figure 11. Multiple-Completion Monitoring Well Data for SGA Central Area

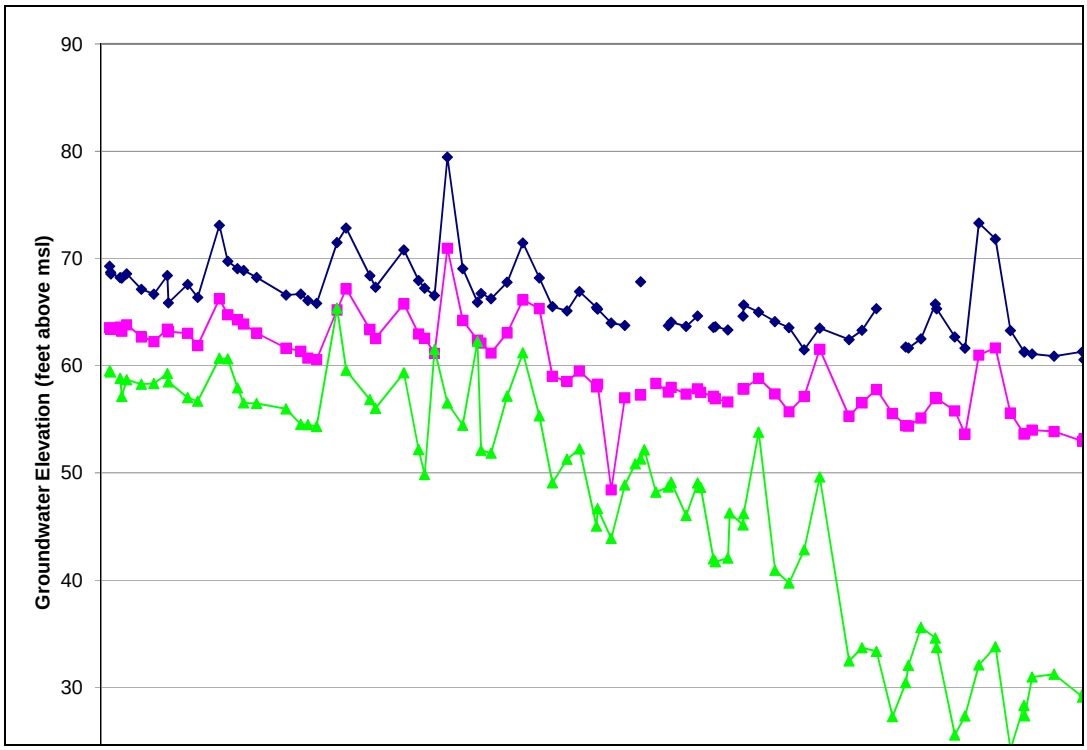


Figure 12. Multiple-Completion Monitoring Well Data for SGA Eastern Area

Groundwater Quality

Generally, the quality of groundwater in the basin is suitable for nearly all uses, with the exception of documented areas of contamination and localized quality issues discussed later in this section.

Water Quality in Public Supply Wells

There are currently 223 public supply wells in the North Area Basin classified as either “active” or “standby” by the California Department of Public Health. Additionally, there are 22 independent small water systems relying on groundwater that are monitored by the Sacramento County Environmental Management Department. SGA members provide water quality data to SGA for entry into the SGA Data Management System. This data is currently requested every other year, with the most recent update being water quality data for 2005 and 2006. While each member agency is responsible for its own compliance with drinking water regulations, SGA utilizes this information to evaluate regional conditions with respect to water quality parameters of interest.

This Basin Management Report describes available data from public supply wells for total dissolved solids (as an overall indicator of groundwater quality), arsenic, nitrate, radon, iron, and manganese. Sampling frequencies for individual constituents vary considerably and are also subject to waivers granted by the Department of Public

Health. To obtain a record for as many wells as possible, the water quality data were queried for records from 2005 through 2006. One exception is radon, for which data has been collected since 1989 to allow for as large a dataset as possible. Each of the parameters is described further below.

Total Dissolved Solids

Total dissolved solids (TDS) is a measure of all dissolved constituents in water, resulting primarily from rocks and sediments with which the water comes in contact. TDS has a secondary maximum contaminant level (MCL) drinking water standard (associated with the aesthetics of the water) of 500 milligrams per liter (mg/L). There were 107 distinct samples from wells analyzed in the period 2005 and 2006. With respect to TDS, the quality of water in the basin is excellent, with an average TDS of 266 mg/L and no wells exceeding the secondary MCL. Figure 13 shows the general distribution of TDS in public supply wells in the North Area Basin.

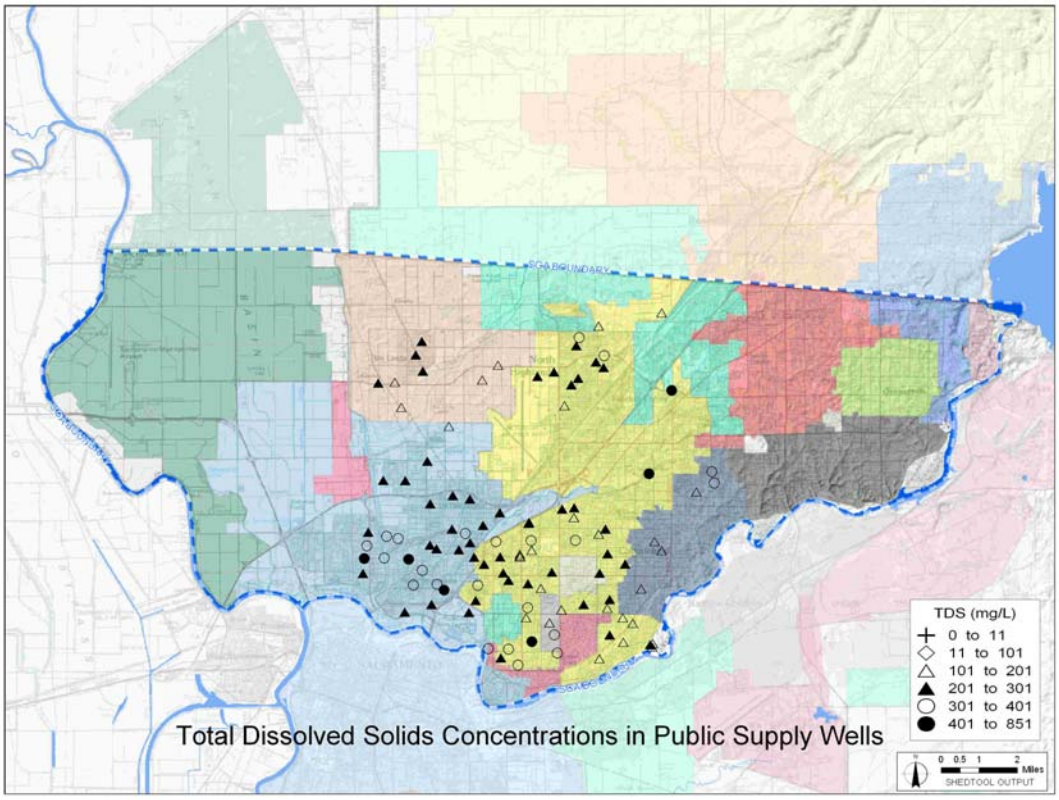


Figure 13. TDS Concentrations in Public Supply Wells in the North Area Basin

Arsenic

Arsenic is a naturally occurring element in the earth's crust. As of January 26, 2006, the federal drinking water standard for arsenic was lowered to 10 micrograms per liter (ug/L). In general, elevated arsenic in the Sacramento region is not the significant problem it is in many parts of the San Joaquin Valley. Of the 120 distinct arsenic samples from wells during the period from 2005 through 2006, eight were below the analytical detection level of 2 ug/L. Of the remaining wells with values above the detection level, the average was only 3.7 ug/L, with two wells exceeding the new federal MCL. Figure 14 shows the general distribution of arsenic concentrations in public supply wells in the North Area Basin.

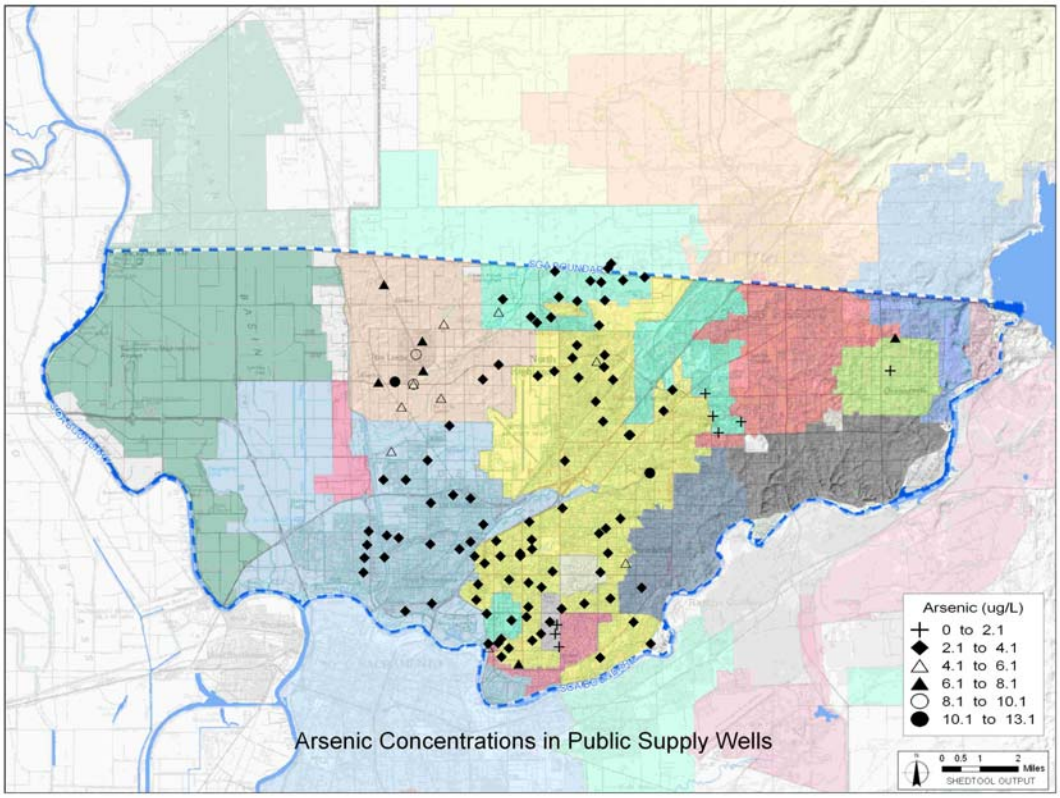


Figure 14. Arsenic Concentrations in Public Supply Wells in the North Area Basin

Nitrate

Nitrate is a naturally occurring element, but elevated concentrations are often associated with human activities such as wastewater discharge, urban runoff of applied fertilizers, and agricultural activities. High concentrations of nitrate interfere with the body's ability to transfer oxygen in the blood stream, most notably in "blue baby" syndrome. The primary MCL for nitrate (as NO3) in drinking water is 45 mg/L. Tests have shown that nitrate levels in public supply wells are generally not of concern within the North Area Basin. Of 185 samples from public supply wells tested during 2005 and 2006, the average concentration was 9.3 mg/L with a maximum observed concentration of 33 mg/L. Figure 15 shows the general distribution of nitrate concentrations in public supply wells in the North Area Basin.

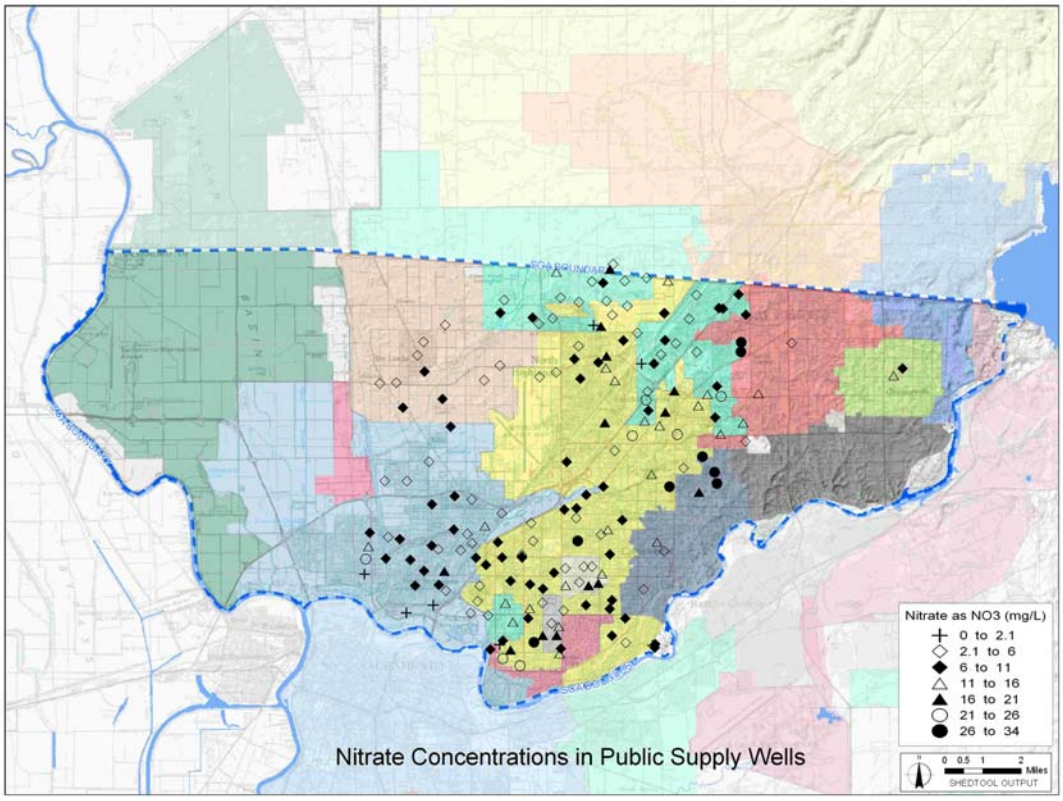


Figure 15. Nitrate Concentrations in Public Supply Wells in the North Area Basin

Radon

Radon is a naturally occurring radioactive gas believed to cause lung cancer in humans (USEPA 1999). Although radon from drinking water sources contributes only a small percentage of overall exposure to radon from all sources, EPA issued a proposed rule for maximum concentrations of 300 picoCuries per liter (pCi/L) in 1999. That rule has yet to be finalized, and it is not clear when further action will be taken. Therefore, there is no current standard for radon in drinking water.

Relative to the proposed rule, radon could be a potential future concern for local public water suppliers in the North Area Basin. Of 101 samples from public supply wells collected between 1994 and 2002, the average concentration of radon exceeded 395 pCi/L. Fifty-nine of the wells (58%) exceeded 300 pCi/L, with 16 of the wells exceeding 600 pCi/L. Local water purveyors will closely monitor this proposed rule as it is further examined in the future. Figure 16 shows the general distribution of radon concentrations in public supply wells in the North Area Basin.

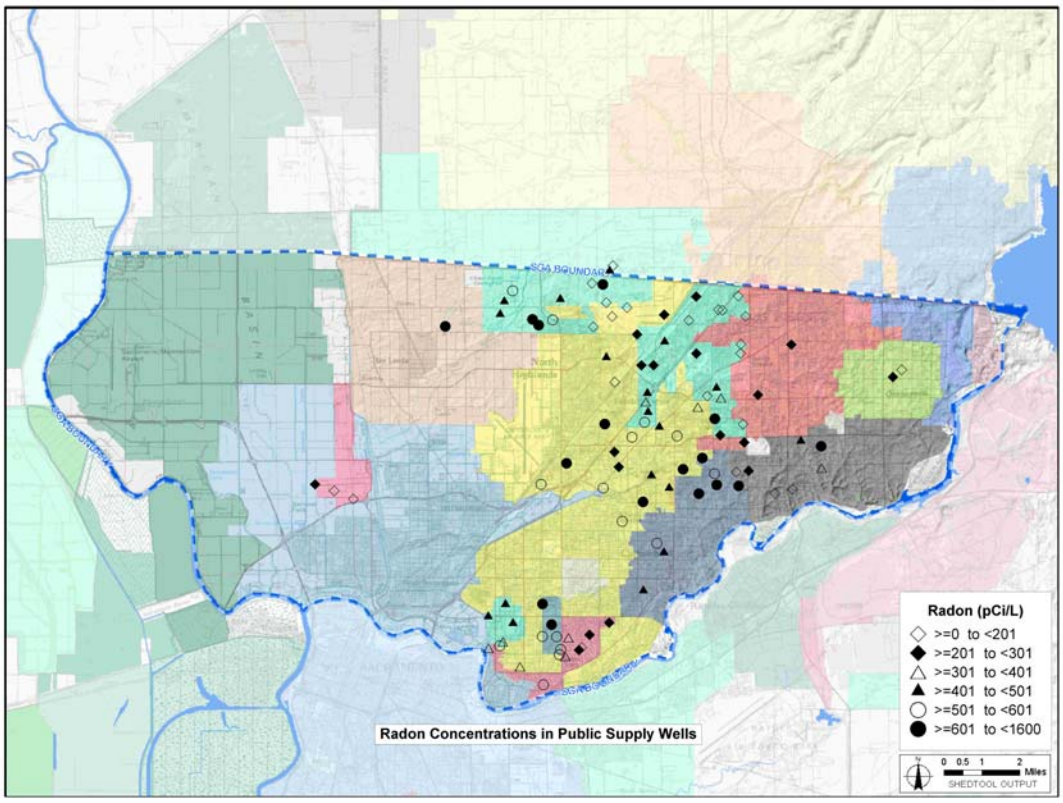


Figure 15. Radon Concentrations in Public Supply Wells in the North Area Basin

Iron

Iron is a naturally occurring element in the earth's crust and is found in groundwater as a metallic ion. Iron has a secondary MCL of 300 ug/L because at elevated concentrations, it tends to have a bad taste and can precipitate as a red-brown solid on plumbing fixtures. In general, dissolved iron is not a problem in SGA-area public supply wells. Of the 122 wells sampled from 2005 through 2006, 80 wells were below the detection level of 10 ug/L. Of the 42 wells with detections, 18 wells had concentrations exceeding the secondary MCL. Figure 17 shows the general distribution of iron concentrations in public supply wells in the North Area Basin.

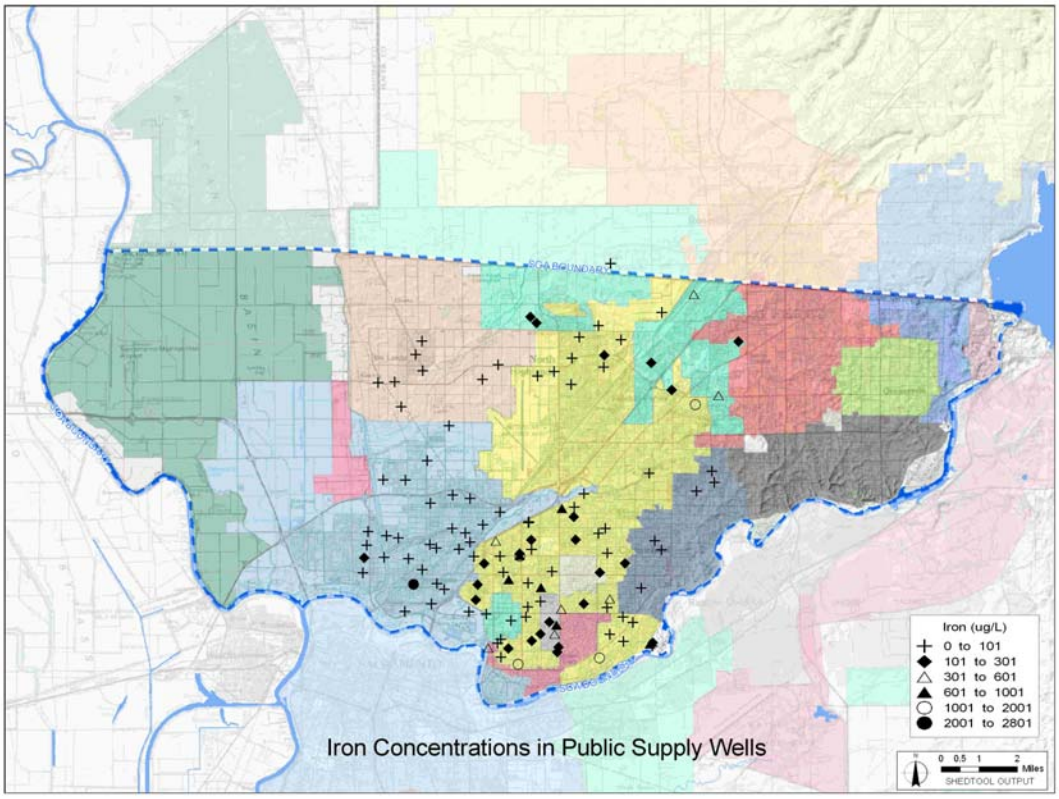


Figure 17. Concentrations of Iron in Public Supply Wells in the North Area Basin

Manganese

Manganese is a naturally occurring element in the earth's crust and is found in groundwater as a metallic ion. Manganese has a secondary MCL of 50 ug/L because at elevated concentrations, it can have a bad taste and can precipitate as a black solid on plumbing fixtures. In general, dissolved manganese is not a significant issue in SGA-area public supply wells. Of the 119 wells sampled from 2005 through 2006, 89 wells were below the detection level of 10 ug/L. Of the 30 wells with detections, 14 wells had concentrations exceeding the secondary MCL. Figure 18 shows the general distribution of manganese concentrations in public supply wells in the North Area Basin.

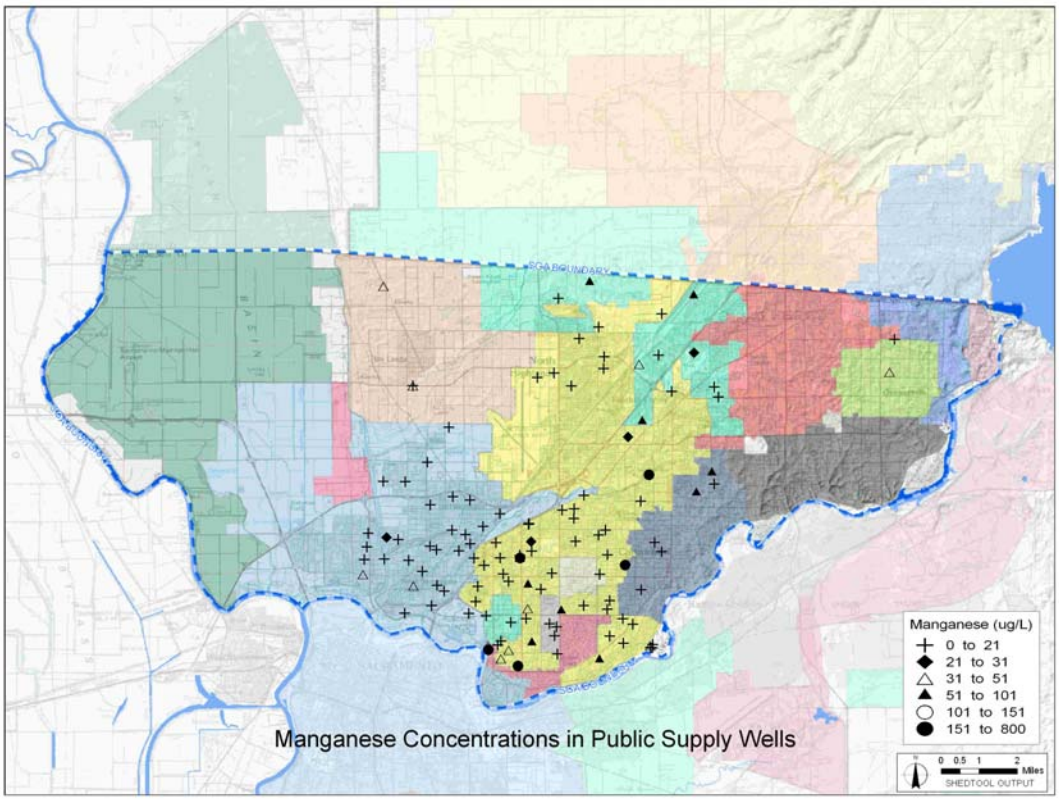


Figure 18. Concentrations of Manganese in Public Supply Wells in the North Area Basin

Known Contaminant Plumes in SGA and Vicinity

Groundwater contaminant plumes within or near the North Area Basin are present from source areas at the former McClellan Air Force Base, the former Mather Air Force Base, and Aerojet. The extent of these plumes, based on available data from late 2003 and early 2004, is shown in Figure 19. The presence of these plumes is of great concern to SGA members as it may impact their ability to fully develop conjunctive use programs to implement the Water Forum Agreement. Further identification of these plumes and other more localized sources of groundwater contamination will continue to be a major focus of the SGA Regional Contamination Issues Committee (described in the Basin Management Activities section of this report).

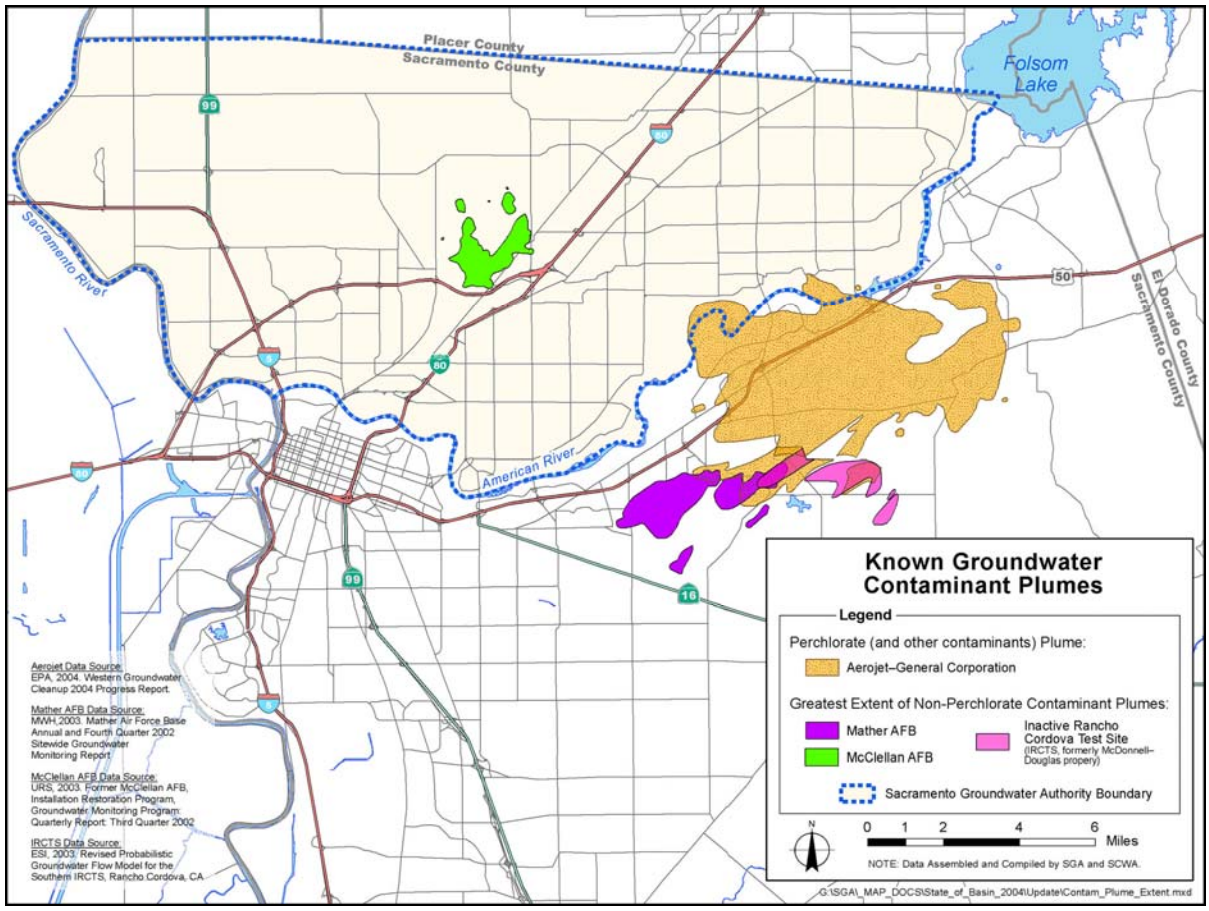


Figure 19. Extent of Contaminant Plumes in the North Area Basin and Vicinity

Basin Management Activities

Management activities in the basin during 2006 and 2007 are described in three general categories in this section: overall implementation of the SGA GMP; specific management activities by SGA that warrant more detailed discussion; and activities by other entities that are relevant to SGA.

Implementation of the SGA GMP

The GMP adopted by SGA in December 2003 identified 63 specific management actions for the groundwater basin. Significant progress was achieved in implementing these actions throughout 2006 and 2007. While many of the actions are considered ongoing, there are many others that have been completed. Appendix A provides a detailed status for each of the adopted actions. In 2008, SGA began revising its GMP to update basin management objectives and management actions. The effort will be complete in early 2009.

Other SGA Management Actions

Several key management actions identified in the GMP warrant more detailed discussion. These include: 1) continuing communication and coordination with both regulators and responsible parties to improve the effectiveness of remediation of contaminated groundwater; 2) improving the existing groundwater model for the North Area Basin; and 3) developing a water accounting framework.

SGA made significant progress on all of these items in 2006 and 2007. Each is discussed further below.

Continuing Communication and Coordination with Regulators and Responsible Parties

One issue of particular importance to SGA is the presence of extensive plumes of groundwater contamination in the region (Figure 19) associated with federal defense-related activities. This contamination may limit local water purveyors' access to a reliable supply of high-quality groundwater, which in turn would threaten the region's ability to implement the Water Forum Agreement.

Since June 2004, SGA has facilitated a Regional Contamination Issues Committee (RCIC).[10] The RCIC is a forum for water purveyors, regulators and responsible parties to raise issues and discuss solutions for dealing with groundwater contamination issues that impact the region. The committee initially met on a monthly basis, but in recent years has met on a quarterly basis.

[10] This committee was previously known as the Contamination Strategy Committee.

To highlight the region's concerns over contamination, SGA developed a groundwater contamination brochure (Appendix B) in 2006. SGA and local water purveyors have briefed members of Congress and their staff on regional groundwater contamination issues associated with federal defense-related activities. SGA has continued to request funding from the Department of Defense and the U.S. Environmental Protection Agency to support studies and other activities to protect the region's groundwater resources. In late 2007, SGA successfully applied for a $250,000 grant through the Department of Water Resources' Local Groundwater Assistance Grant Program (AB 303). This study will commence in early 2009 and will take a comprehensive approach to assessing the threats to groundwater quality sustainability from a variety of sources. Threats include the movement of known plumes, various point sources of contamination, and changing water quality standards. The results of the study are expected in early 2010 and are intended to inform long-term planning and monitoring efforts.

Improving the Existing Groundwater Model in the North Area Basin

In September 2007, an update to the Integrated Groundwater and Surface Water Model (IGSM) application for the North Area Basin was successfully completed. The previous IGSM application was developed in the mid-1990s. Since that time, several improvements were made to the programming to warrant an update of the model datasets. In particular, the model is now capable of simulating daily surface water flows, which could greatly improve simulation of the interaction between groundwater and surface water systems. Additionally, improvements have been made to the algorithm that calculates the surface water/groundwater interaction. Finally, improvements to desktop computer processor speeds enable a much greater number of calculations to be made in shorter time periods. This in turn enables more model nodes, resulting in a more refined model grid and more detailed simulations in areas of particular interest.

Half of the update was funded through a $250,000 grant from the Department of Water Resources' Local Groundwater Assistance Program (AB 303) to SGA. The remaining half of the update was funded through a partnership between the Regional Water Authority (RWA), the U.S. Army Corps of Engineers, and a Proposition 50 planning grant from DWR.

The model improvements included: 1) updating the hydrology for the calibration period (1970 through 2000) from monthly to daily; 2) refining the model grid to improve the model simulation, particularly along stream nodes where recharge to the aquifer system may be occurring; 3) identifying additional monitoring wells to increase the number of groundwater elevation measurements used in calibrating aquifer hydrogeologic parameters; and 4) developing baseline models of existing and future conditions to evaluate potential impacts of various conjunctive use scenarios.

Developing a Water Accounting Framework

Among the purposes for establishing SGA in 1998 were the following:

- To maintain the long-term sustainable yield of the North Area Basin.
- To manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors.

To help satisfy these purposes, SGA embarked on creating a Water Accounting Framework (Framework) beginning in early 2006 that was intended to reward and create incentives for agencies developing or expanding conjunctive use practices. The objectives of establishing the Framework were identified as follows:

1. Ensure a safe and sustainable water supply for the greater Sacramento region.
2. Encourage water purveyors to "bank" water in the basin, when available, for use during dry periods.
3. Establish a framework that supports groundwater banking programs by setting forth rules for operating a model groundwater bank, and monitoring the basin to ensure its sustainability as the program is implemented.
4. Refine and enumerate SGA's role in implementing the objectives of the Framework.

In June 2007, the SGA Board adopted Phase II of the Framework (see Appendix C), which established that SGA would:

1. Maintain the various modeling and management tools needed to assess the results of conjunctive use operations in the basin.
2. Maintain an accounting of groundwater "deposits" and "withdrawals" associated with implementing a conjunctive use program.
3. Communicate with regional stakeholders on the progress of implementing the conjunctive use program.

With the adoption of the Phase II framework, the SGA Board directed staff to conduct a Phase III effort to establish the following:

1. Survey how various water banks operate in the state, and recommend criteria on how local agencies conducting conjunctive use programs could potentially participate in banking and exchange agreements with partners external to the North Area Basin.
2. Recommend monitoring criteria that would allow SGA to assess the long-term sustainability of the groundwater basin as conjunctive use and potential banking programs are operated in the North Area Basin.

Phase III was initially targeted for completion by December 2007. However, a variety of factors caused delays in the completion of this phase. In addition, the USBR and

DWR recently established criteria for participating in a drought water bank that should be incorporated into a banking and exchange program. SGA staff is reviewing these criteria and expects to complete Phase III of the Framework by mid-2009.

Management Actions by Other Agencies

SGA's management activities are closely coordinated with those of other regional agencies. In 2006 and 2007, several key management activities occurred that were directly relevant to SGA. Significant activities by RWA, Placer County, Central Sacramento County Groundwater Forum, and associated stakeholders are discussed further below.

RWA Integrated Regional Water Management Plan

In April 2004, RWA launched the Integrated Regional Water Management Planning Program. In partnership with the U.S. Army Corps of Engineers, 16 RWA members are participating in developing an Integrated Regional Water Management Plan (IRWMP) and associated tools to identify the regional projects and partnerships that will help the region best meet its future needs.

In 2006 RWA, the Freeport Regional Water Authority (FRWA) and the Sacramento County Water Agency entered into a partnership to develop a single plan known as the American River Basin Integrated Regional Water Management Plan (ARB IRWMP) to further integrate planning efforts in central Sacramento County. The plan was adopted in May 2006.[11]

Subsequent to completion of the ARB IRWMP, RWA successfully applied for a $25 million grant from the Prop 50 Implementation Grant Program administered by DWR to complete 14 priority projects through the region. Table 4 provides information on each of the projects. While all of the projects will benefit SGA's management efforts, there are four specific projects within the North Area Basin. These projects include construction of three new groundwater extraction wells to increase the conjunctive use capacity of the basin and a 5 million gallon per day expansion of the Bajamont Water Treatment Plant (WTP) in Carmichael. This WTP expansion will allow Carmichael Water District to reduce groundwater pumping in an area significantly threatened by the presence of contaminated groundwater associated with the Aerojet facility.

[11] The ARB IRWMP is available on-line at: http://www.rwah2o.org/rwa/programs/irwmp/

Table 4. Proposed ARB IRWMP Projects

Project Title	Implementing Agency	Total Project Cost	Local Cost	Grant Funds
Freeport Regional Water Project	Freeport Regional Water Authority	$63,326,885	$51,601,256	$10,725,629
Gardenland Flood Mgmt, Habitat Restoration and Recreation Project	Sacramento Area Flood Control Agency	$5,623,324	$5,140,324	$483,000
South Sacramento County Water Reclamation Betterment and Expansion	Sacramento Regional County Sanitation District	$21,131,250	$19,003,831	$2,127,419
Sacramento Suburban Water District Groundwater Production Well Project	Sacramento Suburban Water District	$2,493,487	$1,743,487	$750,000
Rosemont Conjunctive Use Pipeline	City of Sacramento	$2,589,613	$1,839,613	$750,000
Woodcreek North Aquifer Storage and Recovery Project	City of Roseville	$2,585,860	$2,225,860	$360,000
Bajamont Water Treatment Plant Expansion	Carmichael Water District	$1,734,198	$1,324,198	$410,000
Roseville Water Treatment Plant Expansion	City of Roseville	$38,800,000	$32,770,000	$6,030,000
Cosumnes River Management & Conjunctive Management	The Nature Conservancy	$573,044	$173,044	$400,000
Orangevale Groundwater Production Well Improvement Project	Orange Vale Water Company	$1,340,000	$940,000	$400,000
Old Auburn Road Groundwater Production Well	Citrus Heights Water District	$2,405,000	$1,805,000	$600,000
Placer County Water Agency Sunset Industrial Area Groundwater Supply Improvements	Placer County Water Agency	$3,950,000	$3,200,000	$750,000
County of Sacramento Low Flow Drainage Project	County of Sacramento	$972,500	$528,548	$443,952
Lincoln Reclaimed Water Distribution System Expansion	City of Lincoln	$4,275,000	$3,505,000	$770,000
	Grand Total	**$150,800,161**	**$125,800,161**	**$25,000,000**

Placer County Groundwater Management

In 2007, the City of Roseville (Roseville), Placer County Water Agency (PCWA), the City of Lincoln, and California American Water adopted the Western Placer County Groundwater Management Plan (WPCGMP). The WPCGMP is focused on the southwestern Placer County portion of the North American Subbasin and is intended to complement other existing GMPs in the greater Sacramento region.

Central Sacramento County Groundwater Management

When the Water Forum Agreement was executed in April 2000, a key element of the agreement was the establishment of groundwater management entities over the north, central, and south portions of Sacramento County. The Central Sacramento County Groundwater Forum (CSCGF) began in February 2002, with 30 representatives from six interest groups participating in negotiations to develop a management structure for the area south of the American River and north of the Cosumnes River. SGA was an active participant in those meetings and provided guidance to the CSCGF on a variety of groundwater management structure options.

In August 2006, the Sacramento Central Groundwater Authority (SCGA) officially formed as a joint powers authority between Sacramento County and the cities of Elk Grove, Folsom, and Rancho Cordova. In November 2006, the SCGA adopted a groundwater management plan for the central Sacramento County area. SGA staff regularly attends SCGA meetings.

South Sacramento County Groundwater Management

In 2007, representatives of south Sacramento County groundwater interests convened to discuss groundwater management issues. This group, known as the South Area Water Council (SAWC), is convened by the Southeast Sacramento County Agricultural Water Authority, Sacramento County Water Agency, City of Galt, The Nature Conservancy, and Rancho Murieta Community Services District. After a stakeholder input process, the SAWC is expected to adopt a groundwater management plan for the south county.

Conclusions and Recommendations

Throughout 2006 and 2007, SGA made significant strides toward ensuring a reliable groundwater basin for future generations and advancing successful implementation of the Water Forum Agreement. With the development of critical monitoring and management tools, SGA now has a solid foundation for managing the basin. These tools include the SGA Data Management System, a regional monitoring well network, an updated regional IGSM model to help analyze future conjunctive use operations aimed at improving water supply reliability. In addition, SGA has raised the visibility of regional contamination issues among policy makers and focused significant attention on the potential impact contamination could have on local water supplies.

As stated in the introduction to this report, the Groundwater Management Plan adopted by SGA includes five primary objectives. SGA and its members have made significant progress toward meeting each of these objectives. That progress is described in further detail below.

SGA Groundwater Management Plan Objectives

Maintain or improve groundwater quality in the SGA area for the benefit of basin groundwater users

SGA is making good progress toward meeting this objective. With the noted exception of regional contamination plumes, groundwater quality is very good in the basin and suitable for public water supply needs. SGA has taken a proactive approach to improving the basin's groundwater quality through its Regional Contamination Issues Committee. The committee meets regularly with regulatory agencies and responsible parties to ensure that the basin's importance as a public water supply is considered in developing clean-up strategies. Actions by this committee have helped ensure that clean-up efforts remain on track at McClellan and that effective clean-up strategies are aggressively pursued for recently detected contaminants associated with Aerojet. The planned 2009 study to assess the threats to groundwater quality will provide a quantitative estimate of our ability to sustain the basin from a water quality perspective.

Maintain groundwater elevations that result in a net benefit to basin groundwater users

SGA member agencies have implemented a variety of programs in recent years that are helping to meet this objective. Groundwater elevation contour maps included in this report clearly show that conjunctive use programs are starting to produce tangible results. More projects are under way that will further benefit the basin and support implementation of the Water Forum Agreement. The long-term hydrographs shown previously in this report clearly demonstrate the benefits of conjunctive use in the basin.

Finally, SGA recently completed Phase II of a Water Accounting Framework that will help ensure the basin is operated in a sustainable fashion and that some cost equity is achieved for those investing most heavily in conjunctive use facilities in the basin.

Protect against any potential inelastic land surface subsidence

While subsidence is not a documented problem within the North Area Basin, SGA and its members have taken steps to monitor for potential future subsidence. As part of the regional monitoring well project funded by an AB 303 grant, SGA has established specific well elevations with a level of accuracy that will allow future surveys to detect potential land surface subsidence. Sacramento Suburban Water District has also recently completed surveys that demonstrate that subsidence is not a concern in the North Area Basin.

Protect against adverse impacts to surface water flows in the American River and Sacramento River

SGA is making progress toward meeting this objective. SGA recently installed two dedicated monitoring wells intended to observe the relationship between water elevations in the American River and the adjacent groundwater basin. These wells are located along the central part of the lower American River, where the greatest amount of groundwater pumping is likely to occur in the future. SGA also recently identified dozens of existing monitoring wells along the American and Sacramento rivers. SGA will begin assessing this data to better understand the current relationship between the surface water system and underlying aquifers, and investigate the potential for future interactions between these two systems.

In addition to direct monitoring, SGA completed enhancements to the existing IGSM in 2007. Enhancements included refining the model elements that represent the American River and improving the level of simulation to include daily as well as monthly data. This improved understanding of the surface water/groundwater relationship will allow SGA to develop operational scenarios if needed to ensure that surface water systems are adequately protected.

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

SGA is making progress toward meeting this objective. The modeling and monitoring along the river systems demonstrate that groundwater is not discharging to the surface water to any appreciable degree, so the potential to have negative impacts from groundwater is negligible.

Recommendations for GMP Objectives and Action Items

While SGA has demonstrated great success in implementing its GMP since its adoption in 2003, the GMP Implementation Committee should review the GMP objectives and actions as part of a comprehensive plan update in early 2009.

Appendix A

GMP Action Items

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT			
1.1	***Involving the Public***		
1	Continue efforts to encourage public participation as opportunities arise.	On-going	Provide GMP Program status update at each publicly noticed SGA Board meeting.
2	Review and take actions from the public outreach plan as necessary during implementation of various aspects of the GMP.	On-going	SGA has not encountered any issues requiring significant public outreach since adopting the GMP. To date, the most effective ways of notifying the public have been through regular Board meetings, quarterly newsletters, and the SGA website. The SGA website includes a regularly updated announcements section on the main page. Finally, SGA's participation in regular monthly meetings of the Water Forum Successor Effort (see item below) provides opportunities to identify issues from a variety of interests throughout the region.
3	Provide briefings to the Water Forum Successor Effort on GMP implementation progress.	On-going	SGA staff participate in regular monthly meetings of both the Water Forum Successor Effort and are available to provide briefings upon request. SGA staff met with incoming WFSE Executive Director on August 7, 2007 to provide a briefing on SGA activities.
4	Work with members to maximize outreach on GMP activities including the use of the SGA website, member websites, or bill inserts.	On-going	SGA website launched in November 2003 (www.sgah2o.org). Provide updates through regular quarterly newsletter by RWA and SGA. Beginning in May 2007, SGA staff is conducting additional outreach to SGA member agencies by presenting SGA overview at regular meetings of member agencies. Between June and October, briefings were provided to nine SGA member agencies.
1.2	***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	SGA staff participate in regular meetings of both the Water Forum Successor Effort and the Central Sacramento County Groundwater Forum.
2	Provide copies of the adopted GMP and subsequent annual reports to representatives from Placer, Sutter, and Yolo counties, and the Groundwater Forum.	On-going	Copies of the GMP were sent to Placer County (Placer County Water Agency, City of Lincoln, City of Roseville), Sutter County (South Sutter Water District, Sutter County Public Works), Yolo County Resources Coordinator, and Sacramento County Water Agency (representing the Central Sacramento County Groundwater Forum) on January 22, 2004. The schedule for the Basin Management Report (BMR) has been modified to a biennial report. Copies of the BMR were mailed on June 26, 2006 to stakeholders representing Yolo County Water Resources Association, South Sutter Water District, Placer County Water Agency, City of Roseville, City of Lincoln, Central Sacramento County Groundwater Forum, and the Water Forum Successor Effort.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
3	Meet with representatives from Placer, Sutter, and Yolo counties, and the Central Sacramento County Groundwater Forum as needed.	On-going	Left voice mail with Linda Fiack, Yolo County Resource Director (530) 666-8019 on July 30, 2004 offering to provide briefing at their request. Spoke to Brad Arnold, GM of South Sutter WD (530) 656-2242 on July 30, 2004. Brad indicated that South Sutter WD will begin updating their AB3030 plan soon. SGA offered assistance, including potentially sitting on an advisory committee for the update. On August 30, 2004, Sacramento County WA staff requested that SGA staff participate in limited review of a GMP under development for SCWA's Zone 40 area. Attended regular monthly meetings of Central Sacramento County Groundwater Forum. In August 2006, the Forum officially formed as the Central Sacramento Groundwater Authority. SGA staff attend regular meetings of the Authority as appropriate. SGA/RWA Executive Director serves on the Implementation Committee of the City of Lincoln GMP.
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 a list of agricultural groundwater pumpers concerns and needs relative to SGA's management of the area.	Deferred	Met with Jack DeWit, an SGA Board member and independent agricultural groundwater pumper within SGA in May 2004. Jack agreed to facilitate setting up a meeting with what is a small number of independent pumpers in early 2005 prior to commencement of the next growing season. In June 2005, the SGA adopted a resolution to not assess fees to agricultural water pumpers. The GMP Implementation Committee recommended that staff defer action on this item until such time as specific concerns or needs are expressed.
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.	Deferred	Received list with contact information of 23 small water systems licensed through DHS within the SGA area from Sac County EMD (small water systems in SGA.doc) on August 31, 2004. The systems total approximately 35 wells. EMD confirmed that pumping by these systems is not reported to the EMD or DHS. Because these pumpers likely account for a very small percentage of pumping in the basin, the GMP Implementation Committee has decided to defer any actions in coordinating with them at this time.
1.3	***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.	Complete	A GMP Implementation Committee was established on July 8, 2004 consisting of Mitch Dion (Cal-AM WC), Rob Roscoe (SSWD), Shauna Lorance (SJWD) and Gary Reents (City of Sacramento). The first committee meeting was held August 2, 2004. Committee met January 31, 2005. Will meet as needed for future.
1.4	***Developing Relationships with State and Federal Agencies***		

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
1	Continue to develop working relationships with local, state, and federal regulatory agencies.	On-going	Provided regional briefing of water supply issues to the Manager of the Water Policy and Reform Team for the Government of Australia on Oct 8, 2004. The briefing was given at the request of DWR. Met with management and staff of USEPA, SWRCB, Central Valley RWQCB, DTSC, Water Forum Successor Effort, and purveyors on November 4, 2004 to express concerns over regional impacts of contamination in basin. Beginning in June 2005, set the fourth Tursday of every month as a standing meeting date with regulatory representatives of Aerojet and McClellan contaminant sites. This meeting will serve to involve other regulatory agencies as needed. Met again with regulatory agency staff to update progress in November 2006. SGA staff serve on a Joint Technical Team to evaluate groundwater remediation options at McClellan. The JTT was sunsetted in June 2006 with the successful conclusion of a remediation plan for VOCs in groundwater at McClellan. This resulted in the execution of a Record of Decision for remediation in August 2007.
1.5	***Pursuing Partnership Opportunities***		
1	Continue to promote partnerships that achieve both local supply reliability and achieve broader regional and statewide benefits.	On-going	SGA staff will promote partnerships as requested by SGA membership. SGA is closely coordinated with the RWA Integrated Regional Water Management Planning Program. Part of that effort has identified the need to update the IGSM regional model. SGA was successful in its application for an AB 303 grant from DWR to fund half of the update in June 2005.
2	Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.	On-going	Awarded $250K AB303 grant on June 30, 2004 for regional monitoring well network. Awarded $250K AB303 grant on June 30, 2005 for update to regional groundwater model. SGA is currently preparing an AB 303 grant application due in December 11, 2007.
COMPONENT CATEGORY 2: MONITORING PROGRAM			
2.1	***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.	Complete	SGA met DWR and SCWA on January 29, 2004 at the DWR Central District Office. The status of the existing wells in the monitoring network was discussed. Some of the wells are questionable for monitoring and the agencies will work together to look for opportunities to replace those wells in the long-term.
2	Coordinate with DWR and SCWA to ensure that the selected wells are maintained as part of a long-term monitoring network.	Complete	SGA met DWR and SCWA on January 29, 2004 at the DWR Central District Office and explained the importance of their monitoring wells to our overall network and determined that both DWR and SCWA are maintaining long-term monitoring plans in the basin.
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.	Complete	SGA met DWR and SCWA on January 29, 2004 to coordinate the timing of water elevation measurements. An April 15 goal was set for the collection of spring water elevations. An October 15 goal was set for the collection of fall water elevations. Each participating agency attempted to collect levels within +/- two weeks of these dates. The most recent request for water elevation data was sent to participants in October 2007.
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.	Complete	The final GMP was sent to all member agency General Managers and Directors on January 23, 2004. Water level measurement protocols are included in Appendix D of the SGA GMP. The other important aspect with respect to protocol is the timing of measurements. SGA coordinated with member agencies to collect spring water elevations around April 15 and fall measurements around October 15.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
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.	Complete	SGA spoke with Ken Belitz (California NAWQA Program Chief) of the USGS on January 7, 2004. Ken referred SGA staff to USGS staff to coordinate the collection of water elevation data from USGS monitoring wells when the timing of collection is determined. In February 2005, received water elevation data through 2004 for USGS NAWQA wells monitored in the Sacramento area. In September 2006, SGA approved to allow USGS to add two monitoring wells in SGA's monitoring well network (funded by an AB303 grant) to be added to the USGS NAWQA program. These wells have been sampled by USGS and added to their 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.	On-going	Secured $250K AB303 grant to install dedicated monitoring wells in the basin - award date June 30, 2004. In October 2005, completed installation of nine regional monitoring wells where critical data gaps were known. In 2005, received data on monitoring wells associated with McClellan and Aerojet. The data are mostly limited to water elevation data, but do include some water quality parameters related to contaminant monitoring. Discussed with Dana Booth at February 23, 2004 meeting about opportunities to integrate wells from existing LUST sites into our network. Had subsequent meeting with Dana Booth on Sep 7, 2004 - Mr. Booth indicated that opportunities could be available to collect split samples from these sites to analyze water quality for our information. Given the additional regional monitoring wells and more data available through McClellan, Aerojet, and the USGS NAWQA wells, SGA will not pursue this further at this time.
7	Assess groundwater elevation trends and conditions based on the network annually.	On-going	Initial State of the Basin Report for 2002 calendar year data was completed in February 2004. Electronic version o report is available on SGA website. State of Basin Report for 2003 and 2004 calendar years was completed in June 2006 (renamed as Basin Management Report). The BMR demonstrates that in general groundwater levels stabilized in the basin beginning in the mid-1990s and have even shown some recovery on the order of 0.5 feet/year over the last few years. Preparation of the BMR for 2005 and 2006 will commence in early 2008.
8	Assess the adequacy of the groundwater elevation monitoring well network annually.	On-going	The May 2006 Basin Management Report demonstrates that water elevations are stabilized or recovering in general. The BMR also documents the installation of a regional monitoring well network. Under present conditions, the monitoring network is appropriate.
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.	On-going	This will continue to be assessed through time. Dedicated pressure transducers were installed on eight of the nine regional monitoring wells constructed through funding from a DWR AB 303 grant. Recordings are currently logged four times per day.
2.2	***Groundwater Quality Monitoring***		
1	Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.	Complete	A copy of the DHS guidelines were sent to all member agency General Managers and Directors on January 23, 2004 with the GMP.
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.	On-going	Obtained 1998 water quality data from USGS for NAWQA wells. Wells were sampled again by USGS in 2003/2004. That data will be provided to SGA when it has been QA/QC checked. SGA participated in a USGS/SWRCB AB 599 water quality sampling program in early 2005. The results of that study are expected in late 2007.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
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.	Complete	Added monitoring well data from McClellan and Aerojet.
4	Assess the adequacy of the groundwater quality monitoring well network annually.	On-going	To be assessed through preparation of the Basin Management Report.
2.3	***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.	Complete	Sacramento Suburban Water District has been awarded an AB303 grant application to be conduct additional surveying of these and other locations in 2006.
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.	Deferred	Surveys data from benchmarks in the Arden Arcade area indicate that subsidence is not a significant concern at this time. Additionally, the uncertainties associated with InSAR in rapidly growing urban and agricultural areas makes this a low priority at this time.
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.	Deferred	Surveys data from benchmarks in the Arden Arcade area indicate that subsidence is not a significant concern at this time. Because of limited staff time at SGA, this task is being deferred.
4	Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence.	Deferred	Surveys data from benchmarks in the Arden Arcade area indicate that subsidence is not a significant concern at this time. Because of limited staff time at SGA, this task is being deferred.
2.4	***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.	Complete	A memorandum report on available data on the American River was prepared for SGA by MWH on September 22, 2004. This included a summary of known inputs and outputs to the stream budget of the American River. The Sacramento Coordinated Water Quality Management Program completes an annual monitoring report including water quality and flow data at several locations along the American and Sacramento Rivers. SGA has obtained the 2002-2003 version of this report. One of the objectives of the current effort to update the SGA groundwater model (IGSM) was to simulate daily flows on the American and Sacramento rivers. With the completion of the model, SGA now has a reasonable estimate of recharge/discharge along these river reaches.
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.	Complete	The Sacramento Coordinated Water Quality Management Program completes an annual monitoring report including water quality and flow data at several locations along the American and Sacramento Rivers. SGA has obtained the 2002-2003 version of this report. SGA recently obtained the 2006 annual report and will incorporate information into the 2008 update to the SGA BMR.
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.	Complete	In late 2003, the State Board considered stream aquifer interaction along the American River as part of a fully appropriated stream hearing. Consulting studies associated with the report indicate that the American River is a losing stream along nearly its entirety below Nimbus Dam and that the river is substantially disconnected from the groundwater basin. Because of this data becoming available, no additional studies are planned at this time.
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.	On-going	As mentioned above, the results of the fully appropriated streams hearing on the American River in 2003 have made this a low priority item. In 2005, two monitoring wells were installed for SSWD near the American River. Data collected beginning in early 2006 will evaluated to assess these relationships in the 2008 SGA BMR.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
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.	On-going	Met with Dave Evans of CSUS on September 8, 2004. Dr. Evans indicated that several wells on the south side of the river at CSUS are equipped with pressure transducers, which collect continuous water elevation measurements. The data are collected, but have not been processed to date. Dr. Evans expects to bring in a graduate student in the near future to analyze the relationship between stream stage and groundwater elevations. As of June 2007, this work has not progressed from within the university.
2.5	***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.	Complete	Water level measurement protocols are included in Appendix D of the SGA GMP. The final GMP was sent to all member agency General Managers and Directors on January 23, 2004.
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).	Complete	A copy of the DHS guidelines were sent to all member agency General Managers and Directors on January 23, 2004 with the GMP.
3	Provide training on the implementation of these SOPs to member agencies, if requested.	Complete	The cover letter for the GMP and water quality protocols sent to member agencies on January 23, 2004 extending an offer to provide training on protocols.
2.6	***Data Management System***		
	No Action Required		The initial DMS was completed in February 2004. SGA maintains an annual consulting budget item for maintenance and support of the DMS.
COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION			
3.1	***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	Complete	Provided each member agency with 2003 revised county well construction and destruction standards on April 6, 2004.
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.	On-going	Met with James Taylor of CVRWQCB on September 13, 2004 and received a copy of the 2004 update to the Sacramento County Special Consultation Zone Ground Water Plume Site report. Informed member agencies at the October 14, 2005 SGA Board meeting that the report is available at SGA and that we will make a future effort scan the maps into an electronic file.
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.	Complete	Submitted a September 1, 2004 letter to member agency managers. Each letter included a map showing the maximum plumes extents in a 2-dimensional map view based on 2002 quarterly monitoring reports for each site (GMP letter to GMs 01sep04.doc).
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.	Complete	Offered assistance to all SGA member managers in letters dated January 23, 2004 and again on April 6, 2004.
3.2	***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	Complete	Provided each member agency with 2003 revised county well construction and destruction standards on April 6, 2004.
2	Follow up with member agencies on the reported abandoned and destroyed wells to confirm the information collected from DWR	Complete	Submitted a September 1, 2004 letter to member agency managers. Each letter included a table of member wells and their current status in the SGA database. The letter requested that member agencies update the well status (GMP letter to GMs 01sep04.doc). The updated status was entered into the DMS.
3	Provide a copy of the information on abandoned and destroyed wells in northern Sacramento County to fill any gaps in their records	On-going	Data received on well status requested from SGA members on September 1, 2004 were input into the SGA data management system in mid-2005 as part of the Basin Management Report update. This information on well status will be forwarded to the Central District office of DWR in 2008.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
4	Meet with the EMD to discuss ways to ensure that wells in the SGA area are properly abandoned or destroyed	Complete	Spoke with Steve Kalvelage of Sac County Environmental Management Department on July 26, 2004. Discussed possibility of preparing grant application under AB 303 for a well destruction program. Met with Dana Booth of EMD on September 7, 2004. Encouraged EMD to develop an AB303 grant application for a well abandonment program. Forwarded the AB303 grant application workshop notification to Dana on October 5, 2004. Coordinated with EMD again in October 2007 to determine if they are ready to pursue a joint grant application with SGA to launch a regional program. EMD indicated that they are still completing work they feel is required to beginning such an effort, and may be ready to pursue a grant opportunity in late 2008.
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.	Complete	An electronic version of the District 6 well location database for the Sacramento area was downloaded and incorporated into a GIS coverage of the SGA area. The DOG records confirm that oil and gas development has been very limited in the SGA area. Almost all activity has been confined to the western one-third of Sacramento County. There are records for only 53 permits issued: 40 are for plugged and abandoned dry holes; 5 active gas holes exist in the vicinity of Sacramento International Airport; 1 steam flood well is active in the vicinity also near the airport; and 7 previous gas wells have been plugged and abandoned (SGA_DOG_map.pdf).
3.3	***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.	Complete	This request was not sent to members, because it was unnecessary. The information for each well is available on-line at http://swap.ice.ucdavis.edu/TSinfo/TSsystemc.asp?myCounty=34.
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	Deferred	Because of limited SGA staff time, this item is being deferred. In 2005, SGA staff coordinated a session on local agency management for the Biennial Groundwater Conference. In addition to SGA, briefings on the activities of Orange County Water District and Eastern Municipal Water District were given. This provided insightful information on differences between management in northern and southern California.
3.4	***Protection of Recharge Areas***		
1	When CAS results are available, meet with the SWRCB to discuss those results and consider follow-on actions.	Complete	Coordinated SWRCB and LLNL presentation to SGA Board of Directors on February 12, 2004. Reviewed LLNL draft report in March 2004. Received final report in April 2004.
3.5	***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.	On-going	Met with Craig Fegan and Steve Costello at Aerojet on August 26, 2004. Aerojet agreed to provide construction, water quality and water elevation data on approximately 77 monitoring wells within and adjacent to the SGA boundary. They will provide updated data on those wells on a semi-annual basis. Spoke to Dana Booth with Sac County Environmental Health on July 27, 2004 and again on September 7, 2004. Dana is in charge of leaking underground storage tank site investigations. He indicated that some of the locations might be willing to member agencies to collect a split water sample during active investigations for the purposes analyzing other constituents of interest to local purveyors. One result of the current 2007 AB303 grant application will be to identify priority locations for sentry wells related to contamination at Aerojet.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
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	An SGA Regional Contamination Issues Committee was formed in June 2004. This committee works proactively to ensure that member purveyor needs are addressed if detections occur. The committee has meets monthly or on an as-needed basis. Committee met with regulators and Aerojet responsible parties to get briefing of status of remediation efforts at Aerojet on October 4, 2004. Met with management and staff of USEPA, SWRCB, Central Valley RWQCB, DTSC, Water Forum Successor Effort, and purveyors on November 4, 2004 and again in November 2006 to express concerns over regional impacts of contamination in basin. Developed an informational brochure entitled *Groundwater Contamination in the Sacramento Region - Legacy of the Past, Challenge to Our Future* in early 2006. Gave SGA overview presentation to McClellan Restoration Advisory Board in February 2007.
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	Complete	Spoke to Dana Booth with Sac County Environmental Health on July 27, 2004. He recommended that rather than prepare a static map of these locations that SGA should develop a procedure for querying the GeoTracker web site and consulting with Sac County staff when locating future wells. The directions for using Geotracker were developed by SGA staff and provided to member agency managers in a September 1, 2004 letter (GMP letter to GMs 01sep04.doc).
4	Meet with representatives of the RWQCB to establish a mutual understanding about SGA's groundwater management responsibilities	Complete	Met with Central Valley Regional Water Quality Control Board staff on February 26, 2004. Briefed them on SGA background, SGA GMP, and DMS. RWQCB added SGA to mailing list for updates on underground storage tank sites.
3.6	***Control of Saline Water Intrusion***		
1	Track the progression, if any, of saline water bodies moving toward the east from the Delta.	On-going	Will work with DWR Central District staff to determine if any representative wells are located in the north Delta area to assist in tracking of any possible saline groundwater bodies.
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	To be assessed in future Basin Management Reports as more temporal data become available.
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	No action on this item will be taken until after SGA staff have had an opportunity to discuss the TDS data from the Delta with DWR Central District staff.
COMPONENT CATEGORY 4: GROUNDWATER SUSTAINABILITY			
4.1	***Conjunctive Management Activities***		
1	Continue to investigate conjunctive use opportunities within the SGA area	On-going	SGA will assist any members upon request. Currently, the Integrated Regional Water Management Planning Program is an on-going program under the RWA umbrella. This program identifies opportunities and facilities for implementing expanded conjunctive use in the region. SGA is preparing a Water Accounting Framework for the SGA area through participating members can establish groundwater banks to further promote conjunctive use by members and to acknowledge those investments by members. Phase II of this effort was adopted in June 2007, with staff currently preparing a "model" groundwater banking and exchange guidance documents for member agencies to use should they choose to operate a program.

SGA Adopted GMP Action Items
(as of 12/9/2008)

	Description of Action	Status	Comments
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	SGA has been closely coordinating with the City of Roseville in its feasibility study of an aquifer storage and recovery well. Some SGA members have indicated an interest for use of this methodology pending results of the Roseville study.
4.2	***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	Signatories to the Water Forum Agreement are currently completing a review and renegotiation of existing best management practices for water conservation. That effort is expected to be completed by early 2008 with a likely conclusion of adopting BMPs developed by the California Urban Water Conservation Council.
2	Coordinate with SRCSD through the RWA to investigate opportunities for expanded use of recycled water throughout the county.	On-going	SRCSD completed a recycled water master plan effort in early 2007. One of the goals of the plan is to identify uses in the County for between 30 to 40 mgd of recycled water by the year 2020. SRCSD also joined an RWA effort to complete an Integrated Regional Water Management Plan. The results of the SRCSD effort will be integrally linked to the RWA planning effort. SGA has received a copy of the recycled water master plan.
COMPONENT CATEGORY 5: PLANNING INTEGRATION			
5.1	***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.	Complete	RWA began an Integrated Regional Water Management Planning Program in April 2004. RWA adopted an integrated plan in May 2006. The SGA, PCWA, and City of Lincoln GMPs were each a component of the integrated plan. RWA is currently updating the plan, with an expected completion in mid-2008. SGA is closely coordinating with this effort to elevate key groundwater issues into the IRWMP.
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.	Complete	Reviewed the February 2002 Final Draft: Relationship of the Water Forum Agreement to Land Use Decision-Making with the GMP Implementation Committee. At the direction of the committee, sent an August 18, 2004 letter to Leo Winternitz, Water Forum Successor Effort Executive Director, expressing our continued support of SGA's role in providing groundwater information within the SGA area as requested (land use to Winternitz 10aug04.doc).

Appendix B

Groundwater Contamination Issues Brochure

Groundwater Contamination
in the Sacramento Region

LEGACY OF THE PAST, CHALLENGE TO OUR FUTURE

Groundwater is one of the Sacramento region's most important resources. Unfortunately, the potential spread of contaminants from industrial sites poses a tremendous challenge to regional water management efforts and threatens to impose economic and environmental impacts on the Sacramento metropolitan region.

With so much at stake, local water suppliers have joined forces to protect the region's groundwater resources and water supply infrastructure from this growing threat. The most effective way to address the problem is through a sustained, highly coordinated regional effort that engages federal partners and others whose facilities and investments depend on a healthy groundwater basin.

The Sacramento Groundwater Authority (SGA), a joint powers authority charged with protecting the groundwater basin, is coordinating the effort. (For more information on SGA and its members, see the back cover.)

Groundwater Key to Region's Water Supply

Groundwater is an integral component of a complex water supply system for the greater Sacramento region. The groundwater basin supplies up to 50% of the water used by the region's communities and businesses. Local water purveyors are investing hundreds of millions of dollars in programs and infrastructure to manage groundwater and better coordinate its use in conjunction with surface water to meet the region's needs.

The Water Forum Agreement

The lower American River is the only nationally designated wild and scenic river in the country that runs through a major metropolitan area. Recognizing the need to protect the lower American River while meeting the region's needs for a reliable water supply, a broad representation of stakeholders signed the historic Water Forum Agreement in 2000. A centerpiece of the agreement is a regional program to manage and conjunctively use groundwater and surface water to help meet water needs while reducing diversions from the lower American River during dry spells or environmentally sensitive times. The program – and indeed the landmark agreement itself – hinges on the availability of a safe and reliable groundwater supply.

Long History of Federal Partnerships

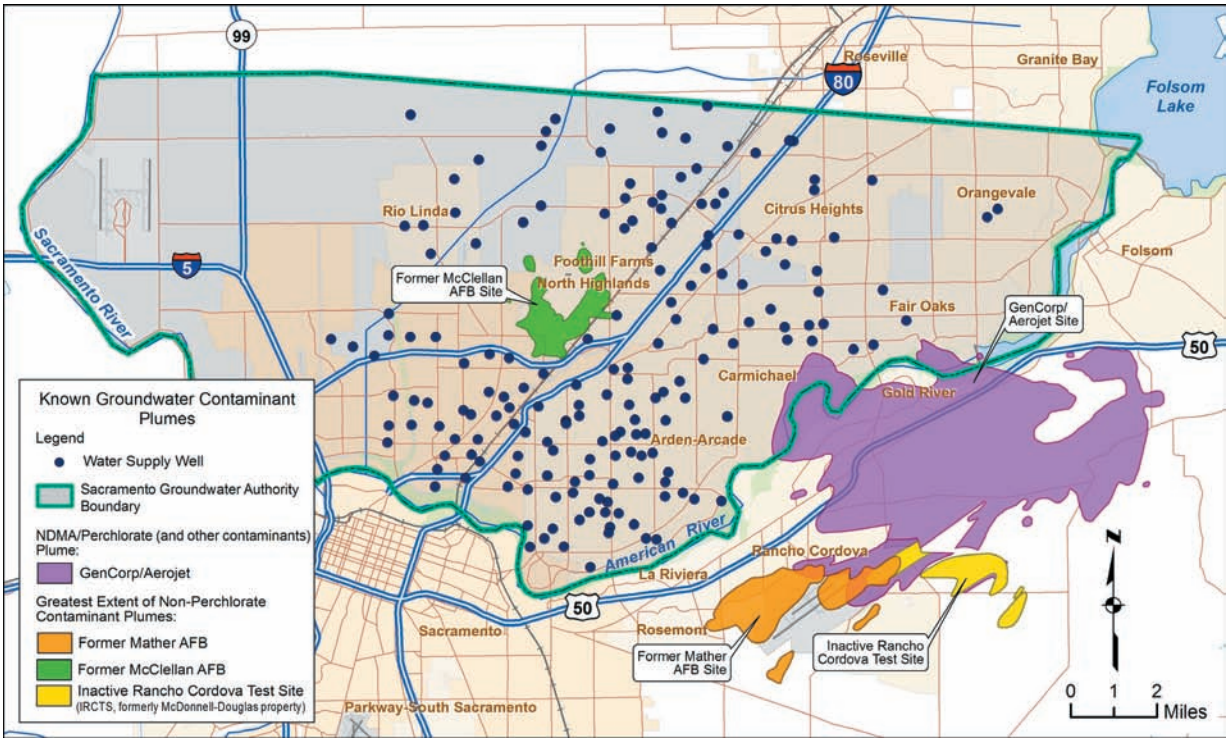
In addition to locally developed water supply infrastructure, federal projects and facilities play a key role in the region's water supply and flood control system. Facilities such as Folsom Dam on the American River and flood control and water supply facilities on the Sacramento River are important locally, but also form an essential part of the larger federal water system that delivers water to communities and some of the most productive farmland in the United States.

Federal water facilities in the Sacramento area also provide the operational flexibility needed to meet water quality and fisheries objectives in the Sacramento-San Joaquin River Delta. The success of these facilities depends in large part on the Sacramento region's ability to forgo surface water diversions at critical times. That ability in turn depends on the region's access to clean groundwater supplies. That access may be jeopardized, however, by the legacy of defense-related activities in the region.

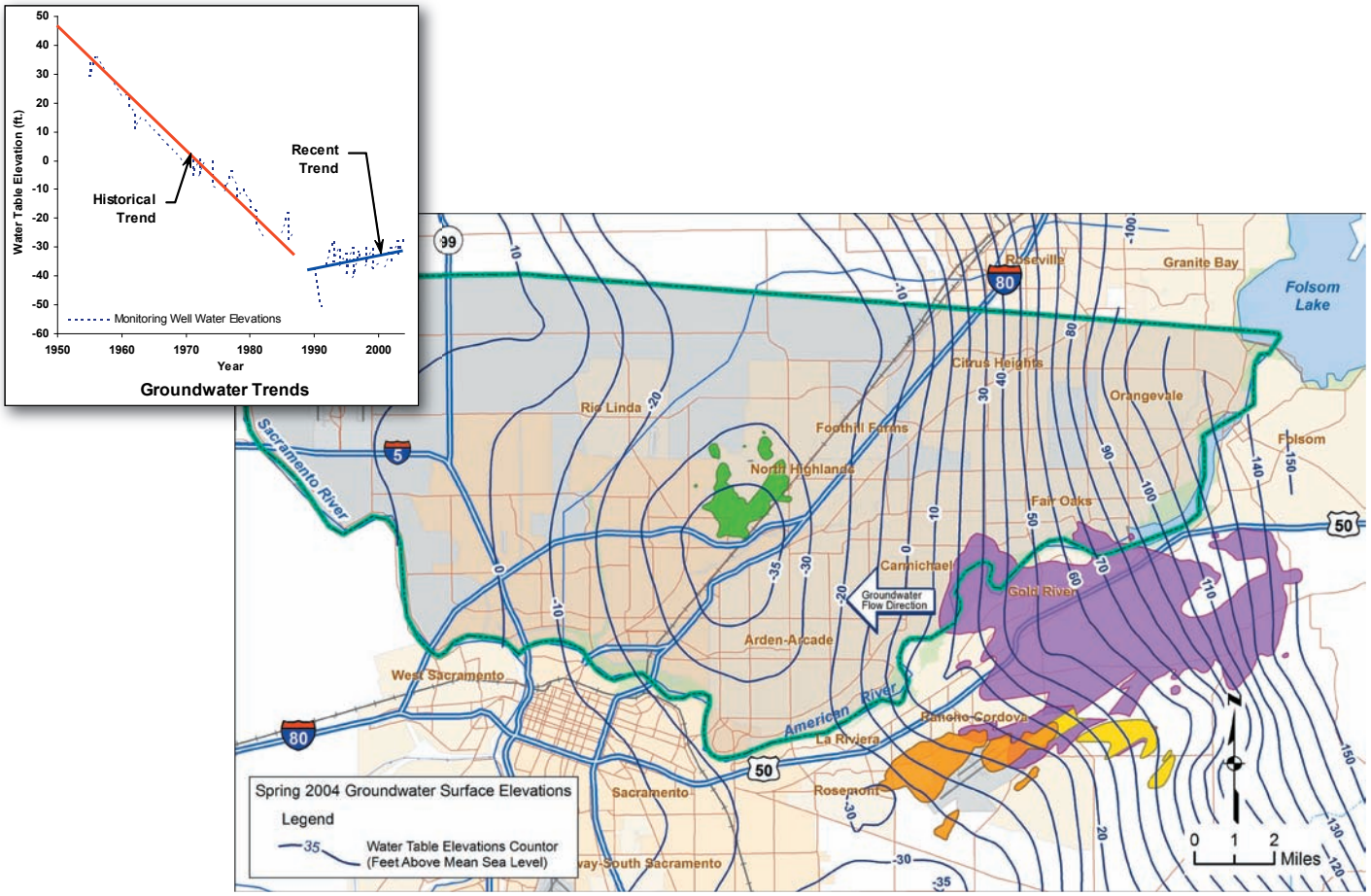
Sacramento has long been home to important federal facilities and industries such as the former McClellan and Mather Air Force Bases and Aerojet, a major defense contractor and manufacturer of critical defense and aerospace technology.

Folsom Dam and Reservoir on the American River

Though there have been many benefits derived from the years of national defense service and technology development in the Sacramento region, one legacy is groundwater contamination directly related to these activities. Several known plumes have contaminated, or threaten to contaminate, public drinking water wells. If not effectively contained and cleaned up, these plumes could render the groundwater basin unreliable.



Regionally extensive contaminant plumes in the vicinity of hundreds of public water supply wells cast an uncertain future on groundwater supply reliability.



Recent investments in water infrastructure have helped arrest a decades-long trend of declining groundwater levels that resulted in a large cone of depression in the heart of the basin.

Significant Investments, Environmental Values at Risk

Regional groundwater contamination could have enormous economic and environmental impacts, requiring replacement of existing water supplies and water supply infrastructure. Expansive contamination also threatens the region's ability to implement the Water Forum Agreement and to contribute to larger water quality and fish and wildlife programs downstream.

Groundwater contamination puts at risk hundreds of millions of dollars in water resources and infrastructure paid for by local ratepayers. Those resources and infrastructure – which include water rights, pipelines, water treatment plants, wells and other facilities – make it possible for water suppliers to reduce diversions of water from the lower American River during environmentally sensitive times. Regional contamination places that public investment at risk.

Contamination could also force water purveyors to acquire costly replacement water supplies, and to construct expensive new facilities to divert and distribute that replacement water to millions of people in the Sacramento region.

Environmental impacts could also be significant. Losing reliability of the groundwater basin places additional pressure on the lower American River to meet the region's water needs. These additional stressors not only affect local environmental and recreational values, but could also reduce benefits to water quality, fish and wildlife and environmental values in the Bay-Delta region.

Opportunities Exist to More Effectively Deal with the Contamination

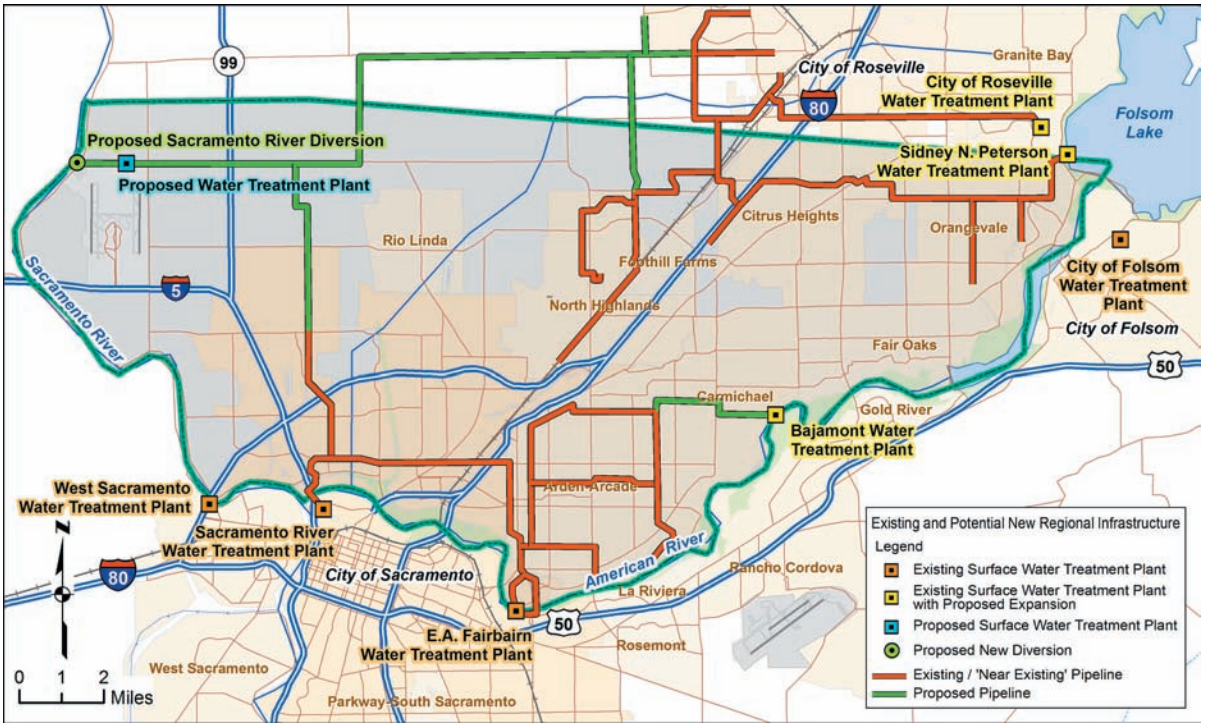
The most recent trend in water supply planning has been to integrate planning across multiple disciplines to achieve the greatest benefit. One example is increasing the use of recycled water for irrigation uses to offset demand for freshwater supplies.

Historically, efforts to address groundwater contamination have not been coordinated with water supply planning. The focus has been on remediation, rather than maximizing the effectiveness of clean-up efforts by coordinating operations with the activities of regional water suppliers.

The SGA and local water purveyors have no responsibility for remediating groundwater contamination in the region. Nevertheless, the collective interest in protecting the basin requires new strategies to more effectively address contamination. SGA and its members are exploring potential opportunities to build on remediation efforts that are currently underway, and to potentially coordinate those activities with ongoing water management activities to protect the groundwater basin and provide reliable water supplies for the region. Obviously, these coordinated efforts would need to prioritize protection of human health and minimize fiscal impacts to ratepayers.

If identified in a timely fashion, such opportunities could result in significant long-term savings in both contamination cleanup and required basin management activities.

Peterson Water Treatment Plant Improvements Under Construction.



The region has constructed and is currently planning many hundreds of millions of dollars in new and expanded water supply facilities.

Potential Ways to Better Address Contamination

- **Develop a plan for an advance replacement water supply**
  A number of water supply wells have already been lost to contamination in the region. Identifying and planning for replacement water is a long and complicated process that cannot be completed overnight. A focused effort is necessary to develop advance plans for replacing water that could be lost, or potentially lost, to contamination. Regulatory agencies should work with water purveyors to identify and plan for replacement water years in advance of when it may be needed.

- **Assist with and expedite the ongoing cleanup efforts**
  Water purveyors can assist by providing local expertise, data and access for monitoring and remediation.

- **Fully delineate and contain the plumes**
  Recent data indicate that a number of contaminant plumes in the Sacramento area have not been fully delineated, which creates substantial uncertainty in water supply planning. The current approach is not adequate for delineating or containing these plumes within the timeframe appropriate for water supply planning efforts. Monitoring, delineation and remediation efforts should be developed with water purveyor input to resolve this issue.

Groundwater well at a farm near Sacramento.

Near-term funding is needed to conduct the following studies and risk assessments related to groundwater contamination problems and potential water supply implications:

- Develop an inventory and assessment of contributing contamination activities and potentially affected facilities and stakeholders;
- Develop a risk assessment of the various contributing activities;
- Identify possible water supply solutions;
- Develop facility and operational contingency plans and strategies that could address impacts to public water supply systems and assist ongoing remediation efforts;
- Assess existing regional groundwater modeling capabilities and make recommendations for improvements to assist with future risk assessments; and
- Develop a regional monitoring plan with recommendations of where new monitoring wells are needed as "sentry wells."

Sacramento Groundwater Authority

The Sacramento Groundwater Authority (SGA) is a joint powers authority created to collectively manage the groundwater basin, underlying Sacramento County north of the American River. SGA's formation in 1998 was inspired by the Sacramento Area Water Forum, a nationally recognized collaborative process to reach consensus among 40 local utilities, business leaders, and the environmental community to preserve the lower American River and ensure a reliable water supply through the year 2030.

SGA draws its authority from an agreement between the cities of Citrus Heights, Folsom, and Sacramento and the County of Sacramento to exercise their police power to protect the basin. In turn, these agencies chose to manage the basin cooperatively by allowing representatives of the fourteen local water purveyors and a representative from agricultural and self-supplied pumpers to serve as the Board of Directors of the SGA. Collectively, these purveyors provide a high quality, reliable water supply to over 500,000 people.

SGA has developed a progressive groundwater management vision including a groundwater management plan and a regional conjunctive use program designed to provide local and regional benefits with the potential to provide broader statewide benefits.

Additional SGA goals include:

- supporting and implementing the Water Forum objectives of preserving American River environmental values and providing water supply reliability to support the Sacramento region's economic health
- maintaining and protecting the long-term sustainable yield and quality of the underlying groundwater basin
- promoting wet-year banking so that the basin can sustain users during dry periods
- coordinating with central and south county groundwater management efforts
- improving communication with other regional, state and federal water management agencies.

SGA Mission

To manage, protect and sustain the groundwater resources of the basin in Sacramento County north of the American River consistent with the Water Forum Agreement for the benefit of the water users within the basin, and to coordinate with other water management entities and activities throughout the region.

Member Agencies

California-American Water Company
Carmichael Water District
Citrus Heights Water District
Del Paso Manor Water District
Fair Oaks Water District
Folsom, city of
Golden State Water Company
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
Agricultural and self-supplied representatives

Byron Buck, Chair
Chuck Rose, Vice Chair
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Fax: (916) 967-7322
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Appendix C

Water Accounting Framework, Phase II Document

SACRAMENTO GROUNDWATER AUTHORITY

WATER ACCOUNTING FRAMEWORK
PHASE II EFFORT

April 10, 2007

Section 1: Adopting Resolution

A RESOLUTION OF THE SACRAMENTO GROUNDWATER AUTHORITY APPROVING AND IMPLEMENTING THE WATER ACCOUNTING FRAMEWORK

[Original Resolution filed with SGA]

Section 2: Framework Overview

The Water Accounting Framework (Framework) is a set of policies and procedures intended to encourage conjunctive use operations within the Sacramento Groundwater Authority (SGA) area to insure the underlying groundwater basin's long-term sustainability. Based on activities over the past decade and extensive discussions with stakeholders, SGA has concluded that the most effective initial step to meet the Framework's intent is to establish a program that recognizes investments by SGA member agencies in conjunctive use operations and supports groundwater banking programs.

The Framework would support banking programs by setting forth rules for operating a groundwater bank (for example, confirming deposits and withdrawals) and monitoring the basin to ensure its sustainability as the program is implemented. This Framework does not limit the ability of participants to extract groundwater to meet their water supply needs within the SGA area.

Introduction

The purposes of this section include: (1) to provide relevant background information on events or activities since the inception of SGA that have influenced development of the Framework proposal; (2) to establish objectives of the Framework; and (3) to provide a depiction of the Framework elements. The intent and policy recommendations of the six primary elements of the Framework are described in following sections of this document. For a definition of terms as used in this document, see Appendix A.

Background

In April 2000, representatives from a diverse group of 40 stakeholder organizations executed the historic Water Forum Agreement (WFA). A centerpiece of the WFA was a regional program to manage and conjunctively use groundwater and surface water to help meet water supply needs through the year 2030, while reducing diversions from the Lower American River during environmentally sensitive periods. To help insure implementation of this regional conjunctive use program and to achieve some measure of equity among those agencies responsible for it, the SGA was charged with developing a Framework.

Beginning in 1998, a progression of events led to the current effort to establish the Framework. The American River Basin Cooperating Agencies (ARBCA) developed the initial concept that a Framework was necessary to support regional conjunctive use, while distributing the costs of the program equitably among basin stakeholders. ARBCA recommended that the task of developing the Framework be given to the SGA (described further below) as it is the agency responsible for implementing the regional groundwater management program. SGA has conducted two key pilot studies to investigate the feasibility of implementing the Framework. While initial efforts and pilot studies helped the region better understand conjunctive use, conditions in the region have changed substantially enough over the past few years so as to result in a Framework concept that takes advantage of opportunities being exercised by local participants, as opposed to the originally envisioned regulatory-oriented approach to manage the basin.

Sacramento Groundwater Authority

The SGA is a joint powers authority formed in 1998 to manage the Sacramento region's groundwater basin north of the American River. Formed as a result of the Water Forum, SGA is recognized as an essential part of implementing the groundwater management element of the WFA.

The SGA draws its authority from a joint powers agreement (JPA) 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. Among other purposes, the JPA cites the following purposes for establishing SGA:

- To maintain the long-term sustainable yield of the North Area Basin.
- To manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors.

Since its inception, SGA has completed or initiated many elements that are foundational to meeting these purposes. These include:

- Creation of a Data Management System to compile important water supply and water quality data to assess and manage the basin.
- Development and adoption of a state-compliant Groundwater Management Plan (GMP) to identify specific actions and management objectives for properly managing the basin.
- Completion of two pilot projects to prove up the legal, institutional, and physical elements of banking and exchange agreements.
- Installation of dedicated monitoring wells and identification of additional existing monitoring wells to assess the basin as expanded conjunctive use operations are carried out.
- Update of an Integrated Groundwater and Surface Water Model (IGSM) application for the SGA area to simulate the impacts of existing or proposed conjunctive use operations at future dates in the basin (model completion expected in mid-2007).
- Completion of a biennial Basin Management Report to assess the current health of the basin, to report on management activities, and to recommend future management actions in the basin.

A remaining critical element needed to allow SGA to meets its purposes is the development of a Framework for the region's purveyors to implement an appropriate conjunctive use program. Given SGA's management responsibilities, the Framework should first and foremost be protective of the long-term health of the groundwater basin. However, there is considerable opportunity for the Framework to establish a program that recognizes investments by SGA member agencies in conjunctive use operations and supports groundwater banking programs, while emphasizing and protecting individual agency decision-making autonomy within the construct of the WFA.

SGA Pilot Studies

SGA facilitated two banking and exchange pilot studies that serve as the basis for much of the current proposed Framework – the first in 1999/2000 with the Sacramento Area Flood Control Agency (SAFCA) and the U.S. Bureau of Reclamation, and the second in 2002/2003 with the CALFED Bay-Delta Program Environmental Water Account (EWA). Both studies employed simplified mechanisms to track and account for:

- Groundwater banking and extraction and changes in groundwater storage.
- Estimated basin losses.
- Surface water forbearance.

Together, these pilot studies allowed SGA and its participating members to exercise the groundwater storage potential of the North Area Basin and investigate the mechanics of a banking program. Specifically, the EWA Pilot Study helped determine the initial policy decisions necessary to begin development of a Framework. The pilot studies also established a precedent for regional banking with state and federal agencies which, through their participation, recognized the validity of the water supply made available and accounted for through this mechanism. The pilot studies also stressed the need for a monitoring program to confirm that there were no unmitigated impacts resulting from the program.

At the conclusion of the Pilot Studies, a draft Proposed Water Accounting Framework was completed in June 2003. That proposal provided detailed analysis of how banking agreements could be facilitated. However, there was a great deal of complexity involved in the June 2003 effort that should only be required under more dire circumstances. As discussed further below, conditions in the basin appear to have already improved over the past several years and the required monitoring and management tools are in place to allow SGA to move toward a Framework that emphasizes opportunities with assurances of protection of the basin through monitoring.

Changed Conditions

Physical conditions and purveyor operations have changed over the past few years allowing Framework development to move forward using a different approach than was previously contemplated. These changes include:

(1) Conjunctive use is currently being implemented on a scale that has resulted in reduced groundwater extractions from the basin and some recovery of groundwater elevations;

(2) The threat of groundwater contamination and plume migration is more significant than previously thought; and

(3) SGA completed or initiated several foundational basin management initiatives including development of the GMP, a regional monitoring well network, updating a regional groundwater model, and completion of a Basin Management Report (BMR) that assesses basin conditions.

Each of these is discussed further below.

Conjunctive Use Being Implemented

When the WFA was executed in 2000, there was a widely-held belief that groundwater extractions from the basin would be near the WFA estimated long-term annual average sustainable yield of 131,000 acre-feet within about 10 years. However, this has not been the case; groundwater extractions have actually trended downward over the past few years. Gross basin pumping is currently below 100,000 acre-feet. Basin extractions are projected to remain lower than anticipated through at least 2010 (see **Figure 1**). While some of the reduced demand for groundwater can be attributed to wetter than normal hydrologic conditions over the past decade, much of these improved conditions can be explained by expanded conjunctive use facilities and operations (namely the importation of more surface water supplies) in the basin.

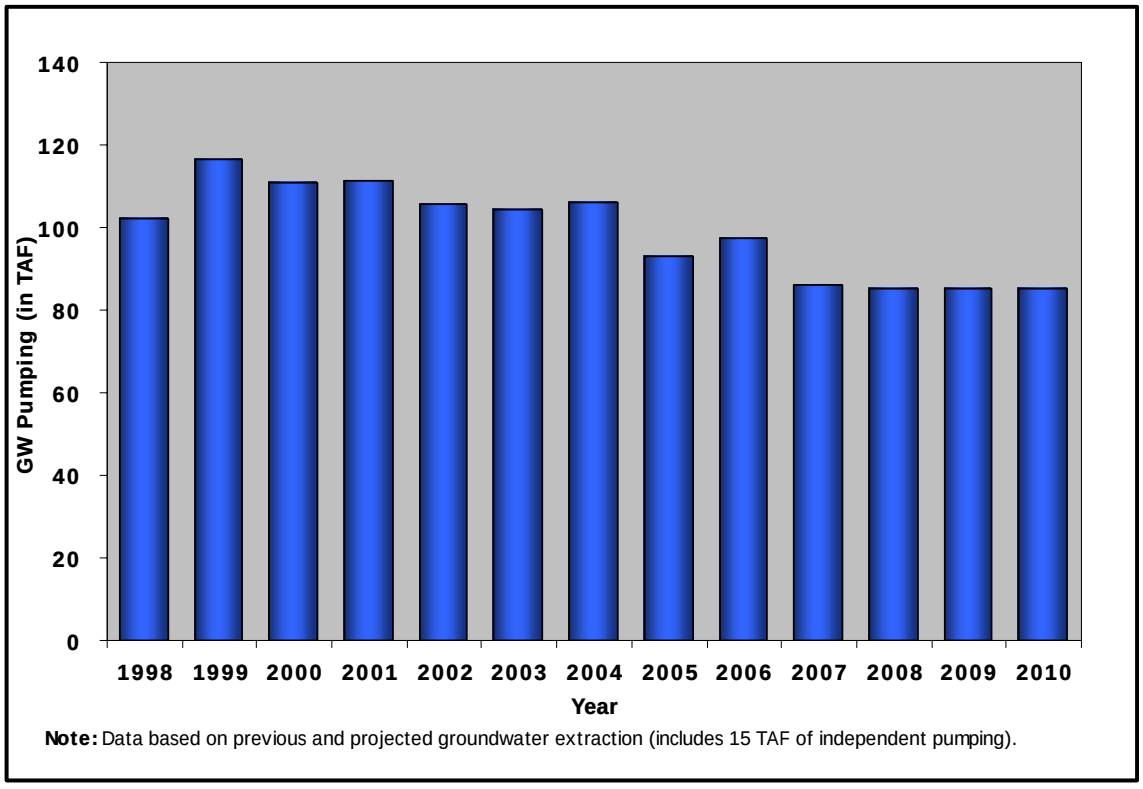

Figure 1. Annual Groundwater Pumping in North Area Basin

For example, Sacramento Suburban Water District initiated a groundwater stabilization project by completing a pipeline to take delivery of Placer County Water Agency surface water, entering into an agreement with San Juan Water District to divert this water supply from Folsom Reservoir and treat it at San Juan's water treatment plant, and take other actions necessary for delivery of this surface water supply to the Sacramento Suburban service area in the mid-1990s. Historic reliance on groundwater had resulted in a large cone of depression in the central portion of the basin, with groundwater elevations that declined over several decades at a rate of about 1.5 ft/yr. With the Sacramento Suburban conjunctive use program implemented in the mid 1990's, water levels have stabilized and in some areas groundwater elevations have recovered at a rate of about 0.5 ft/yr over the last several years. Sacramento Suburban has also recently completed facilities needed to implement a conjunctive use program in its southern service area.

Groundwater Contamination More Threatening
Groundwater contamination has impacted water purveyors over the last decade. Contaminant plumes associated with the Aerojet facility near Rancho Cordova are confirmed to have migrated north of the American River into Fair Oaks and Carmichael, threatening groundwater production wells within SGA's boundaries. The contamination threat emphasizes the need for expanded conjunctive use facilities and operations to maximize flexibility to respond to this problem. Because of this threat, monitoring activities and possibly the use of modeling tools will be integrated into the Framework.

Basin Monitoring and Management Program in Place
When the WFA was executed in 2000, few mechanisms for ensuring groundwater basin sustainability existed. For example, the primary groundwater control mechanism was to establish an agreed upon average annual sustainable yield for the basin at 131,000 acre-feet as part of the WFA. The other key recommendation of the WFA was to have the SGA serve as the groundwater management entity for the Sacramento County portion of the basin north of the American River, while other management options were developed in the central and south basins. Since its inception, SGA has worked with its member agencies to develop several tools including a data management system, a regional monitoring well network, a GMP, and a BMR. Additionally, an update of the regional groundwater model is currently underway. Together, these tools can be used to evaluate the health of the basin from a variety of perspectives (e.g., groundwater elevations, groundwater quality, subsidence, etc.). Based on the most recent BMR completed in May, 2006, the management practices undertaken by member agencies--on the whole--are producing positive results in the groundwater basin. Because these programs are in now in place, the proposed Framework focuses more on monitoring parameters to assess basin sustainability rather than on a single, gross "sustainable yield" ceiling for the basin.

Objectives of the Water Accounting Framework

For purposes of initiating development of the Framework, four objectives were identified as follows:

1. Ensure a safe and sustainable water supply for the greater Sacramento region.
2. Encourage water purveyors to "bank" water in the basin, when available, for use during dry periods.
3. Establish a framework that supports groundwater banking programs by setting forth rules for operating a model groundwater bank, and monitoring the basin to ensure its sustainability as the program is implemented.
4. Refine and enumerate SGA's role in implementing the objectives of the Framework.

Additional objectives will be added as necessary as the Framework is implemented and experience with a groundwater banking program is obtained.

Elements of the Water Accounting Framework

The Framework can be depicted as a pyramid (see **Figure 2**) with a foundation of needed tools supported primarily by SGA via its existing groundwater management program, supporting a robust groundwater banking program, topped by an overarching objective of ensuring a safe and sustainable water supply for the region. The diagram is intended to assist in visualizing the various elements that comprise the Framework. The diagram is not intended to depict a strict hierarchal structure, rather the interaction of several discrete yet related activities. Each of these elements is discussed in detail in subsequent sections of this document.

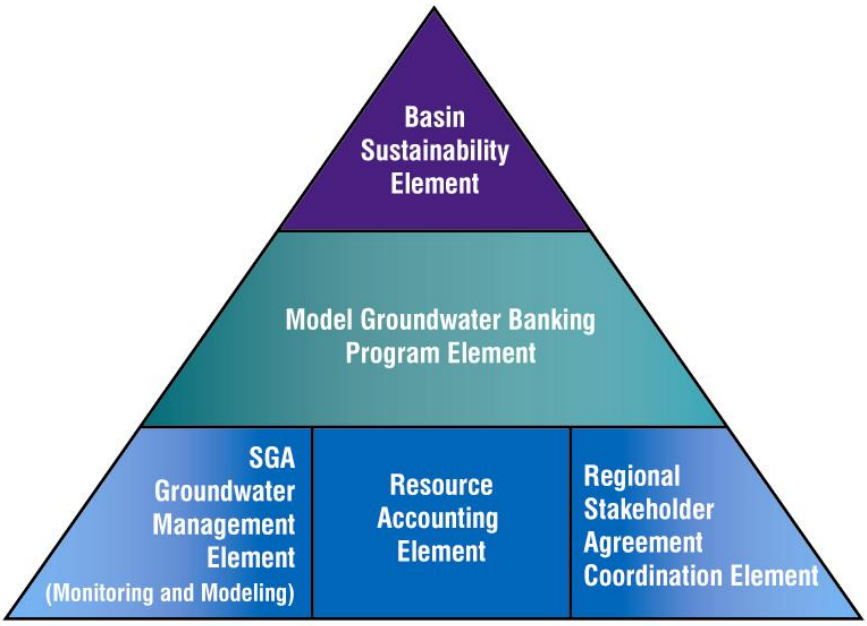

Figure 2-- Proposed Framework Elements

Section 3: Groundwater Management Element

The intent of the Groundwater Management Element is to document the many monitoring and management tools developed over several years that are already in place to ensure basin sustainability and that will support Framework participants should they choose to develop and implement a groundwater banking program.

The Groundwater Management Element includes the tools that SGA already uses to ensure the sustainability of the groundwater basin. Most of these tools were developed after member agencies participated in the banking and exchange pilot studies in 1999/2000 and 2002, so they are directly supportive of implementing the Framework.

The tools currently available that could serve in implementing the Groundwater Management Element are described below:

- **Groundwater Management Plan (GMP) –** To meet SGA's goal of maintaining a sustainable, high-quality groundwater resource for the users of the groundwater basin underlying Sacramento County north of the American River consistent with the objectives of the WFA, a GMP was adopted in 2003. The GMP serves 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. The GMP prescribes a set of Basin Management Objectives (BMO) that SGA and its members agreed to adhere to. The BMOs will serve as a basis for evaluating proposed banking and exchange agreements, and include:

    1. *Maintain or improve groundwater quality in the SGA area for the benefit of basin groundwater users.*
    2. *Maintain groundwater elevations that result in a net benefit to basin groundwater users.*
    3. *Protect against any potential inelastic land surface subsidence.*
    4. *Protect against adverse impacts to surface water flows in the American River and Sacramento River.*
    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.*

- **Data Management System (DMS) –** SGA maintains a DMS that provides ready access to data in either tabular or graphical formats. Data in the DMS include: well construction details; known locations of groundwater contamination and potentially contaminating activities; long-term monitoring data on groundwater extraction, elevations, and quality; and aquifer characteristics based on well completion reports.
- **Regional Monitoring Well Network –** SGA utilizes over 260 public supply wells operated by its member agencies to observe trends in groundwater elevations and water

quality. Additionally, eight dedicated monitoring wells were installed in the basin in 2005 by SGA that can be used under this Framework.

- **Regional Groundwater Model Update –** SGA is currently updating a regional groundwater model to simulate potential regional benefits and impacts of individual or cumulative banking and exchange agreements over multiple years. The update will be completed in early 2007.
- **Basin Management Report –** The Basin Management Report is intended to report, on a biennial basis, hydrologic conditions and SGA management activities. The report also documents the ongoing implementation of the GMP and recommends future implementation activities.

Policy Recommendations

- SGA will continue to maintain its groundwater management tools in support of the Framework's Groundwater Management Element.
- SGA staff will be available at the request of Framework participants to identify groundwater management tools available for specific proposed groundwater banking projects.

Section 4: Resource Accounting Element

The intent of the Resource Accounting Element is to establish that SGA will have the responsibility of maintaining a record of groundwater deposits and withdrawals of each agency should they choose to implement a groundwater banking program. SGA will account for and provide a running tally of SGA member agency groundwater banking program activities. This tally will include tracking credits or debits from the banking program, and accounting for losses or dissipation of credits over time. Dissipation rate estimates are currently being studied separately by SGA and are not a part of this Element.

Tracking or accounting of SGA member agencies' activities as they relate to groundwater banking activities is essential for the Framework's success. The Resource Accounting Element will provide a transparent and defensible means of tracking credits and debits for participants in the groundwater banking program.

Policy Recommendations

- Upon adoption of the Framework, SGA will develop and maintain a spreadsheet tool to maintain an ongoing record of banking activities.
- The accounting spreadsheet will be a public document, and shall be made readily accessible upon request.
- At a minimum, banking program participants will report for inclusion into the accounting spreadsheet once annually.
- Banking program participants may report data more frequently at their discretion.

Section 5: Regional Stakeholder Coordination Element

The intent of this element is to communicate with stakeholders of potential banking program agreements. Most notable is the need to coordinate with Water Forum Successor Effort (WFSE) staff, as conjunctive use operations are a critical component of successfully implementing the WFA. SGA intends to routinely coordinate with the WFSE staff initially during development, and later during implementation of the Framework. Also, SGA will work with additional stakeholders identified by banking program participants as essential to successful implementation of proposed projects (for example, the Sacramento County Planning Department).

Policy Recommendations

- Upon adoption of the Framework, SGA will schedule briefings to describe the overall Framework, its objectives and its relationship to the WFA to WFSE staff or other stakeholder groups as identified by banking and exchange participants.
- An annual statement of banked and exchanged groundwater from within the North Area Basin will be provided to WFSE staff and other stakeholder groups as identified by banking and exchange participants.
- SGA staff will be available, when requested by project participants, to coordinate with identified stakeholder groups to assist in describing a proposed project and its consistency with relevant local policies or regulations.

Section 6: Model Groundwater Banking Program Element

The intent of the Model Groundwater Banking Program (MGBP) Element is to develop a consistent template for use by SGA member agencies should they choose to implement a groundwater banking program. A groundwater banking program will encourage conjunctive use and acknowledge individual agencies' investments in groundwater banking activities by setting forth rules for operating a groundwater bank, including confirming deposits and withdrawals. It is envisioned that the MGBP would suggest the mechanisms under which accumulated banking credits could be transferred or sold to other agencies for use consistent with the WFA, the GMP, or other relevant policies or regulations.

For purposes of the Framework, a banking program is intended to reward and create incentives for agencies expanding their conjunctive use practices brought about by intentional investments or implementation of specific projects or programs. In order for the Framework to properly reward an agency for an investment in conjunctive use infrastructure while ensuring sustainability of the basin, the MGBP would establish criteria and procedures that should be met for an agency to receive banking credits.

Similar to other established groundwater banking programs throughout the state, and as observed in the EWA pilot study technical work, the MGBP will likely need to include a loss or dissipation factor as a percentage of banking operations. These factors will be determined after adoption of the Framework. SGA would review operating rules for other groundwater banks to assist in developing the MGBP.

Policy Recommendations

- Upon adoption of the Framework, the Board directs SGA staff to develop a model groundwater banking program that will establish criteria for operating a groundwater bank, including confirming deposits and withdrawals, and setting loss or dissipation factors. The model groundwater bank will consider how other banks operate within the state, but will also consider local conditions and needs during its development.
- SGA staff will bring the proposed Model Groundwater Bank back to the Board for the consideration of adoption by the end of December, 2007.

Section 7: Basin Sustainability Element

The intent of the Basin Sustainability Element is to define a process by which monitoring parameters will be used to ensure basin sustainability. While the simplest measure of basin sustainability involves maintaining average annual groundwater extraction below the 131,000 acre-feet/year as agreed upon in the WFA, it is also important to consider sub-regional groundwater use. Certain locations of the North Area Basin are more susceptible to negative impacts when pumped than others. Because of this, extra precautions are needed, such as the establishment of monitoring and response criteria in sensitive locations to ensure that future groundwater production does not adversely impact groundwater basin elevations, groundwater gradients, or groundwater quality. Between the existing SGA monitoring and the member agencies programs, much of the required monitoring is already in place.

Sustainability of the North Area Basin is a primary mission of the SGA. In creating a sustainability element for the Framework, it is important to consider the Groundwater Management Element of the WFA and the SGA JPA as discussed further below.

Groundwater Management Element of the Water Forum Agreement

The Water Forum Agreement contains seven major elements, one of which being the Groundwater Management Element. The intent of the element states:

> *"Our vital groundwater resource supplies over half the water used in the region. The purpose of a groundwater management plan is to protect the viability of that resource for both current and future users. To do so requires monitoring the amount of water withdrawn from the groundwater basin and promoting the use of groundwater in conjunction with surface water supplies to maximize the availability of both. This must be accomplished by creating publicly accountable governance structures which respect the rights of all groundwater users. Ideally, these structures should be established using existing authority and institutions."*

Among other requirements of sustainable yield, the preservation of groundwater rights, and the establishment of a governance structure, the Water Forum Agreement's Groundwater Management Element also states the various activities that SGA should undertake. Among the activities are to:

- *Collect and monitor data on annual pumping amounts;*
- *Monitor the migration of toxic plumes;*
- *Facilitate collaboration among purveyors to identify the area's needs and develop a plan to meet those needs.*

SGA Joint Powers Agreement

SGA was formed on the basis of the Water Forum Agreement's Groundwater Management Element. Many of the recommendations from the Water Forum were included explicitly into the

SGA JPA. The powers and functions given to SGA that specifically deal with groundwater management included:

- *Collect and monitor data on the extraction of groundwater from, and the quality of groundwater in, the North Area Basin;*
- *To require permitting of groundwater extractions 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.*
- *To carry on technical and other investigations of all kinds necessary to further the purposes of the Authority.*

Additionally, the JPA cites the following purposes for the Authority:

- To maintain the long-term sustainable yield of the North Area Basin.
- To manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors.

Policy Recommendations

- Upon adoption of the Framework, SGA should investigate establishing monitoring criteria for parameters and objectives identified in the adopted SGA GMP. These include groundwater quality, groundwater elevations, land surface subsidence, and groundwater/surface water interactions. Criteria for these parameters are not currently quantified. Any proposed quantifications of parameter criteria would be subject to approval by the SGA Board.
- Monitoring parameter criteria will, at a minimum, be evaluated during preparation of the SGA Basin Management Report or more frequently as individual data items become available. If SGA staff review determines areas of concern, the issues will be presented for consideration by the SGA Board.

Basin (or North Area Basin) – the groundwater basin underlying the SGA management area, which includes Sacramento County north of the American River.

Conjunctive Use – maximizing operational capacity to utilize either surface water or groundwater as a supply. Surface water is used preferentially during wet periods, while groundwater is used preferentially in dry periods.

Groundwater Banking Program –the initial storage and subsequent extraction of groundwater within the SGA management area. Criteria for crediting or debiting groundwater under the program will be established by development of the Model Groundwater Banking Program Element.

Sustainability – the planned use of a resource in a manner such that the resource is not depleted or damaged through time.

Sustainable Yield – the amount of water that can be pumped from a basin on a long-term average annual basis such that the groundwater is not unacceptably depleted or damaged. The amount of acceptability for depletion or damage is determined based upon local management decisions.