# Sacramento Groundwater Authority

# Basin Management Report Update 2013

SGA

# Table of Contents


**INTRODUCTION** **1**

SGA Background 1

SGA Groundwater Management Plan 4

Report Organization 5

**BASIN CONDITIONS** **7**

Hydrologic Conditions 7
- Sacramento River Water Year Index 7
- Water Forum Agreement Year Type 8
- Local Weather 9

Water Use 11

Groundwater Elevations 14
- Regional Groundwater Elevations 14
- Long-term Hydrographs 18

Groundwater Quality 22
- Water Quality in Public Supply Wells 22
- Known Contaminant Plumes in SGA and Vicinity 25

Land Subsidence 36

**BASIN MANAGEMENT ACTIVITY HIGHLIGHTS** **37**

Implementation of the SGA Groundwater Management Plan (GMP) 37

Other SGA Management Activities 37

**CONCLUSIONS AND RECOMMENDATIONS** **41**

Recommendations for GMP Objectives and Action Items 43

**APPENDIX A** **45**

GMP Action Items 45

# List of Tables

*Table 1. DWR Sacramento River Water Year Index Runoff* **7**

*Table 2. Water Year Types as Defined by Water Forum Agreement* **9**

*Table 3. Reported Surface and Groundwater Supplies by Agency* **12**

*Table 4. Framework Goals and Actual 2012 Groundwater Pumped* **38**

# List of Figures


**Figure 1. North American Subbasin** 3

**Figure 2. Local Water Agencies in North Area Basin** 4

**Figure 3. Unimpaired Inflow to Folsom Lake, March-November** 8

**Figure 4. Precipitation Totals for Six CDEC Stations in SGA Region** 9

**Figure 5. Monthly Six-Station Precipitation Average** 10

**Figure 6. Average Monthly Temperature at Station "Sacramento 5 ESE"** 10

**Figure 7. Groundwater Pumping in North Area Basin 2000-2012** 14

**Figure 8. Groundwater Elevations in Spring 2012** 16

**Figure 9. Groundwater Elevations in Spring 1997** 17

**Figure 10. Long-Term Hydrographs for the North Area Basin** 20

**Figure 11. Multiple Completion Monitoring Well Data for SGA Western Area** 21

**Figure 12. Multiple-Completion Monitoring Well Data for SGA Central Area** 21

**Figure 13. Multiple-Completion Monitoring Well Data for SGA Eastern Area** 22

**Figure 14. TDS Concentrations in Public Supply Wells** 27

**Figure 15. Arsenic Concentrations in Public Supply Wells** 28

**Figure 16. Nitrate Concentrations in Public Supply Wells** 29

**Figure 17. Example of Public Supply Well with Rising Nitrate Concentrations** 30

**Figure 18. Example of Public Supply Well with Declining Nitrate Concentrations** 30

**Figure 19. Iron Concentrations in Public Supply Wells** 31

**Figure 20. Manganese Concentrations in Public Supply Wells** 32

**Figure 21. Hexavalent Chromium Concentrations in Public Supply Wells** 33

**Figure 22. Tetrachloroethylene Concentrations in Public Supply Wells** 34

**Figure 23. Extent of Contaminant Plumes in the North Area Basin and Vicinity** 35

**Figure 24. Land Surface Elevation and Groundwater Level Changes near Elkhorn Blvd and Roseville Road** 36

# SGA Basin Management Report

## Introduction

This Basin Management Report[1] documents management activities of the Sacramento Groundwater Authority (SGA) and its member agencies from 2011 through 2012. It is the fifth in the series of reports that documents hydrologic conditions as well as management activities undertaken to help ensure the long-term sustainability of the region's 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 to manage the groundwater basin in Sacramento County north of the American River. Known locally 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 a result 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)[2] 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 joint powers 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

[1] This and previous reports are available at http://www.sgah2o.org/sga/news/publications/

[2] The WFA is available at http://www.waterforum.org.

Sacramento and adjacent political jurisdictions, to promote coordination of policies and activities throughout the region.

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 creating a governing board of directors comprised of representatives of the following water agencies and other water users within their jurisdiction:

- 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
- Natomas Central Mutual Water Company
- Orange Vale Water Company
- Rio Linda/Elverta Community Water District
- Sacramento Suburban Water District
- San Juan Water District
- Agriculture interests within SGA boundaries
- Commercial/Industrial self-supplied water users within SGA boundaries

For convenience, water purveyors, whether public or private, are referred to as "agencies" throughout this report.

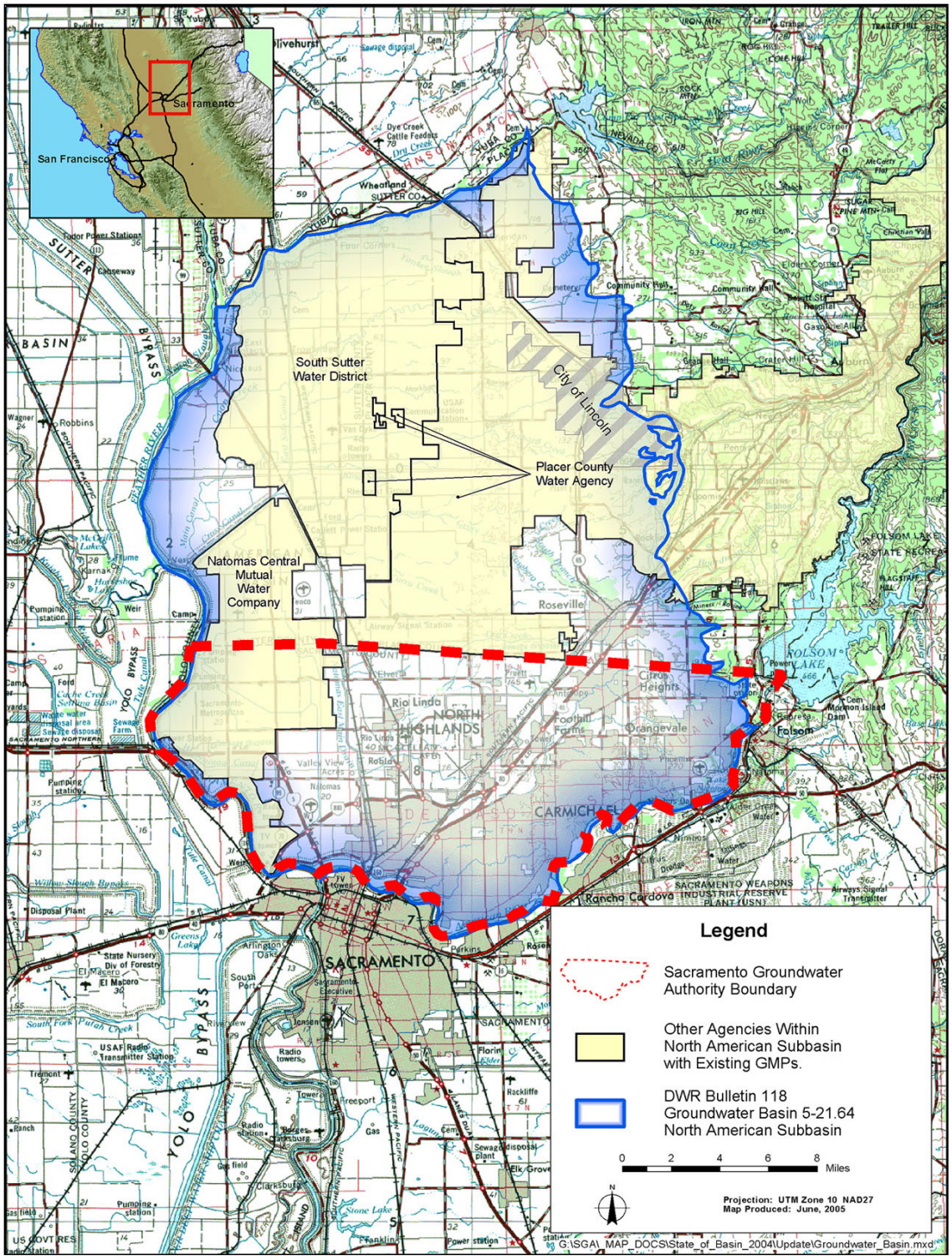


**Figure 1. North American Subbasin**

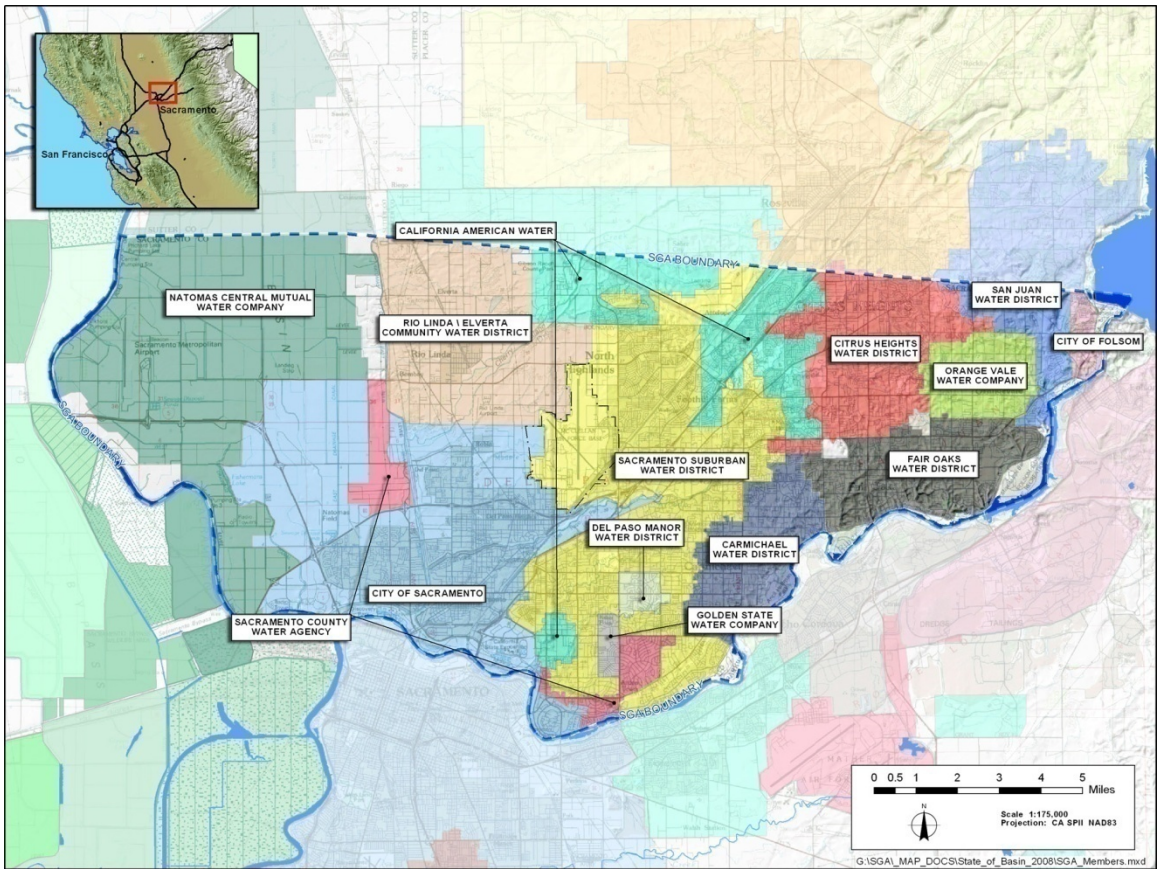


**Figure 2. Local Water Agencies in North Area Basin**

## SGA Groundwater Management Plan

SGA adopted its initial Groundwater Management Plan (GMP)[3] in 2003 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 the JPA and was consistent with the provisions of California Water Code § 10750 *et seq.* Additionally, the GMP included components recommended by the California Department of Water Resources in its 2003 update of *Bulletin 118: California's Groundwater*. In December 2008, SGA adopted a fully updated GMP as called for in the initial 2003 GMP. Another comprehensive GMP update is currently in progress, and is expected to be adopted in December 2013.

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 action items and a description of progress to date on those items (see Appendix A).

[3] The most recent 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 and groundwater elevations and water quality through 2012.

**Section 3: Basin Management Activities.** This section describes the most significant management actions taken by SGA and other local agencies that affected SGA from 2011 to present.

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

# Basin Conditions

## Hydrologic Conditions

Hydrologic conditions from 2011 through 2012 provided one year of relief from the dry conditions that began in 2007 for the Sacramento Valley. In the American River watershed, as in most of the Sacramento Valley, the welcome wet conditions of 2011 were followed by another year of below normal precipitation in 2012. As in past reports, three indicators are used to describe the hydrologic conditions for this period: 1) Sacramento River Water Year Index, 2) Water Forum Agreement year type, 3) Local weather.

### *Sacramento River Water Year Index*

The Department of Water Resources (DWR) maintains a record of water year types based on a calculated index using Sacramento River and tributary runoff[4]. The index classifies hydrologic conditions in the Valley for each water year period, October 1 through September 30, as wet, above normal, below normal, dry, or critical, as shown in Table 1, below.

*Table 1. DWR Sacramento River Water Year Index Runoff*

| Water Year | Runoff (million acre-ft) | Year Type |
|---|---|---|
| 1995 | 12.89 | Wet |
| 1996 | 10.26 | Wet |
| 1997 | 10.82 | Wet |
| 1998 | 13.31 | Wet |
| 1999 | 9.8 | Wet |
| 2000 | 8.94 | Above Normal |
| 2001 | 5.76 | Dry |
| 2002 | 6.35 | Dry |
| 2003 | 8.21 | Above Normal |
| 2004 | 7.51 | Below Normal |
| 2005 | 8.49 | Above Normal |
| 2006 | 13.2 | Wet |
| 2007 | 6.19 | Dry |
| 2008 | 5.16 | Critical |
| 2009 | 5.78 | Dry |
| 2010 | 7.08 | Below Normal |
| 2011 | 10.54 | Wet |
| 2012 | 6.89 | Below Normal |

| 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 |

[4] The Sacramento River Index is maintained at http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST.

The 2011 and 2012 water years were classified as wet and below normal, respectively. After the wet year of 2006, five of the six water years through 2012 were classified as below normal, dry or critical. Table 1 lists the classification for water years 1995 through 2012. The classifications are defined at the bottom of the table.

### *Water Forum Agreement Year Type*

March-through-November total unimpaired inflows into Folsom Lake determine the amount certain Sacramento area water agencies may divert from Folsom Lake and the lower American River as specified in their purveyor-specific agreements under the Water Forum Agreement (WFA). The unimpaired inflows in 2011 were well above the level that would have triggered WFA restrictions. The 2012 water year was classified as an Average Year or "Hodge Year" under the WFA resulting in restrictions to some water purveyors. Figure 3 shows the relationship of the 2011 and 2012 flows to the WFA year types. Table 2 lists the definitions of WFA water year types.

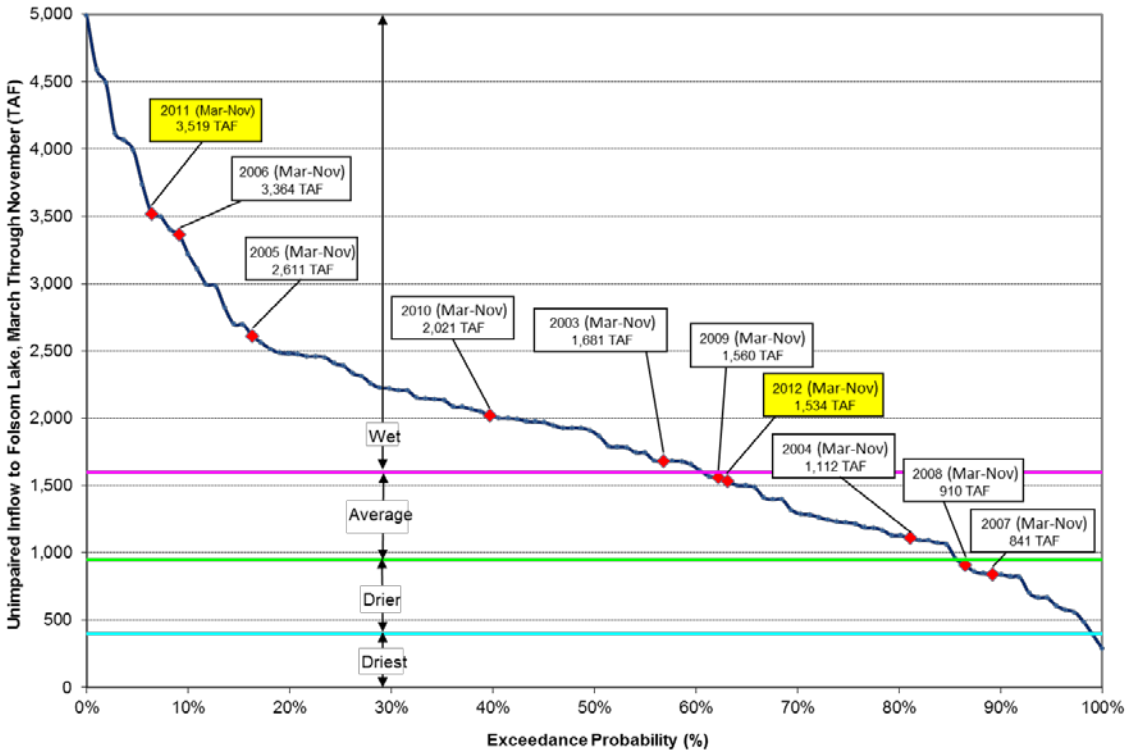


**Figure 3. Unimpaired Inflow to Folsom Lake, March-November**

Flow values plotted in Figure 3 are derived using values of the calculated full natural flow below Folsom Dam as provided at the link http://cdec4gov.water.ca.gov/cgi-progs/queryMonthly?AMF. These values may vary from the final estimates in the Water Forum Successor Effort's Runoff and Allocation Reports, which are derived as discussed in the document at http://www.waterforum.org/DryYearProceduresTM1-Computing-March-Nov-UIFR-5-17-07.pdf. The exceedance probability curve in Figure 3 was calculated using values of full natural flow below Folsom Dam from 1901 through 2012.

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

| Year Type | Unimpaired Inflow to Folsom Lake, March through November (acre-ft) |
|---|---|
| Wet (No Restrictions) | Greater than 1,600,000 |
| Average (Hodge Year) | Greater than 950,000 and less than 1,600,000 |
| Drier (Wedge Year) | Greater than 400,000 and less than 950,000 |
| Driest (Conference Year) | Less than 400,000 |

## *Local Weather*

DWR maintains precipitation data on its California Data Exchange Center (CDEC) Web site (http://cdec.water.ca.gov) for the following six stations within and adjacent to the SGA area: Sacramento Metro Airport (SMF), Rio Linda W. C. (RLN), Roseville Fire Station (RSV), Arden Way (ARW), Chicago (CHG) and Folsom Dam (FLD).

The locations of these stations are shown on Figure 4, along with the water year precipitation totals for 2011 and 2012 at those stations. The total precipitation, averaged over these six stations for water years 2011 and 2012, was 26.11" and 14.51", respectively. The long-term average annual precipitation at Sacramento Executive Airport is 17.52".

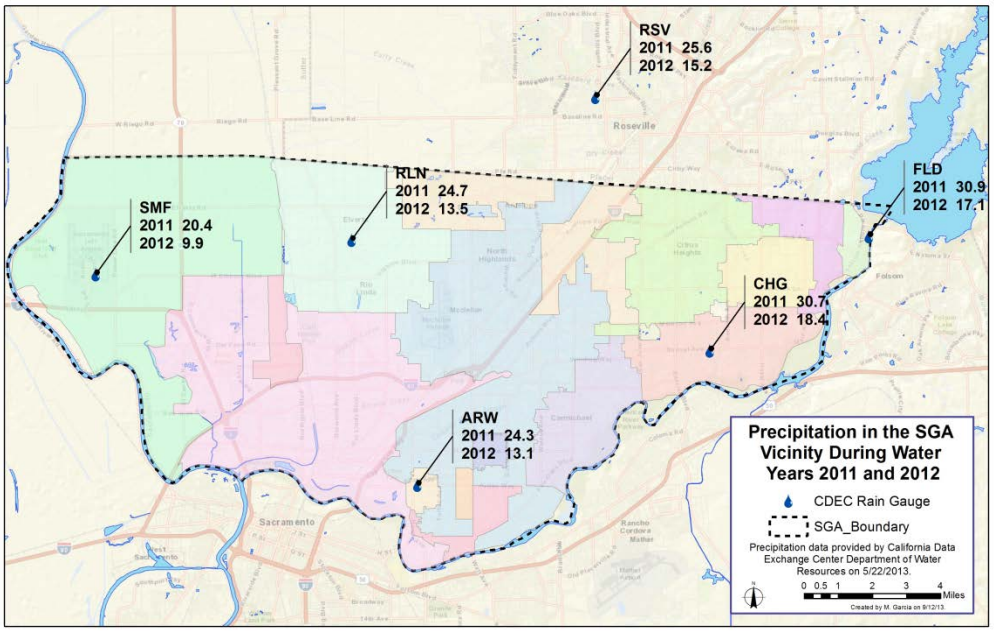


**Figure 4. Water Year 2011 and 2012 Precipitation Totals for Six CDEC Stations in SGA Region**

Figure 5 shows the monthly precipitation totals for water year 2011 through the end of 2012 as an average of the six stations on CDEC in the SGA region in relation to the long-term monthly average precipitation at Sacramento Executive Airport.

A plot of the average monthly temperature for water year 2011 through 2012 is shown in Figure 6. The possible relationship between precipitation, temperature and water use is discussed briefly in the next section.

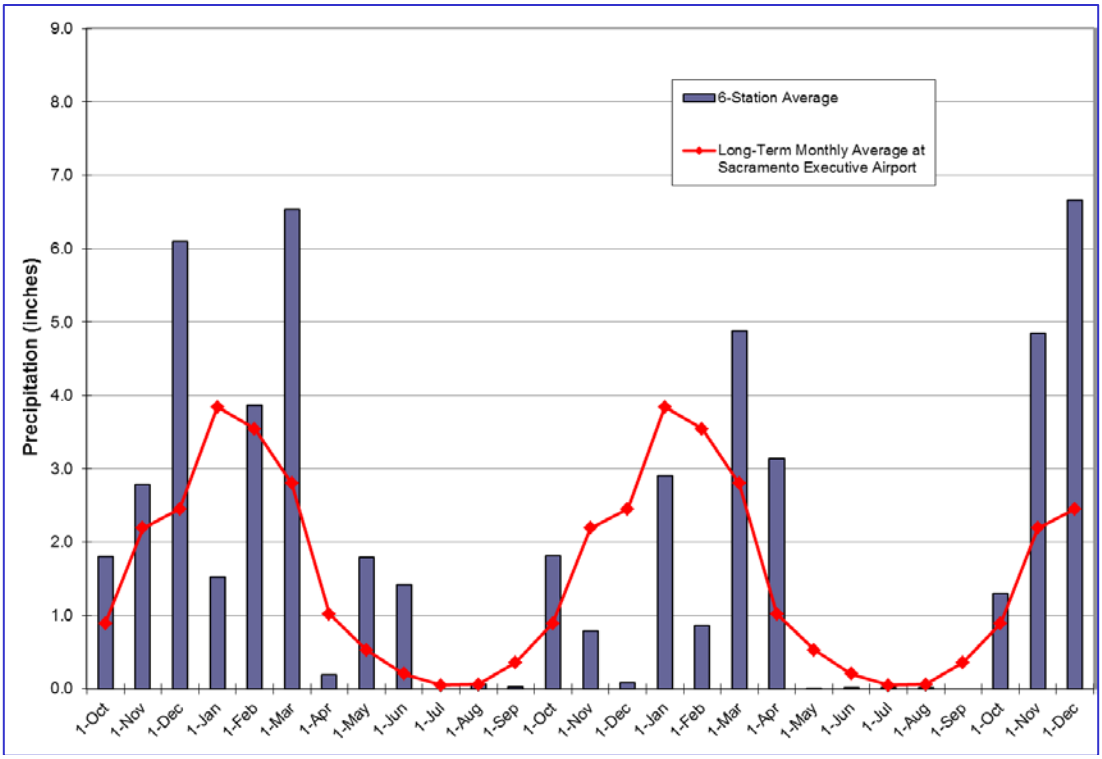


**Figure 5. Monthly Six-Station Precipitation Average**

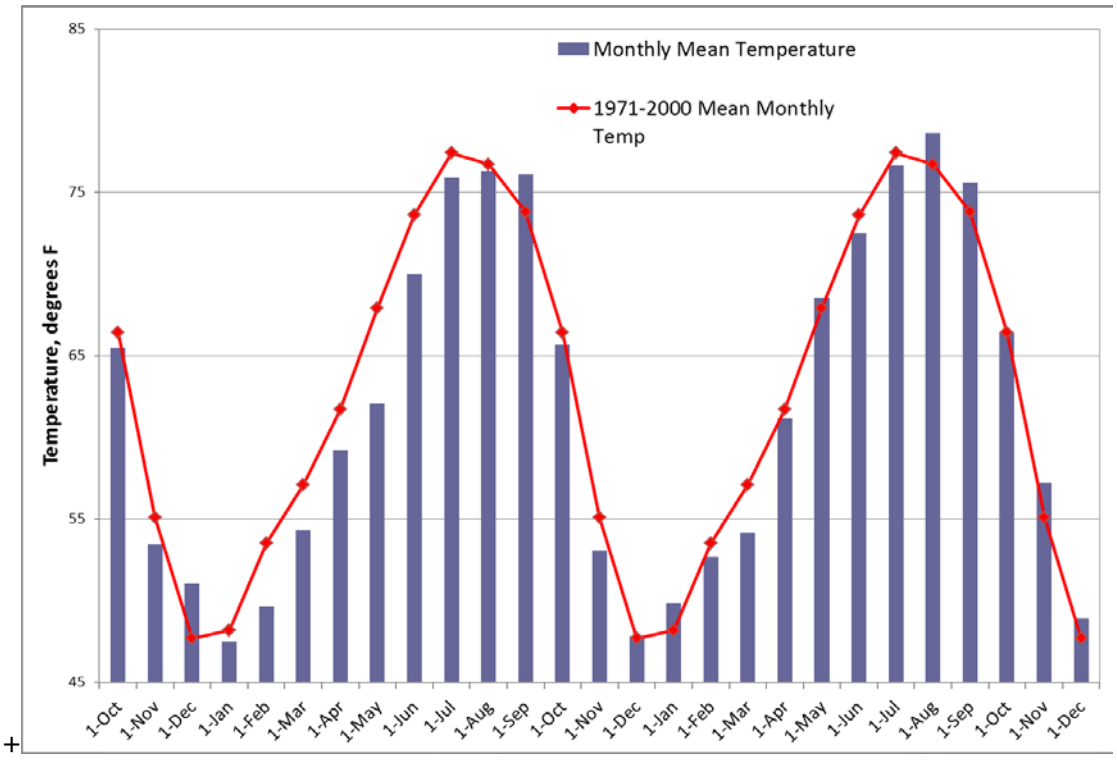


**Figure 6. Average Monthly Temperature at Station "Sacramento 5 ESE"**

## Water Use

Groundwater pumping from the North Basin in each of the years 2010, 2011 and 2012 was lower than any year since 1983. This reduction was due to the expansion of conjunctive use facilities and to some degree by the annual variability in precipitation and temperature. Future basin management reports will examine water use data in light of weather conditions in an attempt to better characterize the relationship between demand and weather conditions.

Local water agencies extracted less groundwater in 2011, 61,954 acre-feet, than any other year from 2000 through 2012 (see Figure 7 on page 14). Note that 2011 was wetter and cooler than average, as shown in Figures 5 and 6, likely accounting for some of the reduced demand. Although conditions turned considerably drier and somewhat warmer in 2012 and more groundwater was pumped than in 2011, local agencies extracted less groundwater in 2012 than under similar conditions in the past.

Water agencies in the North Area Basin as a whole typically meet about half of their water supply needs with groundwater and about half with surface water for municipal and industrial uses. Table 3 shows the reported surface water and groundwater deliveries by agency from calendar year 2008 through 2012[5]. The region has been moving toward more conjunctive use of surface water and groundwater but some agencies must still rely entirely on groundwater, while others rely entirely on surface water. In the 2008 through 2012 period, groundwater made up an average of about 47% of the local agencies' supply, ranging from about 45% in 2011 to about 50% in 2009.

Figure 7 shows total reported groundwater pumping from 2000 through 2012. Over the period, and especially in the past five years, groundwater extraction has decreased as average surface water use has increased due to the expansion of conjunctive use operations following the Water Forum Agreement in 2000. The downward trend in groundwater use by water agencies was interrupted in 2007 and again in 2012, when dry conditions resulted in additional groundwater pumping. It is also worth noting that overall demand for both surface water and groundwater have seen a general downward trend in recent years.

[5] This data does not include surface water supplies for portions of the San Juan Water District in Placer County, the City of Folsom south of the American River, and the Natomas Central Mutual Water Company delivered to agriculture.

*Table 3. Reported Surface Water and Groundwater Supplies by Agency*

| WATER PURVEYOR | YEAR | Surface Water | Ground Water | Total Water Deliveries |
|---|---|---|---|---|
| California American Water | 2012 | 591 | 13,595 | 14,186 |
| | 2011 | 2,099 | 11,605 | 13,704 |
| | 2010 | 1,576 | 13,324 | 14,900 |
| | 2009 | 620 | 19,248 | 19,868 |
| | 2008 | 1,412 | 19,243 | 20,655 |
| Carmichael Water District | 2012 | 8,315 | 1,580 | 9,895 |
| | 2011 | 7,850 | 1,469 | 9,319 |
| | 2010 | 8,214 | 1,518 | 9,732 |
| | 2009 | 8,965 | 1,609 | 10,574 |
| | 2008 | 10,422 | 1,581 | 12,003 |
| Citrus Heights Water District | 2012 | 13,355 | 583 | 13,938 |
| | 2011 | 12,095 | 962 | 13,057 |
| | 2010 | 11,945 | 1,560 | 13,505 |
| | 2009 | 12,007 | 2,120 | 14,127 |
| | 2008 | 16,890 | 352 | 17,242 |
| Del Paso Manor Water District | 2012 | 0 | 1,499 | 1,499 |
| | 2011 | 0 | 1,428 | 1,428 |
| | 2010 | 0 | 1,409 | 1,409 |
| | 2009 | 0 | 1,504 | 1,504 |
| | 2008 | 0 | 1,610 | 1,610 |
| Fair Oaks Water District | 2012 | 9,987 | 1,563 | 11,550 |
| | 2011 | 9,597 | 1,516 | 11,113 |
| | 2010 | 10,606 | 1,194 | 11,800 |
| | 2009 | 11,072 | 1,109 | 12,181 |
| | 2008 | 10,534 | 2,225 | 12,759 |
| Folsom, City of | 2012 | 1,279 | 0 | 1,279 |
| | 2011 | 1,279 | 0 | 1,279 |
| | 2010 | 1,331 | 0 | 1,331 |
| | 2009 | 1,647 | 0 | 1,647 |
| | 2008 | 1,608 | 0 | 1,608 |
| Golden State Water Company | 2012 | 0 | 1,119 | 1,119 |
| | 2011 | 0 | 1,041 | 1,041 |
| | 2010 | 0 | 1,029 | 1,029 |
| | 2009 | 0 | 1,127 | 1,127 |
| | 2008 | 0 | 1,276 | 1,276 |
| Orange Vale Water Company | 2012 | 4,658 | 0 | 4,658 |
| | 2011 | 4,108 | 0 | 4,108 |
| | 2010 | 4,324 | 0 | 4,324 |
| | 2009 | 4,409 | 0 | 4,409 |
| | 2008 | 4,982 | 0 | 4,982 |

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

| WATER PURVEYOR | YEAR | Surface Water | Ground Water | Total Water Deliveries |
|---|---|---|---|---|
| Rio Linda/Elverta CWD | 2012 | 25 | 2,857 | 2,882 |
| | 2011 | 0 | 2,544 | 2,544 |
| | 2010 | 3 | 2,719 | 2,722 |
| | 2009 | 11 | 2,914 | 2,925 |
| | 2008 | 2 | 3,340 | 3,342 |
| Sacramento, City of | 2012 | 24,530 | 13,554 | 38,084 |
| | 2011 | 18,656 | 17,607 | 36,263 |
| | 2010 | 18,324 | 17,768 | 36,092 |
| | 2009 | 21,609 | 18,867 | 40,476 |
| | 2008 | 25,431 | 18,414 | 43,845 |
| Sacramento, County of | 2012 | 0 | 5,211 | 5,211 |
| | 2011 | 0 | 4,663 | 4,663 |
| | 2010 | 0 | 4,950 | 4,950 |
| | 2009 | 0 | 5,202 | 5,202 |
| | 2008 | 0 | 5,028 | 5,028 |
| Sacramento Suburban WD | 2012 | 10,559 | 27,530 | 38,089 |
| | 2011 | 16,709 | 19,119 | 35,828 |
| | 2010 | 17,807 | 20,178 | 37,985 |
| | 2009 | 12,084 | 23,021 | 35,105 |
| | 2008 | 14,982 | 23,516 | 38,498 |
| San Juan Water District | 2012 | 3,421 | 0 | 3,421 |
| | 2011 | 3,046 | 0 | 3,046 |
| | 2010 | 3,011 | 0 | 3,011 |
| | 2009 | 3,249 | 0 | 3,249 |
| | 2008 | 4,270 | 0 | 4,270 |
| **Total for SGA Area** | 2012 | 76,720 | 69,091 | 145,811 |
| | 2011 | 75,439 | 61,954 | 137,393 |
| | 2010 | 77,141 | 65,649 | 142,790 |
| | 2009 | 75,673 | 76,721 | 152,394 |
| | 2008 | 90,533 | 76,585 | 167,118 |

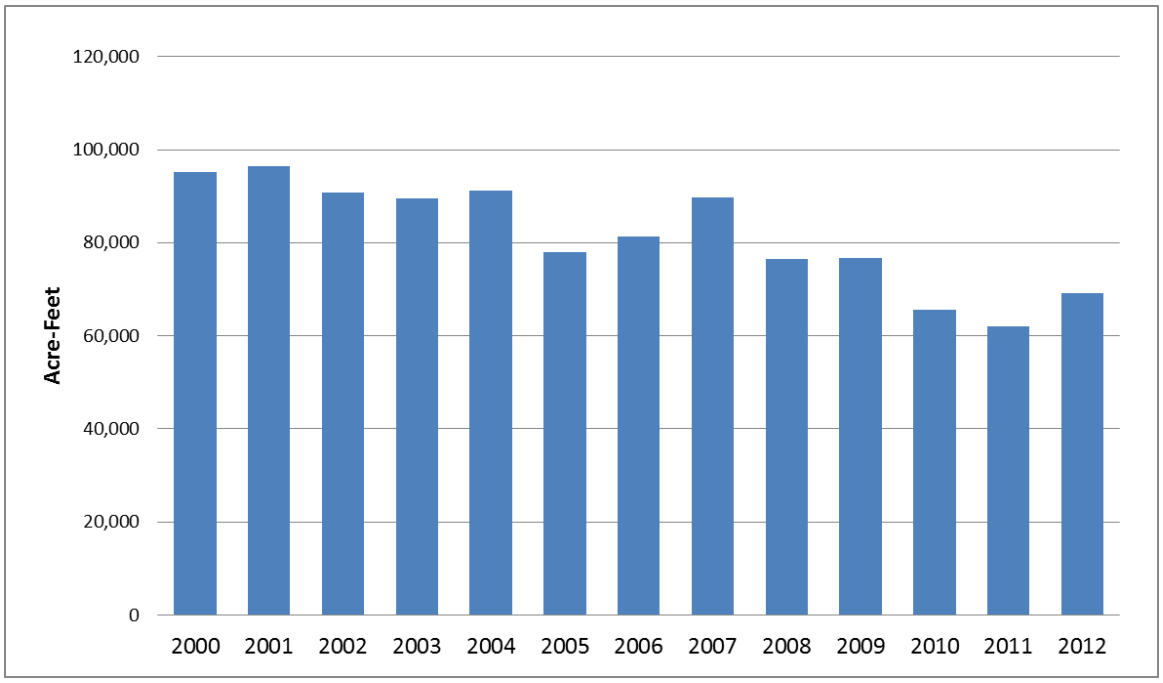


**Figure 7. Groundwater Pumping in North Area Basin 2000-2012**

## Groundwater Elevations

DWR and Sacramento County Water Agency have maintained a network of wells throughout Sacramento County. Water level records for some of the wells date back to the 1950s. Long-term hydrographs from those wells track the groundwater elevation trends during the major period of development of the underlying aquifer system. Additionally, there are newer multiple-completion monitoring wells, which monitor more than one discrete depth from the same location, within the basin. Data from the multiple-completion wells show the vertical gradients that exist between different depth intervals within the aquifer system as well as groundwater elevation trends.

### *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. Water agencies in the region have worked diligently over more than a decade to finance and construct facilities to bring more surface water into the region when available, allowing groundwater levels to recover from their historical low elevations.

Figure 8 is a contour plot of equal elevations of groundwater in the North Area Basin for Spring 2012. Note the continued presence of a cone of depression in the central part of the North Area Basin. The low elevation in the area, located within the -20 foot contour, is approximately 28 feet below mean sea level (MSL). In general, the rest of the North Area Basin does not show any distinctive patterns with respect to 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 9 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 current depression, the low elevation observed in 1997 was approximately 47 feet below mean sea level. Comparing the 1997 and 2012 elevations indicates that groundwater elevations increased nearly 20 feet at the lowest part of the depression over this 15-year period. 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).

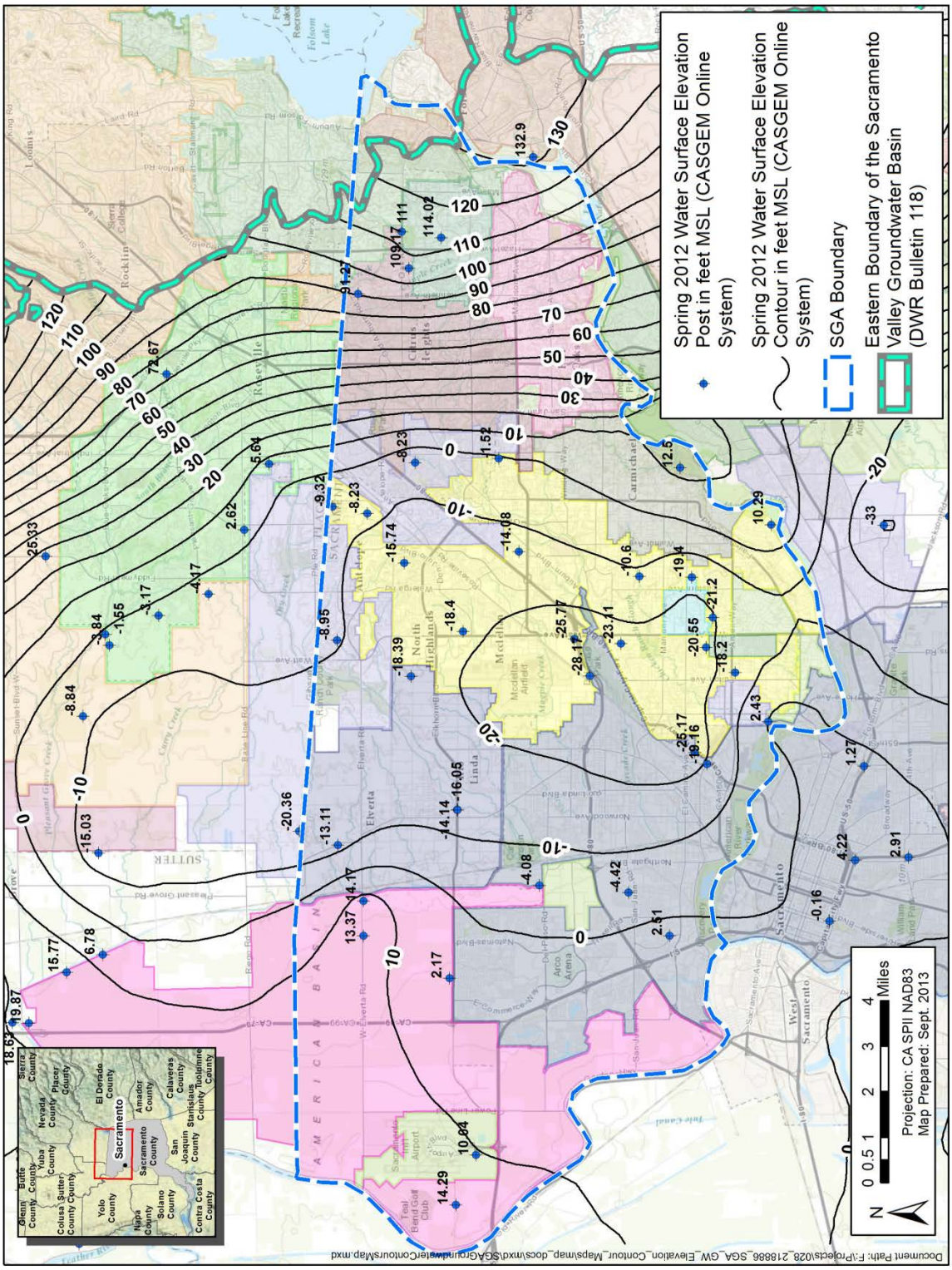


**Figure 8. Groundwater Elevations in Spring 2012**

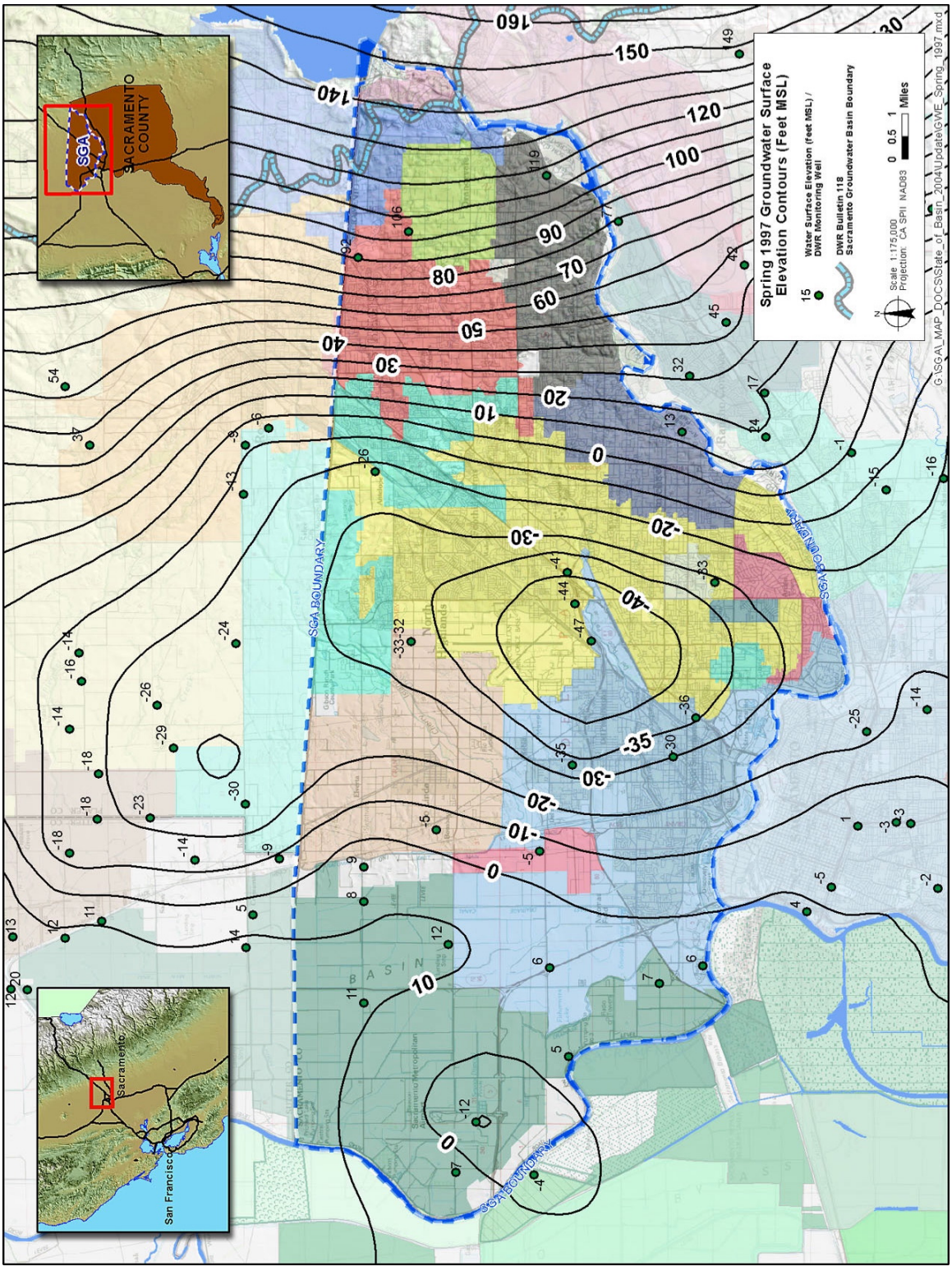


**Figure 9. Groundwater Elevations in Spring 1997**

## *Long-term Hydrographs*

Figure 10 shows the locations and hydrographs of selected long-term monitoring wells in the basin. In general, data from 2011 and 2012 support observations since around the mid-1990s that groundwater elevations are remaining stable in the basin and in some cases are continuing to increase slightly. For purposes of further discussion, the North Area Basin can be divided into the following 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 10). This area is served almost exclusively by surface water. Hydrographs for wells 09N04E27F001M, 10N03E35A001M, and 10N04E23A001M show that groundwater elevations ranged from about MSL to over 15 feet above MSL in 2011 through 2012. Although water level fluctuations are minor, water levels in this region reached their highest levels in spring 2011 since spring 2006. Water levels in each of the selected wells varied seasonally in the past several years. The greatest range of water levels in the period was 7.1 feet seen in well 10N03E35A001M .

Figure 11 shows water level trends in a multiple-completion monitoring well constructed and maintained by DWR since 1997. The water elevations in the shallow aquifer have not changed, other than seasonally, over the period of record. Seasonal high water levels in the middle deep zone declined over eight feet from 1998 to 2009, with about half the decline occurring in the 2006 through 2009 period, possibly due to dry hydrologic conditions. In 2011 and 2012, the seasonal high levels indicate that groundwater has recovered from the recent dry conditions. Water levels in the deep zone trend similarly to those in the middle deep zone. The hydrograph also shows that there is a downward vertical gradient from the shallow through the deep monitored zones. (Note: DWR changed the datum for this well since the last BMR report. Therefore, Figure 11 cannot be compared directly to the corresponding figure in previous reports. Relative changes in water levels over time are the same as before.)

### 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 10). This area currently uses a combination of surface water and groundwater, but historically relied predominantly on groundwater. Hydrographs for 09N05E28K001M, 09N05E14B001M, 09N05E25J001M, 09N06E27D001M, and 10N05E14Q002M show that groundwater elevations currently range from about 10 feet above MSL in the southeastern corner of this area near the American River to nearly 30 feet below MSL near the center of the area.

Significant drawdown, about 80 feet in 35 years, was observed in 10N05E14Q002M beginning when groundwater levels were measured in 1955. Similar declining groundwater level trends were seen in other area wells when groundwater level measurements began. Groundwater levels in this area continued their steady decline until around the mid-1990s, when water levels stabilized due, in substantial part, to

expanded conjunctive use operations. Water levels have continued to rise overall since that time, with slight downticks during the 2007 through 2009 dry conditions in the State. During the 2011 through 2012 period groundwater elevations in SGA's central area have varied only seasonally or shown a slightly rising trend.

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-1990s when they stabilized. Water levels have since shown gradual and steady recovery with seasonal highs and lows. The deepest zone monitored has the highest groundwater elevation, indicating a slight upward gradient. It is also worth noting that the elevations in this well are in the range of 40 feet below sea level, which would seem contrary to the regional groundwater contour map shown in Figure 8. However, these are localized pumping levels associated with the groundwater remediation operations and are not indicative of the broader, long-term regional groundwater conditions.

**Eastern Area**

The eastern portion of the North Area Basin extends roughly east of San Juan Avenue to the American River, which is the eastern edge of the basin (Figure 10). This area has historically relied primarily on surface water. Hydrographs for wells 09N07E17K001M and 10N07E29G001M are in excess of 70 and 100 feet above MSL, respectively. Groundwater elevations within the area can be highly varied as seen by the difference in water levels between these two wells. The groundwater levels tend to mimic ground elevations in this area of rolling topography. Hydrographs indicate that groundwater elevations have not changed greatly with time, reflecting the limited use of groundwater in the area. Groundwater elevations measured in well 10N07E29G001M have varied no more than two feet from October 1998 through 2012. The variation in well 09N07E17K001M has been within a range of five feet during 2011 and 2012, but is generally five feet lower than the levels seen in this well before 2006.

Figure 13 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 declined by about 10 feet between the early 1990s through 2010. The deeper zone shows a downward trend beginning in the mid-1990s that resulted in groundwater levels dropping 35 feet by 2009. These trends are likely localized effects associated with groundwater extractions as part of the American River Groundwater Extraction and Treatment (ARGET) facilities operated by Aerojet. Groundwater levels in all zones seem to have stabilized over the 2011-2012 period.

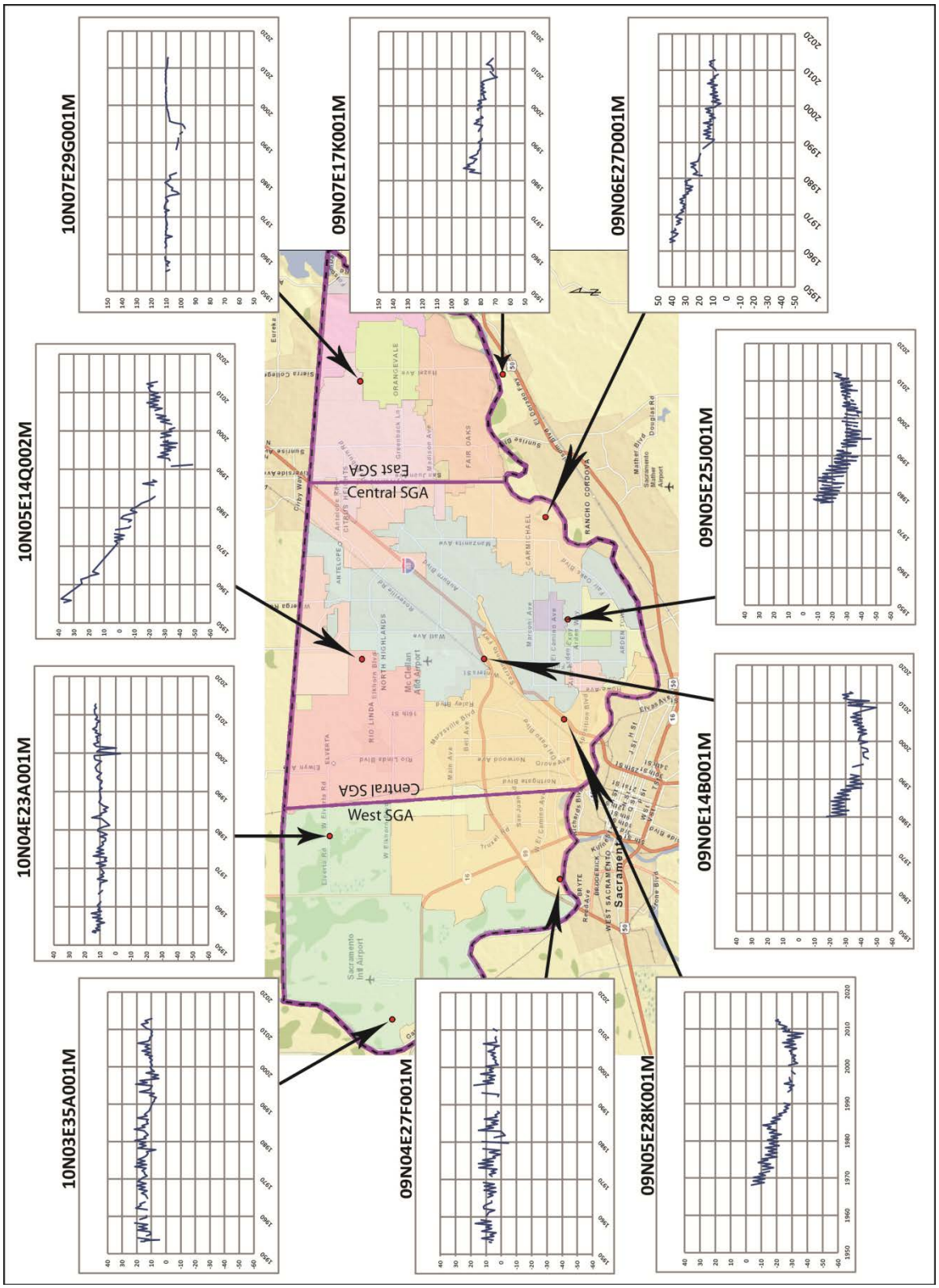


**Figure 10. Long-Term Hydrographs for the North Area Basin**

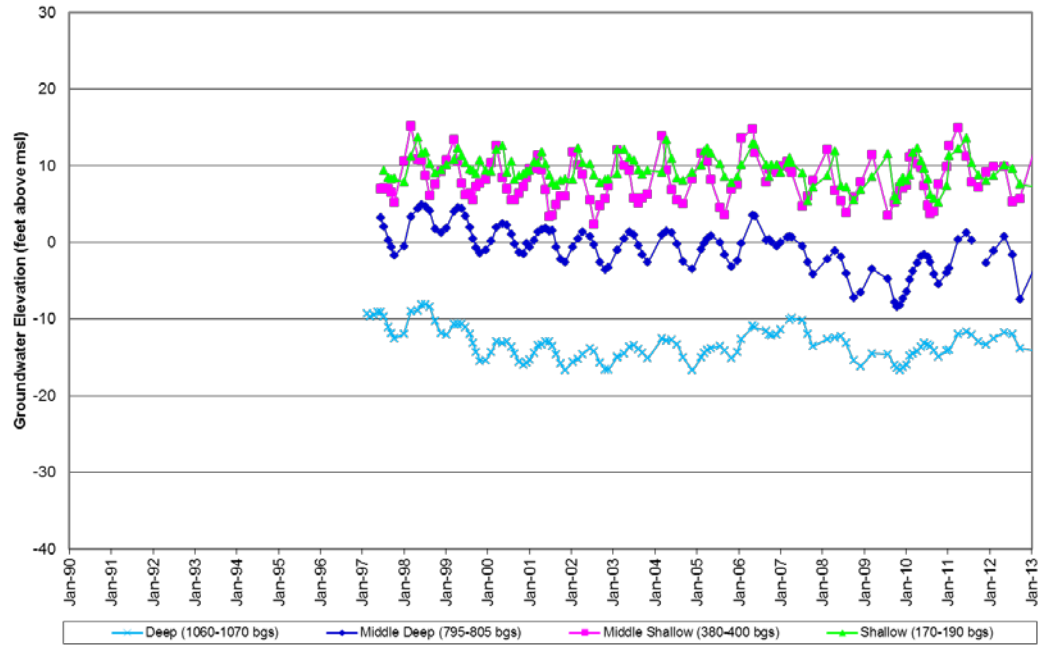


**Figure 11. Multiple-Completion Monitoring Well Data for SGA Western Area**

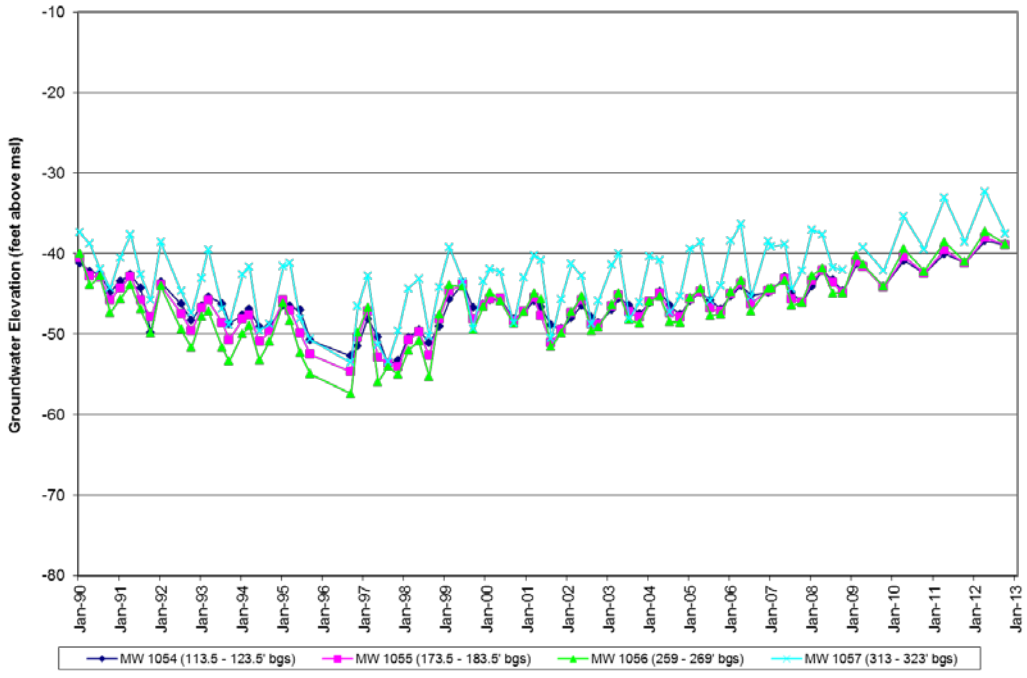


**Figure 12. Multiple-Completion Monitoring Well Data for SGA Central Area**

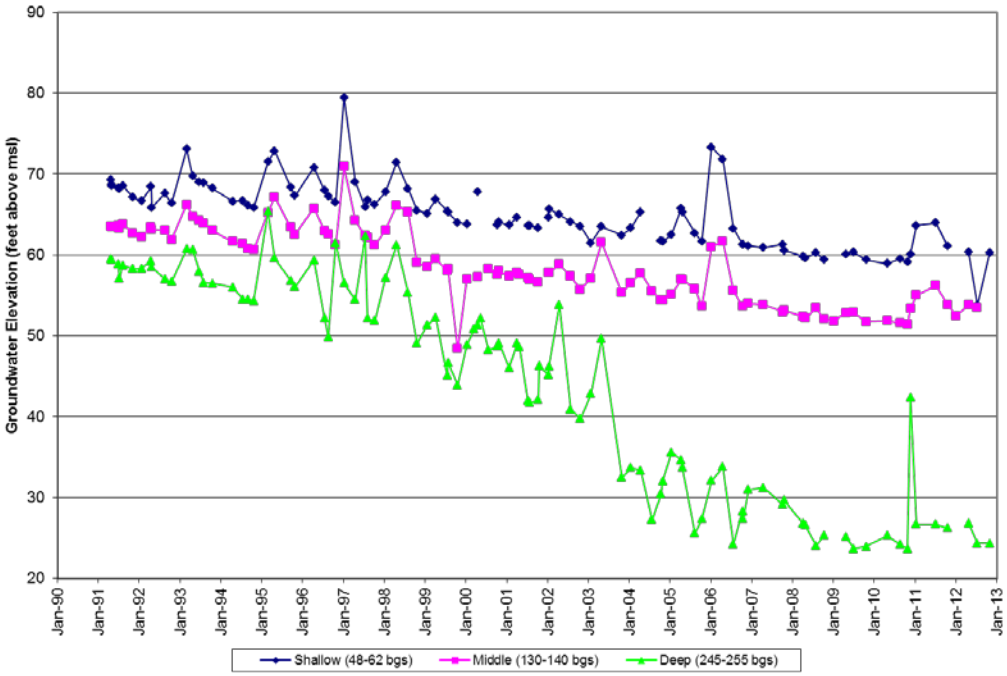


**Figure 13. Multiple-Completion Monitoring Well Data for SGA Eastern Area**

## 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*

As of 2011, there were 208 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. To evaluate groundwater quality, SGA reviewed water quality data reported by SGA members to the California Department of Public Health between 2001 and 2010. 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, manganese, hexavalent chromium, and tetrachloroethylene (PCE). 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 2001 through 2010, with the maximum concentration being used in wells that had

multiple analyses. One exception to the data period noted above 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. Also note that the water quality review included in this version of the Basin Management Report was performed as part of the Groundwater Quality Vulnerability Assessment completed by SGA in 2011. Therefore, data for some wells south of the SGA area are included in the summary and figures for the constituents described below, with the exception of radon.

**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 255 distinct samples from wells analyzed in the period. With respect to TDS, the quality of water in the basin is excellent, with an average TDS of 268 mg/L and only six wells exceeding the secondary MCL. Figure 14 shows the general distribution of TDS in public supply wells.

**Arsenic**

Arsenic is a naturally occurring element in the earth's crust. In 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 236 distinct arsenic samples from the period, 67 were at or below the analytical detection level of 2 ug/L. Of the remaining wells with values above the detection level, the average was 3.6 ug/L, with one well exceeding the MCL. Figure 15 shows the general distribution of arsenic concentrations in public supply wells.

**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 in the SGA area. Of 252 samples from public supply wells tested during the period, the average concentration was 11.5 mg/L with a maximum observed concentration of 51 mg/L. Figure 16 shows the general distribution of nitrate concentrations in public supply wells.

Increasing nitrate concentrations are of concern in the Central Valley, especially in primarily agricultural areas. While much of the SGA is urban, it did have significant agriculture in the past. As part of preparation of this BMR, SGA reviewed water quality from the DPH Title 22 database that routinely had nitrate concentrations above 10 mg/L to see if there were any discernible trends. There were 30 wells that had concentrations near and above 10 mg/L. Of these, 17 wells appeared to show a trend of increasing nitrate concentrations, 3 had no discernible trend, and 10 wells

had a decreasing trend for nitrate concentrations. Figures 17 and 18 show examples of increasing and decreasing trends, respectively.

One observation in discussing nitrate concentrations with water purveyors is that the nitrate concentrations can vary widely, depending on how frequently the well has been used prior to sampling. For example, purveyors indicated that in some instances elevated nitrates were observed in wells that were only recently turned on for sampling purposes. Longer-term pumping resulted in concentrations decreasing. Based on the available data and limitations, SGA did not attempt to determine conclusively if there is an overall trend. However, there are no indications that nitrates present a public health concern within the SGA area.

**Radon**

Radon is a naturally occurring radioactive gas believed to cause lung cancer in humans. 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 a maximum concentration of 300 picoCuries per liter (pCi/L) in 1999. That rule has yet to be finalized, and there is no updated estimate for its release. 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. Because this data has not been updated recently, no updated figure was developed for radon in this report.

**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 considered a significant problem in SGA-area public supply wells, but it is fairly routinely encountered. Of the 196 distinct wells sampled during the period, six wells were below the detection level of 10 ug/L. Of the wells with detections, 56 wells had concentrations exceeding the secondary MCL. Note that these represent the maximum detections observed in a given well, so the well may not routinely sample above these concentrations. Figure 19 shows the general distribution of iron concentrations in public supply wells.

**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, but it is fairly routinely encountered. Of the 183 distinct wells sampled during the period, 55 wells were below the detection level of 10 ug/L. Of the remaining wells, 35 wells had concentrations exceeding the

secondary MCL. Figure 20 shows the general distribution of manganese concentrations in public supply wells in the North Area Basin.

**Hexavalent Chromium**

Hexavalent chromium (CrVI) is a heavy metal that is commonly found in low concentrations in drinking water. It can occur naturally, but has also been sourced historically from industrial operations. CrVI is known to be a potent carcinogen when inhaled, and was also found to cause cancer in laboratory rats and mice that were exposed through drinking water. A public health goal (PHG) has been established at 0.02 ug/L, and a draft MCL was proposed in August 2013 by DPH at 10 ug/L.

The occurrence of CrVI is widespread in the SGA area. Of the 206 distinct wells sampled between 2001 and 2003 as part of the unregulated contaminants monitoring rule (UCMR) program, 126 wells were below 5 ug/L, 63 had concentrations from 5 ug/L up to 10ug/L, and 17 had concentrations greater than 10ug/L. Figure 21 shows the general distribution of CrVI concentrations in public supply wells.

If a final MCL for CrVI is published at 10 ug/L, nearly 10 percent of the wells in the SGA would exceed the MCL, with many more being near the proposed MCL that could be impacted. Current treatment options are very expensive and the size of land needed to have such treatment in generally larger than the current well parcels leaving limited options. The areas of biggest concern appear to north and west of Interstate 80 near the communities of Antelope and Rio Linda. These areas have larger percentages of their current supply that would be impacted.

**Tetrachloroethylene**

Tetrachloroethylene (PCE) is a volatile organic compound (VOC) used as a component of solvents, hydraulic fluids, paint thinners, and dry cleaning agents. PCE currently has an MCL of 5 ug/L, but could be lowered in the future. Of the 142 wells sampled from the period, 118 wells were below the detection level of 0.5 ug/L. Of the remaining wells with detections, six had concentrations exceeding the MCL. Figure 22 shows the general distribution of PCE concentrations in public supply wells. Notably, a number of wells with relatively high concentrations are being detected in the northern part of Sacramento County adjacent to Interstate 80. The number of detections is increasing through time downgradient from this area, which is a source of concern to SGA. Beginning in late 2013, SGA will begin a study to assess the potential regional impacts of this contamination. The study will be funded primarily from a local groundwater assistance grant from DWR awarded in July 2013.

## *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, Aerojet, the Union Pacific Railroad site in Sacramento, and a number of industrial sites in north Sacramento. The extent of these plumes, based on available data through 2008, is shown in Figure 23. The presence of these plumes is an ongoing concern to SGA members as it may impact their ability to fully develop conjunctive use programs to implement the Water Forum Agreement. Further

identification and tracking of these plumes and other more localized sources of groundwater contamination will continue to be a major focus of SGA.

### Former McClellan Air Force Base Groundwater Contamination

SGA has been focused on the contamination at McClellan for the past decade. Since the Regional Contamination Issues Committee began meeting in 2004, SGA has joined representatives of regulatory agencies and responsible parties as regular participants in those meetings. The Air Force Real Property Agency provides quarterly update reports to SGA on progress of cleanup activities at McClellan.

As of the second quarter of 2013, the groundwater treatment system has removed more than 60,000 pounds of contaminants from groundwater over the life of the project. Currently, the groundwater treatment system processes about 2,200 gallons per minute, removing in excess of 20 pounds of contaminant per month from the pumped groundwater. The treated water is discharged into Magpie Creek to the west of McClellan. The discharged water routinely meets discharge requirements imposed by the regulatory agencies.

One noteworthy discharged constituent is hexavalent chromium, which has an average discharge limit of 11ug/L. This limit could be impacted, if the proposed maximum contaminant level for hexavalent chromium of 10ug/L is finalized by the Department of Public Health.

As required by the Comprehensive Environmental Review, Compensation, and Liability Act, the Air Force will commence a 5-year review of the McClellan cleanup program in 2013. This will be the fourth review since the program began. The review is intended to determine whether the remedy at the site is functioning as intended, whether current assumptions and objectives for cleanup are still valid, and whether there is new information that supports a change in the cleanup criteria. The 5-year review is expected to be completed in late 2014. SGA will track the progress of the review.

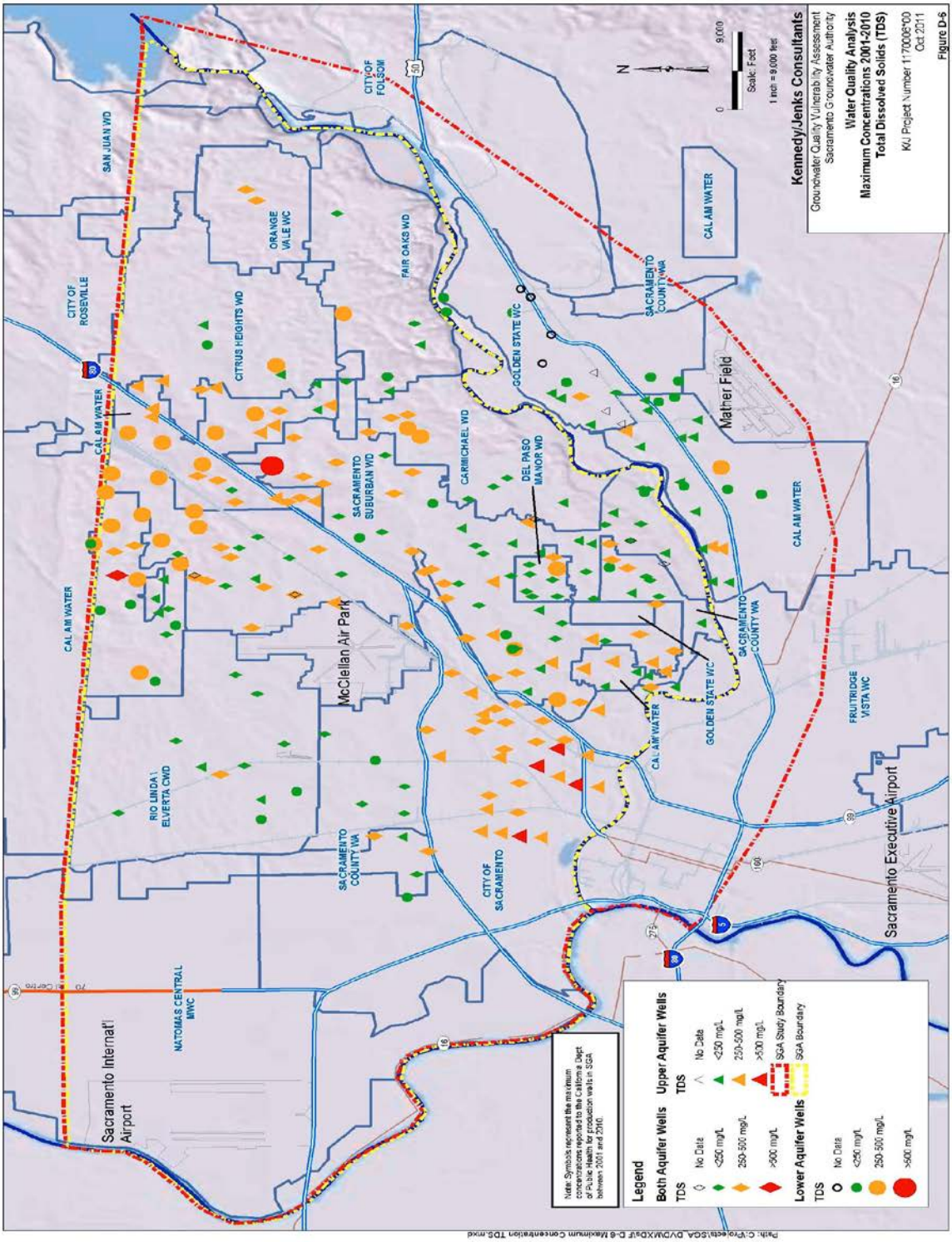


**Figure 14. TDS Concentrations in Public Supply Wells**

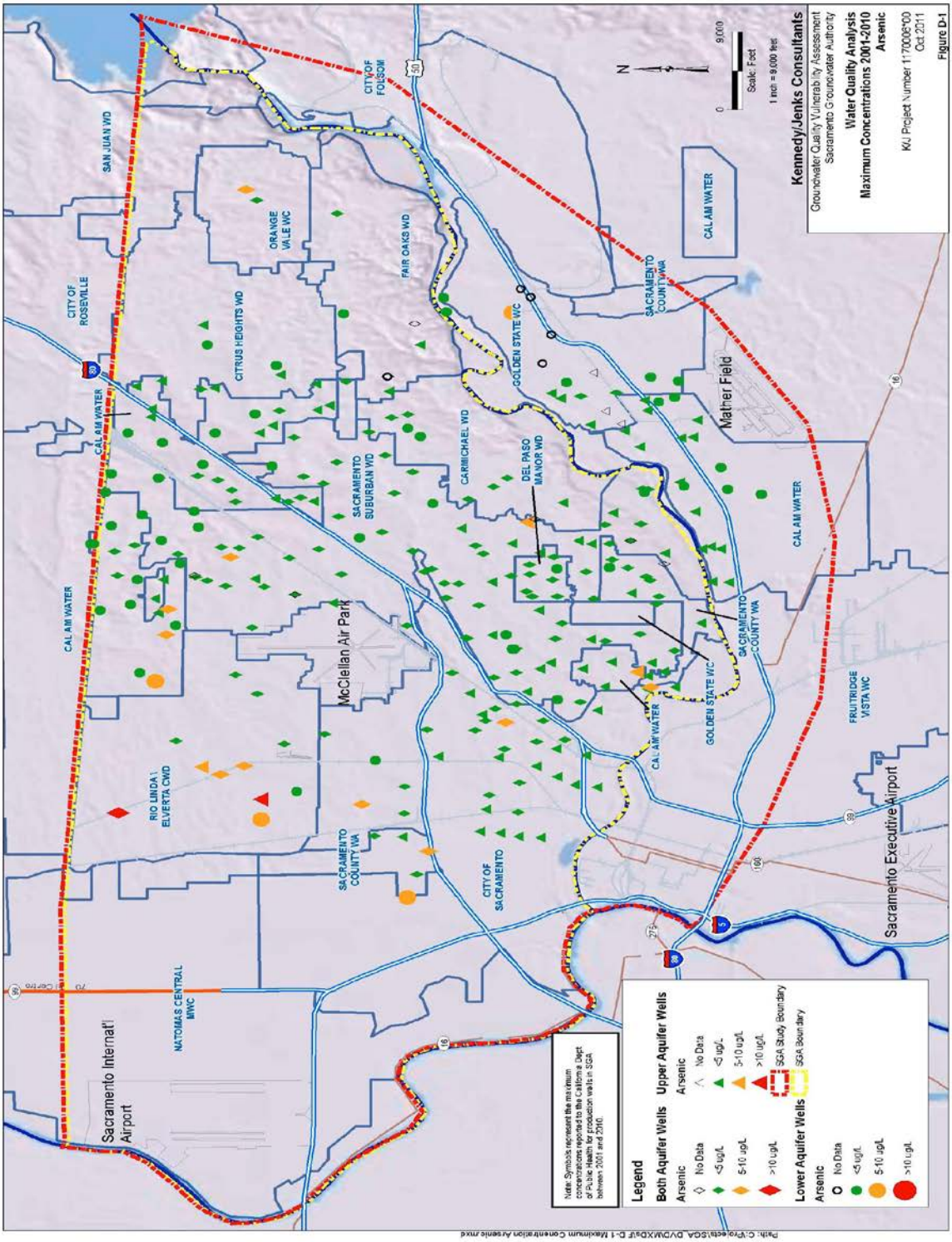


**Figure 15. Arsenic Concentrations in Public Supply Wells**

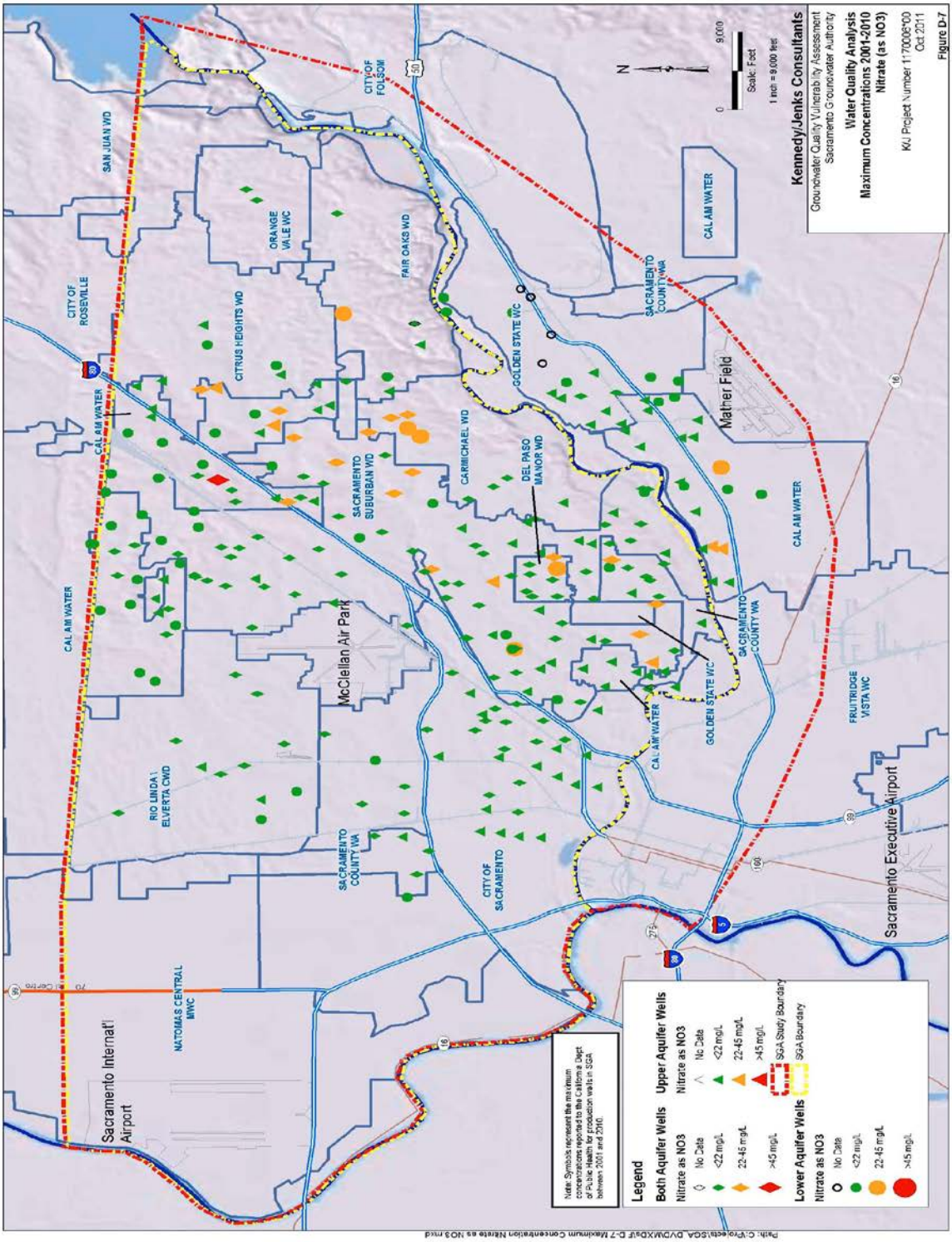


**Figure 16. Nitrate Concentrations in Public Supply Wells**

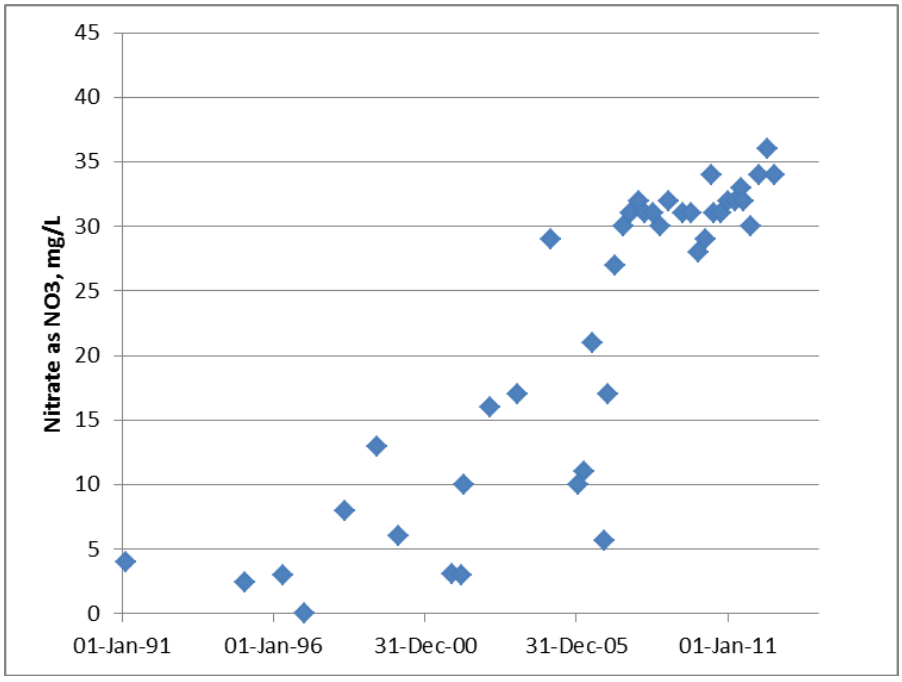


**Figure 17. Example of Public Supply Well with Rising Nitrate Concentrations**

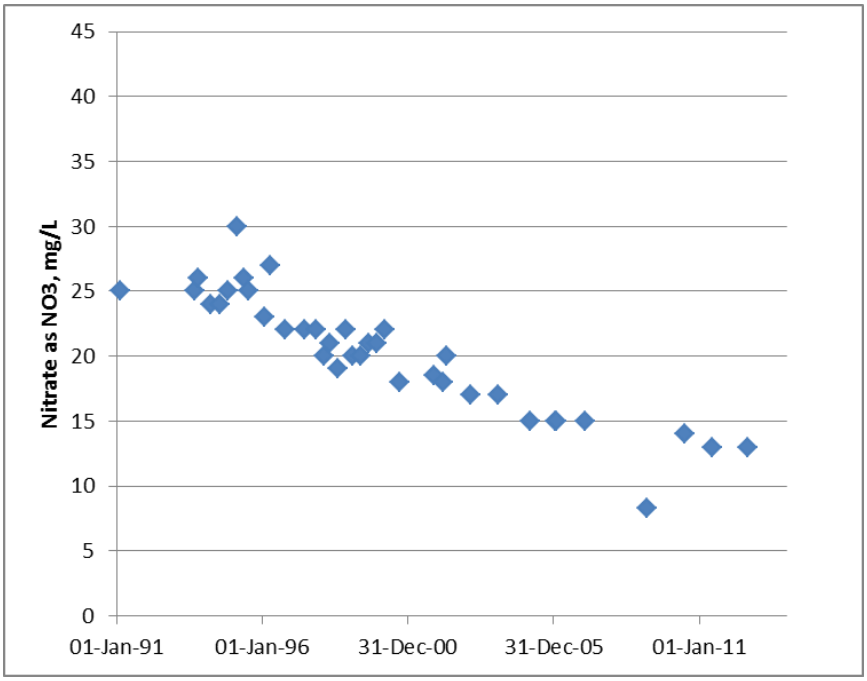


**Figure 18. Example of Public Supply Well with Declining Nitrate Concentrations**

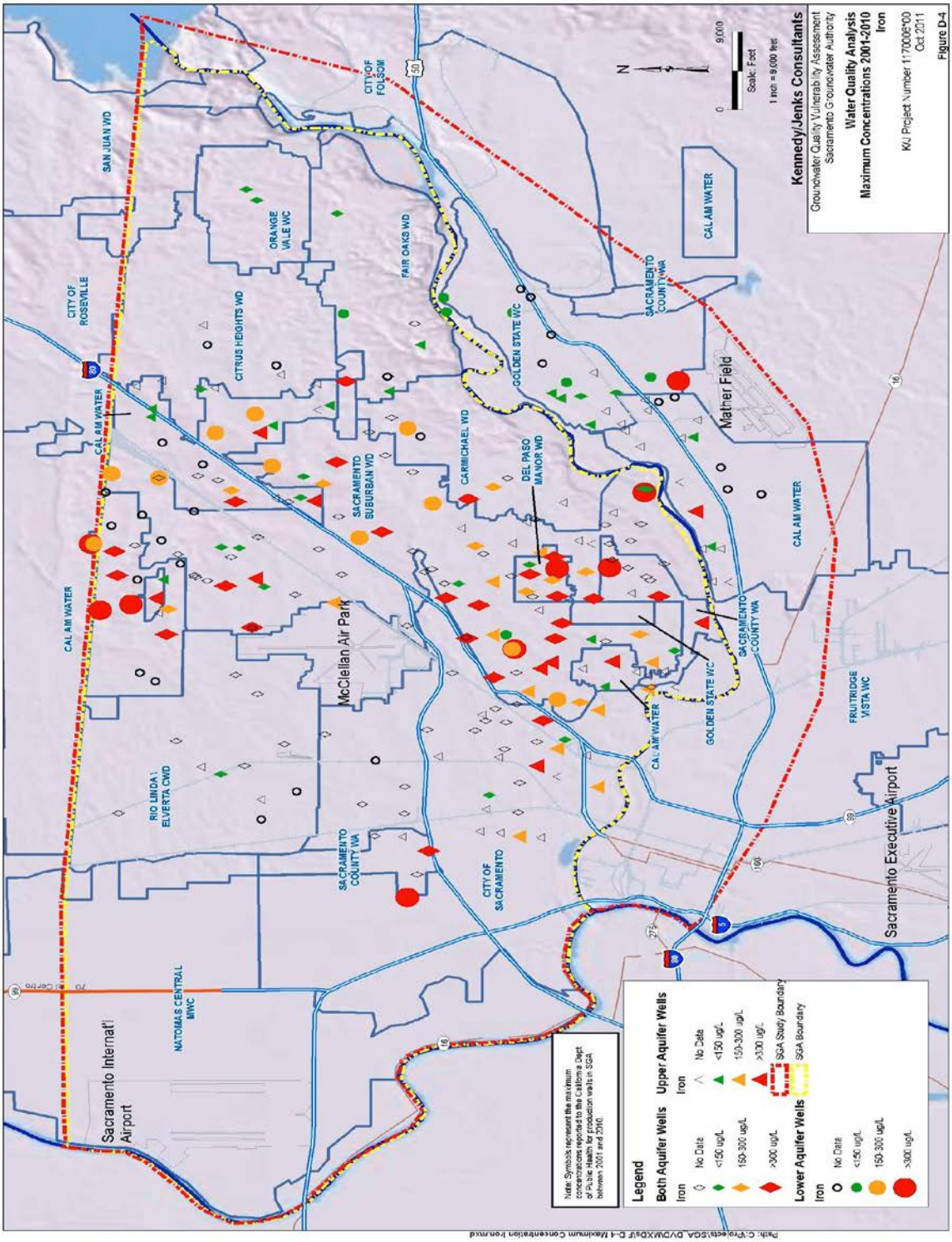


**Figure 19. Iron Concentrations in Public Supply Wells**

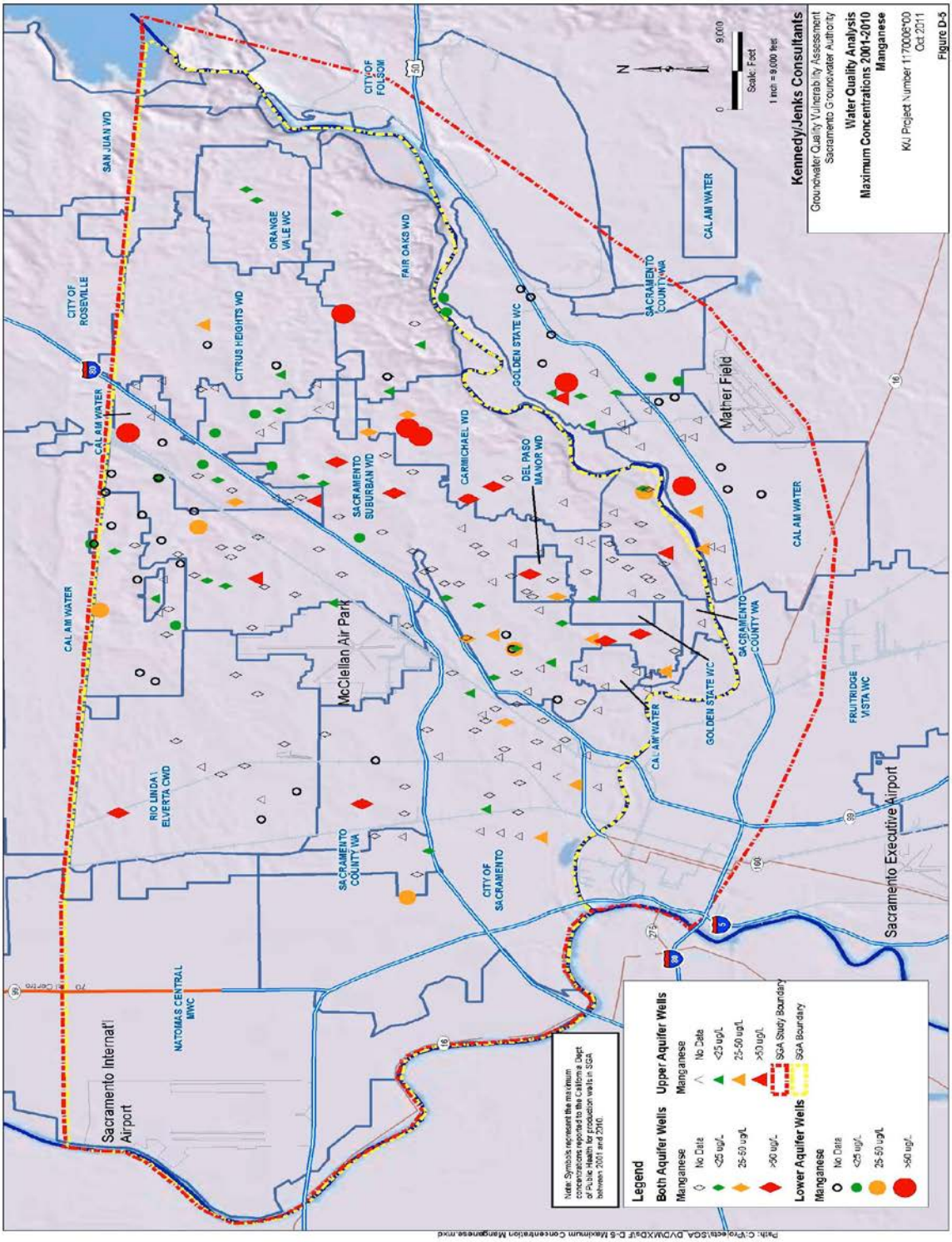


**Figure 20. Manganese Concentrations in Public Supply Wells**

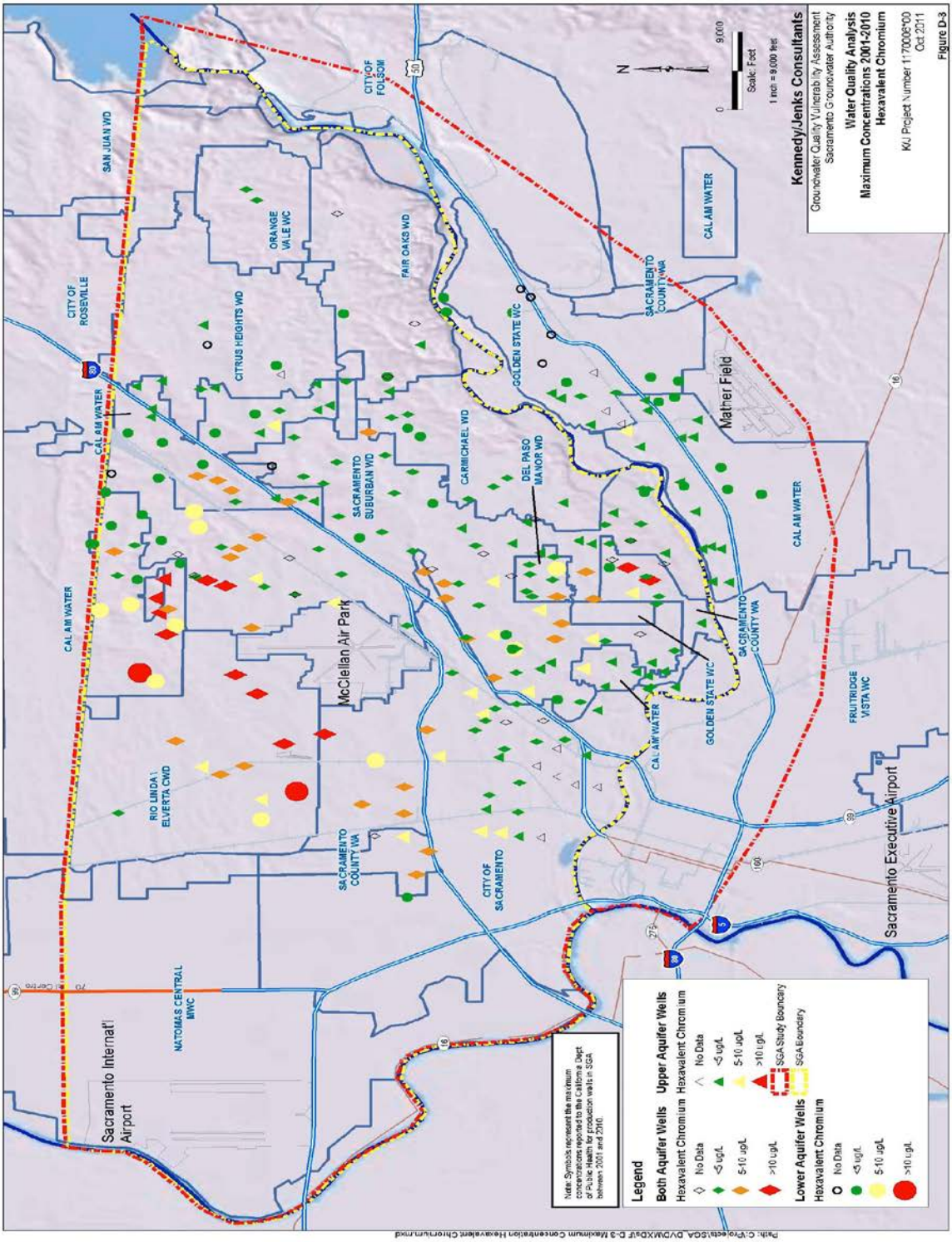


**Figure 21. Hexavalent Chromium Concentrations in Public Supply Wells**

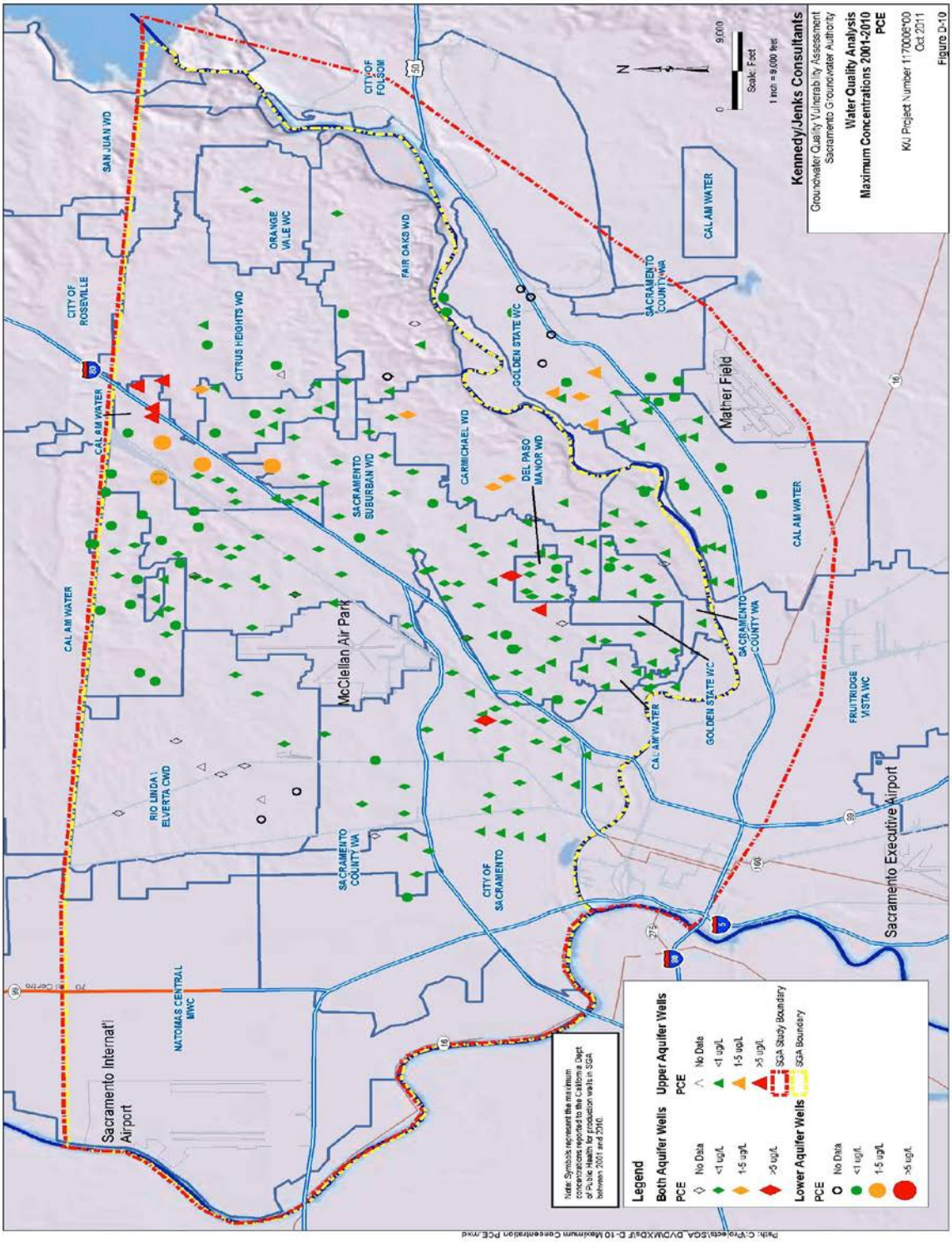


**Figure 22. Tetrachloroethylene Concentrations in Public Supply Wells**

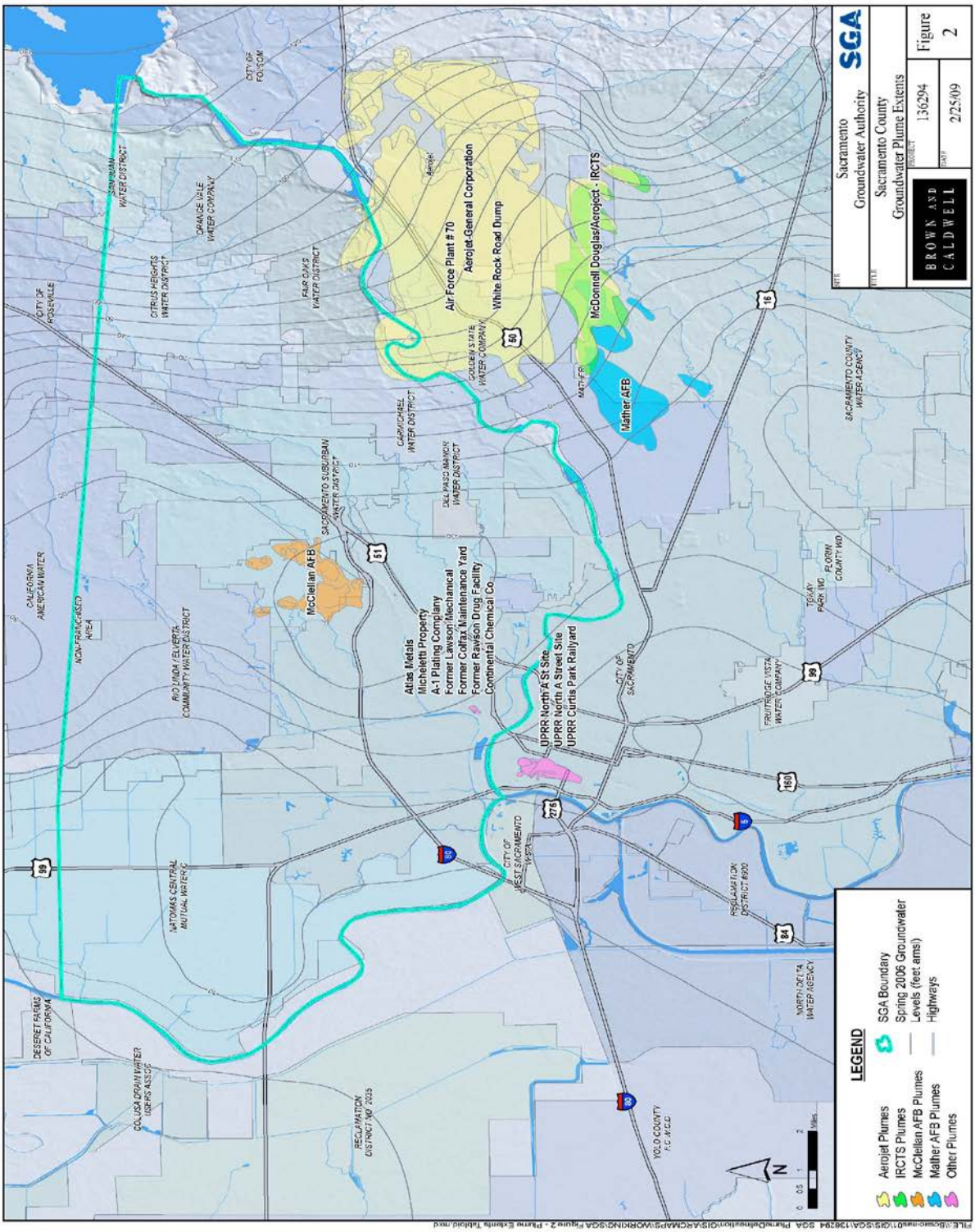


**Figure 23. Extent of Contaminant Plumes in the North Area Basin and Vicinity**

## Land Subsidence

Land surface is estimated to have subsided over 0.3 feet from 1947 to 1969 and an additional 1.9 feet from 1969 through 1989 at a benchmark near Greenback Lane, northeast of the former McClellan Air Force Base (see Figure 24). It is likely that land subsidence in this area resulted from groundwater extraction and resulting water level declines as indicated by water level trends in nearby wells. Water levels in (10N05E14Q002M) a well 2.9 miles to the west of the benchmark declined at least 68 feet in that 42-year period. Similarly, water levels in (110N06E21F002M) a well 1.5 miles to the northeast of that benchmark declined over 95 feet in the same period.

Groundwater levels in the area of the subsiding benchmark reached their lowest point in 1989, stabilized and then gradually began to recover. The rate of water level recovery in the well northeast of the benchmark rose markedly (over six feet) in the last two years. As groundwater levels recover, the region can expect to see land elevations recover to some extent, because land subsidence due to groundwater extraction has a reversible and irreversible component. The extent to which land elevations rise in response to recovering groundwater levels depends on the type of sediments that yielded the groundwater that had previously been extracted.

Land subsidence can be measured by repeating elevation surveys at a benchmark(s). Recently, GPS methods have been employed successfully for this purpose. Land subsidence potential can be determined by observing groundwater level trends and assessing the compressibility of the geologic materials that make up the aquifer.

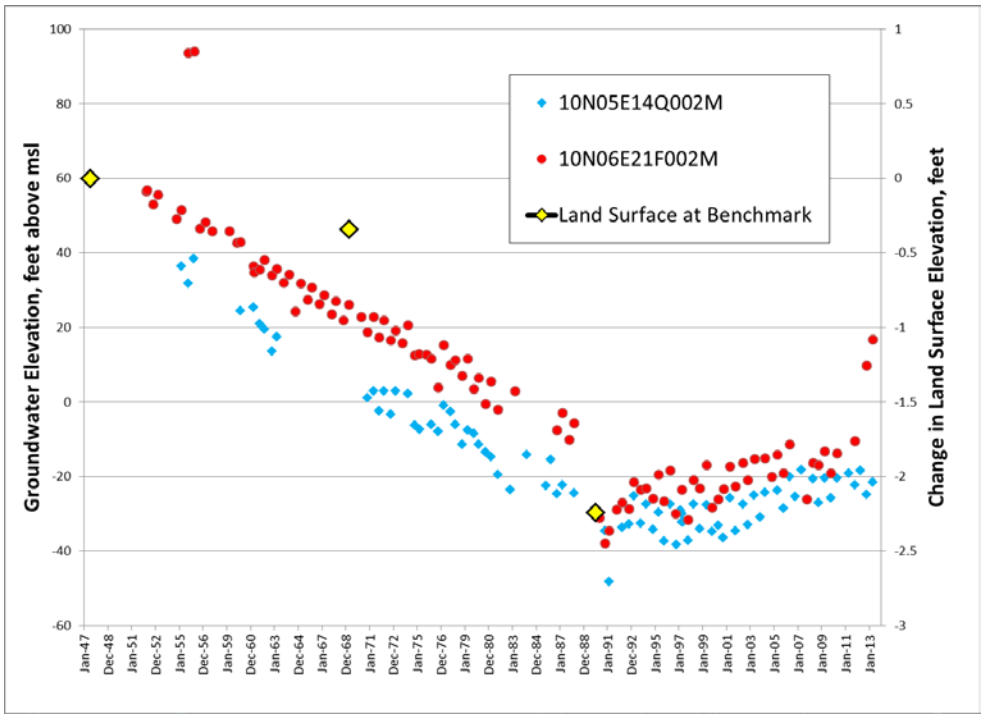


**Figure 24. Land Surface Elevation and Groundwater Level Changes near Elkhorn Blvd and Roseville Road**

# Basin Management Activity Highlights

Key management activities in the basin from 2011 through mid-2013 are described in this section.

## Implementation of the SGA Groundwater Management Plan (GMP)

The updated GMP adopted by SGA in December 2008 identifies 79 actions for management of the groundwater basin. Significant progress was achieved in implementing these actions since 2008. 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 mid-2012, the California Department of Water Resources (DWR) reviewed the status of groundwater management throughout the state, which included review of compliance with elements required in Water Code Section 10750 et seq. DWR staff found SGA's GMP to be fully compliant.

In early 2013, SGA began a comprehensive update to its GMP. As required by the SGA GMP, the plan is fully reviewed and updated every five years. The update is expected to be adopted by the SGA Board in December 2013.

## Other SGA Management Activities

A few key management actions completed by SGA during the period warrant more description. These include the following actions: 1) tracking implementation of the Water Accounting Framework, 2) implementation of CASGEM monitoring, 3) securing a local groundwater assistance grant to assess PCE contamination, 4) assisting in preparation of a representative monitoring plan for the Unregulated Contaminants Monitoring Rule (UCMR), 5) commencing a regional information and tools assessment, 6) partnering in a pilot study for hexavalent chromium treatment technologies and 7) participating in the lower American River Basin Integrated Regional Water Management Plan (ARB IRWMP) development. Each of these activities is discussed in more detail below.

### *Water Accounting Framework Tracking*

The Water Accounting Framework (Framework) adopted by the SGA Board establishes policies and procedures to encourage and support conjunctive use operations within the SGA area. The Framework was developed in three phases between 2006 and 2010. All three documents associated with the Framework phases are available at http://www.sgah2o.org/sga/programs/groundwater/.

The first official year of tracking of the Framework was calendar year 2012. Based on data collected in early 2013, nearly all of the agencies subject to the Framework were at or near their annual target pumping goal as shown in the following table.

*Table 4. Framework Goals and Actual 2012 Groundwater Pumped*

| Agency | Annual Target Pumping Goal | Actual 2012 Groundwater Pumped |
|---|---|---|
| Carmichael WD | 6,646 | 1,580 |
| City of Sacramento | 20,591 | 13,554 |
| California American | 17,995 | 13,595 |
| Del Paso Manor WD | 1,465 | 1,499 |
| Golden State WC | 1,098 | 1,119 |
| Rio Linda/Elverta CWD | 2,882 | 2,857 |
| Sacramento County WA | 4,288 | 5,211 |
| Sacramento Suburban WD | 35,035 | 27,530 |

## *CASGEM Monitoring Network*

In November 2009, the state legislature passed SBx7-6 requiring the monitoring of the state's groundwater basin for representative groundwater elevation trends. The legislation stresses locally-developed monitoring in basins that have the capacity to perform such monitoring, and tied compliance with this monitoring to eligibility for grant and loan programs administered by the state. In response to the legislation, DWR developed guidelines for what it termed the California Statewide Groundwater Elevation Monitoring (CASGEM) Program.

SGA was approved as the monitoring entity for the groundwater basin underlying the SGA area in December 2011, followed by submission of a monitoring plan. The approved network includes 23 distinct locations, 8 of which have multi-completion wells, for a total of 42 measurements to be collected. Of the wells, 12 are monitored directly by SGA staff, 23 are monitored by SSWD staff and reported to SGA, and 7 are monitored by DWR. Initial monitoring of the network occurred in October 2011 and subsequent monitoring has occurred on schedule in mid-April and mid-October since then. The monitoring plan is on the SGA website http://www.sgah2o.org/sga/.

## *Local Groundwater Assistance Act Grant*

SGA was awarded $224,969 from the California Department of Water Resources' Local Groundwater Assistance Program. SGA was one of only six entities statewide to make Tier 1 of the 2012 Local Groundwater Assistance Program funding commitment list, which means that 90% of its funding request of nearly $250,000 was granted.

The grant will allow SGA to analyze potential impacts of tetrachoroethylene (PCE) contamination to the region. SGA will coordinate the work with California American Water in order to complement their efforts regarding the following objectives:

1) better define the extent of the PCE
2) better define the nature of PCE
3) better define the potential source areas
4) better define where PCE could go in the future

The study components include installing new monitoring wells, performing additional water quality sampling, and groundwater contaminant fate and transport modeling.

### *UCMR Representative Monitoring Plan*

When EPA released its latest Unregulated Contaminant Monitoring Rule (UCMR), Sacramento Suburban Water District desired to comply with the rule by developing a plan that monitors a representative set of wells, rather than all of the wells in its system. SGA staff used its data management tools to prepare maps of well location and construction information to determine how similar wells could be grouped together for monitoring. The representative monitoring plan, submitted in October 2012, was approved by EPA. Thirty-one of the nearly 90 wells in SSWD's system were excluded from sampling. SGA's assistance resulted in significant cost savings in preparing the representative monitoring plan and will also result in significant long-term monitoring cost savings to SSWD.

### *Regional Information and Tools Assessment*

In March 2013, RWA completed an agreement with the California Water Foundation for a grant that would support Integrated Regional Water Management for the lower American River Basin. The effort, led by RWA, and coordinated with SGA, Sacramento Central Groundwater Authority, and the Placer Groundwater Management Group, would identify regional information and analytical tools needs, and recommend enhancements to existing tools. SGA is a local funding partner in the effort. Results of the assessment are expected in early 2014.

### *Hexavalent Chromium Treatment Pilot Study*

Water purveyors in the SGA have a strong interest in evaluating potential wellhead treatment options for hexavalent chromium (CrVI). SGA contributed $20,000 for a pilot study to better understand treatment technologies that can reduce the concentration of CrVI in water. Key contributors to the study were the City of Davis, Envirogen, Kennedy/Jenks and UC Davis. Additional funding was provided by the SWRCB, Water Resources Association of Yolo County, and City of Davis. The study concluded in Spring 2012.

Kennedy/Jenks staff presented the results of the study to the SGA Board in June 2013. The study evaluated existing treatment technologies for CrVI removal including a strong base anion exchange, a weak base anion exchange and reduction coagulation filtration. The City of Davis provided water from one of its wells and all three systems successfully reduced CrVI. The study prepared cost estimates of each process.

### *ARB IRWMP Development Coordination*

SGA actively participated in development of objectives and strategies for the ARB IRWMP, which was adopted by the RWA Board on July 11, 2013. SGA ensured that issues related to groundwater are included as priorities in the plan to ensure water resources are being managed in an integrated fashion. SGA also assisted in setting up a groundwater simulation to assess potential impacts of future climate change as part of the required elements by DWR for an IRWMP.

# Conclusions and Recommendations

SGA has continued to make significant strides toward ensuring a reliable and sustainable groundwater basin for future generations and advancing successful implementation of the Water Forum Agreement. With available monitoring and management tools, SGA has had a solid foundation for managing the basin. Moving into the future, SGA is evaluating its long-term data and analytical tools needs and is comprehensively updating its GMP to ensure it reflects the latest understanding and management needs of the basin.

During the revision of its GMP in 2008, SGA reviewed the original 2003 Basin Management Objectives and considered additional objectives. Furthermore, SGA evaluated the need to establish numeric targets associated with these objectives. SGA determined that there was little value in establishing quantified objectives at this time. The 2008 GMP adopted by SGA includes eight 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 to ensure sustainable use of the groundwater basin*

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. Through this committee, the issue of PCE contamination was raised that led SGA to applying for local groundwater assistance grant funding to help assess the problem as described above.

### *Maintain groundwater elevations that provide for sustainable use of the groundwater basin*

This objective is being met. 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 continue to produce tangible results. The long-term hydrographs shown previously in this report clearly demonstrate the benefits of conjunctive use in the basin.

Finally, monitoring of the Water Accounting Framework demonstrates that agencies are making progress to meeting their groundwater use goals in the central part of SGA. This 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 potential inelastic land surface subsidence*

This objective is being met. Although subsidence has been documented at one benchmark northeast of the former McClellan Air Force Base, the declining groundwater levels that appear to have been its cause have stabilized and are even rising slightly. In order to track continuing subsidence that may be resulting from the historical groundwater level decline and to establish a baseline against which future land surface elevation changes can be measured, SGA should investigate the feasibility of conducting land elevation surveys suitable for these purposes.

### *Manage groundwater to protect against adverse impacts to surface water flows in the American River, the Sacramento River, and other surface water bodies within the SGA area*

SGA is continuing to meet this objective. Past model runs during development of the Water Accounting Framework demonstrated no significant adverse impacts to surface water flows. Direct monitoring has demonstrated that groundwater levels have continued to improve in the basin as a result of management actions.

### *Protect against adverse impacts to surface or groundwater quality resulting from interaction between groundwater in the basin and surface water flows in the American River, the Sacramento River, and other surface water bodies within the SGA area*

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.

### *Educate on the need to achieve recharge to the aquifer of appropriate quality and quantity to ensure basin sustainability*

SGA is making progress toward this objective. SGA is coordinating with pilot projects to evaluate recharge in stormwater detention basins near Elk Grove and in a former gravel mining operation south of Rancho Cordova. SGA will also conduct additional assessment of its recharge areas in compliance with AB359 during preparation of its GMP update in late 2013.

### *Maintain a sustainable groundwater basin to help mitigate potential water supply impacts resulting from an uncertain climate future and an increasingly unreliable state and federal water delivery system*

SGA is making good progress toward meeting this objective. The completion of the Water Accounting Framework was a significant step toward defining both the amounts and responsibilities of sustainable levels of groundwater use in the central

part of the SGA area. SGA also coordinated with RWA to evaluate the potential impacts on the groundwater basin resulting from future climate changes scenarios. Based on simulations run during preparation of the ARB IRWMP, the SGA is well-positioned in the face of climate change.

### *Maintain a sustainable groundwater basin underlying the SGA area through coordination and collaboration with adjacent groundwater basin management efforts*

SGA is making good progress toward meeting this objective. SGA continues to regularly coordinate with representatives of Placer County and the Sacramento Central Groundwater Authority. In 2011, SGA coordinated with these entities on development of a CASGEM monitoring network. In 2012 and 2013, SGA has continued to meet with these entities on the regional information and tools assessment as well as evaluating other potential areas where coordination could lead to more effective groundwater management.

## Recommendations for GMP Objectives and Action Items

While the GMP Implementation Table (see Appendix A) is used to track specific actions identified in the 2008 GMP, the following recommendations are priority recommendations for 2013 and 2014 that will help SGA implement its groundwater management mission.

- Revise and re-adopt the SGA GMP by December 2013.
- Continue close coordination with RWA to ensure that groundwater-related issues are represented in the ARB IRWMP.
- Continue active participation with RWA and representatives of Placer County and Sacramento Central Groundwater Authority to complete the regional information and tools assessment which will identify long-term data management and assessment tool needs.
- Assist in the study of potential sources of PCE contamination in north Sacramento County as an issue of regional concern.

# Appendix A

## Groundwater Management Plan Action Items

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | 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 | Provide briefings, copies of Basin Management Reports, and a written annual summary to the Water Forum Successor Effort on GMP implementation progress. | 12 months | Provided copies of the 2008 GMP and Biennial Basin Management Report to WFSE in February 2009.<br><br>Sent 2011 BMR to WFSE in June 2012. |
| 3 | Provide a written annual summary on GMP implementation progress to JPA signatories. | 12 months | Initial annual summary covering 2011 sent to signatories in April 2012.<br><br>Letter covering 2012 sent in October 2013. |
| 4 | Work with SGA members to maximize outreach on GMP activities including the use of the SGA Web site, member Web sites, or bill inserts. | On-going | Posted 2008 GMP and BMR update on SGA website in February 2009.<br><br>Posted 2011 BMR on SGA website in April 2012.<br><br>Electronic versions of all Board packets are posted on the SGA website. |
| **1.2** | ***Involving Other Agencies Within and Adjacent to the SGA Area*** | | |
| 1 | To the extent practicable attend regular meetings of the Sacramento Central Groundwater Authority and the Placer Groundwater Authority and notify them of SGA Board meetings. | On-going | SGA staff participate in regular meetings of the SCGA.<br><br>In Placer County, the groundwater management plan representatives have not formed as an official entity and do not currently have a standing meeting.<br><br>All SGA Board meetings are noticed via e-mail to a representative of SCGA and the Placer County GMP group. |
| 2 | Provide copies of the adopted GMP and subsequent Biennial Basin Management Reports to representatives from Placer Groundwater Authority, Sutter County, and Yolo County, and the Sacramento Central Groundwater Authority. | 3 months | Copies of the 2008 GMP and BMR 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 Water Resources Agency, and SCGA by June 2009.<br><br>Did not send 2011 BMR update. |
| 3 | Meet with representatives from Placer Groundwater Authority, Sutter County, and Yolo County, and the Sacramento Central Groundwater Authority as needed. | On-going | SGA coordinating with representatives of Sutter County during development of a GMP for Sutter County. The GMP was adopted in March 2012, and SGA has obtained a copy of the GMP.<br><br>SGA attended a public scoping meeting for proposed ASR program in City of Roseville (Placer County) in July 2009. Commented on Notice of Preparation. |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 4 | Coordinate with the Placer Groundwater Authority and Sacramento Central Groundwater Authority to develop a common data platform and share groundwater-related data to the greatest extent practicable to help ensure the mutual sustainability of our common groundwater resources. | 12 months | Copies of the SGA database were provided to SCGA and Placer County in 2009.<br><br>SCGA completed a grant-funded update of its database in 2011. Because the SGA and SCGA data were initially in the same dataset, the SGA data was migrated to the HydroDMS platform. SGA is yet to make a determination of its long-term preferred data management platform, but expects to make a recommendation in 2014.<br><br>Met with City of Roseville (representing the Placer County groundwater management effort) on October 29, 2009 to get briefing on their data gathering and storage effort. While Roseville will be using different software to manage its data, it can be exported in a compatible format.<br><br>SGA staff met with SCGA and Placer County representatives in April 2012 to continue discussing data compatibility issues.<br><br>SGA participating in Regional Information and Tools Assessment project managed by RWA throughout 2013. Project expected to be completed in early 2014. |
| **1.3** | ***Utilizing Advisory Committees*** | | |
| 1 | The GMP Implementation Committee will meet at least annually to review and guide implementation of the plan. | On-going | Did not meet in 2009-2012.<br><br>A GMP Update Committee was appointed in October 2012. The committee recommended that a standing Implementation Committee be eliminated. Instead, an annual update should be provided to the SGA Board for feedback on future GMP implementation. |
| **1.4** | ***Developing Relationships with State and Federal Agencies*** | | |
| 1 | Continue to develop working relationships with local, state, and federal regulatory agencies. | On-going | Continue regular meetings of Regional Contamination Issues Committee to engage state and federal regulatory agencies. |
| **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.<br><br>Met with DWR staff at their request regarding member agency participation in 2009 Drought Water Bank.<br><br>Assisted agencies in conducting exchanges in 2009 and 2010.<br><br>Contacted USBR in January 2013 to inquire about potential and process for establishing a USBR-designated banking facility in the region.<br><br>Submitted support letter to State Board for SSWD transfer in May 2013. |
| 2 | Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects. | On-going | Attended AB 303 Local Groundwater Assistance grant Technical Advisory Committee meeting in June 2009.<br><br>Submitted AB 303 application in July 2012 to study PCE contamination. |
| **COMPONENT CATEGORY 2: MONITORING PROGRAM** | | | |
| **2.1** | ***Groundwater Elevation Monitoring*** | | |
| 1 | Coordinate with member agencies to collect data from a group of representative wells for monitoring spring and fall groundwater elevation measurements. | 6 months | Request Spring and Fall measurements annually. These measurements are part of the CASGEM network approved by DWR. |
| 2 | Coordinate with DWR and other well monitoring program partners, including SGA members, to ensure that the selected wells are maintained as part of a long-term monitoring network. | 6 months | Met with DWR, Sacramento County and applicable members in 2011 to develop CASGEM network for long-term basin monitoring. |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 3 | Coordinate with partners and request that the timing of water level data collection occur on or about April 15 and October 15 of each year. | 6 months | Request measurements twice annually on schedule. |
| 4 | Coordinate with partner agencies to ensure that needed water level elevations are collected and verify that uniform data collection protocols are used among the agencies. | 6 months | Water level measurement protocols were included in the SGA GMP, which was sent to General Managers of each SGA member agency. Additional CASGEM guidance was sent to SSWD as a cooperator in 2012. |
| 5 | Coordinate with the USGS to determine the potential for integrating USGS monitoring wells constructed for the NAWQA Program into the SGA monitoring network. | 12 months | Met with USGS in September 2011 to discuss use of a subset of NAWQA network wells as part of the SGA CASGEM monitoring program. USGS has granted access to SGA for monitoring four of the NAWQA wells on a semi-annual basis. |
| 6 | Maintain the existing SGA monitoring well network for purposes of groundwater elevation monitoring. | On-going | Wells are being maintained and monitored and have been incorporated into CASGEM network.<br><br>Pressure transducers have been removed from wells 5 and 6 because they are below grade and had recurring maintenance issues. The transducer has been removed from well 8 because no water level variability was observed. |
| 7 | Provide a biennial assessment of groundwater elevation trends and conditions to SGA's member agencies, the Water Forum Successor Effort, and adjoining groundwater authorities. | 3 months | BMR covering 2006-07 released in December 2008 and posted on SGA website.<br><br>Report covering 2008-10 to released in April 2012 and posted on SGA website.<br><br>Report covering 2011-2012 completed in October 2013 and posted on SGA website. |
| 8 | Assess the adequacy of the groundwater elevation monitoring well network biennially. | 12 months | Review in 2011 as part of CASGEM compliance. SGA has identified a representative set of wells that will be used for CASGEM compliance. SGA has also identified additional wells that will be used for long-term hydrographs and preparation of an annual contour map. Data from these wells is included in the April 2012 SGA Basin Management Report. |
| **2.2** | ***Groundwater Quality Monitoring*** | | |
| 1 | Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data. | On-going | Agencies are using standards for collection of samples under Title 22 monitoring requirements. |
| 2 | Maintain the existing SGA monitoring well network for purposes of groundwater quality monitoring. | On-going | The wells are being maintained. The last water quality sampling occurred in 2007. |
| 3 | Coordinate with the USGS to continue to obtain water quality data from NAWQA wells. | 12 months | Corresponded with USGS to understand status of NAWQA network in July 2010. USGS confirmed wells are monitored every 2 to 3 years for water quality depending on budget. |
| 4 | Coordinate with member agencies and other local, state, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data. Identify opportunities for collecting and analyzing water quality samples from those wells. | 12 months | No areas of significant data gaps are currently identified. |
| 5 | Assess the adequacy of the groundwater quality monitoring well network in the Biennial Basin Management Report. | 12 months | During the 2009-2011 study of groundwater quality vulnerability in the SGA area, the network was determined to be appropriate to understand most water quality concerns in the basin. Specific additional monitoring will need to be identified as specific issues arise. |
| **2.3** | ***Land Surface Elevation Monitoring*** | | |
| 1 | Re-survey the benchmarks established at SGA monitoring wells. | 24 months | Staff does not recommend that the monitoring wells be re-surveyed. Benchmarks were not established at these sites, so the value of surveying them would be questionable. |
| 2 | Coordinate with other agencies, particularly the City and County of Sacramento, the NGS, and SAFCA to determine if there are other available data in the SGA area to aid in the analysis of potential land surface subsidence. | 6 months | In 2008 and 2009, staff attempted to identify appropriate sites through the www.ngs.noaa.gov website. Very little active and accessible data is available in the region. Sac Suburban has actively monitoring benchmarks at most of its well sites, and is not observing any appreciable subsidence. Staff recommends continued coordination with Sac Suburban at this time. |
| 3 | Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence. | On-going | Given the lack of evidence of subsidence in the SGA area, this item is being deferred at this time. |
| **2.4** | ***Surface Water Groundwater Interaction Monitoring*** | | |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 1 | Coordinate with local, state, and federal agencies to identify available surface water quality data from the American and Sacramento rivers adjacent to the SGA area. | 12 months | 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 2007 version of this report, which was completed in early 2009. |
| 2 | Correlate groundwater level data from wells in the vicinity of river stage data to further establish whether the river and water table are in direct hydraulic connection, and if the surface water is gaining or losing at those points. | 12 months | 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 2007 version of this report, which was completed in early 2009. |
| 3 | Continue to coordinate with local, state, and federal agencies and develop partnerships to investigate cost-effective methods that could be applied to better understand surface water-groundwater interaction along the Sacramento and American rivers. | 12 months | This was completed as part of an evaluation of the 2010 Drought Water Bank and development of the SGA Water Accounting Framework. The SGA IGSM application was run to estimate the level of surface-water groundwater interaction in the region as a result of current conjunctive use operations. Results were presented to the SGA Board and DWR in February 2010. |
| 4 | Coordinate with CSUS to analyze data obtained from monitoring wells on the CSUS campus to better understand the relationship between the groundwater basin and surface water flows at that location. | 12 months | SGA staff communicated with CSUS and discovered that the wells are not consistently monitored and data is not consistently analyzed. Staff recommends no further action on this item. |
| 5 | Coordinate with the Corps of Engineers and SAFCA to review projects that could negatively impact recharge from rivers to the underlying groundwater basin. | On-going | Staff is tracking progress on the American River Common Features General Re-evaluation Report (GRR). The GRR will investigate the flood protection system along the American River, Natomas, the east side of the Sacramento River, and the levees in North Sacramento to identify what improvements are needed to bring the system up to a 200-year standard (www.safca.org). The report is expected in 2014. |
| **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. | 3 months | Water level measurement protocols are included in the SGA GMP. The final GMP was sent to member agency General Managers and Directors in 2009. |
| 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). | 6 months | This guidance document is out of date and is no longer available. |
| 3 | Provide training on the implementation of these SOPs to member agencies, if requested. | On-going | No training has been requested. |
| **COMPONENT CATEGORY 3: DATA MANAGEMENT AND ANALYSIS** | | | |
| **3.1** | ***SGA Groundwater Model*** | | |
| 1 | Assemble a committee to review the current functionality of the SGA IGSM application and to discuss the pros and cons of the existing modeling tool and other tools (e.g., IWFM or MODFLOW) that may be available for longer-term modeling needs. | 24 months | This activity did not occur as described in the action. SGA is currently coordinating with RWA on the Regional Information and Tools Assessment, which will look at the features of the current SGA IGSM and a regional MODFLOW application. The assessment will be completed in early 2014. |
| 2 | Canvas the membership annually to determine if they have any upcoming modeling needs. | 12 months | Used model to determine losses of banked water and streamflow losses resulting from participation in water transfers with state or federal programs in 2009-2010.<br><br>Members are being surveyed in October 2013 for any anticipated modeling needs. |
| 3 | Work with the current modeling support consultant to identify tools (pre- and post-processing) that can make the model more efficient to operate and to create graphics that help better present modeling results. | 12 months | The modeling consultant has made improvements to the pre- and post-processing tools for use in the ArcGIS software environment. |
| **3.2** | ***Comprehensive Data Analysis*** | | |
| 1 | Prepare the Biennial Basin Management Report to assess basin conditions in even numbered years. | On-going | Report for 2008-2010 completed in April 2012.<br><br>Report for 2011-2012 completed in October 2013. |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 2 | Prior to preparation of the 2010 version of the Basin Management Report, review the content of the report with the GMP Implementation Committee to ensure the content of the report is addressing the needs of the SGA members. | 18 months | Committee did not meet in 2009-2011.<br><br>SGA consulted with a retired DWR geologist to review report content in 2013. Any recommended improvements are included in the 2011-2012 BMR completed in October 2013. |
| 3 | As requested, conduct more focused analyses on issues of concern to SGA members (e.g., cluster of contamination emerging or declining water elevations in a particular part of the basin). | On-going | SGA assisted the City of Sacramento in meeting with the Central Valley Board in early 2013 over contamination in wells in the El Monte Triangle area. The meeting resulted in learning that remediation efforts in the area are underway.<br><br>Cal Am notified SGA of concerns of cluster of wells with high PCE in March 2009. SGA Board directed staff to apply for AB303 funding to study this problem, which occurred in July 2012. SGA was awarded funds in July 2013.<br><br>SGA advised SSWD staff on follow-up to detected NDMA in a production well in March 2009. |
| **3.3** | ***Data Management System*** | | |
| 1 | Continue to update the SGA database with current water purveyor data. | On-going | Requested 2007-2008 data in 2009. Requested data through 2012 in early 2013. |
| 2 | Make recommendations to the DMS developer on utilities to add to the DMS to increase its functionality. | On-going | The original SGA DMS is no longer being supported by the original developer. Staff will consult with Board in 2014 on recommendations for long-term SGA data maintenance. |
| 3 | Review the current database and recommend actions to increase the accuracy and efficiency of the SGA database. | 12 months | Database review deferred pending results of Regional Information and Tools Assessment to be completed in early 2014. |
| 4 | Work with adjacent groundwater authorities on shared data protocols to achieve the highest level of confidence in the comprehensive data analysis. | 12 months | Staff to meet with representatives of Placer County and the Sacramento Central Groundwater Authority in April 2012. Discussions are ongoing as part of Regional Information and Tools Assessment. |
| **COMPONENT CATEGORY 4: GROUNDWATER RESOURCE PROTECTION** | | | |
| **4.1** | ***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. | 6 months | The County well ordinance was updated in April 2010. The update has been posted on the SGA website at http://www.sgah2o.org/sga/programs/groundwater/. |
| 2 | Inform member agencies of Sacramento County's Consultation Zone and provide a copy of the boundary of the former McClellan AFB prohibition zone to appropriate member agencies. | 6 months | SGA Board was briefed on McClellan consultation and prohibition zone in December 2010, along with proposed modifications to the prohibition zone. |
| 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. | 6 months | Updated plumes extents as part of Groundwater Quality Vulnerability Assessment completed in 2011. Presented to SGA Board and Regional Contamination Issues Committee. |
| 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. | On-going | Staff provided information to Rio Linda/Elverta CWD in 2011 to assist in their design of a new production well.<br><br>Staff coordinated with City of Sacramento in 2011/2012 on two future production wells. |
| **4.2** | ***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. | 12 months | The County destruction procedures have been posted on the SGA website at http://www.sgah2o.org/sga/programs/groundwater/. |
| 2 | Coordinate with the Sacramento County EMD to identify ways to ensure that wells in the SGA area are properly abandoned or destroyed. | On-going | Staff communicated with County on possibility of pursuing joint application for AB303 grant to fund startup of program to be administered by EMD. The SGA Board directed staff to pursue AB303 grant funding for a different study in 2011, but staff will continue to work with the County to ensure wells are properly abandoned. |
| **4.3** | ***Wellhead Protection Measures*** | | |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 1 | Obtain an updated coverage of potentially contaminating activities and provide to member agencies for their use in protecting existing wells and in siting future wells. | 12 months | Obtained in April 2010. Used in Groundwater Quality Vulnerability Assessment completed in 2011. |
| 2 | Canvas the SGA membership for current wellhead protection measures and provide a summary of actions taken by others as a tool in managing their individual wellhead protection programs. | 18 months | This task has not been completed as a low priority. |
| **4.4** | ***Protection of Recharge Areas*** | | |
| 1 | Quantify, using the existing numerical SGA groundwater model, the potential recharge over the SGA area. | 18 months | This was completed as part of an evaluation of the 2010 Drought Water Bank and development of the SGA Water Accounting Framework. The SGA IGSM application was run to estimate the level of surface-water groundwater interaction in the region as a result of current conjunctive use operations. Results also help identify the primary recharge areas in the basin. |
| 2 | Compare modeling results with existing geologic maps to develop a map of areas that are potentially contributing significant recharge in the basin. | 18 months | This task has not yet been completed. AB359 was passed in 2011 and requires mapping of recharge areas in groundwater management plans. Recharge areas will be addressed in the 2013 SGA GMP Update. |
| 3 | Communicate with adjacent groundwater authorities and land-use planners to emphasize the need to protect prominent groundwater recharge areas. | 18 months | This task will be completed following the identification of recharge areas described above. |
| **4.5** | ***Control of the Migration and Remediation of Contaminated Groundwater*** | | |
| 1 | Continue facilitation of Regional Contamination Issues Committee to coordinate the efforts of regulators, responsible parties, and water purveyors to expedite the cleanup of contamination in the basin. | On-going | Met in February, April, August, and September 2009.<br><br>Met in January, April, July 2010.<br><br>Met in February, July, October 2011.<br><br>Met in April, July 2012.<br><br>Met in April, August 2013. |
| 2 | 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 | This issue has been discussed regarding contamination associated with Aerojet at Regional Contamination Issues Committee meetings. Aerojet has coordinated with Carmichael WD to resolve this. |
| 3 | If detections occur in these monitoring wells, facilitate meetings between the responsible parties and the potentially impacted member agency to develop strategies to minimize the further spread of contaminants. An example of a strategy would be to consider altering groundwater extraction patterns in the area to change to groundwater gradient. | On-going | Not applicable at this time. |
| 4 | 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 and monitoring wells. | 12 months | Performed as part of Groundwater Quality Vulnerability Assessment completed in 2011. |
| **4.6** | ***Control of Saline Water Intrusion*** | | |
| 1 | Observe TDS concentrations in public supply wells 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 biennial assessment of basin conditions. | On-going | Most recent TDS concentrations were included in the April 2012 Basin Management Report. |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 2 | Inform all member water purveyor managers of the presence of the saline water interface in the deep Mehrten formation and the approximate depth of the interface below their service area for their reference when siting potential wells. The SGA will also ensure that the EMD, which issues well permits, is aware of the interface. The SGA will provide a map indicating the contour of the elevation of the base of fresh water in Sacramento County to the EMD for their reference when issuing well permits. | 12 months | DWR informed SGA in 2011 that it is attempting to update this information, so the task is not completed. SGA staff will post the information on the SGA website when it is completed by DWR. |
| **COMPONENT CATEGORY 5: GROUNDWATER SUSTAINABILITY** | | | |
| **5.1** | ***Conjunctive Management Activities*** | | |
| 1 | Continue to investigate conjunctive use opportunities within the SGA area. The SGA and its members will coordinate with the RWA and its members, as appropriate. | On-going | Much of this work completed as part of the 2013 update to the American River Basin Integrated Regional Water Management Plan (IRWMP). |
| 2 | Continue to investigate opportunities for the development of direct recharge facilities in addition to in-lieu recharge (e.g. aquifer storage and recovery wells or surface spreading facilities, through constructed recharge basins or in river or streambeds). | On-going | Staff began coordinating in 2010 on pilot studies of a former gravel mine pit near Rancho Cordova and a detention basin with dry wells near Elk Grove as possible recharge options in the region. These studies should be completed by 2014.<br><br>Staff is continuing to track efforts by City of Roseville to implement ASR in the region. Roseville certified an EIR on the project in March 2012. |
| 3 | Participate directly with the RWA IRWMP effort and ensure that SGA projects are included in the IRWMP. | On-going | Staff is ensuring that projects are being included in 2013 update of IRWMP. Projects are being entered into the web-based interface for the IRWMP at http://irwm.rmcwater.com/rwa/login.php. |
| 4 | Implement the SGA Water Accounting Framework to track the level of implementation of an appropriate conjunctive use program for the sustainability of the underlying groundwater basin. | 12 months | WAF Phase III adopted in June 2010. Official reporting commenced in 2013 and was reported to the SGA Board. |
| 5 | Report annually, or as-needed, to the Water Forum Successor Effort on the planning and completion of projects that increase capacity to conjunctively manage the groundwater basin and also report on issues that reduce conjunctive management capacity (e.g., detection of contaminants). | 12 months | Staff provided presentation on Water Accounting Framework to Water Forum Plenary in July 2010.<br><br>Staff provided presentation on IRWMP to Water Forum Plenary in July 2010.<br><br>Staff coordinates with Water Forum Successor Effort to determine if there areas of interest to the Plenary for an update. |
| 6 | Meet with representatives of the upper American River watershed to discuss their recently completed climate change analysis and identify opportunities for incorporating this information into a study for responding to changing future hydrologic conditions. | 6 months | Received briefing in February 2010. |
| 7 | Coordinate with state and federal water agencies to determine if there are any forecasting resources available to give local water suppliers advance warning of expected water supply conditions for the upcoming year. | 6 months | Reviewed available information prepared by DWR and USBR. Staff determined that the degree of uncertainty associated with this forecasting limits opportunities to effectively provide "advance warning." Staff continues to track monthly snow survey results and coordinates with RWA on issuing press releases based on those results. |
| 8 | Meet with representatives of the USBR to understand the status of any studies of future climate change impacts and other operational criteria that could impact operations at Folsom Reservoir, which could impact conjunctive use operations. | 12 months | Staff has not met with USBR. SGA has obtained results of potential impacts to inflow into Folsom as a result of climate change modeling. This data was used in 2013 to estimate potential impacts to surface water supplies and resulting potential impacts to groundwater supply in the RWA IRWMP. |

**SGA Adopted GMP Action Items**
**(as of 10/4/2013)**

| | Description of Action | Schedule | Comments |
|---|---|---|---|
| 9 | Coordinate with representatives from Sacramento Central Groundwater Authority and existing Placer County and Sutter County groundwater management efforts to communicate expected water elevation changes resulting from conjunctive use in the SGA area and to understand the efforts and expected results of implementing conjunctive use in their respective management areas. | 12 months | Completed in 2010 as part of Water Accounting Framework. Results indicated no appreciable changes resulting from implementation of conjunctive use program. Placer County and SCGA received updates during Water Accounting Framework briefings in 2010. |
| **5.2** | ***Assess Water Quality Threats to Groundwater Basin Sustainability*** | | |
| 1 | Using the existing SGA IGSM application and the locations of known contaminant plumes in the basin, run modeling scenarios that simulate the current planned conjunctive use program in the SGA basin to determine the potential future movement of contamination and the potential extent of threatened water supply facilities. | 6 months | As of December 2008, the latest known extents of major contaminant plumes in the basin were compiled into a consolidated GIS coverage.<br><br>The modeling exercise was completed in 2011. Based on the results, the conjunctive use operations do not appear to have an appreciable impact on the mobility of known contaminant plumes. |
| 2 | Update known potentially contaminating activities and other known point-source contaminants (e.g., leaking underground storage tanks) to determine where significant risks may exist to current or planned water supply facilities. | 6 months | The data was purchased in April 2010. Results of analysis of the data are available in the Groundwater Quality Vulnerability Assessment completed in 2011. |
| 3 | Review potential upcoming regulatory changes to water quality standards that could negatively impact water supply facilities. | 12 months | Attended July 14, 2009 talk by Bruce Macler of EPA regarding possible new drinking water regulations.<br><br>Reviewed potential contaminants of concern in the Groundwater Quality Vulnerability Assessment completed in 2011.<br><br>SGA commenting on proposed hexavalent chromium standard in October 2013. |
| 4 | Following completion of the actions above, recommend follow on studies where areas of significant concern or where data gaps exist. | 18 months | The Groundwater Quality Vulnerability Assessment completed in 2011 did not reveal significant data gaps. However, the potential cause of contaminants emerging in the Cal Am north Sacramento County service area remains unresolved. The SGA Board directed staff to pursue AB303 grant funding to investigate potential sources of PCE and TCE in the vicinity, and the study will commence in late 2013. |
| **5.3** | ***Potable Supply Demand Reduction*** | | |
| 1 | Coordinate with the RWA and its members that have signed specific agreements to the WFA to understand if 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. | 12 months | Assisted local agencies in obtaining AB1420 compliance, which is related to complying with these conservation efforts in late 2010. |
| 2 | Coordinate with SRCSD through the RWA to investigate opportunities for expanded use of recycled water throughout the county as a non-potable supply for outdoor irrigation providing natural in-lieu recharge to the groundwater basin. | 12 months | Began participating on SRCSD committee in mid-2010 to identify and promote uses of recycled water in the SRCSD service area.<br><br>Successfully assisted SRCSD in applying for grant funds to expand recycled water to a SMUD Cogen Facility in late 2010.<br><br>Staff participates in SRCSD water recycling coalition meetings (held approximately twice per year). |
| 3 | Encourage the appropriate application of treated remediated groundwater for beneficial uses to help reduce demands for potable water supply. | On-going | Met with EPA staff in October 2010 to begin discussing identifying more uses for remediated water.<br><br>SGA ensured that objectives and strategies for reusing remediated groundwater were included in the 2013 RWA IRWMP update. |


SGA